Running head: ADOPTION OF RECOMMENDED EATING BEHAVIORS

ADOPTION OF RECOMMENDED EATING BEHAVIORS FOLLOWING
BARIATRIC SURGERY: PREDICTING GROUP MEMBERSHIP

A DISSERTATION
SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
DOCTOR OF PHILOSOPHY

BY
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MUNCIE, INDIANA
DECEMBER 2012

Acknowledgements

Through the duration of my education and this project, I have received valuable support and encouragement from many people. I am only able to mention a few of those people in this writing.

I would like to thank my wife, Bridget, for her support, encouragement, patience, and the occasional “reality check” throughout this process kept me grounded and gave me strength to persevere. Nolan, your birth gave me a greater purpose in life and a sense of urgency to complete this dissertation. I would like to thank my parents and my sisters for supporting me and taking an interest in my academic journey.

This dissertation would not be possible without the patience, support, and methodological expertise of my Doctoral Committee Chair, Dr. Lawrence Gerstein. The advice and support provided by Dr. Donald Nicholas helped make this research possible. Additionally, his experience and guidance has aided my professional development in counseling health psychology. I would also like to thank Dr. Kristin McGovern and Dr. Mark Malaby for their support and encouragement through the duration of this project.

A special thanks to Dr. William Hilgendorf of IU Health Bariatric & Medical Weight Loss. This project would not have been possible without your willingness to take me on as a practicum student at the bariatric center and your belief in the research idea. Furthermore, I would like to thank the administration and staff of the bariatric center for their support.

I would like to extend sincere thanks to the entire faculty in the Department of Counseling Psychology and Guidance Services. The learning opportunities and the

guidance Dr. Sharon Bowman and Dr. Theresa Kruczek provided were invaluable to my professional and personal development.

This experience would have been a dull and frustrating experience without the constant support, encouragement, and laughter from my cohort of fellow doctoral students at Ball State University. Let us continue to celebrate one another's successes throughout our careers.

Finally, I would like to extend my sincerest thanks to my extended family and friends who have all provided encouragement and inspiration. I would also like to thank Alex Frieske for his help in editing this document. I hope that my future endeavors continue to garner support from you all. I will pursue those future undertakings with optimism and purpose.

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Abstract**DISSERTATION:** Adoption of Recommended Eating Behaviors Following Bariatric

Surgery: Predicting Group Membership

Student: Eric B. Lester**Degree:** Doctor of Philosophy**Date:** December, 2012**Pages:** 183

The current research was conducted to determine if some social cognitive and psychosocial variables (e.g., maintenance self-efficacy, action planning, & depression) would accurately classify bariatric patients into one of three groups—maintenance, relapse, or recovery—related to adherence to post-surgical nutrition recommendations. One hundred sixty one female bariatric patients aged 18 years or older who had undergone surgery at least six months prior to participation were recruited for this study. Participants completed instruments that assessed social cognitive variables, psychosocial variables, and current nutrition behaviors. In general, it was hypothesized that the combination of the social cognitive and psychosocial variables would predict membership in one of the three groups. Each of the three discriminant analyses performed to test the hypotheses yielded a significant first function. The second function of the first analysis was also significant. The findings of the current study suggested that the social cognitive (54%) and psychosocial (57%) variables as well as a combination of the social cognitive and psychosocial variables (59%) were able to predict a patient's group membership at a rate better than chance. The findings, therefore, revealed that it was possible to predict group membership in terms of adherence to post-surgical nutrition

recommendations at a rate better than chance. This study represented a first step toward identifying bariatric patients who were at-risk for non-adherence to nutrition recommendations, which researchers have argued is responsible for poor outcomes after bariatric surgery. Implications and recommendations for future research are discussed.

ADOPTION OF RECOMMENDED EATING BEHAVIORS

Chapter 1

Introduction

This chapter examines literature in the areas of weight management, bariatric surgery, and self-regulation to explore the role of self-efficacy, planning, anxiety, depression, weight status, and the length of time since surgery in adherence to recommended dietary behaviors following bariatric surgery. A significant minority of bariatric surgery patients do not lose a significant amount of weight, experience slow weight loss, regain most or all of weight lost after surgery, or experience a number of negative consequences related to eating behaviors (Bocchieri et al., 2002a; Byrne, 2002; Hsu, et al., 1998; Sarwer, Wadden, et al., 2005). The most recognized explanation for these patients' unsatisfactory weight loss and weight loss maintenance is a failure to adjust to new, often stringent, eating behaviors prescribed by physicians and dieticians at bariatric surgery centers (Hsu et al., 1998; Sarwer, Wadden, et al., 2005). This project is intended to identify the variables that are related to the maintenance of recommended eating behaviors following bariatric surgery.

The current project utilizes a social cognitive framework that emphasizes self-efficacy and planning behaviors as personal strengths that help improve post-operative outcome. Other psychosocial factors influence the outcome of medical treatments. Affective disorders have been found to impair adherence to medical treatment regimens

(Hsu, 1998). Furthermore, concrete factors such as time may also influence successful adherence to medical prescriptions. Weight status and time since surgery are objective indicators that may provide insight into difficulties that arise for a significant minority of individuals attempting to adhere to the post-surgical dietary recommendations. The emphasis on the utilization of patient strengths in this project is consistent with the professional identity of counseling psychologists (Roth-Roemer, Robinson Kurpius, & Carmin, 1998). For instance, if a sense of personal efficacy for maintaining adherence to recommended dietary behaviors is found to be related to the actual maintenance of those behaviors, strengths based interventions can be developed to increase an individual's perception of self-efficacy with regard to dietary adherence. This project is also relevant to the current emphasis on social justice within the field of counseling psychology. Although it is beyond the scope of this chapter to discuss how obese individuals are discriminated against there exists a body of literature outlining the forms of discrimination, which results in poor social, educational, and occupational outcomes experienced by these persons (Bocchieri et al., 2002a; Herpertz et al., 2003; van Hout et al., 2006). The current investigation and its emphasis on understanding the role of self-efficacy as a means for bariatric patients to derive the most possible benefit from their surgery is but one potential avenue for counseling psychologists to help obese persons to become empowered.

In this chapter, psychological research on weight management, including surgical weight loss interventions, will be discussed first to identify the effects of self-efficacy and other psychosocial variables on adherence to a variety of weight loss interventions. Next, an overview of selected self-regulation literature will be reviewed to provide a conceptual

framework for this project. The Health Action Process Approach (HAPA) is the only theoretically based model of self-regulation that has attempted to explain the causal process of health behavior from the formation of an intention to perform a behavior through the initiation, maintenance, and relapse of a health behavior (Schwarzer, 1992; 2008). The current researcher argues, however, that the HAPA does not sufficiently explain the action process, which includes initiation, maintenance, and recovery from relapse. The roles of self-efficacy and planning in the maintenance and recovery of health behaviors following relapse are not clearly defined by Schwarzer. Furthermore, in the population of interest, bariatric surgery patients, other psychosocial variables not included in the HAPA such as body mass index (BMI), depression, anxiety, and the length of time since surgery may influence the rate of maintenance, relapse, and recovery from relapse of recommended dietary behaviors. Based on the reviewed literature, the current investigator will propose that maintenance, relapse, and recovery from relapse of recommended dietary behaviors following bariatric surgery can be predicted by the aforementioned psychosocial variables. Prior to the discussion of these psychosocial variables, the concept of obesity, the weight management, and the bariatric surgery literature will be examined.

Obesity

The problem of obesity is frequently described as an epidemic due to the rapid increase in its incidence over the last twenty years worldwide (Centers for Disease Control [CDC], 2007). In the most recent statistics published by the CDC (2007), forty-nine States reported at least 20% of their residents were obese, while three of those states, Alabama, Mississippi, and Tennessee, reported that 30% or more of the residents were

classified as obese (CDC, 2007). Based on the same statistics, Indiana reported that between 25% and 29% of the adult population was obese. An individual's Body Mass Index (BMI), which is formulated by dividing body weight in kilograms by meters squared, determines his or her classification of obesity (World Health Organization [WHO], 2000). Obesity classification begins at a BMI of 30 kg/m^2 and it is subdivided into three classes. Class I obesity includes persons with a BMI of 30-34, Class II obesity includes individuals who have BMI values between 35 and 39, and Class III obesity includes persons with BMI values of 40 and above (WHO, 2000).

Obesity is a condition that affects an individual's physical and mental health (Bocchieri et al., 2002a; Herpertz et al., 2003; U.S. Department of Health and Human Services [DHHS], 2001; WHO, 2000). The physical and psychosocial consequences of obesity have received frequent attention by researchers. Physically, obesity is associated with numerous negative effects on personal health such as an increased risk of heart disease, hypertension, type 2 diabetes, cancer, breathing problems such as sleep apnea, an increased risk of experiencing arthritis, reproductive problems, and premature death (DHHS, 2001; WHO, 2000). Psychosocial problems such as discrimination, stigma, decreased self-esteem, and lower quality of life are also associated with obesity (Bocchieri et al., 2002a; Herpertz et al., 2003).

Weight Management

Various weight management programs are currently in use to assist people with obesity. These weight management programs usually emphasize behavior change such as calorie restriction and increased physical activity (Wadden, Brownell, & Foster, 2002).

Two general types of weight management interventions will be reviewed briefly: behavioral weight management and bariatric surgery.

Behavioral weight management. Behavioral weight management programs have an extensive history of psychological research to improve effectiveness (Wadden et al., 2002). Behavioral weight management programs often emphasize adherence to low calorie diets (i.e. 1,200 calories/day) and increased physical activity (Wadden et al., 2002). Success in behavioral weight loss programs is typically defined by the amount of weight lost and decreased health risks (Anderson, Grant, Gotthelf, & Stifler, 2007; Wadden et al., 2002; Wadden, Foster, & Letizia, 1992). Research has shown that a moderate reduction in weight, between 5% - 15% of excess weight, is associated with a significant reduction of health risks, especially cardiovascular disease (DHHS, 2001; Wadden et al., 2002; WHO, 2000). Behavioral interventions emphasizing diet and exercise have been shown to result in losses of approximately 10% of excess body weight (Wadden et al., 2002). The literature indicates, however, that many individuals who lose weight while receiving behavioral treatments will regain one third of lost body weight within a year after the completion of treatment followed by additional, gradual increases in weight (Wadden et al., 2002). This trend suggests that behavioral interventions do not produce a high degree of adherence to treatment following completion (Elfhag & Rossner, 2005). An alternative to behavioral weight management programs, which produces larger, more rapidly occurring weight losses, is bariatric surgery (Bocchieri et al., 2002a; Wadden et al., 2002).

Bariatric surgery. Surgeries to treat morbid obesity are termed bariatric surgery. This type of intervention is specifically reserved for individuals who are morbidly obese

and those who are obese with significant medical comorbidities (Bocchieri et al., 2002a). This collection of procedures results in weight loss by restricting the amount of food consumed (i.e., Laparoscopic adjustable gastric banding), altering the gastrointestinal tract to achieve malabsorption of food (i.e., biliopancreatic diversion), or combining surgical targets to produce a procedure that is both restrictive and malabsorptive (i.e., Roux-en-Y gastric bypass) (Mechanick et al., 2008). Bariatric surgery is reported to be the most effective method for achieving dramatic, long-term weight loss and is only indicated for the morbidly obese (Bocchieri et al., 2002a; Dziurawicz-Kozłowska, Wierzbicki, Lisik, Wasiak, & Kosieradzki, 2006; Puzziferri, 2005; van Hout, Fortuin, Pelle, & van Heck, 2008). The morbidly obese includes persons who may be classified as having Class II obesity with significant physical comorbidities and Class III obesity (Bocchieri, Meana, & Fisher, 2002a; Larsen et al., 2003; Dziurawicz-Kozłowska et al., 2006; Shai, Henkin, Weitzman, & Levi, 2003; WHO, 2000). Individuals who elect to undergo bariatric surgery are required to make several lifestyle changes (e.g., dietary choices and eating habits) prior to surgery and are expected to maintain adherence to those changes following surgery in order to maximize and maintain weight losses initiated by the effects of the surgery (Alvarado et al., 2005; Mechanick et al., 2008).

The physical alteration of the post-operative bariatric surgery patients' gastrointestinal tract limits the quantity of food they can consume at a meal (Bocchieri et al., 2002a; Herpertz et al., 2003). The limited capacity for food intake forces such individuals to adhere to dietary recommendations for 12 – 24 months following surgery, but later, these patients struggled to maintain adherence to the recommended dietary behaviors (Bocchieri et al., 2002a, 2002b; Ogden, Clementi, & Aylwin, 2006). Failure to

adhere to the recommended eating behaviors may result in negative side effects. Patients who did not sufficiently adjust their eating habits experienced a long-term pattern (i.e., up to 15 years) of vomiting in response to overeating (van Hout et al., 2006). Post-operative bariatric surgery patients who do not adhere to dietary recommendations may experience “dumping syndrome,” a physiological reaction that follows consumption of foods high in fat or sugar. Dizziness, heart palpitations, lightheadedness, and nausea characterize the symptoms of dumping syndrome (Bocchieri et al., 2002a). Dumping syndrome is reported to occur in 50-70% of bariatric surgery patients who had undergone the Roux-en-Y gastric bypass surgery (van Hout et al., 2006). Patients who adjusted eating patterns successfully were less likely to report negative side effects following bariatric surgery than those who did not adjust their eating patterns (Alger-Mayer et al., 2008; van Hout et al., 2006).

Recommended eating behaviors, such as eating three meals, avoiding snacks, and drinking the prescribed protein supplement, following bariatric surgery were predictive of the extent of weight lost and maintenance of that loss (Wadden et al., 2001). Sarwer, Wadden, and colleagues (2008) found patients who self-reported adherence to the recommended post-operative diet lost more weight and maintained that loss longer than individuals who deviated from dietary recommendations. Adherence to post-operative dietary recommendations contributes to successful weight loss and weight maintenance following bariatric surgery (Bocchieri et al., 2002a; Herpertz et al., 2003; Hsu et al., 1998). These findings allude to the importance of developing and practicing new eating behaviors prior to the surgery.

Investigators who have conducted qualitative and quantitative research have characterized the adoption of new eating behaviors as a challenge for bariatric surgery patients (Bocchieri et al., 2002a, 2002b; Ogden et al., 2006; van Hout et al., 2006). Research has suggested, however, that the establishment of new eating behaviors appears to be rather straightforward immediately following bariatric surgery due to the physically reduced capacity for food (Bocchieri et al., 2002b; Ogden et al., 2006; van Hout et al., 2006). Over time (e.g., 6-12 months), though, patients have been found to experiment with new foods, ignore dietary recommendations, or revert to old eating patterns resulting in unsatisfactory weight loss or weight regain (Bocchieri et al., 2002b; Ogden et al., 2006; van Hout et al., 2006).

Ogden, Clementi, and Aylwin (2006) found that bariatric surgery patients recognized the negative consequences of exceeding their physical capacity for food and were cognizant of the benefits of following the recommended dietary behaviors. Some participants in Ogden and colleagues' research expressed satisfaction with a more pragmatic association with food (e.g., "I'm still a foodie...I've become more selective about the type of food that I can eat" [p. 285]), which reflects an acceptance and integration of the recommended dietary behaviors. However, others reported dissatisfaction with the required changes in their eating habits (e.g., "Now I don't get hardly any pleasure out of eating because you can't eat much" [Ogden et al., 2006, p. 285]). Whether a participant was satisfied with or dissatisfied with the changes in eating behaviors recommended by bariatric center dieticians did not affect reported adherence to the recommended dietary changes. Both groups self-reported adherence to the recommended dietary behaviors (Ogden et al., 2006). This finding suggests that

adherence to the dietary recommendations is influenced by processes other than satisfaction with the post-bariatric diet. Adherence to dietary recommendations is reflected by the maintenance of weight losses (Sarwer, Wadden, et al., 2008).

Reviews of the bariatric surgery research have reported mixed findings with regard to long-term maintenance of weight loss. Some studies reported maintenance of weight loss up to 9 years after undergoing bariatric surgery; while other studies found weight regain beginning approximately 2 years after surgery (Bocchieri et al., 2002a; Sarwer, Wadden, & Fabricatore, 2005). Preoperative preparation in the form of required weight loss and other lifestyle changes has led to consistent findings of greater sustained weight loss, for as long as four years, than individuals who were not required to satisfy preoperative requirements (Alger-Mayer, Polemini, & Malone, 2008; Alvarado et al., 2005; Tarnoff, Kaplan, & Shikora, 2008). In order to achieve preoperative weight loss, patients were provided with dietary plans that began introducing eating behaviors consistent with the post-surgical dietary recommendations (Alger-Mayer et al., 2008). The patients in the studies mentioned above adhered to the post-surgical recommended dietary behaviors better than those who did not have preoperative requirements. Those who were not required to begin adjusting to the dietary changes prior to surgery may experience more difficulty managing the dietary recommendations following surgery. Bocchieri et al. (2002b) noted that a majority of patients who participated in their qualitative study experienced difficulty establishing new eating behaviors. In this regard, it has been suggested that the adoption of new health behaviors, such as eating behaviors, requires effortful self-regulation (Schwarzer, 1992).

Self-Regulation

The self-regulation literature contains various explanations for the adoption of health behaviors intended to decrease the risk of developing disease. Maes and Karoly (2005) defined self-regulation as being composed of a “goal-guidance process, occurring in iterative phases that require the self-reflective implementation of various change and maintenance mechanisms that are aimed at task- and time-specific outcomes” (p. 269). Most models of self-regulation incorporate the spirit of this definition through various constructs. The HAPA shown in Figure 1 is a model of self-regulation based on social cognitive principles and it attempts to determine causality in behavior change processes in addition to predicting intentions to adopt a particular behavior (Schwarzer, 1992).

Schwarzer (1992; 2008) articulated three stages in the HAPA, the pre-intentional motivational stage, the post-intentional planning stage, and the post-intentional volitional stage. In the pre-intentional motivational stage, the intention to act is formed (Schwarzer, 2008). The post-intentional planning stage is characterized by the planning to act on the intentions formed in the pre-intentional motivational stage (Schwarzer, 2008). The final stage, the post-intentional volitional stage, is characterized by the target health behavior being performed (Schwarzer, 2008). The current research project is concerned with predicting the maintenance of recommended dietary behaviors, relapse to prior dietary behaviors, and recovery of those dietary behaviors after a relapse with selected psychosocial variables consistent with the post-intentional stages of the HAPA and broader social cognitive principles. Once an intention has been formed, maintenance self-efficacy, action planning, and coping planning behaviors are thought to bridge the gap between the intention and the initiation of action as part of the post-intentional planning stage (Schwarzer, 1992; Schwarzer, 2008). The post-intentional volitional stage of the

HAPA includes maintenance self-efficacy, recovery self-efficacy, action planning and coping planning (Schwarzer, 2008).

Maintenance self-efficacy is represented by the presence of optimistic beliefs about one's own ability to continue a behavior and overcome barriers (Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Schwarzer, 2008). *Recovery self-efficacy* refers to an individual's confidence in his or her ability to return to the behavior after relapse (Scholz, Sniehotka, & Schwarzer, 2005). *Action planning* involves consideration of when and where to engage in a behavior as well as determining how best to initiate that behavior (Schwarzer, 2008). Anticipation of barriers and preemptively developing strategies to overcome those barriers is referred to as *coping planning* (Schwarzer, 2008). Each of these constructs is thought to influence the *action process* within the post-intentional volitional stage of the HAPA.

A recent elaboration of the HAPA model described action as being composed of three processes: initiation, maintenance, and recovery (Schwarzer, 2008). Initiation is simply enacting a new health behavior, which would be consistent with undergoing bariatric surgery in order to consume less food (Scholz et al., 2005). Maintenance and recovery are action processes in which behaviors are continued or re-initiated following relapse (Conner, 2008). The HAPA does not represent the concept of relapse explicitly. If an individual is unable to overcome a barrier, the risk for relapse of a recently initiated behavior increases. Relapse occurs when an individual abandons efforts to maintain newly initiated behaviors and in turn reverts to old behaviors (Witkiewitz & Marlatt, 2004). Relapse, when applied to the proposed research, would constitute a return to eating behaviors that are not recommended by the bariatric dieticians. Schwarzer (1992)

suggested that relapses are a result of interruptions based on high-risk situations that compete with the new behavior. The process of relapse proposed by Schwarzer is consistent with the relapse prevention model developed by Marlatt and Gordon (1985), which conceptualizes the process of relapse from first encountering a high-risk situation to relapse. After encountering a high-risk situation, the individual utilizes coping resources to manage temptation. If the temptation is stronger than the individual's coping strategy then a lapse occurs. This lapse is followed by decreases in self-efficacy, which is subsequently followed by relapse after self-imposed rules for behavior maintenance have been violated (e.g., having a food not included in dietary recommendation) (Brownell, Marlatt, Lichtenstein, & Wilson, 1985). For someone who recently began dieting, a high-risk situation may be comprised of cues associated with the old behavior such as a bowl of potato chips at a party. High-risk situations are more likely to induce initial relapses in which an individual will revert to old patterns of behavior (Witkiewitz & Marlatt, 2004). Each high-risk situation and environmental factor that is incompatible with a newly adopted behavior represents a potential barrier to behavior maintenance. When one has relapsed, recovery from the relapse is required to initiate the goal behavior once again.

It has been well established and extensively researched that changing eating behaviors is medically recommended following bariatric surgery (Bocchieri et al., 2002a). To the current author's knowledge, however, the psychosocial mechanisms (e.g., maintenance self-efficacy, recovery self-efficacy, planning, time) involved in the maintenance of newly changed eating behaviors and recovery from relapses has not received much attention in the bariatric surgery literature. The current research seeks to determine if the psychosocial mechanisms described below predict whether an individual

will be classified as maintaining, being in relapse, or having recovered the recommended dietary behaviors following relapse.

Self-Efficacy

Self-efficacy, as defined by Bandura (1997), “refers to beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). In relation to the current proposed study, self-efficacy refers to the beliefs one has in his or her competence to adhere to dietary recommendations provided by the bariatric dietitians following bariatric surgery. Perceived self-efficacy has received attention in many areas of the psychological behavior change literature (e.g., weight management, smoking cessation). In each of these areas, self-efficacy has been found to influence the likelihood that an individual will achieve the desired health behavior change.

A review of recent weight maintenance literature revealed that low perceived self-efficacy was associated with poor maintenance of weight management behaviors in obese persons after the completion of various weight loss interventions (Byrne, 2002; Elfhag & Rossner, 2005). Gormally, Rardin, and Black (1980) and Jeffery et al. (1984) found that self-efficacy was related to adherence to weight maintenance strategies immediately following the completion of behavioral weight loss interventions. However, the association of self-efficacy with weight loss at follow-up is mixed. One study found no relationship between self-efficacy and weight loss six months following completion of a behavioral weight loss intervention (Linde, Rothman, Baldwin, & Jeffery, 2006). Another study reported a significant relationship between self-efficacy and weight loss following an 18-month behavioral intervention (Warziski, Sereika, Styn, Music, & Burke, 2008). The findings of these studies suggest that absolute weight loss maintenance at follow-up

is not consistently associated with self-efficacy. These studies, however, do not address the role of self-efficacy in weight maintenance behaviors and dietary adherence after the intervention. Self-efficacy in those studies was measured during the intervention and in some cases at the end of treatment but not at follow-up (Byrne, 2002; Elfhag & Rossner, 2005; Linde et al., 2006; Warziski et al., 2008). A few of these studies found that self-efficacy was related to modest weight loss maintenance in the short-term (e.g., less than 24-months) literature (Byrne, 2002; Elfhag & Rossner, 2005; Gormally et al., 1980). Thus, self-efficacy should not be discounted as a potential contributor to long-term weight maintenance.

Bariatric surgery, which induces dramatic weight losses, is an alternative to behavioral weight loss interventions for obese individuals. Between 20 – 50% of individuals who have bariatric surgery regain a significant amount (e.g., all or most of lost weight) of weight following surgery (Budak & Thomas, 2009). Adherence to dietary recommendation appears to be a vital aspect of weight loss maintenance following some weight loss intervention (Byrne, 2002). It has been found that up to one-third of bariatric surgery patients do not adhere to dietary recommendations following their surgery and they consequently experience negative side effects (e.g., weight regain) that may impair self-efficacy (Bandura, 1997; van Hout et al., 2006). High levels of self-efficacy should be associated with improved weight loss maintenance according to behavioral weight management literature (Byrne, 2002; Jeffery et al., 1984).

According to social cognitive theory, self-efficacy can be enhanced in several ways. One such way is enactive performance of a behavior in which mastery experiences are attained (Bandura, 1997). In a study of individuals participating in a smoking

cessation program, it was found that the sustained attempts to maintain adherence to a new health behavior were often influenced by the individual's experience of more benefits and fewer negative consequences (Gwaltney et al., 2009). This study of smoking cessation may have implications for individuals who are attempting to establish new eating behaviors such that frequent positive experiences (e.g., more weight lost) and fewer negative experiences (e.g., weight regain, dumping syndrome) could increase that person's motivation to maintain adherence to the dietary recommendations or to return to the dietary recommendations following a relapse. For example, Ogden and colleagues (2005) found that bariatric surgery patients, post-operatively, had greater confidence in their ability to adhere to eating behaviors that are consistent with dietary recommendations provided by their dietitians. This increase in confidence is effectively similar to the concept of self-efficacy in that these patients' belief in their ability to adhere to recommended dietary behaviors was improved.

To this author's knowledge, no research investigating the role of self-efficacy's effect on adherence to dietary changes following bariatric surgery has been published. However, adherence to dietary recommendations following surgery has received attention from several researchers. These researchers have found adherence to be related to increased rates of weight loss maintenance (Bocchieri et al., 2002a; Ogden, et al., 2005). This and similar research may provide clues into the role of self-efficacy for adherence to dietary recommendations. Furthermore, self-efficacy may have situation specific functions such as self-efficacy for the maintenance of dietary adherence. Another specific type of self-efficacy is one's perceived competence to recover adherence to dietary recommendations following a lapse or relapse: maintenance self-efficacy.

Maintenance self-efficacy. The role of self-efficacy in the maintenance and recovery of a health behavior after relapse has received support in the literature (Luszczynska & Sutton, 2006; Rothman, 2000). Maintenance of a behavior has been defined as sustaining a behavior over an extended period (Schwarzer, 1992). Research has found maintenance behaviors to be associated with an individual's perceived satisfaction with a new health behavior (Rothman, 2000). Sustaining maintenance behaviors requires exerting cognitive control (Rothman, 2000; Schwarzer, 1992). Rothman (2000) suggested that individuals were more likely to continue to perform a health behavior if they were optimistic that the behavior was valuable and they were capable of successfully adopting the behavior. The belief that one is able to initiate and maintain a health behavior such as dietary adherence is reflective of his or her level of maintenance self-efficacy and is related to the individual's efforts to initiate and sustain performance of the specific health behavior (Bandura, 1997; Schwarzer, 2008).

