

RELATIONSHIP BETWEEN WEIGHT LOSS AND BODY IMAGE
IN OBESE INDIVIDUALS SEEKING
WEIGHT LOSS TREATMENT

A Dissertation

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DEDICATION

This work is dedicated to my four wonderful nieces, Corinne, Courtney, Julianne, and Cara, whose imagination, energy, and laughter always makes me smile.

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ABSTRACT

The present study investigated the nature and extent of changes in body image following weight loss treatment in an obese sample and examined the role of weight loss in predicting body image improvement. Participants were 53 obese individuals (BMI > 30) recruited from the Pennington Biomedical Research Center in Baton Rouge, the Scripps Clinic in San Diego, CA, and the Weight Management Center at the St. Charles Hospital in New Orleans. Measures of psychological functioning and a figural body image rating procedure (Body Image Assessment for Obesity; BIA-O, Williamson, et al., 2000) were administered at baseline and after a 6-month follow-up (average 195 days \pm 41.9 days). Body image dissatisfaction was operationally defined as the discrepancy between BIA-O current body size and ideal body size estimations. Weight loss for the total sample averaged 30.66 lbs, or a loss of 12.7% body weight. Body image significantly improved between T1 and T2, resulting from a decrease in participant's estimations of current body size, while selections of an ideal body size remained stable. Results from a stepwise MRA revealed that a higher initial BMI, the tendency to overeat, and depression were significant predictors of initial body image discrepancy at T1 ($r = .712$). At follow-up, weight loss consistently performed as the strongest predictor of body image improvement. Data suggest that weight loss brought participants' perceptions of current body size closer in congruence with their ideal body size, thereby reducing levels of body image dissatisfaction. Several limitations of this study are discussed as well as clinical implications in relation to future directions for the assessment and treatment of body image concerns in obese individuals.

INTRODUCTION

Obesity is a serious health problem worldwide. In the United States, the number of obese people (defined as BMI>30) has reached epidemic proportions, affecting approximately one-quarter of the American population. The prevalence of obesity is increasing worldwide, and the percentage of people who are overweight has steeply risen more than 30% since 1980 (Bray, 1998). Data from the National Center for Health Statistics indicate an uneven distribution of obesity, with African-American and Mexican-American females most affected (Flegal, Carroll, & Kuczmarski, 1998). Children and adolescents are not immune to this epidemic. Data suggest that over 20% of children are currently overweight, and 30% of these individuals become obese adults later in life. Excess weight increases the risk of serious medical consequences such as hypertension, diabetes, coronary heart disease, and some forms of cancer. It has been argued that the "preponderance of evidence suggests that even mild overweight is probably associated with some increase in mortality risk" (Solomon, Willett, & Manson, 1995). In addition to the tremendous health risks, the financial cost of obesity is staggering. Obesity-related problems are estimated to cost the United States 39.3 billion dollars annually (Colditz, 1998). Given this backdrop, it is not surprising that the study of obesity has received an increasing amount of attention from local and federal policy-makers, health care professionals, and researchers.

Despite the well-established relationship between medical risks and obesity, the relationship between psychological functioning and obesity remains less clear. Common beliefs implicating psychological distress as a contributing factor in the development of obesity has not been well supported by research (Hill & Williams, 1998). Several large-

scale studies, each involving at least 500 subjects, found no consistent evidence to support the claim that severely obese persons show higher levels of psychopathology than normal-weight controls (Moore, Standard, & Srole, 1996; Silverstone, 1968; Hallstrom & Noppa, 1982; Kittel, Rustin, Dramaix, DeBacker, & Kornitzer, 1978; Hill & Williams, 1998; Stunkard & Wadden, 1992). Wadden, et al. (2001) contend that a substantial minority of extremely obese patients seeking bariatric surgery present with significant emotional complications.