Schwarzer (2008) hypothesized that maintenance self-efficacy is an important contributor to the task of maintaining an implemented health behavior. In support of Schwarzer's hypothesis, patients after myocardial infarction (MI), with high levels of maintenance self-efficacy, measured two weeks after a short-term (2-week) cardiac rehabilitation program, were found to maintain physical activity at an 8 month follow-up (Luszczynska & Sutton, 2006). While Luszczynska and Sutton did not set out to identify a predictive relationship between maintenance self-efficacy and actual behavior maintenance, their finding supports the idea that individuals who believe they were capable of dealing with barriers were more likely to maintain a newly initiated behavior. Luszczynska, Sakar, and Knoll (2007), in another study, found that maintenance self-

efficacy was related to patient adherence to a highly active antiretroviral medication regimen among a sample of participants who were HIV positive. Maintenance self-efficacy beliefs then may be employed to predict whether an individual is likely to maintain engagement in adherence to the recommended post-surgical dietary changes. The question of how an individual who slips and experiences a lapse or relapse recovers and engages in the health behavior once again remains unaddressed by maintenance self-efficacy.

Recovery self-efficacy. Recovery is the act of returning to the previous goal behavior or initiated behavior after a relapse (Schwarzer, 1992). Recovery self-efficacy refers to an individual's confidence that he or she will be able to return to the desired goal behavior following a relapse (Schwarzer, 2008). Conceptually, individuals with high levels of recovery self-efficacy will be more likely to return to a previously implemented health behavior and research has found support for this idea. Luszczynska and Sutton (2006) suggested that for patients in a cardiac rehabilitation program, higher reported recovery self-efficacy was a protective factor such that MI patients were more likely to continue exercising during relapse, albeit at a level below that indicative of exercise maintenance. That is, the presence of a high level of recovery self-efficacy in the sample of MI patients operated as a protective factor, by predicting which participants would continue to exercise at the eight-month follow-up ($p > 0.05$). Schwarzer, Luszczynska, Ziegelmann, Scholz, and Lippke (2008) also conducted a study with two cardiac rehabilitation samples. Their research found that, in both samples, recovery self-efficacy predicted the continuation of prescribed cardiac rehabilitation exercises at four and eight months following MI.

Evidence for the role of recovery self-efficacy in health behavior change has been found in the smoking cessation literature as well. A recent meta-analysis of smoking cessation literature found individuals who had achieved abstinence from smoking had higher self-efficacy (Gwaltney et al., 2009). The authors found, in this meta-analysis, that self-efficacy was increased through mastery experiences when managing high-risk situations compared to individuals who had relapsed. The type of self-efficacy utilized to navigate successfully a high-risk situation is recovery self-efficacy. Individuals who were high in recovery self-efficacy were more likely to engage in attempts to minimize effects of the relapse and return to the newly adopted behavior (Schwarzer, 2008). Another psychosocial factor involved in the maintenance of recently initiated health behaviors and recovery of those behaviors after relapse is planning to overcome barriers and setbacks (Schwarzer, 2008).

Planning

Planning is “a prospective self-regulatory strategy, a mental simulation of linking concrete responses to future situations” (Sniehotta, Schwarzer, Scholz, & Schuz, 2005, p. 566). Luszczynska and Schwarzer (2003) found that as much as 49% of the variance for the prediction of breast self-exam behavior was accounted for by planning. This finding does not provide evidence for a relationship between planning and behavioral maintenance. However, planning, like self-efficacy, may be identified as situation specific such that the prediction of behavioral maintenance or recovery from relapse would be possible. Planning may be specified as being either action planning or coping planning (Schwarzer, 2008).

Action planning, defined as a mental preparation for a response in a given situation, accounts for the when and where (situation) a behavior will be implemented or monitored to ensure continuation and how that behavior will be maintained (response) (Sniehotta, Scholz, & Schwarzer, 2005). Coping planning, on the other hand is the anticipation of difficulties in implementing a behavior and the formulation of plans to overcome those barriers (Scholz, Schuz, Ziegelmann, Lippke, & Schwarzer, 2008). Action planning and coping planning are two theoretically distinct constructs. Theoretically, action planning is related to the initiation and maintenance of a health behavior, while coping planning improves the likelihood of behavior maintenance once an individual is faced with barriers and obstacles (Scholz et al., 2008; Sniehotta, Schwarzer, et al., 2005).

Action planning. Action planning has been found to be correlated with behavioral initiation and maintenance (Sniehotta, Scholz, et al., 2005). Schwarzer, Schulz, Ziegelmann, Lippke, Luszczynska, and Scholz (2007), in four experiments, found that planning was a consistent predictor of participants' actually engaging in a targeted health behavior such as dietary adherence. The researchers asserted that this finding was theoretically consistent with the purpose of action planning in that barriers that are anticipated can be managed better than barriers that are unexpected. In other research, Schwarzer and colleagues (2008) found that planning accounted for 18%-39% of the variance for behavioral maintenance in three separate experiments with independent samples of cardiac rehabilitation patients. Action planning appears to be related to the maintenance of health behaviors. However, it should be noted that the intention to perform a health behavior is predictive of the formation of an action plan (Sniehotta,

Scholz, Schwarzer, Furrhmann, Kiwus, & Voller, 2005). In the current research, individuals who have undergone bariatric surgery are assumed to have previously formed an intention to change their dietary behavior and adhere to the recommendations given by their bariatric dietitians. Thus, participants in this study, who maintain adherence to the dietary recommendations, are expected also to have formed action plans. Once an individual has formed an action plan and initiated a behavior, barriers and obstacles may present a challenge to the maintenance of that behavior. Coping plans address those barriers and obstacles.

Coping planning. The relationship between coping planning and increased levels of behavioral adherence have been reported by many researchers. An example of this relationship comes from the research of Simkin and Gross (1994). They found that previously sedentary women who, prior to beginning an exercise program, use cognitive and behavioral strategies more frequently to cope with high-risk situations were less likely to relapse. In research with cardiac rehabilitation patients, Sniehotta, Schwarzer, and colleagues (2005) found that coping planning was not a significant predictor of exercise during the intervention period. However, the researchers reported that two months after being discharged from a formal cardiac rehabilitation program coping planning was found to be a significant predictor of exercise at follow-up. This finding suggests that coping planning was not a good predictor of behavior during the program due to the patients' inability to formulate strategies to combat high-risk situations that would occur in their natural environment. Another study found that individuals with coronary heart disease (CHD) who were given an intervention to increase coping planning successfully increased adherence to a medically recommended rehabilitation

exercise program (Sniehotta, Scholz, et al., 2005). Similar findings have been found in a study of dietary change.

Schwarzer, Schuz, Ziegelmann, Lippke, Luszczynska, and Scholz (2007) found that individuals who reported high levels of recovery self-efficacy and planning were more likely to have initiated the target behavior—eating five servings of fruits and vegetables a day. While the dietary changes required for bariatric patients involve increasing the consumption of certain macronutrients (e.g., protein) and nutritional supplements, the overwhelming result of bariatric surgery is a dramatic reduction in calorie consumption that patients and bariatric health care providers wish to see maintained over time (Bocchieri et al., 2002a; Mechanick et al., 2008). The study by Schwarzer and colleagues (2007) does not address how planning will affect adherence to a reduced calorie diet following bariatric surgery. That study also does not report the effect of planning alone and thus leaves an inconclusive picture of the role of planning in a dietary intervention.

The bariatric patient, however, would not need to develop coping strategies until he or she is physically able to consume a wider range of foods and increase the amount of food. According to the bariatric surgery literature, most patients between 12 – 24 months after surgery have expanded the types and volume of food consumed and may deviate from the recommended diet (Bocchieri et al., 2002a; Herpertz et al., 2003). It is at this time that a need for coping plans would become an issue for post-surgery bariatric patients. The literature above suggests that the development and utilization of coping plans is an integral element of adherence to health behaviors such as dietary recommendations following bariatric surgery. Affective disorders are another obstacle

that many obese individuals confront and an obstacle that may decrease adherence to health behaviors (Bandura, 1997; Bocchieri et al., 2002a).

Affective Disorders

Affective disorders such as depression and anxiety are often present in obese men and women who seek bariatric surgery (Bocchieri et al., 2002a; van Hout et al., 2008; Wadden et al., 2001). As much as two-thirds of bariatric patients report at least mild depression as measured by the Beck Depression Inventory (Fabricatore, Wadden, Sarwer, Crerand, Kuehnel, Lipschutz, et al., 2006). Individuals who report binge eating prior to weight loss attempts, including bariatric surgery, report higher levels of depression than non-binge eaters (Ames, Patel, Ames, & Lynch, 2009; Bocchieri et al., 2002a; Fabricatore et al., 2006; Herpertz et al., 2003; Wadden et al., 2002). It has been noted in the bariatric literature that individuals who binge eat were more likely to have difficulty adopting new eating patterns following bariatric surgery and may continue maladaptive eating, in the form of grazing or eating small quantities throughout the day in response to negative affect (Bocchieri et al., 2002a; Green, Dymek-Valentine, Pytluck, le Grange, & Alverdy, 2004). A return to maladaptive eating patterns, approximately 12 – 24 months following bariatric surgery, after post-surgical dietary recommendations are provided, and dietary restrictions are lifted meets the definition of relapse (Bocchieri et al., 2002a; Brownell et al., 1986).

Relapse in substance abuse and weight management literature has been associated with depression. A review of relapse literature by Brownell and colleagues (1986) reported a study where it was found that as individuals lost weight levels of depression decreased. Several researchers replicated this finding in the behavioral weight loss

literature (Wadden et al., 2001; Wadden et al., 2002). This pattern of depression being alleviated with weight loss is consistent with research on bariatric surgery patients (Bocchieri et al., 2002a; Fabricatore, Wadden, Sarwer, & Faith, 2005). That is, levels of reported depression tend to decrease as long as a patient continues to lose weight. Once patients begin to regain weight, levels of depression have been reported to increase toward presurgical levels (Bocchieri et al., 2002a; Herpertz et al., 2003). Anxiety also has been found to diminish following bariatric surgery as weight loss increased (Bocchieri et al., 2002a; van Hout et al., 2008). Rates of depression and anxiety, however, returned toward presurgical levels after weight loss had reached a plateau or weight regain had begun (Bocchieri et al., 2002a; Herpertz et al., 2003).

The literature reviewed above collectively suggests that depression and anxiety are predictive of weight regain and engaging in maladaptive eating patterns, patterns that are not conducive to adherence to post-surgical dietary recommendations given to bariatric patients (Fabricatore et al., 2006). However, it should be noted that affective psychopathology has not been found to be related to the amount of weight lost following bariatric surgery but is related to adherence to behavioral recommendations (Puzziferri, 2005; Saunders, 2004). The current researcher expects that individuals who are experiencing high levels of depression will be more likely to have relapsed and returned to maladaptive eating patterns such as eating in response to emotional cues. It is also expected that patients who are experiencing high levels of anxiety will be more likely to relapse to old or maladaptive eating patterns. Body mass index and the length of time that has elapsed since having the surgery are two additional variables that may influence the

patient's likelihood of maintaining adherence to the recommended dietary behaviors following bariatric surgery.

Body Mass Index

BMI may affect maintenance of dietary adherence in several ways. First, initial rapid weight loss may be experienced as a success and may lead to increased self-efficacy while maintaining weight loss may also serve as an experience of success (Bandura 1997; Bocchieri et al., 2002a). The experience of success in maintaining a lower BMI after weight loss, in particular, is indicative of dietary adherence after bariatric surgery. Sarwer, Wadden, and colleagues (2008) found that high levels of self-reported dietary adherence were related to a 4.5% greater weight loss among bariatric surgery patients at 92-weeks after surgery ($p = .02$). Furthermore, Pontiroli and colleagues (2007) found that BMI and overall compliance (including dietary) were associated with weight loss at follow-ups of 12, 24, and 36 months. BMI, by affecting the level of motivation, can also have an effect on adherence to recommended dietary behaviors. The current researcher is not aware of any information in the literature that explicitly states that dietary adherence is improved in individuals with a lower BMI. However, the link between eating habits and weight gain is well established. The final variable under investigation in this study is the duration of time since the surgery.

Time Since Surgery

The amount of time since bariatric surgery is, in the literature, associated with a gradual weight regain which often begins between 12 – 24 months (Bocchieri et al., 2002a; Herpertz et al., 2003; Ogden et al., 2005; Sarwer et al., 2008). A conceptual basis for the inclusion of time is articulated by Luszczynska and Schwarzer (2003) who note

that an individual's past behavior can be interpreted as a good predictor of future behavior. This, however, does not account for the majority of bariatric surgery patients who maintain weight loss for several years (Mitchell et al., 2001). It has been acknowledged that past behaviors do not exert lasting influence over an implemented behavior change that has become habitual (Luszczynska & Schwarzer, 2003). Luszczynska and Schwarzer (2003) suggested that psychological interventions could increase the likelihood of performing a health behavior. In their research, women received questionnaires that may have unintentionally increased the participants' awareness and self-efficacy for performing the breast self-exam. This increase in awareness and self-efficacy was reflected in the data by an increase frequency of performance of breast self-exam over thirteen weeks regardless of how often those women performed the breast self-exam in the past. This finding suggests that repeated provision of reminders may increase the likelihood that one will engage in a health behavior without reference to past behaviors. The ability to overcome the effects of past behavior is an important factor in the maintenance of adherence to dietary recommendations.

The difficulties in maintaining weight loss have been assigned various explanations by researchers. With regard to bariatric surgery, some research has found support for the notion that some bariatric patients eat in response to emotional cues prior to surgery and report no incidences of emotionally triggered eating following surgery, whereas others continued to eat in response to emotional cues such as depression and anxiety (Saunders, 2004). Binge eating is another maladaptive eating pattern that has been found to affect the amount of weight lost and maintenance of weight losses among

bariatric surgery patients (Rusch & Andris, 2007). Binge eating is not physically possible after surgery due to the reduction in the size of the stomach (Bocchieri et al., 2002a).

However, individuals dealing with binge eating may develop a different way to express binge eating, grazing, or snacking constantly throughout the day (Kalarchian, Wilson, Brolin, & Bradley, 1999; Rusch & Andris, 2007). Those individuals who continue to deal with binge eating and those who eat in response to emotional cues such as depressed mood and anxiety may be at greater risk for lapsing, a temporary slip or mistake, or relapsing (Brownell et al., 1986).

Relapse

Literature on dietary relapse suggests that dietary behaviors are difficult to maintain and that most people relapse then begin to gradually regain weight within the first year after a behavioral weight loss intervention (Brownell et al., 1986; Jeffery et al., 1984; Wadden et al., 2002). The rate of dietary relapse has been found to be similar to relapse in substance abuse research (Brownell et al., 1986). The rate of dietary relapse varies with each study and is generally found to occur in 40% - 50% of participants. In the reviewed literature, researchers have used varying benchmarks for weight regain (e.g., regaining > 50% of weight lost) to classify a participant as maintaining weight lost or relapsing (Byrne, 2002). However, the common factor among most dietary relapse literature is that between 40% and 50% of participants, within one to two years following initiation of a behavioral weight loss program, have experienced weight regain of greater than 20% of the weight lost (Byrne, 2002). In research using data from random digit dialing and the National Weight Control Registry (NWCR), researchers found that approximately 20% of individuals who had lost weight without surgical intervention were

successful in maintaining at least a 10% weight loss for one year after initiation of the weight loss program (Wing & Phelan, 2005). The two figures identified suggest that weight loss maintenance is difficult in the near-term with as few as 20% of individuals seeking weight loss succeeding. There is hopeful information regarding weight loss maintenance, however.

Data from the NWCR suggests that if an individual is able to maintain weight loss for at least 2 years the chances of maintaining weight loss in the next year approaches 50% (Wing & Phelan, 2005). Sarwer, Wadden, and colleagues found that individuals who self-reported high levels of dietary adherence lost and maintained more weight loss than patients who self-reported low levels of dietary adherence for as long as 92-weeks following the surgery. Patients in this study who reported high levels of adherence at 20-weeks had lost 28% more weight than those who reported low adherence (Sarwer, Wadden, et al., 2005). Finally, at the 66-week and 92-week follow-ups, patients' weight loss was significantly associated with dietary adherence with individuals reporting high levels of adherence losing more weight than those reporting low levels of adherence (Sarwer, Wadden, et al., 2005). These studies suggest that bariatric surgery patients, over time, are capable of maintaining weight loss. These findings are, however, atypical for the majority of weight management studies, which have found most individuals regain weight over time (Anderson et al., 1999; Bocchieri et al., 2002a; Byrne, 2002; Wadden et al., 2002).

Statement of Problem

Obesity is a problem in the United States for which many weight loss interventions have been developed and researched (CDC, 2007; Wadden et al., 2002).

Much of the psychosocial research on weight loss methods has investigated the efficacy and effectiveness of behavioral weight loss interventions (Wadden et al., 2002).

Historically, behavioral weight loss interventions result in weight losses of approximately 10% - 20% of excess body weight (Wadden et al., 2002). Surgical weight loss interventions, in comparison, have received little research attention regarding the affect of psychosocial factors on the success of the surgery (Bocchieri et al., 2002a; Wadden et al., 2002).

Bariatric surgery is a radical option for most individuals who seek to lose weight. However, for those who are morbidly obese, bariatric surgery may be the best option to induce large weight losses (CDC, 2007; Herpertz et al., 2003). Patients who have bariatric surgery lose a tremendous amount of weight, on average 60% of excess body weight (Bocchieri et al., 2002a). Among individuals who undergo bariatric surgery, however, approximately 20% of patients regain a significant amount of the weight that was lost because of the surgical intervention (van Hout et al., 2006). The primary explanation in the literature for these individuals' weight regain is non-adherence to the dietary recommendations following surgery (Tarnoff et al., 2008). Yet, this researcher is not aware of any studies that attempted to identify psychological factors associated with improving dietary adherence following bariatric surgery.

From the literature reviewed, several problems in the bariatric surgery literature were identified. First, psychosocial research in bariatric surgery does not attempt to identify predictors of dietary adherence. The proposed study seeks to examine several psychological constructs as predictors of dietary adherence in terms of maintenance, recovery after lapse or relapse, and relapse. The predictors of post-bariatric surgery

dietary adherence for the proposed study, social cognitive variables (maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning), borrowed from the HAPA have not been tested in a sample of the bariatric surgery patient population. Second, these social cognitive variables have not been implicated in the prediction of dietary adherence beyond a short-term follow-up (e.g., 12 weeks) (Schwarzer & Luszczynska, 2003; Schwarzer et al., 2007). Finally, the bariatric surgery literature has primarily examined psychopathology (e.g., depression, anxiety, eating disorders), presurgical preparation (e.g., medically supervised weight loss prior to surgery), and participation in support services (e.g., support groups) following surgery as predictors of the amount of weight lost (Ames, Patel, Ames, & Lynch, 2009; Bocchieri et al., 2002a; Herpertz et al., 2003). Identifying social cognitive factors that may predict adherence to dietary recommendations after bariatric surgery is a unique approach to understanding successful outcomes in this population of patients. To this researcher's knowledge, this approach has not been studied or reported in the literature.

The proposed study seeks to identify social cognitive predictors of maintenance of medically recommended dietary patterns that should be established following bariatric surgery. Research has repeatedly shown that approximately 20% of bariatric surgery patients will experience significant weight regain and that there are a multitude of potential contributors to this regain (Ames et al., 2009; Bocchieri et al., 2002a). Ultimately and for various reasons, bariatric surgery patients who regain a significant amount of weight following surgery consume calories in excess of what is needed to maintain their new lower weight (Ames et al., 2009). Predicting the maintenance of new

dietary behaviors and recovery of those behaviors after relapse is an alternative approach to understanding weight maintenance challenges after bariatric surgery.

Definition of Terms

Bariatric Surgery – Surgical therapy used to treat morbid obesity, which is composed of a collection of procedures that results in weight loss by restricting the amount of food consumed, altering the gastrointestinal tract to achieve malabsorption of food, or by combining surgical targets to produce a procedure that is both restrictive and malabsorptive (Mechanick et al., 2008)

Maintenance Self-Efficacy – optimistic beliefs about one's own ability to continue adherence to the recommended post-surgery diet and overcome barriers to adherence (Schwarzer 2008)

Recovery Self-Efficacy – an individual's confidence in his or her ability to return to the recommended diet following relapse (Schwarzer, 2008)

Action Planning – consideration of when and where to adhere to the post-surgical dietary recommendations as well as determining how best to begin the recommended diet (Schwarzer, 2008)

Coping Planning – anticipation of barriers to adherence to the dietary recommendations and preemptively developing strategies to overcome those barriers (Schwarzer, 2008)

Maintenance – sustaining adherence to post-surgical bariatric dietary recommendations over an extended period (Schwarzer, 2008)

Recovery – the act of returning to the recommended post-surgical diet after a relapse (Schwarzer, 2008)

Relapse – failure to adhere to post-bariatric surgery dietary recommendations for at least one week (Schwarzer, 2008)

By-Chance Accuracy Rate – rate of accurate classification that would be expected by chance alone. This is calculated by adding together all squared prior probability values in the same discriminant analysis (Hair, Black, Babin, & Anderson, 2010).

Hypotheses

1. Maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning will predict whether six-month post-bariatric surgery patients can be categorized as being in maintenance, relapse, or recovery.
2. Levels of depression, anxiety, BMI, and time since surgery of bariatric patients that are six-months or more post-surgery will predict whether these patients are in maintenance, recovery, or relapse.

Chapter 2

Literature Review

This dissertation seeks to identify whether the psychosocial constructs of self-efficacy, planning, depression, anxiety, body mass index (BMI), and time since surgery will predict whether a bariatric surgery patient can be classified as being in maintenance, recovery, or relapse with regard to the level of adherence to the nutrition plan recommended by bariatric surgeons and dietitians following surgery. The following literature review will outline the problem of obesity, describe behavioral weight loss interventions, describe the emerging role of psychology in surgical weight loss interventions, and outline the social cognitive constructs relevant to this research (e.g., self-efficacy and planning). A social cognitive framework was the conceptual basis for the psychological constructs included in this study. The Health Action Process Approach (HAPA) model of self-regulation was the social cognitive framework that has been employed to form the current research questions. The HAPA was hypothesized to explain the role of selected social cognitive constructs (self-efficacy and planning) in the maintenance and recovery of a recently changed health behavior following relapse. The HAPA provided a contextual framework from which to understand the importance of those constructs in the current research. Each of these constructs and the model, as it pertains to the bariatric surgery literature, are reviewed critically.

Obesity

Obesity is frequently described as a global epidemic in media, medical, and scientific communities. The incidence of obesity in the United States over the last twenty years has risen steadily, which is cause for concern due to the prevalence of medical and psychological problems among obese individuals. An individual who suffers with obesity will have a Body Mass Index (BMI) of 30kg/m^2 at minimum (World Health Organization [WHO], 2000). Classifications of obesity provide more information about an individual's level of obesity. Individuals may also fall within one of three classes of obesity above the minimum required BMI of 30kg/m^2 . Five-point increments in BMI separate the first two classes of obesity from one another where a BMI of 30 kg/m^2 - 34 kg/m^2 would be classified as Class I obesity, Class II obesity includes those who have BMI values between 35 kg/m^2 and 39 kg/m^2 , and Class III obesity includes individuals with BMI values of 40 kg/m^2 and above (WHO, 2000). Class III obesity is also referred to as morbid obesity and includes the super obese or those individuals whose BMI is above 50 kg/m^2 (WHO, 2000).

The Centers for Disease Control (CDC) began collecting and reporting obesity statistics in 1985. At that time, not all states reported obesity data. Of the states participating in data collection none reported more than 15% of individuals residing in their state could be classified as obese (CDC, 2007). In contrast, in the most recent statistics, published in 2007, forty-nine states reported at least 20% of their residents were obese, including Indiana where obesity was reported to affect 20 to 24% of residents. Twenty-eight states reported obesity rates of between 25 and 29% and three states,

Alabama, Mississippi, and Tennessee, reported that 30% or more of residents could be classified as obese (CDC, 2007).

Obesity is associated with numerous health risks and psychosocial problems such as a higher incidence of discrimination, depression, anxiety, heart disease (e.g., myocardial infarction), hypertension, type 2 diabetes, cancer (e.g., colon cancer), breathing problems such as sleep apnea, and an increased risk of experiencing arthritis, reproductive problems, and premature death (WHO, 2000; U.S. Department of Health and Human Services [DHHS], 2001). A reduction in weight is associated with decreases in these health risks for obese individuals. In fact, a moderate reduction in weight of 5% - 15% of excess weight is associated with a significant reduction of health risks, especially cardiovascular disease (WHO, 2000; DHHS, 2001). Weight losses of 5% - 15% can be achieved through behavioral interventions (Wadden, Brownell, & Foster, 2002). Unfortunately, most individuals who successfully complete behavioral, commercial, or medically supervised diets are unable to maintain long-term (e.g., longer than six months) weight losses once active dieting is concluded (Jeffery et al., 2000). Weight loss attempts are often successful for moderate weight losses in the short-term, but eventually erode and the lost weight is regained gradually (2002Wadden et al., 2002). Bariatric surgery or weight loss surgery has been shown to be the most effective method for dramatic, long-term weight loss with losses averaging 65% of excess body weight (Jeffery et al.; van Hout, Fortuin, Pelle, & van Heck, 2008).

Individuals who qualify for bariatric surgery must be classified as having either Class II obesity or Class III obesity (WHO, 2000). Those classified as having Class II obesity must also suffer with significant physical comorbidities such as type-2 diabetes

and heart disease in order to qualify for bariatric surgery (Bocchieri, Meana, & Fisher, 2002a; Larsen et al., 2003; Shai, Henkin, Weitzman, & Levi, 2003; Dziurawicz-Kozłowska, Wierzbicki, Lisik, Wasiak, & Kosieradzki, 2006; WHO, 2000). Two groups of individuals with BMI greater than 30 would not be eligible for bariatric surgery. These two groups include individuals classified as having Class I obesity and those classified as having Class II obesity without significant physical comorbidities (Sarwer, Wadden, & Fabricatore, 2005). For the purposes of this literature review and to avoid confusion, individuals who do not qualify for bariatric surgery will not be discussed and individuals who qualify for bariatric surgery will be referred to as morbidly obese.

Behavioral Weight Management

Psychology has contributed much to the behavioral weight management literature for more than three decades. The first comprehensive review of weight management literature published in 1982 described physiological explanations for obesity and advances in behavioral interventions from the first ten years of psychological research in that area (Brownell, 1982). Early behavioral weight loss programs established methods such as the application of behavior modification to the treatment of obesity, parental education and training for childhood obesity, and managing environmental cues to aid in weight loss among obese participants (Brownell, 1982). The effects of those methods provided the first educational components for behavior change and reduced the amount of attrition common among early weight management interventions (Brownell, 1982). Perhaps the most important and lasting contributions of early behavioral weight loss intervention research included the identification of appropriate weight loss targets of one to two pounds per week, the finding that few individuals continue to lose weight

following treatment, and that no variable consistently predicted weight loss or maintenance (Brownell, 1982; Wadden et al., 2002). While these early efforts in the area of behavioral weight management have established the precedent from which the current research was based, the rationale and evaluation metrics (e.g., amount of weight lost) for behavioral weight loss programs are important to explicitly state before proceeding with the review of recent weight loss research.

Contemporary efforts in biomedicine research have identified several significant benefits of weight loss for obese individuals (WHO, 2000). Decreases in health risks related to excess weight and the reduction of excess weight are typical markers of success for behavioral weight loss programs (Anderson et al., 2007; Wadden et al., 2002; Wadden, Foster, & Letizia, 1992). As mentioned earlier, a moderate reduction in weight is correlated with significant reductions in health risks (DHHS, 2001; Wadden et al., 2002; WHO, 2000). Behavioral weight loss interventions emphasizing diet and exercise have consistently reported weight losses of approximately 10% of excess body weight over the standard 10-20 week course of treatment (Perri, Nezu, McKelvey, Shermer, Renjilian, & Viegner, 2001; Wadden et al., 2002). Many commercial weight loss programs have components of behavioral weight management programs. These commercial programs, however, tend to emphasize one specific change in diet (e.g., low-fat, high-protein, very-low calorie) rather than a balanced behavioral approach (Markis & Foster, 2005). It appears that without a balanced behavioral approach the sustainability of weight losses achieved in commercial programs is diminished to a shorter duration than behavioral weight loss programs (Markis & Foster, 2005; Wadden et al., 2002).

Current psychological weight management programs emphasize adherence to low calorie diets (i.e. 1,200 calories/day) and increased activity levels (e.g., exercise) (Anderson, Grant, Gotthelf, & Stifler, 2007; Wadden et al., 2002). A typical formal behavioral weight loss program will usually last between 10 and 20 weeks (Wadden et al., 2002; Wiltink, Dippel, Szczepanski, Thiede, Alt, & Beutel, 2007). These programs often result in weight losses of 10% -15% (Wadden et al., 2002). Beginning in the 1970s, behavioral weight loss researchers have consistently reported that behavioral weight loss programs lasting 10-20 weeks produced weight losses of approximately 10% of excess body weight. Recent behavioral weight loss researchers have reported similar findings (e.g., 10% of excess body weight lost) according to reviews of research in that area of the literature (Wadden, 2002). A natural progression in research was to extend the length of behavioral weight loss interventions.

The behavioral weight loss interventions reviewed for this chapter ranged from just longer than the traditional behavioral interventions up to one year (Anderson et al., 2007; Wadden et al., 2002). Weight loss programs of longer duration generally lead to more weight loss when compared to interventions of shorter durations, yet the rate of weight loss diminishes significantly following the maximum standard duration of 20 weeks. The losses reported in these studies are not significantly greater than losses reported following the completion of programs of shorter duration (i.e., standard program losses of 10% - 15% versus long-term program losses 12% - 14%) (Wadden et al., 2002). For instance, behavioral weight loss programs ranging from 40-52-weeks excited researchers because participants showed weight losses of 10%-12% after twenty-weeks (Perri, Nezu, Patti, & McCann, 1989; Wadden et al., 1994; Wing et al., 1994).

Ultimately, the participants' final weight losses of 14%-18% of excess weight loss disappointed the researchers who expected greater weight losses from a program of that duration (Wadden et al., 2002). In a study by Anderson and colleagues (2007) an intensive very low energy diet (VLED) (e.g., less than 800 calories per day) in combination with a 38-week behavioral weight loss program helped participants achieve an average weight loss of 25% of their excess weight. The impressive losses reported in this study, however, were not maintained long-term.

Occasionally, psychotherapeutic weight management programs garner research attention in contrast to the oft-investigated behavioral weight loss programs. In a study by Wiltink, Dippel, Szczepanski, Thiede, Alt, and Beutel (2007), participants with psychological comorbidities seeking inpatient weight loss treatment were randomly assigned to a seven-week behavioral or psychodynamic therapy treatment for weight loss. While the majority of participants did not lose a significant amount of weight during the seven-week intervention, with weight losses across all participants averaging 2% of excess weight (Wiltink et al., 2007). Yet, approximately one-third of participants lost more than 5% of their excess weight (Wiltink et al., 2007). An important contribution of this research is that in just seven weeks of behavioral or psychodynamic treatment modest weight losses are possible. These researchers also showed that a significant minority of patients (17.9%) continued to lose weight after the intervention. These participants also reported weight losses greater than 10% of original body weight at the three-year follow-up (Wiltink et al., 2007). Furthermore, both therapeutic approaches employed in this intervention were deemed to be successful because one-third of participants reported losses of at least 5% of excess body weight at a three-year follow-up

(Wiltink et al., 2007). This finding is as good as or better in the long-term than most standard behavioral weight loss programs.

In general, participants in longer-term programs are expected to achieve weight losses between 18% - 25% (Wadden et al., 2002). Intensive, long-term weight loss programs also have been shown to produce significantly greater weight losses than standard programs of any duration. Anderson and colleagues (2007) found that an intensive behavioral weight loss program lasting 39-weeks resulted in weight losses of 23% - 27%. Contrary to findings for many other weight loss programs where weight losses quickly slow and weight regain begins, this study noted continuing weight losses at 51-weeks after beginning the program. It appears that the participants in the Anderson and colleagues (2007) study incorporated maintenance strategies into their post-weight-loss program routine in order to continue losing weight for 12-weeks following the end of the program. However, the strategies used to maintain their weight losses after completion of the program were not assessed. This omission in measurement left Anderson and colleagues to speculate when searching for an explanation of the participants' success when the broader weight management literature repeatedly shows that participants of other programs fail to maintain weight losses and certainly do not continue to lose weight. As such, maintenance of weight losses has been the source of much consternation for researchers and participants of weight loss programs.

Maintenance of weight losses is a problem addressed in much of the research on behavioral weight loss interventions. Many researchers have found that most individuals who lose weight while receiving behavioral treatments will not continue to lose weight after treatment has ended and will regain one third of lost body weight within a year

(Brownell, 1982; Wadden et al., 2002). Even intensive behavioral weight loss programs suffer from similar problems in that participants are unable to maintain their maximum weight loss once the intervention has ended. For example, individuals in one intensive behavioral weight loss program reported weight losses of 23-27% at the conclusion of a 39-week intervention (Anderson et al., 2007). Although the weight losses continued to mount immediately following the treatment and maximized average losses of 37.5% for women and 41.5% for men one year after the intervention began, at the 72-week follow-up weight losses were found to have regressed from the peak and averaged 23% (Anderson et al., 2007). Post-intervention weight regain is often followed by additional, gradual increases in weight (Anderson et al., 2007; Wadden et al., 2002; Wiltink et al., 2007). Wiltink et al. (2007) found that only one-third of patients participating in a seven-week in-patient behavioral weight loss program were able to maintain weight losses of greater than five percent of their initial weight at three-year follow-up. This trend typifies the broader weight management literature with regard to poor maintenance of weight loss and suggests that behavioral interventions are not strongly adhered to following completion of treatment. Yet, two studies reviewed here described programs designed to encourage the maintenance of weight losses. In a study conducted by Gorin, Pinto, Tate, Raynor, Fava, and Wing (2007), participants of the STOP Regain program received training that “emphasized daily weighing, self-reinforcement for weight maintenance, and corrective actions to reverse small weight gains” (p. 3087) after having lost at least 10% of their body weight and maintained that loss for two years. Forty-two percent of participants in this program maintained weight losses (within 2.3kg of enrollment in the STOP Regain program) at a higher level than what is reported in most studies (Gorin et

al., 2007). Yet, a majority (58%) of participants in this study failed to maintain their weight losses in the long-term (Gorin et al., 2007). The higher level of success reported in this study is not surprising since those who enrolled had already maintained weight loss longer than what is reported in the weight management literature. However, this research has the potential to inform researchers and clinicians in potentially efficacious methods for weight loss maintenance. A study by Cleanthous, Noakes, Keogh, Mohr, and Clifton (2007) provided data to suggest that training participants in diet, exercise, and behavior modification can increase the duration in which weight losses are maintained. In their research, Cleanthous and colleagues (2007) noted that participants achieved modest (e.g., 4%) losses of excess body weight and were able to maintain that weight loss for up to three years.

Weight Loss Maintenance

Researchers and clinicians alike have devoted attention to the challenge of increasing adherence to weight loss programs to improve participant outcomes and sustain health benefits (Wadden et al., 2002). Reviews of weight maintenance literature show that older research has revealed three primary psychological factors related to poor weight maintenance. Unrealistic weight goals, poor coping skills, and low self-efficacy are related to poor maintenance of weight management behaviors in obese persons following weight loss interventions (Byrne, 2002; Elfhag & Rossner, 2005). Relevant to this research, self-efficacy is associated with adherence to weight maintenance strategies following behavioral weight loss interventions in older research. Two independent studies found that participants who reported, at follow-up, maintenance of weight loss also reported greater confidence in their ability to maintain weight losses (Gormally,

Rardin, & Black, 1980; Jeffery et al., 1984). These findings provide support for the notion that increases in the level of self-efficacy is related to longer-term weight maintenance. However, these studies were correlational and researchers were unable to determine whether self-efficacy helped improve weight maintenance or if weight maintenance produced higher levels of self-efficacy. Recent research efforts have attempted to make the role of self-efficacy in weight maintenance more clear.

Recent research on self-efficacy and weight loss during an intervention is mixed. One study found no relationship between eating self-efficacy at eight weeks and weight loss at six-month follow-up during a behavioral weight loss intervention (Linde, Rothman, Baldwin, & Jeffery, 2006). In an earlier study by Linde, Jeffery, Levy, Sherwood, Utter, Pronk, and Boyle (2004), men and women were found to report an inverse relationship between “weight control self-efficacy” and weight at baseline. At follow-up, low “weight control self-efficacy” was correlated with higher weight in women at 6, 12, and 24 month follow-up after participation in one of three conditions (“a mail-based weight intervention, a telephone-based weight intervention, or usual care”) (Linde et al., 2004, p. 419). The researchers did not find any correlation between “weight control self-efficacy” and weight among participating men at any of the follow-up measurements (Linde et al., 2004). Like the vast majority of studies in the weight management literature, these studies were based on self-report measures and had a relatively short (e.g., 6-month) follow-up period. These two studies do not clearly identify what, if any, role self-efficacy specific to eating behavior has in weight loss but merely report the presence of a relationship between the two concepts.

In contrast to the studies that found no relationship between eating self-efficacy and weight loss, other recent studies support the notion that general self-efficacy and weight loss were related. For example, one study reported a significant relationship between self-efficacy and weight loss following an 18-month behavioral intervention (Warziski, Sereika, Styn, Music, & Burke, 2008). The duration reported for this behavioral intervention is interesting since an 18-month intervention is considerably longer than the average duration of typical behavioral interventions. The length of the intervention reported by Warziski and colleagues (2008) suggested that a lengthy intervention may provide an opportunity for levels of self-efficacy to increase that was not present in brief interventions, usually lasting between 10-20 weeks. In the study by Linde and colleagues (2006), further analysis showed that eating self-efficacy did not correlate directly with weight loss, but the level of eating self-efficacy was related to adherence to weight management behaviors such as portion control. Portion control was also correlated with weight change in the four months following treatment (Linde et al., 2006). This finding suggests that a mediational relationship exists between self-efficacy and weight loss maintenance through the effect of self-efficacy on weight maintenance behaviors. There is consistent support for the relationship between self-efficacy and weight maintenance behaviors reported in the literature despite the role of self-efficacy in weight loss being unclear (Byrne, 2002; Elfhag & Rossner, 2005). Thus, it appears that behavioral weight management interventions, which include self-efficacy as a component might indirectly lead to weight loss through the increased adherence to weight management behaviors.

Overall, the weight management literature has shown that behavioral weight management interventions can produce modest weight losses, but those losses are difficult to maintain (Elfhag & Rossner, 2005; Wadden et al., 2002). The duration of behavioral weight management interventions varies widely. In studies that increased the duration of a behavioral intervention from shorter (e.g., 12 weeks) to longer (e.g., 18 months), the amount of weight lost did not increase significantly (Wadden et al., 2002; Warziski et al., 2008). In behavioral weight management programs of any duration, weight losses are seldom maintained over the long-term. Because long-term maintenance of weight losses is difficult for the majority of participants to achieve following the completion of behavioral programs there is a need for more research (Wadden et al., 2002). Improving the understanding of factors involved in the maintenance of behavior changes and developing alternative, novel interventions to promote better maintenance of weight loss is needed. Gastrointestinal or bariatric surgeries have emerged as an alternative method to achieve significant weight loss for morbidly obese individuals.

Bariatric Surgery

Bariatric surgery is an umbrella term for a variety of surgeries that alter a patient's digestive tract and produce dramatic and rapid weight loss (Mechanick et al., 2008). This collection of procedures results in weight loss through a variety of methods. One procedure restricts the amount of food consumed by the placement of a band filled with a liquid solution around the stomach (i.e., Laparoscopic adjustable gastric banding) (Mechanick et al., 2008). Other procedures physically alter the gastrointestinal tract to produce malabsorption of food (i.e., biliopancreatic diversion) (Mechanick et al., 2008). The most common procedure combines surgical targets to produce a procedure that is

restrictive and malabsorptive (i.e., Roux-en-Y gastric bypass) (Mechanick et al., 2008). The two most common bariatric surgeries performed in the United States are Roux-en-Y gastric bypass and laparoscopic gastric banding (Wilding, 2007). Multiple studies have found that bariatric surgery is the most effective method for dramatic, long-term weight loss for the morbidly obese (Bocchieri, Meana, & Fisher, 2002a; Dziurawicz-Kozłowska, Wierzbicki, Lisik, Wasiak, & Kosieradzki, 2006; Puzziferri, 2005; van Hout, Fortuin, Pelle, & van Heck, 2008). Roux-en-Y gastric bypass is the most effective in terms of percentage of excess body weight lost (Bocchieri et al., 2002a). Bariatric surgery is indicated for individuals who are classified as having Class II obesity with significant physical comorbidities and those who are classified as having Class III obesity (Bocchieri et al., 2002a ; Larsen et al., 2003; Dziurawicz-Kozłowska et al., 2006; Shai, Henkin, Weitzman, & Levi, 2003; WHO, 2000). Individuals who have a BMI of 35-39 are included in class II obesity (WHO, 2000). The WHO (2000) classifies individuals whose BMI is greater than 40 as falling within class III obesity, which is also referred to as morbid obesity. Two goals of bariatric surgery are to induce dramatic reductions in an individual's weight, thereby lowering BMI, and resulting in prompt improvements in medical comorbidities (Bocchieri et al., 2002a; Dziurawicz-Kozłowska et al., 2006; Puzziferri, 2005; WHO, 2000). These goals are the focus of the majority of research regarding the success or failure of bariatric surgery.

The percentage of excess weight-loss, level of improvement in physical functioning, and level of improvement in medical conditions often determine whether an individual's bariatric surgery is deemed successful (Bocchieri et al., 2002a; Oria & Moorehead, 1998). Excess weight-loss is defined as a percentage of the amount of weight

lost divided by the number of excess weight units (e.g., kg) above a medically recommended or “ideal” weight measured in the same unit (Bocchieri et al., 2002a). The consistent success of bariatric surgery in helping morbidly obese individuals dramatically reduce their weight is evidenced by the rapid increase in the number of procedures performed, more than doubling between 2000 and 2002 (Schirmer & Watts, 2004). Shai et al. (2003) found that 65% of patients reported satisfaction with the outcome of bariatric surgery 3-10 years after surgery. Successful weight loss, however, is not guaranteed.

Reviews of bariatric surgery research have reported mixed findings with regard to long-term maintenance of weight loss. Longitudinal studies have displayed variation in long-term success rates of bariatric surgery with some studies showing dramatic weight reduction of over 60% of excess body weight and 51% of excess body weight loss maintained up to nine years after surgery (Sugerman et al., 1992). Other research has found that weight-loss reaches a plateau before losses begin to dissipate at approximately two years following surgery with a slow regain toward pre-surgical weight (Bocchieri et al., 2002a; Sarwer, Wadden, & Fabricatore, 2005). These findings mirror the problem of maintaining weight losses initiated by behavioral weight loss programs. While there is some variation in the duration of weight-loss maintenance reported in these studies, the latter findings are reported more frequently.

One predictor of weight loss maintenance after bariatric surgery is adherence to recommended eating behaviors following bariatric surgery (Sarwer et al., 2008; Wadden et al., 2001). Recommended eating behaviors, such as eating three meals, avoiding snacks, and drinking the prescribed protein supplement following bariatric surgery are predictive of the extent of weight lost and maintenance of that loss (Wadden et al., 2001).

Sarwer et al. (2008) found that self-reported adherence to the recommended post-operative diet precipitated greater weight loss and better maintenance of that loss over a longer duration than individuals who deviated from dietary recommendations. Adherence to post-operative dietary recommendations contributes to successful weight loss and weight maintenance following bariatric surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). As is the case with many studies in psychology, these studies are marked by the limitations of self-report measures and may not accurately reflect the amount of adherence to dietary recommendations.

Post-operative bariatric surgery patients have reported that physical limitations, such as the surgical reduction in capacity of the stomach, enabled them to adhere to dietary recommendations following surgery (Bocchieri et al., 2002a, 2002b; Mechanick et al., 2008; Ogden, Clementi, & Aylwin, 2006). These patients reported the physical limitation of food consumption lasted for approximately the first 12 months following surgery. After the first 12 months after surgery had elapsed, the patients struggled to maintain adherence to the recommended dietary behaviors (Bocchieri et al., 2002a, 2002b; Ogden et al., 2006). Failure to adhere to the recommended eating behaviors may result in negative side effects and weight regain.

Patients who did not sufficiently adjust their eating habits experience negative consequences such as a long-term pattern (e.g., up to 15 years) of vomiting in response to overeating (van Hout et al., 2006). Post-operative bariatric surgery patients who do not adhere to the recommended nutrition plan recommended by the bariatric physicians and dietitians frequently experience side effects such as “dumping syndrome,” a physiological reaction that follows consumption of foods high in fat or sugar, which is

characterized by dizziness, heart palpitations, lightheadedness, and nausea (Bocchieri et al., 2002a). Dumping syndrome, perhaps the most uncomfortable side effect of bariatric surgery, is reported to occur in 50-70% of patients (Bocchieri et al., 2002b; van Hout, Boekestein, Fortuin, Pelle, & van Heck, 2006). Patients who successfully adjust eating patterns are less likely to report negative side effects following bariatric surgery than those who do not adjust their eating patterns to follow the recommended nutrition plan (van Hout et al., 2006).

Several qualitative and quantitative studies have been conducted with bariatric surgery patients. Researchers conducting these studies and analyzing the results characterize the adoption of new eating behaviors as a challenge for bariatric surgery patients (Bocchieri et al., 2002a, 2002b; Ogden et al., 2006; van Hout et al., 2006). The participants in the aforementioned studies often had undergone bariatric surgery at least one year prior to reporting on their ability to adopt new eating patterns, which may skew the participants' recall of successes and difficulties in adopting new nutrition behaviors. The authors of these studies suggested that the establishment of new eating behaviors appeared to be rather straightforward immediately following bariatric surgery (Bocchieri et al., 2002b; Ogden et al., 2006; van Hout et al., 2006). That is, the patient's stomach was unable to accommodate large quantities of food after surgery thus leading to the patient eating a smaller quantity of food and changing eating behaviors. With time, however, patients have been found to begin experimenting with new foods, ignore dietary recommendations, or revert to pre-surgical eating patterns (Bocchieri et al., 2002b; Ogden et al., 2006; van Hout et al., 2006). Bocchieri et al. (2002b) noted that a majority of patients who had undergone bariatric surgery at least six months earlier, experienced

difficulty establishing and maintaining recommended eating behaviors. Thus, the literature suggests that many patients begin experimenting with new foods and are unable to adhere fully to the nutrition recommendations given by the bariatric surgeons and dietitians as early as six-months post-surgery. The difficulty in establishing and adhering to recommended eating behaviors is often viewed as the culprit in weight regain among bariatric surgery patients (Bocchieri et al., 2002a; van Hout et al., 2006). It has been suggested that the adoption of new behaviors, such as eating behaviors, requires effortful self-regulation (Schwarzer, 1992). Self-regulation in the adoption of new health behaviors is a subject addressed by many theorists.

Self-Regulation

The literature contains many theories of self-regulation and behavior change such as the theory of planned behavior (TPB), social cognitive theory (SCT), protection motivation theory (PMT), the Transtheoretical model (TTM), and the health belief model (HBM) (Schwarzer, 1992). Various explanations for the successful adoption of health behaviors intended to decrease the risk of developing disease are presented in the theoretical literature. Maes and Karoly (2005) defined self-regulation as a “goal-guidance process, occurring in iterative phases that require the self-reflective implementation of various change and maintenance mechanisms that are aimed at task- and time-specific outcomes” (p. 269). This definition incorporates an individual’s intention to change, which appears to be an integral component of post-bariatric surgery adherence to nutrition recommendations. Most models of self-regulation incorporate the spirit of this definition through various constructs.

Frequently cited models of self-regulation (e.g., SCT, TPB) offer theoretical explanations of the process an individual goes through from evaluating the costs and benefits of a health behavior that may prevent future illness through the adoption or rejection of that behavior (Bandura, 2005; Schwarzer, 1992). Schwarzer's health action process approach (HAPA), shown in Figure 1, is a model of self-regulation based on social cognitive theory. The HAPA, like other models of self-regulation, attempts to explain the process an individual goes through when evaluating and adopting a health behavior. The HAPA also attempts to predict one's intention to adopt a particular health behavior (Schwarzer, 1992). The path from intention formation to the adoption of a health behavior is somewhat different from the TPB, SCT, PMT, TTM, and HBM, all of which attempt to predict behavior primarily through the formulation of an intention to change behavior. According to these models, intention formation is critical to the adoption of a health behavior. This conceptual gap between intention formation and behavior adoption is common among these theories of health behavior and results from the absence of a theoretical explanation of how behaviors are initiated. The prominent feature of the HAPA, which distinguishes it from other models, is an attempt to explain the path of causality in the behavior change process from the formation of an intention to the initiation of a health behavior to the maintenance of that behavior after it has been adopted (Schwarzer, 2008).

The HAPA is also unique in that the model is constructed to provide representation of the processes of health behavior adoption from either a continuum or a stage orientation (Conner, 2008). Continuum models are linear. In continuum-oriented models, individuals are theorized to be at some point along a continuum that represents

their likelihood (e.g., from inaction to action) of initiating a health behavior (Schwarzer, 2008). In order to track one's movement along the continuum from non-action to action, predictors of intention to act (e.g., beliefs and attitudes) need to be identified (Schwarzer, 2008). The HAPA can be viewed as a continuum model, which is similar to the TPB in that it accounts for the process leading to behavioral intention formation (Conner, 2008; Schwarzer, 2008). The HAPA, when conceptualized from a continuum orientation, is thought to be appropriate for research designed to predict intention to perform a behavior (Schwarzer, 1992). The primary criticism of continuum-oriented models is that these models do not explain the intention-behavior gap and do not account for the initiation of a behavior after intention formation (Schwarzer, 2008). The HAPA is conceptually flexible and also can be conceptualized as a stage-based model of behavior change.

Stage models of behavior change, in contrast to continuum models, are not linear. In a stage model, one set of variables may predict progression through the model at an earlier point in the model while a different set of variables predicts the progression through the model at a later point (Conner, 2008). For instance, if an individual reports a high level of self-efficacy, which is required for intention formation, then that individual will move to the next stage in intention formation. Stage models have a distinct advantage in the explanation of behavior change processes compared to continuum models in that each stage is qualitatively different from the stage either in front or behind it (Schwarzer, 2008).

Stage models, then, are able to describe the differences between behavioral intention and action processes, but these models fail to adequately operationalize the hypothetical constructs responsible for movement from one stage to the next (Schwarzer,

2008). In other words, even though researchers are able to determine which variables are prerequisites for later stages, the mechanisms responsible for movement from one stage to the next remain poorly defined. Other criticisms of stage models include that having qualitatively different stages implies that one must progress sequentially through each stage and cannot pass over a stage or revert back to previous stages (Bandura, 2000).

Creating a bridge between implementation intention and actual implementation are maintenance self-efficacy beliefs, action planning, and coping planning (Conner, 2008; Schwarzer, 2008). In the population of interest for the current study, bariatric surgery patients, one could speculate the decision to undergo the surgery implies an intention to change dietary behaviors has been formed. Following the logic of this implication, the post-bariatric surgery patient would begin the process of behavior change (e.g., adopting nutrition recommendations) in a stage that follows intention formation. The HAPA, as a stage-based approach, has three stages.

According to Conner (2008) and Schwarzer (1992; 2008) the three stages of the HAPA are the pre-intentional motivational stage, the post-intentional planning stage, and the post-intentional volitional stage. The pre-intentional motivational stage of the HAPA is similar to other models of health behavior change in that the constructs of action self-efficacy, outcome expectancies, and risk perceptions are hypothesized to lead to the formation of implementation intentions (Luszczyska et al., 2007; Schwarzer 1992; 2008). According to the HAPA, the intention to implement a new health behavior is required prior to the action processes, of initiation, maintenance, and recovery, becoming relevant (Scholz et al., 2005; Schwarzer, 2008). The motivational phase includes several constructs such as action self-efficacy beliefs, outcome expectancies, and risk perceptions

(Schwarzer, 1992; 2008). Each of these constructs is thought to influence the development of an intention to perform a behavior (Schwarzer & Luszczynska, 2008). Other theories of health behavior change incorporate many of the same constructs but do not attempt to incorporate the same combination of specific constructs into the formation of an intention to change.

Self-efficacy is one psychological construct commonly incorporated in theories of health behavior change (e.g., Theory of Planned Behavior) (Bandura, 1997; Schwarzer, 1992). Self-efficacy has also been the focal point of many research projects and has been found to correlate with the adoption of health behaviors (Bandura, 1997; Schwarzer, 2008). Generally, self-efficacy is defined as one's belief in their ability to perform a given action to achieve the desired results (Bandura, 1994). Schwarzer (2008) proposed that self-efficacy could be assessed at a more specific level, action self-efficacy for example. Action self-efficacy is the belief that one possesses the ability to initiate a particular health behavior that will result in specified positive outcomes (Schwarzer, 2008). In the formulation of action self-efficacy as a distinct construct, it appears that there is little difference between the definitions offered by Schwarzer (2008) and Bandura (1994). The major distinction between the two formulations of self-efficacy is that action self-efficacy as a means by which intentions to act are formed focuses on an individual's self-evaluation of his or her ability to perform the specified behavior (Schwarzer, 2008). Schwarzer (2008) proposed that action self-efficacy as a form of behavior specific self-efficacy would offer researchers a more sensitive construct from which to explain how individual judgments lead to intention formation and initiation of the target behavior. The HAPA, however, also includes other constructs, outcome expectancies and risk

perception that contribute to the formation of an intention to initiate a target behavior (Schwarzer, 1992; 2008).