Despite the bulk of support indicating a lack of relationship between psychopathology and obesity, a few studies have demonstrated the opposite, suggesting the presence of significantly higher levels of depression and anxiety in the obese (Sullivan, et al, 1993; Goldsmith, et al., 1992). However, many research trials include a high proportion of treatment-seeking individuals, who demonstrate a higher percentage of psychopathology, similar to other treatment-seeking medical populations. Thus, it has been argued that these clinical samples may be overrepresented in the literature, resulting in a selection bias (Williamson & O'Neil, in press). A review of the literature concluded that divergent findings were often the result of methodological inconsistencies, and it would be premature to make firm conclusions regarding the relationship between psychopathology and obesity (Friedman & Brownell, 1995). A complex association between obesity and psychopathology appears to exist, and importantly, obese individuals constitute a heterogeneous population, making it very difficult to draw generalized conclusions.

A growing body of literature has begun to focus on the experience of body image in obese populations. There is a converging line of evidence demonstrating that obese

persons experience a more negative body image when compared to non-overweight controls. Overall, studies using non-clinical populations show that obese persons, especially women, report a more negative body image than persons of normal body weight (Brodie & Slade, 1998; Cash, 1990; Cash, 1994a; Wadden, Foster, Stunkard, & Linowitz, 1989). A negative body image may adversely affect quality of life and impact social and interpersonal behaviors. For example, many individuals organize their lifestyle to accommodate a negative body image by avoiding social situations which may emphasize their appearance. The clinical implications of a negative body image was observed more than 30 years ago by the research of Stunkard and Mendelson (1967). In their seminal work, they concluded that:

“ the body image disturbance takes the form of an overwhelming preoccupation with one’s obesity, often to the exclusion of any other personal characteristic. It may make no difference whether the person be also talented, wealthy, or intelligent, his weight is his only concern and he sees his whole worth in terms of body weight.”

To further illustrate the self-disparagement which often accompanies obesity, Rand and MacGregor (1991) revealed that not a single patient in a sample who maintained an average loss of 45 kg for at least 3 years would prefer being obese to being deaf, diabetic, or having heart disease. These findings provide striking evidence to the powerful nature of the body image dissatisfaction which can accompany obesity.

However, it is important to again note that a great deal of heterogeneity exists among obese persons. Thus, body image problems should not be considered as universal. Rather, it appears individual differences such as a juvenile onset of obesity, presence of a comorbid disorder, or binge eating may place some individuals at a greater risk for a

negative body image (Cash, 1990; Cash, 1993; Stunkard & Burt, 1967; Brownell & Wadden, 1992). Those who have been teased by parents and friends, especially during adolescence, appear to have a stronger disparagement (Wadden & Stunkard, 1985). The identification of factors which may contribute to the development of a negative body image is an important area of study and will be further addressed in a following section.

Definition of Body Image

Generally, body image has been defined as “the picture of our body which we form in our mind, that is to say the way in which our body appears to ourselves” (Schilder, 1935). The past 15 years has witnessed a burgeoning interest in the study of body image disturbance, resulting in a growing consensus that body image is a multi-dimensional phenomena, involving perceptual, attitudinal, and behavioral features (Williamson, 1990). Thompson (1995) concluded that a body image disturbance can be defined as any form of affective/ cognitive, perceptual, or behavioral disturbance that is directly related to concerns about body size.

Most research on the body image construct has focused on 2 components, 1) the perceptual component, otherwise referred to as size perception accuracy, and 2) the attitudinal/subjective component (general dissatisfaction, cognitive evaluation) of body image. The dichotomization of the construct of body image into perceptual and attitudinal components is based on the finding that there is the little overlap between the two dimensions (Thompson, Penner, & Altabl, 1990).

Different assessment techniques can be used to tap into these two components. Perceptual disturbances in body image are typically measured by visual-size estimation and distorting mirrors (Ben-Tovin & Walker, 1992). Subjective/attitudinal features of body

image are measured by global questionnaires, rating scales, and figural stimuli which are designed to assess overall satisfaction with body shape and size. Such figural rating scales obtain a measure of overall satisfaction by assessing the discrepancy between one's perception of current body size (CBS) and the individual's perception of ideal body size (IBS). The difference between the current and ideal rating is called the "discrepancy index" and has been validated as a measure of the individual's level of dissatisfaction (Williamson, Gleaves, Watkins, & Schlundt, 1993). According to this definition, the greater the discrepancy, the greater the body image dissatisfaction.