The other two constructs hypothesized to be responsible for intention formation are straightforward compared to self-efficacy. Outcome expectancies refer to assumptions about the consequences of a behavior (Schwarzer, 1992). Positive outcome expectancies are more likely to lead to intention formation whereas negative outcome expectancies are less likely to result in intention formation (Schwarzer, 1992). As with self-efficacy, there are specific types of positive outcome expectancies that may have a role in the formation of an intention to act. The specific types include social, physical, and emotional outcome expectancies (Schwarzer, 2008). Unlike self-efficacy, however, the type of outcome expectancy is specific to the anticipated results of the target behavior and often differs from one person to the next (Schwarzer, 2008). Risk perceptions are beliefs about one's vulnerability to a perceived threat to health (Schwarzer, 2008). Risk perceptions are perhaps the least influential factor included in the HAPA with regard to intention formation (Schwarzer, 1992; 2008). Nevertheless, when one believes he or she is vulnerable to a perceived threat the likelihood of taking action is increased (Connor, 2008; Schwarzer, 1992). The pre-intentional motivational stage is composed of action self-efficacy, outcome expectancies, and risk perceptions (Schwarzer, 1992; 2008). When levels of self-efficacy are high, outcome expectancies are positive, and risk perceptions are high, individuals are more likely to form an intention to perform a health behavior (Conner, 2008; Schwarzer, 1992; 2008).

Following the formation of an intention to undergo bariatric surgery, patients who follow-through with that decision and undergo bariatric surgery begin a two-step process

of taking action (Schwarzer, 2008). This two-step process begins with the formation of a second intention to change, the intention to change eating behaviors in accordance with the nutrition recommendations provided by the bariatric center physicians and dietitians, and is followed by efforts to initiate and maintain adherence to that nutrition plan (Bocchieri et al., 2002b; Ogden et al., 2006; Schwarzer 2008). As was mentioned earlier, the vast majority of patients do not struggle to follow the nutrition plan until somewhere between 12-24 months after surgery (Bocchieri et al., 2002a; Mechanick et al., 2008). This pattern suggests that adherence to the plan is likely and that many patients may be considered to be maintaining adherence to those behaviors within the first 12-24 months following bariatric surgery.

Schwarzer's (1992) description of maintenance of a newly adopted health behavior is consistent with the use of psychological control over eating behaviors. Maintenance self-efficacy has been found to support the notion of increased cognitive control and researchers have found that maintenance self-efficacy is related to persistent efforts to sustain a new behavior (Luszczyska & Sutton, 2006; Scholz et al., 2005). Eating habits must be altered dramatically following bariatric surgery for maximum weight loss to occur with minimal side effects as well as for maintenance of lost weight (Bocchieri et al., 2002b; Ogden et al., 2006; van Hout et al., 2006). However, some bariatric surgery patients are unable to sustain the level of psychological control needed to control their eating patterns after the physical effects that enabled them to control their food intake wore off (Ogden et al., 2005). Adherence to post-surgical dietary recommendations is a behavior change process independent of the original action,

undergoing bariatric surgery. Bariatric surgery patients' experiences have been reported to support these assumptions (Bocchieri et al., 2002b).

Once an intention has been formed, maintenance self-efficacy, action planning, and coping planning behaviors are hypothesized to bridge the gap between intention formation and initiation of a behavior (e.g., action) in the post-intentional planning stage (Conner, 2008; Schwarzer, 1992; 2008). This "intention-action" bridge is the unique aspect of the HAPA that makes it more comprehensive than other stage models of behavior change. Maintenance self-efficacy represents an individual's confidence in his or her ability to stick with a specific behavior once it has been initiated (Schwarzer, 2008). Maintenance self-efficacy is characterized by the anticipation of barriers and having confidence in one's ability to overcome those barriers (Schwarzer, 2008). The role of self-efficacy in the initiation and maintenance of a health behavior has received support in the literature (Conner, 2008; Luszczynska & Sutton, 2006; Rothman, 2000; Schwarzer, 2008). This construct appears to be important in an individual's decision to initiate and maintain a new health behavior.

Bocchieri et al. (2002b) conducted a qualitative study in which bariatric surgery patients reported feeling the surgery gave them a "new life" in which the date of the surgery was reported to be a "new birthday." Most patients described themselves as having a positive view of bariatric surgery, however, successful adherence to dietary recommendations was challenging. Patients who reported successful establishment and maintenance of new eating behaviors were found to utilize progressively more psychological control over eating behaviors as the time since surgery increased (Bocchieri et al., 2002b). The pattern of patients describing their post-surgery experience

as a “new life” would suggest that mastery experiences in adhering to the nutrition recommendations would increase the likelihood of increased level self-efficacy.

Participants in another study reported feeling that they had more control over their eating patterns following surgery due to the effects of the surgery, an external perception of control (Ogden, Clementi, Aylwin, & Patel, 2005). This study by Ogden and colleagues (2005), however, paints a different picture. Mastery experiences are incompatible with an external locus and therefore would be unlikely to bolster the levels of self-efficacy let alone increase those levels. Therefore, the internal attribution of mastery experience is important to increases in reported self-efficacy.

The linchpin in the formation of the “intention-action” bridge is planning. Schwarzer (2008) identified two types of planning, action planning and coping planning, which act as mediators of intentions and behaviors. Action planning involves defining parameters of action such as when, where, and how to initiate a behavior (Schwarzer, 2008). Coping planning involves the anticipation of potential barriers to the action (Schwarzer, 2008). When an individual engages in coping planning, they are likely to formulate “if-then” contingencies such as, *“If I am eating with friends at a restaurant, I will choose the meal that most closely matches my dietary needs”* (Schwarzer, 2008). Planning, however, does not imply that an action will be initiated. The collective power of maintenance self-efficacy, action planning, and coping planning are implicated in the initiation of a behavior according to the HAPA (Conner, 2008; Schwarzer, 2008). Once an individual has developed action plans and coping plans to initiate an action the third and final stage of the HAPA is encountered.

In the third and final stage of the HAPA, the post-intentional volitional stage, individuals are hypothesized to act on their intention to adopt a new health behavior (Schwarzer, 1992). Self-efficacy and planning also have a role in the post-intentional volitional stage of the HAPA (Schwarzer, 1992; 2008). The post-intentional volitional stage of the HAPA includes constructs such as maintenance self-efficacy, recovery self-efficacy, action planning, coping planning, and action (Schwarzer, 2008). Maintenance self-efficacy has a more significant influence on volition as compared to its role in the “intention-action” gap. Maintenance self-efficacy is a specific form of self-efficacy that consists of optimistic beliefs about one’s ability to continue a behavior and overcome barriers (Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Schwarzer, 2008). Individuals with high levels of maintenance self-efficacy compared to individuals with lower maintenance self-efficacy are more likely to exhibit persistence and increased effort toward the newly initiated behavior (Schwarzer, 2008). Research on maintenance self-efficacy suggests that the role of this construct may have a powerful effect on the likelihood of an individual’s persistence in sticking with the newly initiated behavior (Conner, 2008; Luszczynska & Sutton, 2006; Schwarzer, 2008).

That changing eating behaviors is medically recommended following bariatric surgery has been well established and extensively researched (Aills, Blankenship, Buffington, Furtado, & Parrott, 2008; Bocchieri et al., 2002a). Improved adherence to recommended eating behaviors following bariatric surgery can result in positive outcomes for patients as well. Adherence to post-surgical nutrition recommendations is associated with greater excess weight loss, improved maintenance of weight loss, increased self-esteem, and improved self-efficacy in other areas of life (Bocchieri et al.,

2002a; 2002b; de Zwaan et al., 2002; Herpertz, Kielmann, Wolf, Langkafel, Senf, & Hebebrand, 2003). Each of these outcomes is congruent with the concept of mastery experiences that should increase the level of maintenance self-efficacy in terms of adherence to the nutrition recommendations (Schwarzer, 2008).

Schwarzer (2008) hypothesized that maintenance self-efficacy is an important contributor to the task of maintaining an implemented health behavior. Intuitively, maintenance self-efficacy would influence the level of effort put forth to maintain a behavior an individual thinks is beneficial. According to the HAPA, however, maintenance self-efficacy appears to mediate the relationship between planning and action, indirectly influencing maintenance. Maintenance self-efficacy has been found to be correlated at an 8 month follow-up with the maintenance of physical activity in patients who have had myocardial infarction (MI) (Luszczynska & Sutton, 2006). Luszczynska and Sutton (2006) also found that the level of exercise prior to MI was predictive of relapse to pre-MI levels of exercise. The findings of the study conducted by Luszczynska and Sutton (2006) imply that individuals who exercised prior to MI would have higher levels of maintenance self-efficacy compared to those who did not exercise prior to MI. Following a relapse, the level of recovery self-efficacy reported by the participants was, at least, predictive of some return to exercise even if the level of exercise did not reach prescribed levels (Luszczynska & Sutton, 2006). Their findings support the idea that individuals who believe they are capable of dealing with barriers are more likely to maintain a newly initiated behavior. If an individual is unable to overcome a barrier, the risk for relapse or abandonment of the newly initiated behavior increases. Yet, immediately after undergoing bariatric surgery, patients do not have to actively

control their eating behaviors because the physical limitations imposed by the surgery do not allow for deviation from the nutrition plan without the patient experiencing complications or some other negative side effect (Mechanick et al., 2008).

Ogden, Clementi, and Aylwin (2006) found that patients responded differently to their reduced capacity for consuming food and the consequences of exceeding the limited physical capacity for food following bariatric surgery. All participants reported being cognizant of a change in how they approach food decisions and the consequences associated with not following the recommended nutrition behaviors. Some patients embraced the change in their relationship with food, expressing satisfaction with a more pragmatic relationship with food (i.e. "I'm still a foodie...I've become more selective about the type of food that I can eat.") (Ogden et al., 2006, p. 285). While other patients expressed dissatisfaction with the change in their relationship with food (i.e. "Now I don't get hardly any pleasure out of eating because you can't eat much.") (Ogden et al., 2006, p. 285). Satisfaction with and dissatisfaction with the recommended change in eating behaviors did not affect reported adherence to the recommended dietary changes. Both groups reported adherence to the recommended dietary behaviors.

However, Ogden and colleagues (2006) did not assess the impact of satisfaction on levels of self-efficacy among the participants. Levels of self-efficacy tend to increase with successful mastery experiences and adherence to the recommended dietary behaviors would likely serve as a successful mastery experience for these patients (Bandura, 1999). With regard to the tenets of the HAPA, successful mastery experiences would serve to increase the level of maintenance self-efficacy (Bandura, 1999; Schwarzer, 2008). Several patients described difficulties establishing healthier eating

patterns whereas others have reported the development of healthier eating habits to be a direct result of bariatric surgery (Bocchieri et al., 2002b; Ogden et al., 2006). These findings suggest that bariatric patients struggle to make a change to healthier eating patterns. When these patients are successful, healthier eating patterns were perceived to be due to an external stimulus, which would not be considered a mastery experience. Experiencing behavior change as an external process would not contribute to the development of self-efficacy. Self-described “emotional eaters” were more likely to have difficulty adhering to post-surgical recommended eating behaviors (Bocchieri et al., 2002b). These experiences would not help to increase the level of maintenance self-efficacy because patients who “emotionally eat” tend to perceive their emotions and their reaction to those emotions as outside of their control (Bocchieri et al., 2002b; Ogden et al., 2006; Bandura 1999). Those who have difficulty adhering to the post-bariatric surgery nutrition recommendations may have to rely upon a third type of self-efficacy that has a role in the volitional stage of the HAPA, recovery self-efficacy (Schwarzer, 2008).

Recovery self-efficacy refers to one’s confidence in his or her ability to resume efforts to perform target behavior after a lapse or relapse (Scholz, Sniehotta, & Schwarzer, 2005). Schwarzer (2008) postulated that recovery self-efficacy would influence the action process according to its hypothesized role in the HAPA (Schwarzer, 2008). Scholz and colleagues (2005) suggested that recovery self-efficacy was needed only when some internal or external stimulus prevents or threatens to prevent an individual from maintaining the initiated target behavior. Recovery self-efficacy is an integral piece of the HAPA and represents an individual’s perceived confidence to return

to the target behavior if he or she is unable to maintain adhere to the behavior.

Furthermore, self-efficacy has been implicated in the recovery of target health behaviors after a lapse or relapse (Conner, 2008; Luszczynska & Sutton, 2006; Rothman, 2000; Schwarzer, 2008).

Failure to adhere to the recommended nutrition behaviors may result in negative consequences such as nausea, vomiting, or dumping syndrome and would not be considered mastery experiences (Herpertz et al., 2003; Schwarzer 1992, 2008).

Therefore, these experiences may lead to decreases in maintenance self-efficacy and a greater likelihood of non-adherence with regard to the nutrition recommendations.

Failure to adhere to the recommended nutrition behaviors, though, may lead to an opportunity to recover and resume those behaviors thus recovering from lapses or relapses (Marlatt & Gordon, 1985). These behaviors also may have negative effects on self-efficacy.

Experiencing negative consequences such as those mentioned earlier could detrimentally impact a patient's level of maintenance self-efficacy and level of recovery self-efficacy (Bandura, 1994; Gwaltney, Metrik, Kahler, & Shiffman, 2009). Thus, the likelihood of the patient sticking with the target health behavior, adhering to the nutrition recommendations, would be reduced (Bandura, 1994; Gwaltney et al., 2009). Up to one-third of bariatric surgery patients have been found to report non-adherence to post-bariatric surgery nutrition recommendations and consequently experience negative side effects (Herpertz et al., 2003; van Hout et al., 2006). Adherence to the nutrition recommendations following bariatric surgery will likely reduce the occurrence of negative consequences and could bolster maintenance self-efficacy because those

recommendations are intended to encourage sustained weight loss, continued improvement in psychosocial functioning, and decreased health risks (Bocchieri et al., 2002a; Herpertz et al., 2003). The tenacity with which an individual pursues adherence to recommended eating behaviors is likely to be influenced by experiencing more benefits and fewer negative consequences while initiating new eating behaviors (Gwaltney et al., 2009). These benefits may lead to increased levels of self-efficacy such that one may choose to re-initiate the recommended nutrition behaviors or, in other words, recover from a lapse. Empirical support for this pattern is seen in research with patients prescribed an exercise regimen after suffering myocardial infarction (Luszczynska & Sutton, 2006).

Luszczynska and Sutton (2006) suggested that higher reported recovery self-efficacy was a protective factor such that MI patients were more likely to continue exercising during relapse, albeit at a level below that indicative of exercise maintenance. Individuals in a cardiac rehabilitation program who began an exercise program following heart surgery were more likely to resume exercise behavior following a health related break from exercise within the first four months of treatment (Scholz et al., 2005). Evidence for the role of self-efficacy in health behavior change has been found in smoking cessation literature as well (Schwarzer, 2008). A recent meta-analysis of smoking cessation literature found individuals who had achieved abstinence from smoking had higher self-efficacy (Gwaltney et al., 2009). Self-efficacy in the study by Gwaltney and colleagues (2009) was increased through experiences of successfully managing high-risk situations compared to those who have relapsed.

These studies support the notion that recovery self-efficacy is a protective factor from the abstinence violation effect, which posits that even an isolated slip will be interpreted as a relapse and in turn be detrimental to the effort to change behavior (Marlatt, 1996; Schwarzer, 2008). Individuals high in recovery self-efficacy are more likely to attempt to minimize the effects of a relapse and quickly return to the recently adopted health behavior (Schwarzer, 2008). The inclusion of recovery self-efficacy in the HAPA implies that individuals are expected to relapse and that the newly adopted health behaviors continue to be desirable (Luszczynska et al., 2007). Not all research supports the inclusion of recovery self-efficacy as a predictive factor in the performance of a health behavior. Scholz and colleagues (2005) found that exercise behavior at one year after discharge from a cardiac rehabilitation program was not significantly correlated with recovery self-efficacy. However, as noted earlier, recovery self-efficacy was associated with resuming exercise following relapse. These seemingly contradictory findings can be explained. Only participants who needed to take a health related break from exercise were found to utilize recovery self-efficacy (Scholz et al., 2005). Thus, only a portion of the total sample called on their recovery self-efficacy resources in order to resume a post-cardiac rehabilitation exercise program (Scholz et al., 2005). The preceding discussion of processes involved in the HAPA bear out the complexity of the model and imply that testing the entire model, due to the number of variables, would be contraindicated (Kline, 2005; Schwarzer, 2008).

Recovery self-efficacy, however, is not necessary for one to initiate a target behavior. Having discussed three specific forms of self-efficacy it is important to note that all three are functionally different, can co-exist any point in time, and are not

mutually exclusive (Scholz et al., 2005; Schwarzer, 2008). According to the HAPA, maintenance self-efficacy and recovery self-efficacy are the specific types of self-efficacy that may influence the post-intention volitional stage of the model (Conner, 2008; Luszczyska & Sutton, 2006; Schwarzer, 2008).

The major volitional process identified within the post-intentional volitional stage of the HAPA is simply termed “action.” The action phase within the HAPA is composed of three processes, which occur in a closed loop: initiation, maintenance, and recovery (Schwarzer, 2008). Initiation, the first process in the loop, is intentionally enacting a new health behavior (Scholz et al., 2005). All preparation needed to initiate a new health behavior is thought to occur prior in the first two stages of the HAPA that, optimally, are completed prior to the action phase of the HAPA (Scholz et al., 2005). Rothman (2000) suggested that an individual is more likely to initiate a new health behavior if they are optimistic that the behavior is valuable and believe that they are capable of successfully adopting the behavior. Individuals who believe that a behavior is valuable would be classified as having positive outcome expectancies (Schwarzer, 2008). Individuals who believe that they are capable of performing the behavior are said to have high action self-efficacy (Luszczyska & Sutton, 2006; Schwarzer, 2008). Thus, as was laid out earlier, individuals who have positive outcome expectancies, who have high levels of action self-efficacy, and who believe that the target behavior is relevant to reducing risk will formulate an intention to perform a behavior (Conner, 2008; Schwarzer, 1992; 2008). This is termed the pre-intentional stage of the HAPA. Then, movement through the intentional stage is influenced by maintenance self-efficacy, action planning, and coping

planning. Movement through this stage will theoretically lead to the initiation of a target behavior, which is the first process in the action stage (Schwarzer, 2008).

Maintenance and recovery are processes explicitly identified in the action stage and are a unique contribution of the HAPA. The majority of behavior change models presume that behavioral initiation follows intention formation and is either maintained or abandoned (Conner, 2008; Schwarzer, 1992). These models do not explicitly account for the closed loop that makes up the action cycle of the HAPA (see Figure 1). Maintenance and recovery, in this closed loop, represent the process of continuing (maintenance) a behavior or the re-initiation of a behavior following relapse (Conner, 2008). Behavior maintenance has been defined as sustaining a behavior over an extended period of time (Rothman, 2000). This definition is important in our understanding of adherence to nutrition recommendations made to bariatric surgery patients. These recommendations are intended to precipitate long-term changes in dietary behaviors (Mechanick et al., 2008). Maintenance of a new health behavior is thought to be related to an individual's perceived satisfaction with the behavior (Rothman, 2000; Schwarzer, 2008). Maintenance of a target behavior also requires cognitive control (Rothman, 2000; Schwarzer, 1992). According to these assertions, if one exerts the required cognitive control and is satisfied with the outcome of the behavior, then the behavior is more likely to be maintained. Maintenance is unfortunately not always the case. If all behavior change efforts were maintained there would not be a need to address recovery.

Recovery, as it is defined in the HAPA, is necessary when one has encountered a lapse or relapse and abandoned a target health behavior. Recovery is functionally defined as the act of returning to the goal behavior or initiated behavior after a relapse

(Schwarzer, 1992). The role of recovery in the HAPA is to provide an explicit path for an individual to re-initiate the target behavior following a failure to maintain adherence to the target behavior, also called a lapse or relapse (Schwarzer, 2008). Relapse occurs when an individual abandons efforts to maintain newly initiated behaviors and in turn reverts to old behaviors (Marlatt & Gordon, 1985; Witkiewitz & Marlatt, 2004). Not every individual who abandons efforts to maintain adherence to the target behaviors relapses. A lapse is a discreet abandonment of newly initiated target behavior in favor of old behaviors from which the individual will recover and resume the target behavior (Marlatt & Gordon, 1985; Witkiewitz & Marlatt, 2004). Relapse is not explicitly represented in the HAPA, which appears to be an oversight or weakness in the model. It seems that relapse is important to the action stage and would be a prerequisite for the process of recovery.

Marlatt and Gordon (1985) in their book entitled “Relapse Prevention” provide several definitions of relapse that originate from the work of clinicians and researchers in the field of addiction and substance abuse. These definitions have in common the tendency to describe the addiction treatment process as an all-or-nothing phenomenon. That is, relapse is often defined in terms of success or failure to comply with treatment (Marlatt & Gordon 1985). Relapse is not just the process of “backsliding or worsening” (p. 32) but indicates that the individual has stopped trying to adhere to the new behaviors (e.g., the nutrition plan in this research) (Marlatt & Gordon, 1985). These definitions failed to account for the occasional mistake in adherence, the individual who does not adhere for a brief period but then gets back on track with regard to adherence, and for the one-time offense. An important distinction to make is the difference between the absence

of effort to adhere (e.g., complete failure) and a single episode of failure after which one resumes the target behavior. A lapse refers to the occasional mistake, the brief period of non-adherence, and the one-time offense and then getting back on track with regard to adherence (Marlatt & Gordon, 1985). This distinction is important to determine which individuals appear to have stopped attempting to adhere to the nutrition plan recommended by the bariatric center dietitians and physicians.

Schwarzer (1992) suggested that lapses are a result of interruptions based on high-risk situations that compete with a new behavior. A high-risk situation may be comprised of cues associated with behaviors that are no longer desired. An example of a cue in a high-risk situation is a bowl of potato chips at a party for someone who recently began dieting. High-risk situations are more likely to induce initial lapses from which an individual is at an increased risk for relapse (Witkiewitz & Marlatt, 2004). After a lapse, an individual may not attempt to resume the target health behavior, marking relapse to previous behaviors that are undesirable (Marlatt, 1996). Luszczynska and Sutton (2006) found that psychosocial and environmental factors, which contribute to the power of high-risk situations, correlated with the susceptibility of relapse in MI patients. These factors included poor social support, poor diet prior to MI, less regular exercise prior to MI, and weaker intentions to change exercise behavior upon release from the hospital (Luszczynska & Sutton, 2006). Each high-risk situation, psychosocial factor, and environmental factor that is incompatible with a recently adopted health behavior represents a potential barrier to maintenance of that behavior. In situations that result in relapse an individual may have succumbed to the “abstinence violation effect,” the belief that they have failed to adhere to their goal behavior and subsequently cease any attempt

to pursue the target behavior (Marlatt, 1996; Marlatt & Gordon, 1985; Schwarzer, 2008). The abstinence violation effect is indicative of a person having few cognitive resources for engaging in the target behavior (Marlatt, 1996). Increasing cognitive resources through planning responses to potential barriers and increasing one's level of recovery self-efficacy should then decrease the likelihood that the abstinence violation effect will impede a desire to return to the goal behavior (Marlatt, 1996). As will be laid out in the following paragraphs, the processes that lead to relapse must be understood and considered in any model seeking to explain the concepts and processes of "action" as defined by Schwarzer in the HAPA (2008).

Research on addiction suggests that relapse rates are high across all addictive behaviors (Brownell, Marlatt et al., 1986; Marlatt & Gordon, 1985). Dietary change also has a notoriously high rate of non-adherence (Brownell, Marlatt et al., 1986; Marlatt & Gordon, 1985; Wadden et al., 2002). High-risk situations or situations in which an individual is tempted to abandon the new behavior (e.g., sobriety or nutrition change) are thought to contribute to rates of relapse. A high-risk situation is marked by the presence of strong contextual cues that precipitate relapse such as being in a bar, eating a buffet style meal, seeing fast food commercials, and feeling sad or anxious (Marlatt & Gordon, 1985). Marlatt and Gordon (1985) provided a taxonomy of relapse episodes and the triggers that precede the relapse. In general, the cues can be classified as being either 1) an interaction of intrapersonal and environmental determinants (e.g., to cope with negative emotional state or giving in to temptation in the presence of the substance or junk food) or 2) primarily associated with interpersonal factors such as interpersonal conflict (e.g., eating to sooth oneself following an argument with a loved one) (Marlatt &

Gordon, 1985). However, the presence of strong cues does not mean that an individual will relapse.

Protective factors that decrease the likelihood of relapse include self-monitoring, high-levels of self-efficacy, and having coping skills relevant to the situation and behavior (Bandura, 1997; Marlatt & Gordon, 1985; Conner, 2008). Self-monitoring is a protective factor in as much as the individual is more aware of his or her high-risk situations. This procedure raises the individual's awareness of the problem behavior, the frequency with which he or she engages in that behavior, the antecedents of the behavior, and the consequences of the behavior (Marlatt & Gordon, 1985). Increased awareness is a protective factor, reducing the likelihood of relapse because the individual can avoid or prepare for potential high-risk situations. When an individual anticipates and plans to cope with a potential high-risk situation he or she is engaging in planning behaviors described earlier. Research on self-efficacy has shown that an individual who has a high level of confidence in his or her ability to perform a behavior, in the context of this research, changing nutrition behaviors, is more likely to weather high-risk situations and maintain adherence to the new nutrition behaviors (Bandura, 1997; Conner, 2008; Marlatt & Gordon, 1985). Coping skills are integral to relapse prevention. Simply put, if an individual is capable of navigating various high-risk situations that may occur during the behavior change process then he or she is less likely to relapse (Marlatt & Gordon, 1985). However, if the individual does not have adequate coping skills to navigate the high-risk situations then relapse is more likely and the individual may be susceptible to the abstinence violation effect.

In the most stringent of instances a single lapse is interpreted by the patient as a total violation of adherence and leads to complete relapse. This is called the abstinence violation effect (AVE) (Marlatt & Gordon, 1985). The AVE is intended to be evaluated on a continuum in which perceived personal control and perceived relevance determine the strength of the AVE. According to Marlatt and Gordon (1985), individuals who attribute a lapse to factors that are perceived to be internal, uncontrollable, stable, and global are more likely to experience a strong AVE. The opposite is true (AVE intensity decreases) for individuals who perceive the cause of a lapse to originate in external, changeable, and specific factors (Marlatt & Gordon, 1985). Those who have a strong AVE reaction are more likely to relapse than those who have a weaker AVE (Marlatt & Gordon, 1985). Mooney, Burling, Hartman, and Brenner-Liss (1992) found the strength of AVE was related to less total weight loss in a study of participants enrolled in a very low calorie diet program. Over half of participants lapsed within 3 months and this finding suggests that those participants who viewed their lapses as unchangeable characterological deficits were less likely to achieve a substantial weight-loss than those who viewed lapses as situational and changeable (Mooney et al., 1992). Additionally, those who viewed lapses as internal and uncontrollable were more likely to drop out of the weight-loss program sooner than program dropouts who viewed lapses as external and changeable (Mooney et al., 1992). The research conducted by Mooney and colleagues suggests that AVE has relevance to changing dietary behaviors, particularly with strict nutritional changes like those associated with bariatric surgery.

Affective Disorders

Affective disorders such as depression and anxiety are believed to have a role in adherence to behavior change efforts (Julius, Novitsky, & Dubin, 2009). The presence of depression and anxiety are well documented in samples of obese men and women prior to undergoing bariatric surgery (Bocchieri et al., 2002a; van Hout et al., 2008; Wadden et al., 2001). Up to two-thirds of patients who sought bariatric surgery reported at least mild depression as measured by the Beck Depression Inventory (BDI) (Fabricatore, Wadden, Sarwer, Crerand, Kuehnel, Lipschutz, et al., 2006). The BDI is a self-report depression screening instrument that has face validity. A face valid instrument such as the BDI has limitations such that an individual may over or under-report the symptoms he or she is currently experiencing. With this in mind, those patients seeking bariatric surgery who reported higher levels of depression did not differ in pre-surgical BMI compared to those who did not report symptoms of depression (Fabricatore, Wadden, Sarwer, Crerand, Kuehnel, Lipschutz, et al., 2006). This is in contrast to research on post-bariatric surgery patients who reported higher levels of depression with higher weight (Bocchieri et al., 2002a; van Hout et al., 2008; Wadden et al., 2001). The presence of disordered patterns of eating is also related to increased levels of depression and anxiety.

Individuals who report binge eating prior to weight loss attempts, including bariatric surgery, reported higher levels of depression than non-binge eaters (Ames, Patel, Ames, & Lynch, 2009; Bocchieri et al., 2002a; Fabricatore et al., 2006; Herpertz et al., 2003; Wadden et al., 2002). In these studies, the increased levels of depression were often linked to negative emotional states and an attempt to cope with those attempts through binge eating behaviors. According to the bariatric surgery literature, individuals who binge eat were more likely to experience difficulties in their attempts to establish new

nutritional habits after bariatric surgery and may continue to struggle with maladaptive eating patterns in the form of grazing in response to negative affect (Bocchieri et al., 2002a; Green, Dymek-Valentine, Pytluck, le Grange, & Alverdy, 2004). Grazing is defined as eating small quantities of food throughout the day, which increases overall caloric intake and circumvents the intention of bariatric surgery (Bocchieri et al., 2002a; Green, et al., 2004). These studies, like those mentioned earlier, are limited by the use of self-report measures. When individuals return to maladaptive eating patterns, approximately 12 – 24 months following bariatric surgery, that individual's behavior meets the definition of relapse and is thought to be, in some cases, related to affective disorders (Bocchieri et al., 2002a; Brownell et al., 1986; Marlatt & Gordon, 1985).

Relapse in the substance abuse and weight management literature has been associated with depression. A review of relapse literature by Brownell and colleagues (1986) reported a study where it was found that as individuals lost weight, levels of depression decreased. Several studies have replicated this finding in the behavioral weight loss literature (Wadden et al., 2001; Wadden et al., 2002). This pattern of depression being alleviated with weight loss is consistent with research on bariatric surgery patients (Bocchieri et al., 2002a; Fabricatore, Wadden, Sarwer, & Faith, 2005). However, there is no clear indication of causation in these studies. As cross-sectional self-report studies, these studies provide us with evidence of a relationship between decreasing weight and lower levels of depression. However, depression is not the only affective disorder that has been found to decrease following bariatric surgery.

Anxiety also has been found to diminish following bariatric surgery as weight loss increased (Bocchieri et al., 2002a; van Hout et al., 2008). In a study by Karlsson,

Sjostrom, and Sullivan (1998), patients undergoing bariatric surgery reported a significantly greater decrease in the level of anxiety when compared to a control group of obese individuals. While the comparison to a control group is preferable, the rates of anxiety among the participants of this study increased over the course of the two-year follow-up period. At the two-year follow-up, levels of self-reported anxiety were not significantly different from those reported by the control group (Karlsson, et al., 1998). One study acknowledged the limitations frequent in much of the bariatric literature that examined affective disorders in bariatric patients (Wadden, Sarwer, Fabricatore, Jones, Stack, & Williams, 2007). Wadden and colleagues (2007) cited the use of measurement tools with psychometric limitations, poorly defined or absent control groups, and the use of samples of convenience that are likely to report higher levels of anxiety and depression.

Despite those limitations in the measurement of affective disorders with this population, Wadden and colleagues (2007) have reported similar patterns of anxiety and depression among bariatric patients. These patterns show that levels of anxiety and depression increase after an initial drop following bariatric surgery and usually followed the pattern of weight loss and regain. That is, when one loses weight dramatically following bariatric surgery, the level of depression and anxiety tends to decrease and when weight regain begins between 12-24 months following surgery the levels of depression and anxiety tends to increase (Maddi, Fox, Harvey, Lu, Khoshaba, & Persico, 2001; Wadden et al., 2007). In these studies, however, levels of anxiety and depression returned toward presurgical levels after weight loss had reached a plateau or weight regain had begun (Bocchieri et al., 2002a; Herpertz et al., 2003).

This literature on affective disorders in the bariatric surgery literature collectively suggests that higher levels of depression and anxiety are predictive of weight regain and engaging in maladaptive eating patterns, patterns that are not conducive to adherence to post-surgical dietary recommendations given to bariatric patients (Fabricatore et al., 2006; Wadden et al., 2007). However, it should be noted that affective psychopathology has not been found to be related to the absolute amount of weight lost following bariatric surgery, but is related to adherence to behavioral recommendations and thus poor weight loss maintenance (Puzziferri, 2005; Saunders, 2004). These findings suggest that the effect of levels of depression and anxiety on adherence to nutrition recommendations is moderated by the amount of weight lost or gained. That is, individuals who experience high levels of depression will be more likely to have relapsed and returned to maladaptive eating patterns such as eating in response to emotional cues. Additionally, it is also likely that bariatric patients who experience high levels of anxiety will be more likely to relapse to old or maladaptive eating patterns. Body mass index and the length of time that has elapsed since having the surgery also have received research attention in terms of the degree to which a patient's likelihood of maintaining adherence to the recommended dietary behaviors following bariatric surgery will be affected.

Body Mass Index

Body mass index (BMI) has been linked to adherence to nutrition recommendations in several ways. The research linking failed attempts to diet and progressive weight gain among bariatric surgery patients is well documented. One study by Gibbons and colleagues (2006) is an exemplar of this phenomenon. The researchers found that bariatric patients reported, on average 4.7, successful diet attempts, which was

defined as losing 10 or more pounds. Yet, the seemingly inevitable outcome was an increase in weight over the long-term leading to bariatric surgery (Gibbons et al., 2006). Such failures in dieting attempts may lead one to believe that he or she is unable to lose weight on her own and mastery experiences may be needed to improve self-efficacy and sustain efforts to reduce weight and therefore reduce BMI (Bandura, 1997; Gibbons et al., 2006; Pontiroli et al., 2007). Thus, a history of dieting failure would likely contribute to lower levels of self-efficacy prior to bariatric surgery.

Levels of self-efficacy are increased with mastery experiences and the rapid weight loss experienced immediately after undergoing bariatric surgery may be interpreted as a mastery experience (Bandura 1997; Bocchieri et al., 2002a). Perhaps a more powerful mastery experience would be maintaining a lower BMI after the initial weight loss. In particular, this successful experience would indicate dietary adherence after bariatric surgery. Sarwer, Wadden, and colleagues (2008) found that high levels of self-reported dietary adherence were related to a 4.5% greater weight loss among bariatric surgery patients at 92-weeks after surgery. Furthermore, Pontiroli and colleagues (2007) found that BMI and overall compliance (including dietary) were associated with weight loss at follow-ups of 12, 24, and 36 months. BMI, by affecting the level of motivation, also can have an effect on adherence to recommended dietary behaviors. While the research reviewed here does not explicitly state that improved adherence to the nutrition recommendations given by the bariatric center surgeons and dietitians is related to a lower BMI, the correlation between eating habits and weight gain is well established. Another factor related to the maintenance of weight loss following bariatric surgery is the

length of time that has passed since a patient had bariatric surgery. The duration of time since undergoing bariatric surgery is final variable to be reviewed for this study.

Time Since Surgery

In studies and reviews of weight patterns over time following bariatric surgery, patients consistently reported an immediate and dramatic weight loss for the first six months followed by a gradual leveling off of weight until one year post-surgery (Bocchieri et al., 2002a; Herpertz et al., 2003; Ogden et al., 2005; Sarwer et al., 2008). Between the twelfth and twenty-fourth months most patients experienced weight regain to some degree (Bocchieri et al., 2002a; Herpertz et al., 2003; Ogden et al., 2005; Sarwer et al., 2008). As explained earlier, a significant minority of patients tended to regain a significant amount of weight beginning between 12 – 24 months after surgery. It is this group, those who regain a significant amount of weight that are suspected of poor adherence to the recommended nutrition plan. The weight management literature suggests that poor adherence to dietary changes are related to the difficulty many people encounter when trying to change a long-standing behavior (Bocchieri et al., 2002a; Luszczynska & Schwarzer, 2003; Ogden et al., 2005; Milne & Orbel, 2000; Sarwer et al., 2008; Sutton, 1994).

According to the literature, an individual's past behavior is a good predictor of future behavior (Luszczynska & Schwarzer, 2003; Milne & Orbel, 2000; Sutton, 1994). The idea that one's past behavior will predict future behavior provides the conceptual basis for the inclusion of time since surgery. Many researchers have noted that the majority of bariatric patients actually maintain a significant percentage of weight loss for several years after surgery (e.g., Bocchieri et al., 2002a; Gibbons et al., 2006; Mitchell et

al., 2001). Thus, the axiom that past behavior will predict future behavior is not necessarily true among bariatric surgery patients. Once behavior changes have been incorporated into daily life and become habitual, past behaviors that were the target of change no longer significantly influence adherence (Luszczynska & Schwarzer, 2003).

For individuals struggling with adherence to the target health behavior, Luszczynska and Schwarzer (2003) suggested that psychological interventions could increase the likelihood of performing a health behavior. In their research, women received questionnaires that may have unintentionally increased the participants' awareness and self-efficacy for performing the breast self-exam. This increase in awareness and self-efficacy was reflected in the data by an increase frequency of performance of breast self-exam over thirteen weeks regardless of how often those women performed the breast self-exam in the past. This finding suggests that repeated provision of reminders may increase the likelihood that one will engage in a health behavior without reference to past behaviors. This study did not directly measure the effect of time as it relates to adherence to performing a breast self-exam. Yet, the role of time is emphasized by the repeated reminders and practice attempts to make breast self-exams habitual. Thus, the ability to overcome the effects of past behavior and reinforce a new behavior over time is an important factor in the maintenance of adherence to dietary recommendations.

Various explanations have been offered by researchers attempting to explain the difficulties in maintaining weight loss following behavioral and surgical interventions. Some findings in bariatric surgery research supports the notion that bariatric patients eat in response to emotional cues prior to surgery and report no incidences of emotionally

triggered eating following surgery, whereas others continued to eat in response to emotional cues such as depression and anxiety (Bocchieri et al., 2002b; Herpertz et al., 2003; Saunders, 2004). That is, patients did not alter their eating behaviors despite the changes induced by the surgical procedure. This is likely due to a dearth of coping strategies to manage negative emotions over time (Saunders, 2004).

Summary

Obesity is a problem across the United States and the industrialized world (CDC, 2007). This literature review examined research that makes clear the potential physical and mental health consequences of obesity (see Bocchieri et al., 2002a; Herpertz et al., 2003; Ogden et al., 2008). Heart disease and cancer are among the physical health risks that have been documented to increase with obesity (CDC, 2007). Depression and anxiety are mental health conditions reported more often by obese individuals (Bocchieri et al., 2002a; CDC, 2007). In order to treat obesity and decrease the risks associated with obesity, a range of behavioral treatments have been studied.

The literature documenting early behavioral treatments for obesity began in the 1970s (Brownell, 1982). These behavioral treatments helped obese individuals achieve weight losses of 5-10%, on average (Brownell, 1982). The last thirty years has yielded some innovative approaches to the treatment of obesity. For example, researchers have changed the duration of behavioral interventions from 20 weeks up to 52 weeks but found only marginal increases in the amount of excess weight lost (e.g., from approximately 10% in a 20-week program to 14-18% in a 52-week program) (Wadden et al., 2002). An important finding in behavioral weight loss programs was that the majority of participants do not maintain weight losses achieved during the programs (Wadden et al., 2002).

Several studies have been devoted to investigating the ability of participants to maintain weight losses after cessation of (Wadden et al., 2002; Wing et al., 1994). These studies generally found that patients were unable to maintain weight losses for longer than a few months after completing a weight loss program (Wadden et al., 2002). The mechanisms responsible for difficulties in maintaining weight losses are not well understood, but appear to be caused by a combination of psychological and biological factors (Byrne, 2002; Elfhag & Rossner, 2005; Wadden et al., 2002). However, one weight loss intervention, bariatric surgery, seems to enable a higher percentage of individuals to maintain weight losses for a longer duration than found with behavioral interventions (Bocchieri et al., 2002a).

Bariatric surgery is not a panacea. A significant minority of individuals struggle with weight regain after bariatric surgery (Bocchieri et al., 2002a; Mechanick, 2008). Approximately 20% of individuals either regain most or all of the weight lost as a result of bariatric surgery or fail to lose a significant amount of weight following surgery (Herpertz et al., 2003; Ogden et al., 2005; Mechanick et al., 2008). This weight regain typically begins between the 6-12 months after surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). Several potential explanations have been offered to explain these poor outcomes. The most frequently offered explanation is that these individuals have difficulty adhering to the post-surgery nutrition recommendations (Ogden et al., 2005). Yet, this researcher is not aware of any studies that explored the psychosocial factors involved in adherence to post-surgery nutrition recommendations.

The literature reviewed in this chapter makes clear the gap in bariatric surgery literature with regard to identifying and understanding which psychosocial factors are

involved in adherence to the recommended nutrition plan following bariatric surgery. Potentially important psychosocial variables (maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning) were also reviewed. Maintenance self-efficacy and recovery self-efficacy are related to an individual's confidence to stick with or get back on track with regard to post-bariatric surgery nutrition recommendations, respectively. Action planning and coping planning are related to an individual's planning to overcome barriers or to get back on track with the post-bariatric surgery nutrition recommendations.

While none of these variables have been explicitly implicated in the level of adherence to nutrition recommendations following bariatric surgery, there is evidence for these variables playing a role in the behavior change process. For example, Luczyńska & Schwarzer (2003) and Schwarzer and colleagues (2008) conducted research to test the contribution of these variables to the HAPA. In the researchers' studies several different health behaviors were investigated (e.g., diet, self-breast exam, using dental floss). A consistent finding was that higher levels of maintenance self-efficacy and recovery self-efficacy were associated with increased performance of the target behavior. Action planning and coping planning have been found to be associated with higher levels of reported adherence to a target health behavior (Luczyńska & Schwarzer, 2003; Schwarzer et al., 2008). However, the studies conducted on these variables have similar limitations that include a relatively short follow-up period (e.g., 3 years), a heavy reliance on self-report measures, and no studies reviewed here provide more than correlational data. The social cognitive variables mentioned earlier are related to levels of adherence or maintenance, relapse, and recovery from relapse. Maintenance and recovery are

classifications of the behavior change process as described by the HAPA (Schwarzer, 1992; 2008). Relapse is not explicitly represented in the HAPA. This is an oversight of the model and is addressed in this study.

The current study sought to identify the role of maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning in adherence to post-bariatric surgery nutrition recommendations in terms of maintenance, relapse, and recovery from relapse. These social cognitive constructs do not form an exhaustive list of possible social cognitive constructs involved in the adoption of post-bariatric surgery nutrition recommendations. Other variables that might be involved include depression, anxiety, the amount of time that has passed since undergoing surgery, and body mass index (BMI). These variables have been shown to be related to outcome following bariatric surgery and will be included in the current study (Bocchieri et al., 2002a; Mechanick, 2008).

Understanding the role of the social cognitive variables mentioned earlier would contribute to the development of the body of knowledge regarding bariatric surgery and outcome in terms of adherence to treatment recommendations. The current research is a first step in understanding the role of those psychosocial variables and has the potential to inform the development of interventions to improve post-bariatric surgery adherence to the nutrition recommendations.

Chapter 3

Methods

This study sought to identify social cognitive and psychosocial predictors of adherence to dietary recommendations following bariatric surgery. The predictor variables, maintenance self-efficacy, recovery self-efficacy, action planning, coping planning and depression, anxiety, body mass index, and time since surgery were expected to predict membership in one of the following three groups, maintenance, relapse, or recovery. These three groups were used to describe an individual's level of adherence to post-surgical dietary recommendations. Prior to conducting the primary study, a pilot study was conducted to determine the internal consistency and initial evidence of validity of the scales measuring maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning that were developed for this research.

Pilot Study

The pilot study for this project sought to establish initial evidence for reliability and validity of scales that had been developed for use with a sample of bariatric surgery patients. These scales included a maintenance self-efficacy scale, a recovery self-efficacy scale, an action planning scale, a coping planning scale, and a behavior scale that assessed the degree of adherence to the post-bariatric nutrition plan, all of which were developed or adapted for use with the target population. The maintenance self-efficacy

and recovery self-efficacy scales were developed to match recommendations provided by Bandura on the structure of self-efficacy scales (Bandura, 1994).

Participants. The participants for the pilot study were all women ($n = 47$) and had an average age of 51.32 years. Caucasian participants represented 93.62% of the participants. African American, Native American, and unreported ethnicity made up the remainder of the sample and each group represented 2.13% of the sample. The majority of participants were married (59.57%). The next two most frequently reported relationships were single, never married (12.77%), and divorced (14.89%). The vast majority of participants completed high school or higher (89.36%). Those who completed at least a bachelor's degree comprised 38.3% of the total sample. Finally, the majority of participants were employed full-time (57.45%) or part-time (14.89%), while those who were unemployed (6.39%) or receiving disability benefits (12.77%) made up a smaller proportion of the total sample.

Nonprobability, convenience sampling was used to recruit potential participants from the IU Health Bariatric & Medical Weight Loss bariatric center in Indianapolis, IN for the pilot study (Guo & Hussey, 2004; Pike, 2007). Typical bariatric surgery populations reported in the literature consist of approximately 75-80% women (Bocchieri et al., 2002a; Herpertz et al., 2003). The reported outcomes of bariatric surgery for males and females have not been significantly different and thus do not suggest differences based on sex (Bocchieri et al., 2002a; Herpertz et al., 2003). The pilot sample was consistent with existing bariatric surgery literature in which many studies used homogenous samples of females (Bocchieri et al., 2002a).

In this pilot study, the only specified inclusion criteria was based on type of bariatric surgery, Roux-n-Y gastric bypass (RNYGB), and time since undergoing that surgery. The bariatric surgery literature has suggested that patients begin deviating from the recommended dietary behaviors between 12-24 months following surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). At this time after surgery, patients are faced with making dietary choices that are no longer dictated by the effects of the surgery. In this pilot study, participants who had undergone bariatric surgery at least 6 months prior to recruitment were identified through existing patient databases at the bariatric surgery center. This timeframe of six months post-surgery was consistent with the earliest reported deviations from the post-surgical dietary recommendations in the bariatric population found in the literature (Bocchieri et al., 2002a; Bocchieri et al., 2002b).

Measures. A variety of scales were used to measure the variables of interest in the pilot study. These scales assessed the constructs of maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning. However, the scales for this study were developed or adapted by the current researcher for use with a bariatric surgery population and thus psychometric properties were not known prior to the pilot study. All scales employed in the pilot study featured language in accordance with the nutritional guidelines set forth by the American Society for Metabolic and Bariatric Surgery (ASMBS) for patients after bariatric surgery (Mechanick et al., 2008).

Maintenance self-efficacy. Maintenance self-efficacy was measured with a 37-item scale that was constructed in accordance with Bandura's (1997) recommendations for the construction of self-efficacy instruments (See Appendix). Bandura (1997) recommended that measures be constructed on a scale of 0 (No confidence) to 100

(Complete confidence) to accurately assess the strength of a participant's confidence. This format provided a larger range of responses than other measures of self-efficacy which have a narrower range of responses (e.g., 0, No confidence – 4, Total confidence). A total of 37 items were submitted to a group of experts, two licensed psychologists and two registered dietitians who practice exclusively with bariatric surgery patients for review. After review, all 37 items were included in the maintenance self-efficacy measure included for the pilot study. The study results suggested the maintenance self-efficacy measure had good internal consistency ($\alpha = 0.96$). Examination of each item suggested that elimination of any one item would lower the level of internal consistency of this measure. Results of the pilot study also provided initial evidence for discriminant validity ($r = 0.77$) when responses to the maintenance self-efficacy measure were correlated with the responses to the measure of recovery self-efficacy.

Recovery self-efficacy. Recovery self-efficacy was measured with a 39-item scale constructed in accordance with Bandura's (1997) recommendations for the development of self-efficacy instruments (See Appendix). Bandura (1997) suggested that measures be constructed on a scale of 0 (No confidence) to 100 (Complete confidence) to accurately assess the strength of a participant's confidence. This format provided a wider range of responses than other measures of self-efficacy which have a narrower range of responses (e.g., 0, No confidence – 5, Total confidence). A total of 39 items were submitted to a group of experts, two licensed psychologists and two registered dietitians who practice exclusively with bariatric surgery patients for review. After review, all 39 items were included in the maintenance self-efficacy measure tested in the pilot study. The pilot study results suggested the maintenance self-efficacy measure had good internal

consistency ($\alpha = 0.97$). Examination of each item suggested that eliminating any item would lower the internal consistency of this measure. Results of the pilot study also provided initial evidence for discriminant validity ($r = 0.77$) when responses to the recovery self-efficacy measure were correlated with the responses to the measure of maintenance self-efficacy.

Action Planning. Action planning, as described in Chapters 1 and 2, is the formation of plans that help to initiate and sustain a health behavior (Schwarzer & Luszczynska, 2008). The action plan helps a bariatric surgery patient to develop plans that determine when, where, and how to perform a behavior (Schwarzer & Luszczynska, 2008). Researchers, in the past, have successfully measured this construct with self-report questionnaires (e.g., Schwarzer & Luszczynska, 2008; Sheeran, Webb, & Gollwitzer, 2005). The scale used to measure action planning in this study was based on an instrument of action planning developed and validated by Schwarzer and Luszczynska (2008). In their research, Schwarzer and Luszczynska (2008) validated the use of a sentence root such as "...I have made a detailed plan regarding..." (p. 145). This sentence root was followed by the behavior under study and was represented as "when to eat" for the sentence root above (p. 145). This sentence root has been employed in the measurement of numerous health behaviors including dietary adherence, breast self-exam, and exercise adherence (Luszczynska & Schwarzer, 2003; Schwarzer & Luszczynska, 2008; Sniehotta, Scholz, & Schwarzer, 2006). The action planning scale adapted for and included in this pilot study was composed of four Likert-type items with a 4-point response range. The response choices ranged from 1 (*completely disagree*) to 4 (*totally agree*) (Sniehotta, Schwarzer, Scholz, & Schuz, 2005). The original scale has

demonstrated reliability and validity across several studies (Luszczynska & Schwarzer, 2003; Schwarzer & Luszczynska, 2008; Sniehotta, Scholz, & Schwarzer, 2006).

The reported internal consistency of action planning scales that utilized the same sentence root and different target behaviors (e.g., breast self-exam, adherence to a low-fat diet) ranged from $\alpha = 0.75-0.95$ (Lippke, Weidman, Ziegelmann, Reuter, & Schwarzer, 2009; Luszczynska & Schwarzer, 2003; Schwarzer & Luszczynska, 2008; Ziegelmann & Lippke, 2007). Several researchers also have reported satisfactory construct validity for the action planning scale (Luszczynska & Schwarzer, 2003; Schwarzer & Luszczynska, 2008; Ziegelmann & Lippke, 2007). The factor loadings reported for the action planning scale have ranged from $0.66-0.77$, $0.72-0.90$, and $0.78-0.81$ in three separate studies and this suggests that the items of the action planning scale used in those studies formed factors that were different from items assessing other constructs (Luszczynska & Schwarzer, 2003; Schwarzer & Luszczynska, 2008; Sniehotta et al., 2005). The action planning scale for the current research utilized the same root sentence structure reported in prior research and appeared to be a reliable and valid instrument. Results of the pilot study suggested good internal consistency ($\alpha = 0.826$) and initial evidence for discriminant validity ($r = 0.57$) when responses to the action planning instrument were correlated with the responses to the instrument that measured coping planning.

Coping Planning. Much like the action planning scale described above, the coping planning scale was composed of a generic root sentence structure and was adapted for the bariatric population under study by this researcher in accordance with relevant literature (Bocchieri et al., 2002a; Schwarzer, 2008; Wadden, Sarwer, et al., 2008). When an individual engages in coping planning, he or she develops plans to overcome

anticipated barriers to performing the desired health behavior (Schwarzer, 2008). The coping planning scale in the current study was adapted to provide specific reference behaviors (e.g., “If, when dining out, I am offered food that is not recommended by bariatric physicians and dieticians I will decline by saying ‘No thanks’.”) that are expected to occur when a bariatric patient anticipates and overcomes barriers (Sniehotta, Scholz, & Schwarzer, 2006). Research has found that coping planning improves the likelihood of maintenance of the desired health behavior such as dietary adherence after bariatric surgery (Sniehotta, Scholz, & Schwarzer, 2006). The coping planning scale used in this study was composed of five items. This scale was developed by Sniehotta and colleagues in 2005. Response choices for each item were on a 4-point Likert-type scale and ranged from 1 (*completely disagree*) to 4 (*totally agree*). An example item is “In order to stick with bariatric dietary recommendations, I have made a detailed plan regarding what to do if something interferes with my plans.” Validity and reliability for this measure have been documented in the literature.

Internal consistency for the coping planning scale has been reported to be between $\alpha = 0.91-0.92$. In longitudinal research, test-retest reliability reportedly improved from the second administration of the scale to the third (Sniehotta et al., 2005). However, reliability coefficients were not provided to corroborate the researchers’ statement that test-retest reliability improved from the second to third administration. Initial evidence for the validity of this scale was provided by Sniehotta and colleagues (2005) who conducted a principle component factor analysis to differentiate between action planning items, coping planning items, and items thought to assess intention to act. The researchers identified three factors, including five items that were theoretically consistent with coping

planning and that loaded strongly on the same distinct factor. A confirmatory factor analysis performed by Sniehotta and colleagues (2005) in a separate study showed that the three-factor model suggested by the principle component analysis was the best representation of the data. This finding provided evidence for the construct validity of this scale. In their research, the coping planning scale was composed of five items that loaded strongly on a single factor. The item loadings ranged from 0.76- 0.84. These findings have been replicated in other research where the sentence root, as in the current research, was adapted to apply to a specific population (e.g., increasing physical activity after myocardial infarction) (Ziegelmann & Lippke, 2007). Since this measure had not been used with bariatric surgery patients, it was included in the pilot study. The coping planning scale included in the pilot study had good internal consistency ($\alpha = 0.80$) and initial evidence for discriminant validity ($r = 0.57$) was suggested when responses to the coping planning instrument were correlated with the responses to the instrument that measured action planning.

Dietary behavior. Dietary behaviors were measured with ten items developed for use in this research. This behavior scale was developed to assess the level of adherence to specific nutrition behaviors recommended by bariatric center surgeons and dietitians (Bocchieri et al., 2002a, 2002b; Mechanick et al., 2008; Wadden et al., 2002). Each item was reviewed by experts including two licensed psychologists and two registered dietitians who practice exclusively with bariatric surgery patients. These experts concluded that the scale could assess relevant nutrition behaviors. All items were constructed on a 4-point Likert-type scale with response choices ranging from 1 (Not at All) to 4 (All of the Time) assessing how closely the participant had followed the

recommended nutrition plan. Example items are “In the past month, I avoided drinking pop, juice, or other sugary beverages” and “In the past month, I have followed the nutrition plan recommended by the bariatric center dietitians.” On items 2 to 10 for this measure, participants who responded with a 1 or 2, indicating adherence to the specific health behavior less than half of the time, were asked to indicate whether she had gotten “back on track” with regard to nutrition behaviors. These items allowed for grouping individuals in one of three groups (maintenance, recovery, and relapse) based on their responses.