Cognitive Model of Body Image

Research on cognitive biases has demonstrated lability of the body image construct, suggesting that the estimation of current body size may be reactive to negative emotion or stress (Baker, et al., 1995; Kulbartz, Florin, & Pook, 1999; McKenzie et al., 1993, Slade, 1985). For example, Kulbartz, et al. (1999) demonstrated that the induction of negative mood increased current body size estimations of women with bulimia nervosa, worsening their body image. In contrast to CBS, the selection of an ideal body size appears to be stable, suggesting that IBS is a "standard," serving as an anchor which may motivate a person to lose weight (Williamson, 1996). Based on these findings, ideal and current body size estimations appear to be independent (uncorrelated) constructs. Thus, it is likely that as a person gains or loses weight, CBS may change while IBS remains stable.

The principle component of the cognitive approach to body disturbances is that individuals who are preoccupied with body size and shape interpret information related to eating/weight in a biased manner. Specifically, these persons may differentially attend to and remember body-related stimuli, which in turn perpetuates dissatisfaction with their

body size (Baker, Williamson, & Sylve, 1995; Sebastian, Williamson, & Blouin, 1996; Watkins, Martin, Muller, & Day, 1995). Further, individuals may judge ambiguous situations or stimuli in a manner congruent with their negative beliefs regarding their appearance (Jackman, Williamson, Netemeyer, & Anderson, 1996). For example, a girl preoccupied with weight may interpret another's laughter as directed toward her body size, rather than a funny joke.

It is generally assumed that this biased processing occurs automatically, outside the awareness of the individual (Williamson, 1996). Several types of biases have been identified, including an attentional bias, memory bias, and judgment bias, with the latter being of particular importance to the maintenance of a negative body image. In sum, this conceptualization of body image suggests that current body size estimation may be subject to the influence of other psychological variables, whereas IBS is rather stable across conditions.

Developmental and Socio-Cultural Theories of Body Image

In addition to a cognitive model of body image which primarily focuses on maintenance factors, both developmental and sociocultural theories have been proposed to explain how one's body image develops. An understanding of these theories lends considerable insight into understanding why a negative body image has been shown repeatedly in obese populations. Developmental theorists have focused on the importance of childhood and adolescence as a critical time period during which the development of body image occurs (Heinberg, 1995). Factors such as pubertal timing and teasing have been implicated as variables which may contribute to body image development. Socio-cultural theories have targeted social comparison and socio-cultural messages regarding

appearance and beauty as important factors in the development of body image. Research supporting these approaches will be discussed below.

Several studies have documented a relationship between body image dissatisfaction and maturational timing in female adolescents (Fabian & Thompson, 1989; Brooks-Gunn & Warren, 1985). In general, results indicate that girls who develop earlier than their peers report more dissatisfaction with their bodies than girls who develop later. Proposed explanations for these findings, however, emphasize that early maturers are also at a greater risk for being teased and for having more body fat (Thompson, 1992). Thus, the timing of puberty may be less important than the presence of teasing or a higher body weight.

One longitudinal study found support for this claim. In a 3-year study of adolescents, Cattarin and Thompson (1994) found that a history of teasing rather than onset of puberty, predicted a negative body image. Cash, Winstead, and Janda (1986) also documented that teasing during adolescence had a significant effect on appearance satisfaction later in life for a sample of adult women. Teasing has been implicated as a significant factor in determining a negative body image among obese individuals. Grilo, Wilfley, Brownell, and Rodin (1994) found that frequency of being teased specifically about weight during childhood was positively correlated with the extent of body image dissatisfaction during adulthood.

Not unlike developmental theories, socio-cultural theories propose that body image develops in a social and cultural context, implicating 2 primary factors that may explain the development of body image, including 1) social comparison and 2) sociocultural messages regarding appearance. Some researchers have shown that children

as young as preschool age learn society's message of how one "should" look and then judge themselves against these standards (Lerner & Jovanovic, 1990). Social comparison theories suggest that individuals who frequently compare their looks to others, especially to those who are "more attractive" by societal standards, feel more dissatisfied with their bodies.