Procedure. The pilot study sample was identified from the Indiana University Health Bariatric and Medical Weight Loss Clinic database of patients and was limited to females over the age of eighteen who had surgery at least six months prior to being contacted by this researcher (Bocchieri et al., 2002a; Herpertz et al., 2003). Each potential participant was contacted first by letter via United States Postal Service informing them about the purpose of the study, which was to develop measures of their confidence to maintain adherence to recommended dietary behaviors (Groves et al., 2004). In the letter, prospective participants were informed that they would 1) receive a questionnaire packet via USPS and 2) have the option of completing the questionnaire online at www.surveymonkey.com. The letter was printed on the bariatric center’s letterhead and signed by this researcher.

The mailed questionnaire packet included an informed consent form, the questionnaire, an entry form for a drawing for a \$50 donation to the charity of the participant’s choice, and a self-addressed stamped envelope for the completed questionnaire to be returned. Participants were asked to mark “X” on the signature line of

the informed consent to maintain confidentiality of their responses to the questionnaire. After the participants endorsed the informed consent, the instructions indicated that the questionnaire should be completed next. The questionnaire included the following forms and scales, which were presented in random order: demographic questionnaire, the maintenance self-efficacy scale, the recovery self-efficacy scale, action planning scale, coping planning scale, and the behavior scale. The drawing entry form was completed last. The entry form did not include any information that would link the form to the participant's responses to the questionnaire. The questionnaire and drawing entry were returned in the same envelope and were separated upon receipt by the researcher. At the end of all materials, a brief message of thanks for the individual's participation was attached with information on how the drawing winners would be notified of a donation made to her charity of choice.

The on-online version of the survey, advertised in the initial mailing to all participants, included all of the same documents for the participants, and provided a link, separate from the questionnaire, to the drawing entry form to ensure that the participant's identifying information and answers to the questionnaire could not be linked with her entry into the drawing. An introductory page was the first page the participant saw upon visiting the web address provided in the introductory letter. On this page, the purpose of the study was stated and was followed by instructions. After reading the introduction, participants were directed to the informed consent page. In order to sign the informed consent, the participant was asked to select an icon at the bottom of the page indicating whether she agreed to participate in the study. For women who agreed to participate, they were prompted to proceed to the questionnaire, which was constructed identically to the

paper and pencil questionnaire. Instructions for each scale were presented above the scale. All scales that required unique instructions were presented on a new web page. Upon completing the final scale, participants were asked to follow the link to complete the drawing entry. After completing the drawing entry page, the participants viewed a message of thanks for completing the questionnaire as well as information about how she would be notified if a charity donation had been made to the charity specified on the entry form with her name.

Analysis. The pilot study was conducted to establish the validity of these measures with a sample of bariatric surgery patients. Evidence of reliability and validity for the proposed scales was determined by calculating Cronbach's alpha and examining the correlation matrix. The results of the pilot study suggested the internal consistency for each scale (maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning) was good. Initial evidence for the divergent validity of these scales was also found upon examination of the correlation matrix. The correlations for responses to each of the scales was below $r = 0.80$ and in-line with expectations for conceptually related but distinct measures (Howell, 2002).

Primary Study

Participants. Consistent with the literature, a homogenous sample of females was recruited to participate in the current research. The literature suggested that after 12-24 months, individuals who had bariatric surgery were able to deviate from the recommended dietary behaviors and their dietary choices were not dictated by the surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). Thus, participants who had undergone bariatric surgery at least six months prior to the current study were identified through the

patient database at the Indiana University Health Bariatric and Medical Weight Loss Clinic. This timeframe of six months was consistent with the timeframe reported for the earliest deviations from the post-surgical dietary recommendations in the bariatric population (Bocchieri et al., 2002a; Bocchieri et al., 2002b).

A total of 161 female patients aged 18 years and older who had surgery at least six months prior to participating in this study were recruited from the same Midwestern bariatric center as described in the pilot study (Tabachnick & Fidell, 2007).

Nonprobability, convenience sampling was used to recruit participants for the primary study (Guo & Hussey, 2004; Pike, 2007). One participant's responses were thrown out because she did not meet the minimum criteria of BMI ≥ 35 prior to surgery. Six potential participants returned surveys that had not been completed and one male returned a survey. See Figure 2 for a graphical depiction of the estimated flow of participants from recruitment through completion of the study. After removing incomplete and ineligible surveys, 153 participants were included in the study. The mean age of participants was 51.33 years, SD = 11.90. The mean pre-surgical BMI for all participants was 48.96, SD = 9.04. Self-reported BMI at the time of this study was 30.42 with SD = 6.85. The mean difference in BMI from pre-surgery to the time of survey was 18.40 with a SD = 6.72. Like in the pilot study, the overwhelming majority of participants were Caucasian (90.2%). African American participants represented 6.54% of the sample and all other ethnic minorities made up 3.26% of the sample. Participants who reported being married were the majority of participants (62.09%), while those who reported being divorced (18.95%) or single and never married (9.80%) made up a much smaller proportion of the sample. The remaining 9.15% of participants reported being in a committed relationship

(5.23%), engaged (1.31%), or widowed (2.61%). The vast majority of participants reported completing high school or higher (84.96%). Those who reported completing at least a bachelor's degree comprised 22.87% of the total sample, while 7.84% of the sample reported having completed a graduate or professional degree. Only 4.58% of participants reported that high school was not completed and 10.46% reported having earned a GED. See Table 1 for demographic information on socioeconomic status and Table 2 for information on employment status.

Table 1

Socioeconomic status and employment status for all participants.

Income	Socioeconomic Status	
	N	% of sample
< 20,000	36	23.53
20,000-40,000	28	18.3
40,000-60,000	36	23.53
60,000-80,000	17	11.11
80,000-100,000	17	11.11
> 100,000	16	10.46
Missing	3	1.96

Measures. Initial evidence for reliability and validity was found in the pilot study for the measures of maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning. These measures were used in the primary study. The PHQ-9, GAD-7, as well as items to assess the patient's current BMI, time since surgery, and a measure

of nutrition behavior was also included in the primary study. A discussion of all scales not used in the pilot study follows.

Table 2

Employment data for all participants

Employment Status	Employment Status	
	N	% of sample
Employed, Full-Time	69	45.10
Employed, Part-Time	15	9.80
Unemployed, > 1-year	3	1.96
Unemployed, < 1-year	2	1.31
Unable to work, Disability Benefits	27	17.65
Unable to work, No Disability Benefits	2	1.31
Homemaker	5	3.27
Retired	28	18.30
Student	2	1.31

Anxiety. The GAD-7 scale was used to measure anxiety in this research. The GAD-7 is a seven-item scale that assesses the presence of clinically significant symptoms of generalized anxiety (Spitzer, Kroneke, Williams, & Lowe, 2006). Instructions for the GAD-7 were read prior to the participant completing the questionnaire. These instructions asked the participant to indicate how often she had been bothered by the problems listed on the questionnaire using a scale of 0 (*Not at All Sure*) – 3 (*Nearly Every Day*) (Spitzer et al., 2006).

Figure 2. Estimated flow of participants from recruitment through completion of this research project

Spitzer and colleagues (2006) thoroughly tested the GAD-7 for validity and reliability. The researchers found evidence of good reliability, construct validity, criterion

validity, factorial validity, specificity, and sensitivity for the GAD-7 as a screening tool for generalized anxiety. Internal consistency for the GAD-7 was $\alpha = .92$. One-week test-retest reliability for the GAD-7 was good (intraclass correlation = .83). Spitzer and colleagues (2006) also investigated specificity and sensitivity. The researchers found that a cut-point of 10, out of a total possible score of 21, maximized specificity and sensitivity both of which exceeded 0.80.

Spitzer and colleagues (2006) found evidence for the construct validity of the GAD-7. This evidence included the association of increased scores on the GAD-7 with increasing severity reported on the Medical Outcome Survey 20-item Short-Form General Health Survey (SF-20), which measures health status. In addition, the association of severity levels of the GAD-7 with other indicators such as disability days, clinic visits, and difficulty attributed to symptoms suggested support for the construct validity of the scale. Support for the convergent validity for the GAD-7 came from the statistical examination of correlations between responses to the GAD-7 and responses to the Beck Anxiety Inventory ($r = .72$) and responses to the anxiety subscale of the Symptom Checklist-90 ($r = .74$) (Spitzer et al., 2006). Factorial validity of the GAD-7 was supported by the results of a principle component factor analysis in which fifteen items, the seven items of the GAD-7 and the eight depression items from the Physicians Health Questionnaire (PHQ-8) were analyzed. The seven anxiety items from the GAD-7 loaded most strongly on the expected factor with loadings that ranged from 0.69- 0.81 (Spitzer et al., 2006). The eight depression items from the PHQ-8 loaded most strongly on the other expected factor with factor loadings that ranged from 0.58-0.75 (Spitzer et al., 2006).

Depression. Like the GAD-7, the 9-item PHQ-9 (Kroenke, Spitzer, & Williams, 2001) has been subjected to rigorous psychometric testing. The PHQ-9 was developed to assess the level of depressive symptoms present based on patient self-report and has been found to be a reliable and valid scale with good sensitivity and specificity in a variety of clinical settings, including a medical outpatient setting (Gilbody, Richards, Brealey, & Hewitt, 2007; Kroenke et al., 2001). Internal consistency of the scale ranged between $\alpha = .86-.89$ (Kroenke et al., 2001). The range of scores on the PHQ-9 is 0-27. Kroenke and colleagues (2001) found that a PHQ-9 score ≥ 10 had specificity of 88% and sensitivity of 88%. Thus, the cut-off score of 10 on the PHQ-9 is used as a clinical reference point when screening for depression (Kroenke et al., 2001).

When the PHQ-9 was tested for criterion validity, likelihood ratios for the presence of major depressive disorder were established. The likelihood ratios were identified as 0.04 for scores between 0 and 4, 0.5, for scores between 5 and 9, 2.6 for scores between 10 and 14, 8.4 for scores between 15 and 19, and 36.8 for scores between 20 and 27 (Kroenke et al., 2001). Construct validity for the PHQ-9 was assessed by self-reported functional status. Scores of functional status decreased on the SF-20 as scores on the PHQ-9 increased. In essence, as individuals perceived their ability to perform activities of daily living to be poor they were more likely to report, on the PHQ-9, more symptoms of depression. Furthermore, on the SF-20, the mental health scale correlated most strongly with the PHQ-9 (0.73) and to a lesser extent with general health perceptions (0.55), social functioning (0.52), role functioning (0.43), physical functioning (0.37), and bodily pain (0.33) (Kroenke et al., 2001). In a meta-analysis of 14 studies testing the psychometric and diagnostic properties of the PHQ-9 among various

populations, Gilbody and colleagues (2007) found a “high level of between study heterogeneity (combined diagnostic odds ratio $I^2 = 82\%$) and no evidence of publication or small study bias” (p. 1599). Other researchers have corroborated the findings of the psychometric investigation by Kroenke and colleagues (2001).

Body Mass Index. Body mass index (BMI) is calculated by dividing an individual’s weight in kilograms by height in meters squared ($BMI = kg/m^2$) (CDC, 2007). For the purposes of the current study, the component pieces of BMI (e.g., weight and height) were gathered by participant self-report at the time the participant completed the survey and a review of medical records, to obtain pre-surgical BMI when patient height and weight data were not provided. Height was requested in feet and inches and weight was requested in pounds. This information was then entered into the National Heart Lung and Blood Institute online BMI calculator (<http://www.nhlbisupport.com/bmi/>). Each participant’s BMI was obtained from this BMI calculator and recorded in the dataset. The difference between pre-surgery and post-surgery BMI was then calculated and recorded in the dataset.

Time Since Surgery. The length of time since having bariatric surgery was a straightforward concept. The date, including month and year, of the patient’s bariatric surgery was obtained in the demographic portion of the questionnaire. The number of months since the individual underwent bariatric surgery was then calculated and recorded in the dataset.

Analysis. Descriptive statistics including the mean, *SD*, and ranges of demographic, self-efficacy, and behavioral variables were computed. Discriminant analysis, a statistical technique used to determine whether multiple predictors can predict

group membership, was used to test the hypotheses (Tabachnick & Fidell, 2007). In discriminant analysis, the independent variables are the predictors and the levels of the dependent variable are the groups (Tabachnick & Fidell, 2007). In order to test both hypotheses in the current study, discriminant analysis was used to determine whether the predictor variables (e.g., maintenance self-efficacy, recovery self-efficacy, depression, BMI) would predict membership in the maintenance group, relapse group, or recovery group. For hypothesis one, the predictor variables maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning were expected to predict whether bariatric patients who had bariatric surgery at least six-months ago can be categorized as being in maintenance, relapse, or recovery (dependent variables). Hypothesis two was also examined with discriminant analysis. This researcher hypothesized that levels of depression, anxiety, BMI, and time since surgery of bariatric patients that are six months or more post-surgery would predict whether these patients were in maintenance, recovery, or relapse.

Discriminant analysis cannot be conducted with confidence if the assumption of multivariate normality was not met or if multicollinearity was present among items measured in the study (Tabachnick & Fidell, 2007). Box's M test was used to determine whether the assumption of multivariate normality was met. The assumption of multivariate normality would be met if Box's M was not significant ($p > .05$). Four variables in the study, maintenance self-efficacy, time since surgery, depression, and anxiety, were not normally distributed thus violating the assumption of multivariate normality. A square root transformation was performed on these variables to correct for the violation of this assumption. Covariance matrices were examined to determine

whether multicollinearity was present among the responses to the scales in the current project. Significant covariance between the responses to the items of scales included in the proposed study would have suggested the presence of multicollinearity between two or more of the scales (Tabachnick & Fidell, 2007). Responses to scales that are found to have multicollinearity would not be well differentiated and would measure similar constructs, thus violating the assumption of non-multicollinearity (Tabachnick & Fidell, 2007). The assumption of non-multicollinearity was met with this sample.

According to Tabachnick and Fidell (2007), interpreting discriminant functions involved examining the location of group centroids along a discriminant function plot and structure matrix. If the group centroids did not overlap and have some distance between them on the discriminant function plot the discriminant function adequately separates the groups. Determining if the distance between centroids is adequate to separate the groups was a somewhat arbitrary decision. The structure matrix allowed for the evaluation of the strength of correlation between predictors and discriminant functions (Tabachnick & Fidell, 2007). Evaluating predictor variables involved contrasting the means for the predictors with means for each group (Tabachnick & Fidell, 2007). This process allowed for the identification of predictors that are important to classifying cases into one of the groups proposed in this study.

The classification of groups in this study was determined by examining the data and following a decision tree (see Figure 3) based on theoretical and empirical literature reviewed for this project. There was no clear precedent, however, for determining “good” adherence. Those participants who, on the first item of the behavior scale described earlier, indicated that they have not followed the recommended nutrition plan at all were

classified as being in relapse. If any of the other three choices on the first item were chosen the rest of the participant's responses to the behavior questionnaire were examined. Each of the nine remaining items asked a participant to indicate her level of adherence to the nutrition recommendations with the following choices: "not at all (1)," "less than half the time (2)," "more than half the time (3)," or "all of the time (4)." The responses of those participants who selected a response other than "not at all" on the first item were then added to determine the total. Items 2 through 10 were then examined to determine if participants marked "not at all" or "less than half the time." On items that "not at all" or "less than half the time" was selected, the participants were asked to indicate whether they had gotten back on track with a "yes" or "no." The number of "yes" and "no" responses were then summed. For a participant who indicated that "no" she had not gotten back on track with regard to her diet for three or more items, she was classified as being in relapse. For the remaining participants, a total score of 30 or higher was classified as maintenance unless there were four or more responses marked "less than half the time" with a "yes" for getting back on track. Individuals with a total score of 30 or higher and four or more "less than half the time" and "yes" for getting back on track were classified as being in recovery. Participants whose responses to the behavior items totaled 20-29 were classified as being in recovery while those responding with a total of less than 20 were classified as being in relapse.

The rate of accurate classification of participants into one of the three groups was determined by examining classification tables where actual and predicted group membership was compared (Tabachnick & Fidell, 2007). That rate of classification was then compared with the rate of classification expected to occur by chance alone. The

Figure 3. Decision Matrix for determining group membership in terms of reported adherence to postsurgical nutrition recommendations based on responses to the behavior scale.

"by chance" accuracy rate was determined by using a probability matching procedure in which each prior probability was squared and then summed. A rate of classification that was 25% greater than "by chance" was considered to be meaningful (Hair, Black, Babin, & Anderson, 2010). Also located within the classification tables were tables that informed this researcher about how many and what type of classification errors were present in the discriminant function analysis. To check the accuracy of the findings for discriminant analysis, the jackknife classification procedure was used. This procedure

checked the accuracy of the discriminant analysis by leaving out the data of one case “when the coefficients used to assign it to a group are computed” (p. 405), which also reduces bias in classification (Tabachnick & Fidell, 2007).

This researcher expected that the discriminant analysis would identify whether the predictor variables in hypothesis one (maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning) and the predictor variables in hypothesis two (depression, anxiety, BMI, and time since surgery) would predict classification into one of three groups, maintenance, relapse, or recovery. For hypothesis one, it was expected that high levels of maintenance self-efficacy and action planning would predict a participant’s classification in maintenance, whereas high levels of recovery self-efficacy and coping planning would predict classification in recovery. Participants who did not report high levels of any of these predictor variables were expected to be classified as being in relapse. The expectation for hypothesis one was consistent with the theoretical basis upon which the predictor variables were chosen (Schwarzer, 2008). With regard to hypothesis two, participants who reported lower levels of depression, anxiety, BMI, and less time since surgery were expected to be classified as being in maintenance. The identification of predictor variables that best predicted classification in one of the three groups (maintenance, recovery, and relapse) after bariatric surgery may contribute to future research on ways to improve patients’ long-term outcomes in terms of their dietary adherence, weight loss, and the occurrence of side effects (e.g., dumping syndrome) after surgery.

Chapter 4

Results

Correlations

Correlations between responses to the different measures of social cognitive variables (e.g., maintenance self-efficacy, recovery self-efficacy, action planning, coping planning) included in the current study were examined to determine if there was any conceptual overlap between measures, especially those that shared conceptual underpinnings. The measure of maintenance self-efficacy and the measure of recovery self-efficacy were thought to assess conceptually similar, yet distinct constructs (Bandura, 1997; Schwarzer, 2008). The correlations between the responses to the items on these measures were examined to determine if there was excessive conceptual overlap between the measures that would suggest the instruments were assessing the same construct. Obtaining a correlation below $r = .80$ is considered as initial evidence for discriminant validity, that the measures are assessing constructs that are distinct from one another (Tabachnick & Fidell, 2007). Similarly, the measures of action planning and coping planning were thought to be conceptually similar, and as such, responses to these should correlate below $r = .80$ as well to show initial evidence of discriminant validity (Tabachnick & Fidell, 2007). Table 3 presents the correlation matrix for all relevant social cognitive variables measured in the current research. No correlations between

responses to any of the measures reached $r = .80$. Thus, each measure showed initial evidence of discriminant validity from the others in this project.

Table 3

Correlation Matrix for Scores on Measures of Maintenance Self-Efficacy (MSE), Recovery Self-Efficacy (RSE), Action Planning (AP), Coping Planning (CP), PHQ-9, GAD-7, BMI Difference from Pre-Surgery to Post-Surgery (BMI Diff), and Time Since Surgery (TSS)

Measure	1	2	3	4	5	6	7	8
1. MSE	-	.63*	.27*	.19	-.35*	-.26*	.13	.04
2. RSE	.63*	-	.30*	.34*	-.35*	-.39*	.18	-.06
3. AP	.27*	.30*	-	.75*	-.25*	-.14	.13	-.15
4. CP	.19	.34*	.75*	-	-.29*	-.22*	.19	-.09
5. PHQ-9	-.35*	-.35*	-.25*	-.29*	-	.73*	-.11	.12
6. GAD-7	-.26*	-.39*	-.14	-.22*	.73*	-	.00	.00
7. BMI Diff	.13	.18	.13	.19	-.11	.00	-	.02
8. TSS	.04	-.06	-.15	-.09	.12	.00	.02	-

Note. Correlations of responses between measures should be below .80 in order to have confidence that each measures a distinct construct. * $p < .01$.

Discriminant Analysis

To determine how the participants' responses to the measures of the social cognitive and psychosocial variables would predict membership in one of three groups (maintenance, relapse, or recovery), a discriminant analysis was conducted. These analyses were performed to test Hypothesis one and Hypothesis two. A third discriminant analysis involving the two predictors that contributed most to the classification of the first and second analyses was also conducted. This analysis was conducted to determine

whether a combination of social cognitive and psychosocial variables would improve the rate at which membership was predicted in one of the three groups.

Hypothesis one stated that maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning would predict whether six-month post-bariatric surgery patients could be categorized as being in maintenance, relapse, or recovery.

Hypothesis two was similar in that it was expected that levels of depression, anxiety, BMI, and time since surgery of bariatric patients that were six-months or more post-surgery would predict whether these patients were in maintenance, recovery, or relapse.

The data for the measure of maintenance self-efficacy, time since surgery, responses to the PHQ-9 (measure of depression), and responses to the GAD-7 (measure of anxiety) were not normally distributed and were treated with a square root transformation to reduce variance. All other data were normally distributed, were not transformed, and met the assumption of non-multicollinearity.

Hypothesis 1. To test the first hypothesis, discriminant function analysis was used and two discriminant functions were calculated. The first function was significant $\Lambda = .64$, $\chi^2 (8, N = 140) = 49.58$, $p < .01$. It accounted for 84% of the explained variance and had a Canonical $R^2 = .26$. Thus, the first function accounted for 26% of the total relationship between the social cognitive predictors and the three groups. As shown in Figure 4, the first discriminant function maximally separated those participants whose responses categorized them in the maintenance group from those categorized in the relapse group while those in the recovery group fell between those two groups. The structure matrix of correlations, as seen in Table 4, suggests that responses to the measure of maintenance self-efficacy, responses to the measure of recovery self-efficacy, and

responses to the measure of action planning were the best predictors for distinguishing between those in the maintenance group from those in the relapse group with the recovery group falling in the middle. Participants in the maintenance group reported higher levels of maintenance self-efficacy ($M = 48.02$, $SD = 6.68$) than those in the recovery group ($M = 46.25$, $SD = 6.86$) or those in the relapse group ($M = 40.69$, $SD = 8.45$). Individuals in the maintenance group also reported higher levels of recovery self-efficacy ($M = 3251.16$, $SD = 787.96$) than persons in the recovery group ($M = 2693.20$, $SD = 770.79$) or those in the relapse group ($M = 2229.86$, $SD = 883.32$). Finally, participants in the maintenance group reported higher levels of action planning ($M = 12.44$, $SD = 2.91$) than those in the recovery group ($M = 12.36$, $SD = 2.23$) or those in the relapse group ($M = 10.02$, $SD = 2.79$).

Table 4

Results of Discriminant Analysis for Hypothesis One on Social Cognitive Predictors of Group Membership

Predictor Variable	Correlations of Predictor Variables with Discriminant Functions	
	1	2
MSE	.69	.24
RSE	.86	-.41
AP	.60	.55
CP	.42	.46

The second discriminant function, which removed the effects of the first function, was also significant $\Lambda = .94$, $\chi^2(3, N = 140) = 8.82$, $p = .03$. It accounted for 16% of the explained variance and had a Canonical $R^2 = .66$. Thus, the second function accounted for 6% of the total relationship between the social cognitive predictors and the three groups. As shown in Figure 4, this function maximally separated participants categorized in the

recovery group from those categorized in the maintenance and relapse groups. For the second discriminant function, only one predictor, action planning, had a loading higher than .50. According to Tabachnick and Fidell (2007), a loading of .50 is the lowest level at which a loading should be interpreted. Individuals categorized in the recovery group reported higher levels of action planning than those in relapse but did not differ from the maintenance group on this variable (means cited earlier).

Figure 4. Plots of three group centroids on two discriminant functions derived from four social cognitive variables

Table 3 displays the correlations between responses to the predictors involved in Hypotheses 1. Among the four predictors tied to the first hypothesis there were three correlations that were significant at $\alpha = .01$. The positive relationship between responses to the measure of maintenance self-efficacy and responses to the measure of recovery self-efficacy and responses to the measure of action planning suggested that individuals who reported high levels of maintenance self-efficacy would also have high levels of recovery self-efficacy and engage in high levels of action planning. Similarly, the

significant positive relationship between the responses to the measures of recovery self-efficacy and responses to the measure of action planning and responses to the measure of coping planning, suggested that those participants who reported higher levels of recovery self-efficacy also engaged in high levels of action planning and coping planning. Finally, the correlation between the responses to the measure of action planning and responses to the measure of coping planning had a strong positive correlation that suggested those who engaged in action planning would also engage in coping planning.

To classify cases as accurately as possible, the “jackknife” procedure (Tabachnick & Fidell, 2007) was employed. This procedure deletes one case at a time to reduce possible over estimation of classification results in discriminant analysis. Employing this procedure resulted in a total useable sample of 140 women of which 75 (54%) were classified correctly. This is in contrast to 35% that would have been classified correctly by chance alone. Hair, and colleagues (2010) stated that a useful improvement in classification rate would be one that is 25% higher than by a chance alone classification rate. This benchmark for useful improvement was calculated for each discriminant analysis conducted in this study. For the first discriminant analysis linked with Hypothesis 1, this benchmark accuracy rate was 44%. The overall rate of accurate classification for the first discriminant analysis was judged to be useful because it was greater than the benchmark rate. The rates of accurate classification for each group in this analysis revealed that a disproportionate number of participants were correctly classified as being in the maintenance group (79% correct classifications) as compared to the relapse (44% correct classifications) or recovery (26% correct classifications) groups.

Hypothesis 2. To test the second hypothesis, discriminant function analysis also was used and two discriminant functions were calculated. The first function was significant, $\Lambda = .66$, $\chi^2(8, N = 143) = 57.84$, $p < .01$. The second function was not significant, $\Lambda = .96$, $\chi^2(3, N = 143) = 5.23$, $p > .05$, and was not interpreted. The first function accounted for 92% of the explained variance and had a Canonical $R^2 = .32$. Thus, it accounted for 32% of the total relationship between the predictors and the three groups. As shown in Figure 5, the first function maximally separated those participants categorized in the relapse group as compared to those categorized in the maintenance group or from those in the recovery group.