Widespread support has been found for sociocultural influences on the development of body image. In western societies, societal ideals promote thinness as the aesthetic standard. Messages from the media, peers, and family teach children that being thin is desirable and that this goal is achievable by anyone who "works hard enough, exercises long enough, and eats little enough" (Rodin, 1993). The diet industry capitalizes on this preoccupation with thinness, making it a multi-billion dollar industry. Fashion models, TV stars, and other media images promote this celebration of being thin and strengthen the associations between thinness and success, happiness, and being popular. Weight preoccupation is so common, that even women of average or underweight are often dissatisfied with their weight, resulting what has been called a "normative discontent" (Rodin, Silberstein, & Striegel-Moore, 1985).

In a society where the prevalence of overweight (BMI > 25) has risen to 50% over the past few decades, it is shocking to learn that concomitantly, the aesthetic ideal has become increasingly thinner. For example, a recent comparison of the body weights of Miss America Pageant contestants revealed a drop in BMI from the average range (20-25) in the 1920's to BMIs of 18.5 or less in the 1990's, a level considered by the World Health Organization to be undernourished (Rubenstein & Caballero, 2000). Lindeman

(1999) argued that the ideal body shape is presented by the media and toy manufacturers to women of all ages, ranging from adults to young girls.

In addition to media images, the message that “thin =good” is also purported within the family context. Rieves and Cash (1996) documented that children who grow up with a family member who models appearance concerns learn that appearance is “something to worry about,” fostering a preoccupation with appearance in their children.

The role of western culture in promoting the thin ideal is most apparent in studies contrasting western versus non-western countries. Furnham and Baguman (1994) compared traits ascribed to both thin and fat figural stimuli using Native Ugandan and British college-aged students. The Ugandan students rated the obese figures more positively and healthier than the thin figures. A recent study found significant differences in body shape perceptions between Australian-born and Hong Kong-born students at an Australian university, with the Australian-born students reporting greater dissatisfaction (Lake, Staiger, & Glowinski, 2000). In a review of the distribution of eating disorders, Hoek (1995) found that immigrants to industrialized nations (e.g., Arab students in London) are more likely to develop an eating disorder than their peers in their country of origin.

Considering the overconcern with body shape and size prevalent in Western society, it is not surprising to learn the degree to which obese persons encounter social discrimination. Research has shown that obese persons receive lower salaries than the non-obese (Frieze, Olson, & Good, 1990) and negative attitudes toward the obese are found in both laypersons and the health professionals who treat them. Nursing, medical, and mental health workers were found to carry negative stereotypes of obese persons

(Yuker & Allison, 1994). Many overweight persons are stigmatized and chastised for their “lack of self-control and laziness” (Allon, 1982). A recent study by Myers and Rosen (1999) found that stigmatization is a common experience for obese persons and that more frequent exposure to stigmatization was associated with greater psychological distress. The measurement of negative attitudes and stereotypes toward obese persons has received considerable attention over the past few years, spawning new rating scales, interviews, and questionnaires aimed to better examine this issue (Yuker, Allison, & Faith, 1995).

Given these findings, it is no surprise that many overweight persons attempt weight loss. In fact, a review of studies investigating dieting prevalence reported that 64% of overweight women and 47% of overweight men in the US are trying to lose weight (French & Jeffrey, 1994), and even more (66%-75%) would like to weigh less. Further, it appears that improvement of body image is a leading reason for the desire to lose weight. In one study, the overwhelming majority of women enrolled in a weight loss program reported that improvement of appearance, not health-related concerns, was the number one reason for weight loss (Levy & Heaton, 1993). Others have also documented that body image concerns are primary motivators of exercise and dieting (Cash, Novy, & Grant, 1994).

Effect of Weight Loss on Body Image

The finding that a preponderance of obese persons attempt weight loss in order to improve their appearance raises the important question of whether weight reduction is indeed sufficient to improving one’s satisfaction with their appearance. Unfortunately, this issue has been largely ignored in the weight loss literature, leaving a serious gap in our

knowledge of this issue. In fact, a review of the behavioral treatment outcome literature between 1978-2000 revealed that only one study evaluated body image during treatment (Rosen, Orosan, & Reiter, 1995). If weight loss alone is responsible for improvement in body image, then weight loss treatment may prove to be the recommended course of action for obese persons wishing to improve their body image.