Figure 5. Plots of three group centroids on one discriminant function derived from four social cognitive variables

The structure matrix of correlations, as seen in Table 5, suggests that depressive symptoms as measured by the PHQ-9 and symptoms of anxiety as measured by the GAD-7 were the best predictors for distinguishing between persons in the relapse group as contrasted with those in the maintenance or recovery groups. Participants in the relapse group reported higher levels of depression ($M = 3.28$, $SD = 1.09$) than those in the

recovery group ($M = 2.24$, $SD = .73$) or those in the maintenance group ($M = 1.89$, $SD = .82$). Individuals in the relapse group also reported higher levels of anxiety ($M = 2.87$, $SD = 1.19$) than those in the recovery ($M = 2.29$, $SD = .99$) or maintenance ($M = 1.75$, $SD = .88$) groups. Time since surgery and the difference in BMI from pre-surgery to post-surgery did not have a loading higher than .50, which is the cutoff for interpretation according to Tabachnick and Fidell (2007). Therefore, those predictors were not interpreted for this discriminant function.

The correlations in responses to predictors connected to Hypothesis 2 are shown in Table 3. Among these four predictors there was only one correlation that was significance at $\alpha = .01$. There was a significant positive relationship between responses to the PHQ-9 and responses to the GAD-7, $r(148) = .73$, suggesting that persons who reported higher levels of depressed also reported higher levels of anxiety.

Table 5

Results of Discriminant Analysis for Hypothesis Two on Social Cognitive Predictors of Group Membership

Predictor Variable	Correlations of Predictor Variables with the First Discriminant Function
	1
PHQ-9	.95
GAD-7	.64
Time Since Surgery	.29
Difference in BMI	-.20

To classify cases as accurately as possible, the “jackknife” procedure also was used in the testing of Hypothesis two. This procedure resulted in a total useable sample of 143 women of which 81 (57%) were correctly classified as being in either the maintenance, recovery, or relapse groups. This is in contrast to 35% that would be

classified correctly by chance alone. The accuracy rate of classification in the second discriminant analysis in the current study was also greater than the benchmark (44%) for useful improvement in the rate of classification for this particular analysis (Hair et al., 2010). The rates for each group showed that a disproportionate number of participants were correctly classified as being in the maintenance (76% correct classifications) and relapse (63% correct classifications) groups as compared to the recovery group (24% correct classifications).

Additional planned analysis. A planned follow-up analysis of the four strongest predictors (two from Hypothesis one and two from Hypothesis two) of classification into the three groups, maintenance, recovery, and relapse, was conducted using discriminant function analysis. This planned discriminant analysis was not associated with any hypothesis because the predictors used in this analysis were determined by the outcome of the first two discriminant analyses. The four strongest predictors were identified using the standardized canonical correlation coefficients because these are measures of the strength of the contribution to the function as opposed to the strength of correlation with the function that is identified in the structure matrix (Tabachnick & Fidell, 2007). The four variables included in this discriminant function were time since surgery, depression, recovery self-efficacy, and action planning.

Two discriminant functions were calculated. The first was significant, $\Lambda = .61$, $\chi^2(8, N = 145) = 70.47$, $p < .001$. The second function was not significant, $\Lambda = .03$, $\chi^2(3, N = 145) = 4.40$, $p > .05$, and was not interpreted. The first function accounted for 95% of the explained variance and had a Canonical $R^2 = .39$. Thus, it accounted for 39% of the total relationship between the predictors and the three groups. As shown in Figure 6, the

first function maximally separated participants categorized in the relapse group from those in the maintenance group with those in the recovery group falling in the middle.

Figure 6. Plots of three group centroids on one discriminant function derived from a combination of two social cognitive variables and two psychosocial variables

The structure matrix of correlations, as seen in Table 6, suggested that depressive symptoms as measured by the PHQ-9 and recovery self-efficacy were the best predictors for distinguishing between persons in the relapse group as compared to the maintenance or recovery groups. Participants in the relapse group reported higher levels of depression ($M = 3.16$, $SD = 1.15$) than those in the recovery ($M = 2.24$, $SD = .73$) or maintenance ($M = 1.87$, $SD = .81$) groups. Individuals in the relapse group reported lower levels of recovery self-efficacy ($M = 2214.53$, $SD = 880.69$) than those in the recovery group ($M = 2694.87$, $SD = 762.26$) or those in the maintenance group ($M = 3215.57$, $SD = 800.23$). Time since surgery and action planning did not have a loading higher than .50, which is the cutoff for interpretation according to Tabachnick and Fidell (2007). Thus, these predictors were not interpreted for this discriminant function.

The correlations between all predictors used in this study are shown in Table 3. Among the four predictors included in this analysis, three correlations were significant at $\alpha = .01$. The significant positive relationship between responses to the measure of recovery self-efficacy and responses to the measure of action planning, suggested that those who reported high levels of recovery self-efficacy also reported high levels of action planning. The significant negative relationship between responses to the measure of recovery self-efficacy and responses to the PHQ-9 suggested that those who reported high levels of recovery self-efficacy also reported low levels of depression. There was also significant negative relationship between responses to the measure of action planning and responses to the PHQ-9, which suggested that the participants who reported high levels of action planning also reported low levels of depression.

Table 6

Results of Additional Planned Discriminant Analysis on Social Cognitive Predictors of Group Membership

Predictor Variable	Correlations of Predictor Variables with the First Discriminant Function
	1
PHQ-9	.76
Time Since	.32
Surgery	-.63
RSE	-.47
AP	

Once again, to classify cases as accurately as possible, the “jackknife” procedure was used in this analysis. This procedure led to a total useable sample of 145 women of which 85 (59%) were correctly classified as being in either the maintenance, recovery, or relapse groups. This rate of accurate classification in the third discriminant analysis was greater than the benchmark rate (45%) for this particular analysis. The rates for each

group revealed that a disproportionate number of participants were correctly classified as being in the maintenance (76% correct classifications) and relapse (61% correct classifications) groups as contrasted with the recovery group (33% correct classifications).

The results of this study show that combinations of social cognitive variables and psychosocial variables could be used to classify female bariatric surgery patients into a maintenance, recovery, or relapse group. The rate of accurate classification was greater than would be expected by chance, thus providing initial evidence for the usefulness of the variables and measures used in this study in predicting group membership. The strongest predictors of accurate classification were also identified and were shown to improve the accuracy of classification even further when combined. These results suggest that it is possible to classify patients who have undergone bariatric surgery into the maintenance, recovery, or relapse group in terms of adherence to post-surgical nutrition recommendations. Further, the patient's reported levels of depression and recovery self-efficacy provided the greatest contribution to classification. In each of the analyses conducted, the maintenance group was the most accurately classified group and the recovery group had a disproportionately low rate of accurate classification in terms of percent correctly classified. In sum, these results supported the hypotheses articulated earlier and provided some clarity as to which variables would contribute to accurate classification.

Chapter 5

Discussion

Many researchers have investigated a variety of psychosocial factors (e.g., depression, anxiety) related to the outcome of bariatric surgery (Bocchieri et al., 2002a; Herpertz et al., 2003; Ogden et al., 2006). These researchers typically referred to postsurgical outcome in terms of the amount of weight lost following bariatric surgery. They collected data on psychosocial and social cognitive variables for supplementary purposes only. This strategy has left many questions about the role of such psychosocial and social cognitive factors in weight loss or outcome following bariatric surgery. Researchers have speculated that nonadherence to nutrition recommendations may be responsible for poor outcomes following bariatric surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). This speculation, however, has not received any research attention. The current study represented a first step toward understanding the role of some social cognitive and psychosocial variables on adherence to postsurgical nutrition recommendations after bariatric surgery. The variables included in this study were used to predict which patients would be classified in the maintenance, relapse, or recovery groups.

Summary of Main Findings

The primary aim of the current study was to determine if select social cognitive and psychosocial variables would predict membership in one of three groups (maintenance, recovery, or relapse). In general, the results of this study suggested that a bariatric patient can be classified in one of the three groups with greater accuracy than by chance using the social cognitive and psychosocial variables of interest.

The results of the analysis that tested the first hypothesis suggested that a patient's reported level of maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning, collectively, were better than random chance at predicting whether a bariatric patient would be classified in one of the three groups. Thus, the first hypothesis was supported. This finding is in line with research linking self-efficacy and planning to improved weight loss (Byrne, 2002; de Zwaan et al., 2002; Elfhag & Rossner, 2005; Gormally et al., 1980; Jeffery et al., 1984; Linde et al., 2004; Luszczynska & Sutton, 2006; Scholz et al., 2005). The results of the second analysis, which supported the second hypothesis, followed the same pattern as reported for the first analysis.

The second analysis tested if depression, anxiety, elapsed time since surgery, and change in body mass index from presurgery to postsurgery would predict group membership. In the current study, the group of variables just mentioned was better than random chance at predicting if a bariatric patient would be classified in the maintenance, relapse, or recovery group. This finding is consistent with the literature stating that depression, anxiety, change in BMI, and time since surgery are related to outcome after surgery (Bocchieri et al., 2002a; Brownell et al., 1986; Fabricatore et al., 2005; Fabricatore et al., 2006; Puzziferri, 2005; Saunders, 2004; van Hout et al., 2008; Wadden et al., 2002). However, the current researcher did not review any literature to suggest that

these variables would predict if a bariatric patient would adhere to the recommended postsurgical nutrition recommendations.

A third analysis was then conducted in which the two variables that contributed the most to predicting each of the first two analyses were combined to see if the accuracy of prediction would improve. In this third analysis, the accuracy of prediction did increase. The combination of variables that included depression and recovery self-efficacy, time since surgery, and formulating cognitive plans to stick to the nutrition recommendations was better than either of the first two combinations of variables at predicting group membership.

The literature reviewed for the current study is consistent with the finding that the combination of variables used in the post-hoc third discriminant analysis would be related to adherence to postsurgical nutrition recommendations (Bocchieri et al., 2002a; de Zwaan et al., 2002; Elfhag & Rossner, 2005; Linde et al., 2004; Luszczynska & Sutton, 2006; Brownell et al., 1986; Fabricatore et al., 2006; Puzziferri, 2005; Saunders, 2004; Wadden et al., 2002). However, this combination of variables is atheoretical, which is in contrast to the basis for the combination of variables included in the first discriminant analysis. The finding in the current study that the third analysis improved classification accuracy suggests that a combination of variables that was not limited to a single theoretical explanation would better predict group membership than a strictly theoretical explanation (e.g., social cognitive theory). This researcher suspects that some variables (e.g., depression) might exhibit a mediating or moderating effect on other variables based on the results of the improvement in accuracy of classification seen in the third analysis. Future research should attempt to sort out the mediating or moderating effects of these

variables in relation to adherence to the postsurgical nutrition plan. For example, a study that seeks to determine if higher levels of depression would directly or indirectly affect levels of other variables (e.g., recovery self-efficacy) in terms of adherence to nutrition recommendations would help to elucidate the role of depression. Furthermore, a study such as this would begin to clarify the need for interventions to help bariatric patients potentially manage their depression after surgery.

The greater than by-chance rate of accuracy of prediction in each discriminant analysis and the improvement in the accuracy of prediction seen in the third discriminant analysis suggests that several variables contribute to adherence to postsurgical nutrition recommendations. A theoretically integrated approach to adherence may be the most prudent strategy to identify patients in need of additional assistance in terms of adherence to the nutritional recommendations. To this researcher's knowledge, there have not been any studies conducted investigating the association between adherence to postsurgical nutrition recommendations and any of the variables included in this study. One possible explanation regarding the lack of investigation is the dearth of validated measures to assess maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning. This researcher developed measures of maintenance self-efficacy and recovery self-efficacy and adapted measures of action planning and coping planning for use in the current study. These measures were all found to show initial evidence of reliability and discriminant validity.

Variables Contributing to Classification

Using the measures developed for this study, this researcher was able to identify the variables that contributed most to the classification of participants into the

maintenance, relapse, or recovery groups. Among the social cognitive variables of interest in the first analysis, recovery self-efficacy, maintenance self-efficacy, and action planning all strongly contributed to classifying participants into one of the three groups. This suggests that the participants' responses to the measures of recovery self-efficacy, maintenance self-efficacy, and action planning contributed to a rate of classification that was better than chance. The literature reviewed for this study is consistent with this finding. The literature has suggested that higher levels of these variables were related to higher rates of adherence to attempts to change a behavior (Luszczynska & Sutton, 2006; Scholz et al., 2005; Schwarzer, 2008). In the current study, coping planning did not appear to make a significant contribution to classification. This finding was not consistent with the literature on the role of coping planning in terms of adherence to attempts to change a behavior (Luszczynska & Schwarzer, 2003; Luszczynska & Sutton, 2006; Schwarzer, 2008).

Coping planning has been found to contribute to an individual's ability to get back on track with efforts to change behavior after a lapse or relapse (e.g., Luszczynska & Schwarzer, 2003; Schwarzer, 2008; Schwarzer et al., 2008). The finding in the current study that coping planning did not significantly contribute to classification is in contrast to the published literature. Researchers have found that individuals with high levels of coping planning were more likely to get back on track following a lapse or relapse from a behavior change effort (e.g., dieting, exercise, sunscreen application) (Luszczynska & Sutton, 2006; Scholz, Schuz, Ziegelmann, Lippke, & Schwarzer, 2008; Schwarzer, 2008). It is possible that the patients who participated in this study did not formulate plans to get back on track following a lapse or relapse. It is also possible that the

participants were more inclined to rely on the action plans they developed to help themselves adhere to the postsurgical nutrition recommendations. A third potential explanation for these findings would be that participants who reported higher levels of coping planning may have moved toward recovery following a lapse or relapse, but did not achieve the standard to be included in the maintenance or recovery groups established in this study. This explanation would be consistent with the research by Luszczynska and Sutton (2006) which found that individuals with high levels of coping planning and who had abandoned exercise after discharge from rehabilitation following myocardial infarction were more likely to resume some level of exercise even if it did not meet the exercise guidelines given to all patients. The procedures used to examine the variables included in the first hypothesis were also employed to investigate the variables included in the second hypothesis. The purpose of those procedures was to determine which variables contributed most to classification of bariatric patients into one of the three groups.

The results of the second analysis revealed that depression and anxiety contributed most to the prediction of group membership. The role of depression and anxiety is supported by existing literature that has found individuals with high levels of depression or anxiety have a higher BMI, which is often attributed to individuals' poor adherence to the nutrition recommendations after having bariatric surgery (Bocchieri et al., 2002a; Julius et al., 2009; Maddi et al., 2001; Puzziferri, 2005; Saunders, 2004; Wadden et al., 2007). The elapsed time since surgery variable and change in BMI from presurgery to postsurgery variable were thought to be reasonable predictors of group membership since both had been mentioned in the literature as being associated with

outcomes of bariatric surgery (Pontiroli et al., 2007). There are a number of potential explanations for why the elapsed time since surgery and change in BMI variables were not strong contributors to the prediction of group membership.

Most research has found that bariatric surgery patients tend to abandon efforts to adhere to nutrition recommendations between 12-24 months after surgery (Bocchieri et al., 2002a; Herpertz et al., 2003). Had the current study limited the sample to patients within the 12-24 months after surgery timeframe, the results may have shown that time since surgery was a strong contributor to predicting group membership. However, the range in this study was large—between 6-182 months after surgery—and those patients beyond the initial 24 months after bariatric surgery may have ceased efforts for adherence, or may have been more adept at following or getting back on track with nutrition recommendations. It is also possible that the patients in this study reported levels of adherence inconsistently. The change in BMI variable was also identified as not contributing significantly to the classification of participants into one of the three groups.

This researcher speculates that BMI, while intuitively tied to adherence, was likely a moderator of other variables included in this study; it seems reasonable that change in BMI affected the reported levels of maintenance self-efficacy, recovery self-efficacy, depression, and anxiety more than the accuracy of classification into one of the three groups (Bocchieri et al., 2002a; Sarwer, Wadden, et al., 2008). The lack of a contribution of BMI and the time since surgery variables, however, did not affect the interpretation of the results tied to the third analysis.

The two variables that contributed most to the classification of participants in the third analysis were recovery self-efficacy and depression. Action planning and time since

surgery did not contribute a significant amount to the accurate classification of participants into one of the three groups. This is an interesting result. The HAPA—the theoretical basis for the social cognitive variables included in the first hypothesis—was developed to include only social cognitive variables and thus does not include any psychosocial variables such as depression that may act as potential mediators in the behavior change process (Schwarzer, 1992; 2008). An inclusion of depression into the HAPA would help explain this result. Yet, the literature contains several examples of a negative correlation between self-efficacy (which is a variable included in the HAPA) and depression (e.g., Bocchieri et al., 2002a; Julius et al., 2009; Wadden et al., 2001; Wadden et al., 2002).

The literature on psychosocial contributors to outcomes after bariatric surgery seems to explain this result more clearly than the HAPA. Furthermore, recovery self-efficacy and depression both have been found to be correlated with adherence to behavior change attempts (Julius et al., 2009; Luszczynska & Sutton, 2006; Scholz et al., 2005; van Hout et al., 2008; Wadden et al., 2001). For instance, individuals who reported high levels of recovery self-efficacy were more likely to engage in exercise among those who relapsed to a less-active lifestyle after release from a cardiac rehabilitation program (Luszczynska & Sutton, 2006). Depression, on the other hand, is inversely related with adherence to behavior change attempts. In this study, a high level of depression would be expected to result in nonadherence or relapse in terms of the postsurgical nutrition recommendations (Wadden et al., 2001). The results of the current research are consistent with the literature just described and suggest that depression and recovery self-efficacy are important contributors to predicting group membership.

Implications and Recommendations

There are several implications derived from the current results. This study has illustrated the potential role of maintenance self-efficacy, recovery self-efficacy, action planning, depression, and anxiety when identifying bariatric patients who may need assistance to improve their adherence to the postsurgical nutrition recommendations following bariatric surgery. Improving rates of adherence to the postsurgical nutrition recommendations may improve postsurgical outcome in terms of weight loss maintenance. The results of this study can also inform future research that is directed toward improving outcomes of bariatric surgery by focusing on adherence to postsurgical nutrition recommendations. Additionally, a psychologist might help patients adhere to post-surgical nutrition guidelines by utilizing relapse prevention therapy interventions (e.g., skill training, cognitive reframing, lifestyle interventions) that have been shown to improve reported levels of self-efficacy and cognitive planning (Larimer, Palmer, & Marlatt, 1999).

Recovery self-efficacy and depression contributed most to classification when social cognitive and psychosocial variables were combined. This finding suggests that when working with bariatric patients, it would be prudent to approach issues of adherence from a multicomponent approach that may include relapse prevention. That is, interdisciplinary teams would be better positioned to manage a patient in need of assistance than a professional approaching the patient from a single profession's perspective. To achieve optimal adherence from an interdisciplinary approach, the surgeons, nurses, dietitians, psychologists, and other support staff would coordinate care for each patient who is at risk for nonadherence to postsurgical nutrition

recommendations. These professionals also should be mindful that persons who reported higher levels of depression may have followed the trajectory of depression discussed earlier (e.g., decreasing depression immediately after surgery followed by increases in levels of depression associated with weight regain). A female patient that exhibited a similar pattern, in terms of depressive symptoms, could be suffering from untreated depression that is interfering with her intention to adhere to the nutrition recommendations. Appropriate identification of this pattern may improve outcomes with respect to adherence to the postsurgical nutrition recommendations.

The coordination of care would include routine screening of patients during medical visits for psychological distress as well as for disorders such as anxiety and depression. When potential problems are identified, referral to a mental health professional that is also a member of the bariatric treatment team would provide an opportunity for prevention of any untreated mental health issues before deficits in adherence develop. Counseling health psychologists are well trained to not only treat the mental health issues that might impair a patient's ability to stick with nutrition recommendations, but are also uniquely positioned to help prevent future problems by building upon a patient's strengths. Utilizing a patient's strengths to improve adherence through enhancing a patient's levels of maintenance self-efficacy, recovery self-efficacy, and action planning is consistent with the professional identity of counseling health psychologists. Still, more research is needed before information gathered in this study can be put to use in clinical settings. Recommendations for future research are offered in the following paragraphs.

Future research is warranted to further examine the psychometric properties of the measures developed for this study. Future research also should be undertaken to determine if the accuracy of classification found in this study could be replicated with a mixed sample of men and women. Further, research that could determine when patients are at the greatest risk for nonadherence in terms of months or years after surgery would help to determine the most appropriate intervals to assess for problems with adherence. The results of the current study also could be used to identify those bariatric patients who may benefit from interventions designed to increase their level of maintenance self-efficacy, recovery self-efficacy, or coping planning, or to decrease their levels of depression and anxiety. Recovery self-efficacy and depression contributed most to the classification of participants into one of the three groups in this study and may be the most important constructs in terms of identifying patients who are in need of an intervention to improve their adherence.

In order to identify which patients would benefit from a specific intervention, more research is needed to determine which patients could be classified in a particular group. It was not possible, in this study, to determine which variables contributed to the classification of respondents into the maintenance, relapse, or recovery groups. For instance, the role of recovery self-efficacy when classifying an individual in the recovery group was unknown. Without understanding the contribution of each variable to classification into a specific group (e.g., relapse), it would be difficult to develop interventions to improve adherence to postsurgical nutrition recommendations. Replication of the current study would help to better understand the relative significance of each of the variables that contributed most to accurate classification. This may help

clinicians to choose and develop interventions based on a patient's classification in one of the three groups.

The results of this study also leave other questions unanswered. Future research could identify the degree to which changes in BMI mediate the effect of depression, anxiety, and self-efficacy in terms of adherence to postsurgical nutrition recommendations. Clarifying the optimal amount of elapsed time since surgery to assess a patient's status in terms of adherence to postsurgical nutrition recommendations in order to encourage maximal adherence to those nutrition recommendations is another focus that researchers could pursue.

Limitations

The current research is not without limitations. The cross-sectional research design, while appropriate for the current study, did not allow for multiple assessments of nutrition behaviors. Assessing participants' nutrition behaviors on multiple occasions would reduce variability in reporting adherence or nonadherence to nutrition recommendations. There are limitations to the measures used in this study as well.

These measures were developed or adapted by the primary researcher because there were no other existing instruments. While the current study yielded some initial evidence for the reliability and validity of the newly developed scales, further psychometric testing is required to obtain additional data on the strength of the measures' validity and reliability.

A third limitation of this study was the method of data collection. The data was collected primarily by self-report. The use of self-report measures assumes that all participants have been open, honest, and thorough in their responses to the questionnaire.

Development of objective assessment tools (e.g., gathering weight and height for current BMI at the bariatric center, ecological momentary assessment for nutrition behavior), when possible, would have reduced the potential bias by participants reporting of their weight and nutrition behaviors.

The sample also presented a limitation. The generalizability of this study is limited by the sample, which consisted of predominantly middle-aged Caucasian women who were married and employed full-time. This sample, however, was consistent with the overall demographic makeup of the state of Indiana, but underrepresented minorities in the overall population of the United States (U.S. Census, 2010). The results of this study are therefore limited in generalizability due to the specificity of the sample population. A sample that is more diverse and representative of the population of the United States would have engendered more confidence in the external validity of the obtained results.

Conclusion

This study is a first attempt at identifying and classifying bariatric patients in one of three groups related to their level of adherence. In the process of developing this study, new instruments to assess for maintenance self-efficacy, recovery self-efficacy, action planning, and coping planning in bariatric patients were developed. Taken together, this research represents an initial step to identify specific social cognitive and psychosocial factors related to adherence to postsurgical nutrition recommendations. Poor outcome following bariatric surgery has been attributed to nonadherence to postsurgical nutrition recommendations. The results of this study suggested that social cognitive and

psychosocial variables could be used to predict whether a patient will adhere to the postsurgical nutrition recommendations they received.

Given that some relevant social cognitive and psychosocial predictors of adhering to postsurgical nutrition recommendations were identified in the current study, future researchers could extend this project by investigating the relationship between individual variables (e.g., recovery self-efficacy) and classification in a particular postsurgical adherence group. Since this study showed that specific variables (e.g., recovery self-efficacy and depression) contributed more to classification than others, the relationship between those variables should be a focus of future research. The take-home message about this research is that social cognitive and psychosocial factors can predict the level of adherence to postsurgical nutrition recommendations. A better understanding of the relationship between these variables can help to improve the identification of and interventions for those patients who are at risk for nonadherence and thus a poor surgical outcome.

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Barriers and Resources

Figure 1. Elaborated HAPA Model

Appendix A

Demographic Questionnaire

*Age _____

*What is your current weight in pounds?

*Are you: ___ Male ___ Female ___ Other

*What is your height? ___ft ___inches

Do you consider yourself

___ Caucasian

___ African American

___ Asian American

___ Pacific Islander

___ Latino

___ Native American

___ Ethnicity not listed

Please Identify _____

What is your relational status?

___ Single, Never Married

___ In a Committed Relationship

___ Engaged

___ Married

___ Divorced

___ Widowed

What is your household yearly income?

___ Less than 20,000

___ 20,000-40,000

___ 40,000-60,000

___ 60,000-80,000

___ 80,000-100,000

___ More than 100,000

Indicate the highest level of education completed

___ Did not finish High School

___ GED

___ High School Diploma

___ Associates Degree

___ Bachelors Degree

___ Graduate/Professional Degree
(i.e. M.S., Ph.D., M.D., J.D.)

What is your employment status?

___ Employed, Full-Time

___ Employed, Part-Time

___ Unemployed, more than 1 year

___ Unemployed, less than 1 year

___ Unable to work, disability benefits

___ Unable to work, no disability

___ Homemaker

___ Retired

___ Student

___ Other

*Type of surgical procedure ___ Gastric Bypass ___ Lap-Band® ___ Other
If other, please specify: _____

*What was the date of your surgery? ___/___/_____

How often do you attend support group for bariatric surgery?

___Never ___A couple ___ Every ___Monthly ___A couple ___Every
 times a year other month times a month week

Have you ever been readmitted to the hospital for any complications related to your surgery?

___Yes ___No

If so, please

explain:_____

Before surgery, did you suffer with any physical health problems such as joint pain, sleep apnea, shortness of breath, etc.? Yes/No

If so, please name those health problems.

Do you suffer with any health problems now? Yes/No

If so, what health problems do you suffer with?

Do your health problems prevent you from sticking with the recommended diet? Yes/No

How many supervised weight loss appointments did you attend (including your initial consultation)?

___Three ___Six ___Other, please specify how many_____

Maintenance Self-Efficacy Measure

A number of situations are described below that can make it hard to stick to the nutrition plan recommended by the surgeons and dietitians at the bariatric center. Please rate **how certain you are that you can stick to the dietary recommendations most days of the week (4–7 days per week)** in the **Confidence** column. **Please provide a rating for each statement.**

Rate your degree of confidence for each statement by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Not confident at all					Moderately confident					Highly confident

I can maintain the nutrition plan recommended by the bariatric center surgeons and dietitians even if...