However, some researchers have raised doubt as to whether weight loss can indeed ameliorate a negative body image, proposing that obese persons who lose weight may in fact retain “body image disparagement” (Stunkard & Burt, 1967; Stunkard & Mendelson, 1967). One author has termed this phenomena as “vestigial body image” or “phantom fat,” alluding to the experience of amputees (i.e., phantom limb) (Cash & Pruzinsky, 1990). Further, when one considers that a body image disturbance is a central diagnostic feature of anorexia nervosa patients, who are by definition very low weight, it is reasonable to conclude that weight status is not the sole factor responsible in determining body image. Rather, it could be argued that body image is best understood as a complex psychological construct, affected by multiple factors in addition to weight.

The findings of one study provide support for this assumption (Gleaves, Williamson, Eberenz, Sebastian, & Barker, 1995). Gleaves, et al. (1995) tested a multidimensional model of body image disturbance using eating disorder patients and college-aged female controls. Body dissatisfaction was found to vary as a function of actual body weight in addition to other psychological variables, including preference for thinness and the extent to which body size was distorted. Based on the results of this study, it was concluded that several other factors in addition to weight status may combine to influence body image.

Disappointingly, the exact nature of the effect of weight loss and other psychological factors on body image in the obese remains poorly understood. Only a handful of studies has investigated this issue, and these studies have unfortunately been plagued with methodological limitations, such as a reliance on select samples (e.g., surgical patients). The existing literature pertaining to this issue is described below.

Surgical Treatment of Obesity

Most of our knowledge on the effect of weight loss on body image is derived from studies of gastrointestinal surgery on the severely obese. In a review of the literature on psychological aspects in obesity, Stunkard and Wadden (1992) found an average improvement in body image disparagement of 50-70% after surgery. Further, surgical treatment was found to radically reduce the rate of avoidance behaviors (e.g., avoiding pools, etc.) in the obese. For example, Rand and McGregor (1991) reported a 60% decrease in mirror avoidance after surgery. One study which examined body image one year after jeuno-ileal bypass surgery reported improvements in subjects' perceptual accuracy of their body after weight loss, but their negative attitudes toward their bodies were unchanged (Schiebel, Castelnovo and Tedesco, 1978). In general, the majority of these studies documented some improvement in body image after surgery, including perceptual, attitudinal, or behavioral changes.

In a more recent investigation, Adami, et al. (1998) studied biliopancreatic diversion patients 2 years after treatment using a cross-sectional design. Post-obese subjects were compared to a group of currently obese subjects as well as normal-weight controls. Age of onset of obesity (early versus late) was considered as a predictor variable. Average pre-surgical BMI was 48, a level considered to be very severe

according to the WHO and the National Heart, Lung, and Blood Institute, and the average post-surgical BMI was 28. Body image was evaluated by three self-rating questionnaires which tap the subjective/attitudinal component of body image, including the Eating Disorder Inventory (EDI; Garner, 1991), the Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) and the Body Image Avoidance Questionnaire (BIAQ; Rosen, Srebnik, Saltzberg, & Wendt, 1991).

Results indicated that subjects who had lost weight after surgery had a considerably better body image than the currently-obese sample ($p < .001$). In the post-surgical sample, however, body image was found to differ as a function of age of onset, such that body image in adult-onset obese persons was very similar to the never-obese normal weight controls. Persons with an early onset of obesity had a significantly worse body image than adult-onset obese subjects, despite a similar loss of weight (BMI unit loss of 48 to 28). Thus, the authors concluded that weight loss may not be sufficient to changing body image in individuals who developed obesity during childhood.

It should be noted that this study was severely limited by its cross-sectional design. No pre-operative body image data was collected for the surgical sample. Further, having an early age of onset was not clearly defined, making it impossible to determine what age was used as a cut-off for defining early versus late onset.