Confidence

_____	1. I am with friends who do not follow the same nutrition plan
_____	2. I feel hungry
_____	3. I need a long time to develop the necessary routines
_____	4. I have to try several times until it works
_____	5. I have to rethink my entire way of eating
_____	6. I do not receive a great deal of support from others at first
_____	7. I have to make a detailed plan on how to stick to the nutrition plan
_____	8. I want to snack throughout the day
_____	9. I gain a little weight (e.g., 1-2 pounds)
_____	10. I do not keep a nutrition journal regularly
_____	11. I feel depressed
_____	12. I feel anxious
_____	13. I am at a dinner party
_____	14. I am tempted during the holidays
_____	15. I am watching television
_____	16. I am bored or restless
_____	17. I am cooking for others
_____	18. I am eating alone
_____	19. I am angry or annoyed
_____	20. There are lots of foods that are not recommended available (high sugar foods)
_____	21. I feel like celebrating with others
_____	22. During vacations
_____	23. I have a craving for a favorite "old" food that is not on my current nutrition plan
_____	24. I am at an event (e.g., the fair, a ball game) that only serves high fat food
_____	25. I have to prepare my own meals
_____	26. I am upset over family matters

- _____ 27. I am stressed out
- _____ 28. I am traveling and food choices are limited
- _____ 29. I am visiting a city and want to try the local food
- _____ 30. I am bored with my diet, want some variety
- _____ 31. I am offered a pop (soda)
- _____ 32. I am tempted while grocery shopping
- _____ 33. I think the food I ate before surgery tastes better than food on my
nutrition plan
- _____ 34. People close to me do not support my efforts to maintain the diet
- _____ 35. I am lonely
- _____ 36. I feel happy
- _____ 37. I am upset over relationship matters

Recovery Self-Efficacy Measure

A number of situations are described below that can make it hard to **get back on track** with the nutrition plan recommended by the doctors and dietitians at the bariatric center **after “slipping off” the recommended diet/nutrition plan.** Please rate in the **Confidence** column **how certain you are that you can get back on track** with the dietary recommendations if you were to slip. **Please provide a rating for each statement.** When answering these questions, consider **any** “slip”— even one as brief as one day or as long as many weeks/months.

Rate your degree of confidence for each statement by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Not confident at all					Moderately confident					Highly confident

Confidence	In spite of good intentions, lapses or relapses may occur. Imagine you have slipped and are not eating as recommended by your bariatric treatment team. How confident are you about getting back on track, even if...
_____	1. You have gained some weight
_____	2. You binged on high calorie food recently
_____	3. You need a long time to develop the necessary routines to get back on track
_____	4. You have to try several times before you are successfully back on track
_____	5. You have to rethink your entire way of nutrition to get back on track
_____	6. You do not receive a great deal of support from others
_____	7. You have to make a detailed plan to get back on track
_____	8. You want to snack throughout the day
_____	9. You need to regularly keep a nutrition journal to get back on track
_____	10. You feel depressed
_____	11. You feel anxious
_____	12. You are at a dinner party
_____	13. You are tempted during the holidays
_____	14. You are watching television
_____	15. You are bored or restless
_____	16. You are upset
_____	17. You are cooking for others
_____	18. You are eating alone
_____	19. You are angry or annoyed
_____	20. There are lots of foods that are not recommended available (high sugar foods)
_____	21. You feel like celebrating with others

- _____ 22. You have a craving for a favorite “old” food
- _____ 23. You are at an event (e.g., the fair, a ball game) that only serves high fat fast food
- _____ 24. You have to prepare your own meals
- _____ 25. You are upset over family matters
- _____ 26. You are stressed out
- _____ 27. You are traveling and good choices are limited
- _____ 28. You are bored with your nutrition plan, want some variety
- _____ 29. You are offered a pop (soda)
- _____ 30. You are tempted while grocery shopping
- _____ 31. You discover that you do not have dumping syndrome
- _____ 32. You have eaten “bad” foods occasionally
- _____ 33. You have resumed old eating patterns for a couple of days
- _____ 34. You have had a full-blown relapse (a slip that has lasted for at least several days in a row without getting back on track)
- _____ 35. You blame yourself for slipping off your nutrition plan
- _____ 36. The situation made it easy for you to slip off your nutrition plan
- _____ 37. You miss your old eating habits
- _____ 38. You think you have really messed up your diet
- _____ 39. You feel like a failure for even one slip

Action Planning (AP) & Coping Planning (CP)

In order to stick with bariatric dietary recommendations, I have made a detailed plan regarding...*(circle your response)*

1) when to eat (AP)	completely disagree	Disagree	agree	totally agree
2) what foods to eat (AP)	completely disagree	Disagree	agree	totally agree
3) how quickly or slowly to eat (AP)	completely disagree	Disagree	agree	totally agree
4) how many meals and/or snacks to eat (AP)	completely disagree	Disagree	agree	totally agree
5) what to do if something interferes with my plans (CP)	completely disagree	Disagree	agree	totally agree
6) how to cope with possible setbacks (CP)	completely disagree	Disagree	agree	totally agree
7) what to do in difficult situations in order to act according to my intentions (CP)	completely disagree	Disagree	agree	totally agree
8) which good opportunities for action to take (CP)	completely disagree	Disagree	agree	totally agree
9) when I have to pay extra attention to prevent lapses (CP)	completely disagree	Disagree	agree	totally agree

PHQ-9 — Nine Symptom Checklist

1. Over the last 2 weeks, how often have you been bothered by any of the following problems?

Read each item carefully, and *circle your response*.

- a. Little interest or pleasure in doing things

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- b. Feeling down, depressed, or hopeless

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- c. Trouble falling asleep, staying asleep, or sleeping too much

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- d. Feeling tired or having little energy

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- e. Poor appetite or overeating

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- f. Feeling bad about yourself, feeling that you are a failure, or feeling that you have let yourself or your family down

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- g. Trouble concentrating on things such as reading the newspaper or watching television

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- h. Moving or speaking so slowly that other people could have noticed. Or being so fidgety or restless that you have been moving around a lot more than usual

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

- i. Thinking that you would be better off dead or that you want to hurt yourself in some way

Not at all	Several days	More than half the days	Nearly every day
-------------------	---------------------	--------------------------------	-------------------------

2. If you checked off any problem on this questionnaire so far, how difficult have these problems made it for you to do your work, take care of things at home, or get along with

other people?

**Not at all
day**

Several days

More than half the days

Nearly every

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Generalized Anxiety Disorder 7-item Scale (GAD-7)

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
Feeling nervous, anxious, or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Worrying too much about different things	0	1	2	3
Trouble relaxing	0	1	2	3
Being so restless that it's hard to sit still	0	1	2	3
Becoming easily annoyed or irritable	0	1	2	3
Feeling afraid as if something awful might happen	0	1	2	3

Add the score for each column ____ + ____ + ____ + ____

Total Score (add your column scores)

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all ____

Somewhat difficult ____

Very difficult ____

Extremely difficult ____

Continue on next page → → →

Behavior Scale

The IU Health Bariatric and Medical Weight Loss physicians and dietitians recommend following a specific nutrition plan after having surgery. The following questions ask about how closely you have followed the recommendations (i.e., ate as recommended). Please circle the answers that best describe your eating habits.

- 1) In the past month, I have followed the nutrition plan recommended by the bariatric center dietitians.

Not at all	Less than Half of the Time	More than Half of the Time	All of the Time
-------------------	---------------------------------------	---------------------------------------	----------------------------

- 2) In the past month, I made sure to drink 64 oz of fluids each day.

Not at all	Less than Half of the Time	More than Half of the Time	All of the Time
-------------------	---------------------------------------	---------------------------------------	----------------------------

*Have you “gotten back on track” (i.e., returned to eating as recommended) – **Yes / No**

- 3) In the past month, I avoided drinking pop, juice, or other sugary beverages.

Not at all	Less than Half of the Time	More than Half of the Time	All of the Time
-------------------	---------------------------------------	---------------------------------------	----------------------------

*Have you “gotten back on track” – **Yes / No**

- 4) In the past month, when I felt sad I stuck with the recommended nutrition plan.

Not at all	Less than Half of the Time	More than Half of the Time	All of the Time
-------------------	---------------------------------------	---------------------------------------	----------------------------

*Have you “gotten back on track” – **Yes / No**

- 5) In the past month, when I felt anxious or stressed out I stuck with the recommended nutrition plan

Not at all	Less than Half of the Time	More than Half of the Time	All of the Time
-------------------	---------------------------------------	---------------------------------------	----------------------------

*Have you “gotten back on track” – **Yes / No**

6) In the past month, I was tempted by foods high in sugar and stuck with the recommended nutrition plan.

Not at all	Less than Half of the	More than Half of the	All of the
	Time	Time	Time

*Have you “gotten back on track” – Yes / No

7) In the past month, I took the recommended vitamins.

Not at all	Less than Half of the	More than Half of the	All of the
	Time	Time	Time

*Have you “gotten back on track” – Yes / No

8) In the past month, I avoided drinking water or some other beverage with a meal.

Not at all	Less than Half of the	More than Half of the	All of the
	Time	Time	Time

*Have you “gotten back on track” – Yes / No

9) In the past month, I was able to eat the recommended amount of protein.

Not at all	Less than Half of the	More than Half of the	All of the
	Time	Time	Time

*Have you “gotten back on track” – Yes / No

10) When recommended healthy options were limited over the past month, I did not eat any high fat or high sugar foods.

Not at all	Less than Half of the	More than Half of the	All of the
	Time	Time	Time

*Have you “gotten back on track” – Yes / No

Thank you for completing this survey. Your participation will help improve the already good care your bariatric treatment team is able to provide. You will be entered into a drawing for one of three \$50 VISA gift cards upon receipt of this questionnaire.

_____ **Please check here if you DO NOT want to be entered into the drawing for one of three \$50 VISA gift cards.**

Thanks again!

Principle Investigator:	Faculty Supervisor:	Site Supervisor:
Eric Lester, Doctoral	Dr. Lawrence	Dr. William
Candidate	Gerstein	Hilgendorf
Counseling	Counseling	IU Health Bariatric &
Psychology	Psychology	Medical Weight Loss
Ball State University	Ball State University	6640 Intech Blvd, Ste
Muncie, IN 47306	Muncie, IN 47306	300
(765)285-8040	(765)285-8040	Indianapolis, IN 46278
eblester@bsu.edu	lgerstein@bsu.edu	(317)275-7010
		whilgend@iuhealth.org

Appendix B

Month Date, 2011

Patient name

Address

City, State Zip

I am writing to ask for your help with the research intended to help understand the role of confidence, planning, depression, and anxiety in your ability to stick with the nutrition plan recommended by the your nutritionists and bariatric physicians at IU Health Bariatric & Medical Weight Loss. Results from this study will help determine if confidence, planning, depression, and anxiety are related to the successful adherence to the recommended nutrition plan after surgery. It is my intention to use the results of this study to understand the role of those factors and to help develop interventions to help all patients be more successful.

Your privacy is important to us and your responses will be kept confidential. Results of this study will be released in summary and your individual responses will not be identifiable. Your name will be removed from the mailing list when you return the questionnaire. Your name and identifying information will not be associated with your questionnaire in any way. Participation is voluntary. However, your participation is essential for the success of this study. If you choose not to participate, please return the blank questionnaire and your name will be removed from future mailings.

As a token of appreciation, you are eligible to enter into a drawing for one of three \$50 VISA gift cards. If you have any questions, do not hesitate to call (765-285-8040), email (eblester@bsu.edu), or write using the address at the end of this letter.

Thank you for your time and helping make this research successful.

Sincerely,

Principle Investigator:
Dr. William Hilgendorf
IU Health Bariatric &
Medical Weight Loss
6640 Intech Blvd, Ste
300
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Faculty Supervisor:
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P.S. If you had bariatric surgery less than six months ago please report the date of your surgery on the first page of the questionnaire and return it in the envelope provided.

Appendix C

IU Health Bariatric & Medical Weight Loss

2012

Last week a questionnaire was sent to you seeking your experiences in sticking with the nutrition plan recommended by your surgeon and dietitians. Your name was randomly selected from the bariatric center patient database.

If you have already completed and returned the questionnaire please accept our sincere thanks. If not, please do so today. Only with your help are we able to understand how best to help all bariatric patients.

If you did not receive a questionnaire or if it was misplaced, please contact Eric Lester by phone (317-275-7010) and leave a message or by email at

Eric Lester, Doctoral Candidate	Dr. Lawrence Gerstein Counseling Psychology	Dr. William Hilgendorf Lead Psychologist
Counseling Psychology Ball State University Muncie, IN 47306	Ball State University Muncie, IN 47306 Telephone: 765-285-8040 E-mail: lgerstein@bsu.edu	IU Health Bariatric Center Indianapolis, IN 46278 Telephone: 317-275-7010 Email: whilgend@iuhealth.org

With the support of Dr. Don Selzer

Medical Director, IU Health Bariatric & Medical Weight Loss

Appendix D**INDIANA UNIVERSITY INFORMED CONSENT STATEMENT FOR****Adoption of Recommended Eating Behaviors Following Bariatric Surgery:
Predicting Group Membership**

You are invited to participate in a research study of factors that may influence bariatric patients' nutrition behavior after surgery. You were selected as a possible subject because we have identified women over the age of 18 years who had Roux-en-Y gastric Bypass surgery at least six months ago from the IU Health Bariatric & Medical Weight Loss patient database. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

The study is being conducted by Dr. William Hilgendorf from IU Health Bariatric & Medical Weight Loss and Eric Lester and Dr. Lawrence Gerstein from the Department of Counseling Psychology at Ball State University. No external funding has been obtained for this project.

STUDY PURPOSE

The purpose of this study is to determine whether self-efficacy (your confidence in your ability to do something) and planning, can predict whether bariatric surgery patients can be classified in maintenance, recovery, or relapse of recommended nutrition behaviors after bariatric surgery. Self-efficacy and planning may influence the extent to which bariatric surgery patients are able to stick with the nutrition plan suggested by bariatric center dietitians and physicians. The findings from this research may help researchers and bariatric healthcare teams develop interventions to assist patients who are having trouble sticking with their nutrition plans. Having the input of patients who are doing well and those who have not been able to stick with the recommendations is equally important.

NUMBER OF PEOPLE TAKING PART IN THE STUDY:

If you agree to participate, you will be one of 200 subjects who will be participating in this research.

PROCEDURES FOR THE STUDY:

If you agree to be in the study, you will do the following things:

For this project, you will be asked to sign this consent form, sign a release of information form, and complete one questionnaire regarding your thoughts about your level of confidence to perform certain behaviors related to your nutrition plan, questions about depression, anxiety, and planning in addition to providing demographic information. It will take approximately 25 minutes to complete the questionnaire. Once you complete the questionnaire, return it in the postage-paid envelope provided in the packet. By returning the questionnaire, consent form, and release of information form, you will be entered into a drawing for one of three \$50 VISA gift cards. All responses will be kept

confidential and no identifying information such as names will appear in any publication or presentation of the data.

RISKS OF TAKING PART IN THE STUDY:

While on the study, the risks are:

There are no perceived risks for participating in this study. However, should you experience any feelings of anxiety or discomfort when answering the questions, low cost counseling services are available to you through the Ball State University Practicum Clinic in Muncie, which you can contact at (765) 285-8047. You may also contact your personal provider in the event you experience any distress. You are also under no obligation to answer questions that lead you to feel uncomfortable and may skip those questions, if necessary.

BENEFITS OF TAKING PART IN THE STUDY:

The benefits to participation that are reasonable to expect are not directly applicable to you. Researchers who are interested in understanding factors involved in adherence to the nutrition plan following bariatric surgery will derive the most benefit from this study.

ALTERNATIVES TO TAKING PART IN THE STUDY:

Instead of being in the study, you have these options: You may choose not to participate.

CONFIDENTIALITY

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in reports in which the study may be published and databases in which results may be stored

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the Indiana University Institutional Review Board or its designees, and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP), who may need to access your medical and/or research records.

COSTS

Taking part in this study will not lead to added costs to you.

PAYMENT

You will receive entry into a drawing for one of three \$50 VISA gift cards for taking part in this study. In order to be entered into the drawing, you must return this signed consent form, release of information, and the questionnaire (whether completed or not).

COMPENSATION FOR INJURY

In the event of physical injury resulting from your participation in this research, necessary medical treatment will be provided to you and billed as part of your medical expenses. Costs not covered by your health care insurer will be your responsibility. Also, it is your responsibility to determine the extent of your health care coverage. There is no program in place for other monetary compensation for such injuries. However, you are not giving up any legal rights or benefits to which you are otherwise entitled. If you are participating in research which is not conducted at a medical facility, you will be responsible for seeking medical care and for the expenses associated with any care received.

FINANCIAL INTEREST DISCLOSURE

None of the individuals involved in this research are expected to benefit financially from this study.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study or a research-related injury, contact the principle investigator, Dr. William Hilgendorf at (317)275-7010 or the co-investigator, Eric Lester, at 765-641-0225 – use ext 284 to leave a message. If you cannot reach the researcher during regular business hours (i.e. 8:00AM-5:00PM), please call the IU Human Subjects Office at (317) 278-3458 [for Indianapolis] or (812) 856-4242 [for Bloomington] or (800) 696-2949.

For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or offer input, contact the IU Human Subjects Office at (317) 278-3458 or [for Indianapolis] or (812) 856-4242 [for Bloomington] or (800) 696-2949.

VOLUNTARY NATURE OF STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with IU Health Bariatric & Medical Weight Loss.

SUBJECT'S CONSENT

In consideration of all of the above, I give my consent to participate in this research study.

I will be given a copy of this informed consent document to keep for my records. I agree to take part in this study.

Subject's Printed Name: _____

Subject's Signature: _____ **Date:** _____

(must be dated by the subject)

Printed Name of Person Obtaining Consent: _____

Signature of Person Obtaining Consent:_____ **Date:**_____

Appendix E

INDIANA UNIVERSITY AUTHORIZATION FOR THE RELEASE OF HEALTH INFORMATION FOR RESEARCH

Introduction: You have the right to decide who may review or use your Protected Health Information ("PHI"). The type of information that may be used is described below. When you consider taking part in a research study, you must give permission for your PHI to be released from your doctors, clinics, and hospitals to the research team, for the specific purpose of this research study.

What does this authorization relate to? This authorization relates to the following study:

William A Hilgendorf, PhD

PRINCIPAL INVESTIGATOR (in charge of IRB PROTOCOL # 1112007602 Research Team)

SPONSOR #

NAME OF RESEARCH PARTICIPANT

BIRTHDATE

STREET ADDRESS

CITY, STATE & ZIP CODE

What information will be used for research purposes? The PHI that will be used for research purposes may include some or all of your health records. This includes, but is not limited to: information provided by you directly to the Research Team, hospital records and reports; admission histories, and physicals; X-ray films and reports; operative reports; laboratory reports; treatment and test results; immunizations; allergy reports; prescriptions; consultations; clinic notes; and any other medical or dental records needed by the Research Team.

Specific Authorizations: I understand that this release also pertains to records concerning hospitalization or treatment that may include the categories listed below. I have the right to specifically request that records NOT be released from my health care providers to the Research Team. However, I understand that if I limit access to any of the records listed below, I may not be able to be in this research study. Check limitations, if any, below:

- ☐ Mental health records
☐ Psychotherapy Notes
☐ HIV (AIDS)

- ☐ Sexually transmitted diseases
☐ Alcohol / Substance abuse
☐ Other: _____

Who will be allowed to release this information?

I authorize the following persons, groups or organizations to disclose the information described in this Release of Information/Authorization for the above referenced research study:

☐ Treating providers

☒ Hospitals, clinics or other places where I have received treatment

☐ Other: _____

☐ The Principal Investigator and the Research Staff

Who can access your PHI for the study? The people and entities listed above may share my PHI (or the PHI of the individual(s) whom I have the authority to represent), with the following persons or groups for the research study: the Research Team, IU Institutional Review Board and its designees, Research Sponsor and its representatives, Research Organizations, the Department of Health & Human Services or other US or foreign government agencies as required by law, and to the Food and Drug Administration (FDA) or a person subject to the jurisdiction of the FDA in order to audit or monitor the quality, safety or effectiveness of the product or activity.

The **Research Team** includes the Principal Investigator, his/her staff, research coordinators, research technicians and other staff members who provide assistance to the Research Team. If there is a **Research Sponsor(s)**, this shall include: _____ and any **Research Organizations** who provided assistance to the **Research Sponsor(s)** including, but not limited to: _____.

Expiration date of this Authorization: This authorization is valid until the following date or event:

☐ Specify Date ____/____/____

☒ End of the Study

☐ Other: _____ ☐ None; authorization is valid indefinitely

Efforts will be made to ensure that your PHI will not be shared with other people outside of the research study. However, your PHI may be disclosed to others as required by law and/or to individuals or organizations that oversee the conduct of research studies, and these individuals or organizations may not be held to the same legal privacy standards as are doctors and hospitals. Thus, the Research Team cannot guarantee absolute confidentiality and privacy.

I have the right:

1. To refuse to sign this form. Not signing the form will not affect my regular health care including treatment, payment, or enrollment in a health plan or

eligibility for health care benefits. However, not signing the form will prevent me from participating in the research study above.

2. To review and obtain a copy of my personal health information collected during the study. However, it may be important to the success and integrity of the study that persons who participate in the study not be given access until the study is complete. The Principal Investigator has discretion to refuse to grant access to this information if it will affect the integrity of the study data during the course of the study. Therefore, my request for information may be delayed until the study is complete.
3. To cancel this release of information/authorization at any time. If I choose to cancel this release of information/authorization, I must notify the Principal Investigator for this study **in writing** at: William A. Hilgendorf, PhD., 6640 Intech Blvd. Suite 300, Indianapolis, IN 46278. However, even if I cancel this release of information/authorization, the Research Team, Research Sponsor(s) and/or the Research Organizations may still use information about me that was collected as part of the research project between the date I signed the current form and the date I cancel the authorization. This is to protect the quality of the research results. I understand that canceling this authorization may end my participation in this study.
4. To receive a copy of this form.

I have had the opportunity to review and ask questions regarding this release of information/authorization form. By signing this release of information/authorization, I am confirming that it reflects my wishes.

Printed name of Individual/Legal Representative

Signature of Individual/Legal Representative

Date

**If signed by a legal representative; state the relationship and identify below the authority to act on behalf of the individual's behalf.*

***Individual is:** ☐ a Minor ☐ Incompetent ☐ Disabled
☐ Deceased

***Legal Authority:**

☐ Custodial Parent ☐ Legal Guardian ☐ Executor of Estate of
 the Deceased
☐ Power of Attorney Healthcare Representative ☐ Authorized Legal
☐ Other: _____

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IRB REVIEWED

Appendix F **Institutional Review Board**

DATE: December 8, 2011

TO: Eric Lester, M.A.

FROM: Ball State University IRB

RE: IRB protocol # 288833-1

TITLE: Adoption of Recommended Eating Behaviors Following
Bariatric Surgery: Predicting Group Membership

SUBMISSION TYPE: New Project

ACTION: APPROVED

DECISION DATE: December 8, 2011

EXPIRATION DATE: December 7, 2012

REVIEW TYPE: Expedited Review

The Institutional Review Board has approved your New Project for the above protocol, effective December 8, 2011 through December 7, 2012. All research under this protocol must be conducted in accordance with the approved submission.

Editorial Notes:**1. APPROVED**

As a reminder, it is the responsibility of the P.I. and/or faculty sponsor to inform the IRB in a timely manner:

1. when the project is completed,
2. if the project is to be continued beyond the approved end date,
3. if the project is to be modified,
4. if the project encounters problems, or
5. if the project is discontinued.

Any of the above notifications should be addressed in writing and submitted electronically to the IRB (<http://www.bsu.edu/irb>). Please reference the IRB protocol number given above in any communication to the IRB regarding this project. Be sure to allow sufficient time for review and approval of requests for modification or continuation. If you have questions, please contact Jennifer Weaver Cotton at 765-285-5034 or jmweavercott@gmail.com.

Appendix G

INDIANA UNIVERSITY
OFFICE OF RESEARCH ADMINISTRATION

To: WILLIAM ARTHUR HILGENDORF
PED-ADOLESCENT MEDICINE

From: IU Human Subjects Office
Office of Research Administration – Indiana University

Date: January 26, 2012

RE: NOTICE OF EXPEDITED APPROVAL
Adoption of Recommended Eating Behaviors
Following Bariatric Surgery: Predicting Group

Protocol Title: Membership

Protocol #: 1112007602

Funding Agency/Sponsor: Unfunded

IRB: IRB-01, IRB00000220

Expiration Date: January 22, 2013

The above-referenced protocol was reviewed by the Institutional Review Board (IRB-01). The protocol meets the requirements for expedited review pursuant to §46.110, Category (5) (7) . The protocol is approved for a period of January 23, 2012 through January 22, 2013. This approval does not replace any departmental or other approvals that may be required.

If you submitted and/or are required to provide participants with an informed consent document, study information sheet, or other documentation, a copy of the enclosed approved stamped document is enclosed and must be used.

As the principal investigator (or faculty sponsor in the case of a student protocol) of this study, you assume the following responsibilities:

1. **CONTINUING REVIEW:** Federal regulations require that all research be reviewed at least annually. You may receive a “Continuation Renewal Reminder” approximately two months prior to the expiration date; however, it is the Principal Investigator’s responsibility to obtain review and continued approval *before* the expiration date. If continued approval is not received by the expiration date, the

study will automatically expire, requiring all research activities, including enrollment of new subjects, interaction and intervention with current participants, and analysis of identified data to cease.

2. **AMENDMENTS:** Any proposed changes to the research study must be reported to the IRB prior to implementation. Only after approval has been granted by the IRB can these changes be implemented. An amendment form can be obtained at:
http://researchadmin.iu.edu/HumanSubjects/hs_forms.html.
 3. **UNANTICIPATED PROBLEMS AND NONCOMPLIANCE:** Unanticipated problems and noncompliance must reported to the IRB according to the policy described in the Unanticipated Problems and Noncompliance SOP, which can be found at http://researchadmin.iu.edu/HumanSubjects/hs_policies.html. NOTE: If the study involves gene therapy and an event occurs which requires prompt reporting to the IRB, it must also be reported to the Institutional Biosafety Committee (IBC).
 4. **ADVERTISEMENTS:** Only IRB-approved advertisements may be used to recruit participants for the study. If you submitted an advertisement with your study submission, an approved stamped copy is provided with the approval. To request approval of an advertisement in the future, please submit an amendment, explaining the mode of communication and information to be contained in the advertisement.
 5. **COMPLETION:** Prompt notification must be made to the IRB when the study is completed (i.e. there is no further subject enrollment, no further interaction or intervention with current participants, including follow-up, and no further analysis of identified data). To notify the IRB of study closure, please obtain a close-out form at http://researchadmin.iu.edu/HumanSubjects/hs_forms.html.
 6. **LEAVING THE INSTITUTION:** The IRB must be notified of the disposition of the study when the principal investigator (or faculty sponsor in the case of a student project) leaves the institution.
 7. **VULNERABLE POPULATION:** Please note that there are special requirements for the inclusion of prisoners in research. You may not enroll or otherwise include an individual who is or becomes a prisoner while enrolled in the research. For additional information on the requirements for including prisoners in research, please refer to http://researchadmin.iu.edu/HumanSubjects/hs_policies.html.
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1| c/o IU Human Subjects Office | (317) 278-7189 | irb@iu.edu

Note: SOPs exist covering a variety of topics that may be relevant to the conduct of your research. For more information on the relevant policies and procedures, go to http://researchadmin.iu.edu/HumanSubjects/hs_policies.html.

You should retain a copy of this letter and any associated approved study documents (e.g. informed consent or information sheet) for your records. Please refer to the project title and number in future correspondence with our office. Additional information is available on our website at <http://researchadmin.iu.edu/HumanSubjects/index.html>. Please contact our office if you have questions or need further assistance.

Thank you.