Non-Surgical Treatment of Obesity

Much less is known about the effects of weight loss in non-surgical samples, although the literature base appears to be expanding. A review revealed three studies which investigated this issue. Cash (1994a) examined body image by investigating a group of 102 obese persons before and after weight loss. Average pretreatment BMI was 35

and the average age of the sample was 41.4 years. Subjects entered a very-low-calorie-diet (VLCD), in which subjects consumed an average of 600-800 calories via liquid beverages. Drop out rate was 64%. Average weight loss for the sample was 48 lbs, equaling a 24% reduction of initial body weight. Body image was assessed by two attitudinal and subjective methods, including the Multidimensional Body -Self Relationship Questionnaire (MBSRQ; Cash, 1994b) and the Body Image Assessment (BIA; Williamson, et al., 1989).

Body image was found to significantly improve after weight loss, indicating that successful weight loss had positively impacted attitudes about appearance. Weight loss brought subjects' perceptions of their current body size closer to their ideal body size, therefore reducing their discrepancy score. Interestingly, subjects continued to be "weight phobic," as measured by their desire to stay thin. It should be noted that this study was affected by a large attrition rate, limiting the extent to which the conclusions can be generalized. Further, body image was not systematically assessed during the course of weight loss treatment, making it impossible to determine the course of body image improvement. Finally, because every subject who completed treatment experienced a very large amount of weight loss (24%), no judgments can be made about the effects of modest weight loss amounts on body image.

Foster, Wadden, and Vogt (1997) studied body image in 59 obese females using a longitudinal design. Body image, as measured by the Multidimensional Body -Self Relationship Questionnaire (Cash, 1994) and a measure which assess the degree of overall satisfaction with one's body, were administered before treatment, 24 weeks after beginning treatment, and post-treatment (48 weeks). Treatment consisted of a VLCD plus

one of 4 other components: no exercise, aerobic exercise, strength training, or both aerobic and strength training. Attrition rate was 22%. BMI at baseline was 36.3 (4.3) and age was 40 years. Average weight loss at 24 weeks was 19.4 kg (19.5% of initial body weight), and a slight regain from 24 to 48 weeks resulted in a total weight loss of 16.3 kg (16% loss) from baseline.

The course of body image paralleled weight changes. Specifically, body image was found to be improved at 24 weeks, but then a slight but significant decline occurred at 48 weeks, subsequent to the slight weight gain. Although body image remained significantly improved at post-treatment compared to baseline data, the extent of weight loss did not correlate with extent of body image change. Specifically, participants at 24 weeks who had either lost 12.4 kg, 19.5, and 26.8 kg experienced equal amounts of body image improvement. Similar non-significant comparisons in body image improvement across different amounts of weight loss were found at 48 weeks.

The authors concluded that although weight loss did effect change in body image, these changes did not appear to be strongly related. Therefore, amount of weight loss was not a good indicator of the extent of body image improvement. However, it should be noted that in this sample, even losses of 12 kg equals a percent body weight change of approximately 13%, which is well above the 10% loss considered to be a weight loss success by most federal guidelines (see below). Early and more frequent assessments of body image were recommended, in order to capture the changes in body image after even smaller losses. Several methodological limitations should be noted. Unfortunately, no control group was used. Further, this study also included two sessions of cognitive-

behavioral treatment for body image. Thus, it is possible this portion of treatment was partly responsible for body image improvement, rather than weight loss alone.

A recently published study attempted to overcome some methodological problems surrounding the measurement of body image, such as the reliance a single body image rating scale, to investigate the impact of moderate amounts of weight loss on body image improvement (Sorbara & Geliebter, 2002). This study investigated body image disturbance as a composite of distortion, discrepancy, and dissatisfaction in a sample of 82 obese outpatients enrolled in a VLCD (intake of 900 calories a day) program. The VLCD produced a rapid and significant amount of weight loss (average 3.5 lbs per week), resulting in a loss of 5.9% (6.4 kg) after 4 weeks. Significant improvements in body image were detected for the total sample. Predictors of initial disturbance included Caucasian race and male gender, whereas binge eating and early age of onset predicted greater discrepancy scores. After weight loss, individuals reporting an earlier age of onset experienced body image improvement to a lesser degree than adult-onset participant. The authors concluded that after a relatively small weight loss, significant improvements in discrepancy, dissatisfaction, and distortion occurred.

Summary of Surgical and Non-Surgical Approaches

Despite several methodological problems, these studies show some preliminary support that moderate to large reductions in weight may be effective for body image change in at least some individuals. However, the relationship between weight loss and body image does not appear to be universal or linearly related in all studies (Adami, et al., 1998; Schiebel, et al., 1978; Foster, et al., 1997). Also, since these studies included surgical and VLCD interventions that incurred very large weight losses, it is unclear

whether modest amounts of weight loss can effect change in body image. As surgical and VLCD samples represent only a fraction of obese persons, this sample may be highly biased (Stunkard & Wadden, 1992). The lack of control groups in these studies compounds this problem. As the overwhelming majority of persons attempting weight loss fail to achieve such dramatic losses, the dearth of research examining the effectiveness of modest weight loss on body image is surprising.

During the 1990's, a paradigm shift occurred in which weight loss efforts were focused on achieving moderate changes in weight and behavior, rather than large changes (Foster, Wadden, Vogt, & Brewer, 1997). Summaries of studies of behavioral treatment for obesity from 1974-1995 (Williamson & Perrin, 1996; Perri & Fuller, 1995) reveal average losses of approximately 5-9%, with rates increasing with the duration of follow-up. Similarly, a review by Wing (1992) concluded that behavioral approaches to obesity produce weight losses averaging 10 kg at the end of the program and 6.6 kg at 1-year follow-up.

This shift is supported by research indicating that many obesity-related health problems, such as hypertension, are significantly improved with losses of only 5-10% (Goldstein, 1992). Modest weight reductions of 10% appear to increase longevity in obese individuals. On the basis of these observations, current guidelines recommend that a 10% weight loss be the clinical definition of a weight loss success (NHLBI Obesity Education Initiative Expert Panel, 1998). Other guidelines concur with this suggestion, even proposing that a 5% loss be considered as a weight loss success (USDA Dietary Guidelines; Agricultural Research Service, 1995). Similarly, the Institute of Medicine of

the National Academy of Science (1995) suggested that a successful long-term weight loss is a 5% reduction maintained for at least 1 year.

Other Approaches to Body Image Improvement

Based on these recommendations, the question becomes whether small to modest weight losses can effect change in body image, or whether body image can improve independently of weight loss. Although no study has directly assessed this issue, a handful of studies have examined “undieting” approaches to enhance self-acceptance and improve body image. In addition to "undieting" approaches, a cognitive-behavioral approach directly targeting body image has recently been developed.

The “undieting” approach arose from the debate over whether dieting causes more harm than good (Polivy & Herman, 1992). Several distinct lines of research have converged to provide support for this approach, including the high reports of weight regain in clinical samples, the etiological role of dieting in eating disorders, feminist theories, and the negative metabolic and health effects of weight cycling (Brownell, 1993). “Undieting” approaches attempt to improve body image independently of weight loss by focusing directly on changing one’s attitude and beliefs about their body. An examination of this literature may be useful in determining the malleability of body image independent of weight loss.

Polivy and Herman (1992) reported an uncontrolled study that attempted to reduce dieting in a sample of 18 obese women. The 10-week program focused on raising patients’ level of awareness about dieting behaviors, eliminating dieting behaviors, substituting normal eating behavior for dieting, and increasing acceptance of their bodies. Findings revealed significant decreases in dieting behaviors and eating pathology, as well

as significant decreases in depression, negative self-esteem, and binge eating. However, no change in weight loss or body image occurred, suggesting that this program was ineffective in changing body image.

Another study demonstrated contrasting findings. Roughan, Seddon, and Vernon-Roberts (1990) conducted a program to discourage dieting behavior and reduce body image dissatisfaction in a sample of 87 females (BMI = 31.9). Treatment components of the program included food monitoring, awareness of hunger/satiety, reduction of emotional eating, and acceptance of body regardless of shape or size. Results indicated a significant improvement in body image at post-treatment and again at 2-years follow-up, as measured by the Body and Self Cathexis Scale (Secord & Jourard, 1953). Based on these results, the authors concluded that it is possible to change body image independently of weight loss.

It should be noted that this study was limited by the absence of a control group and subjects were selected on the basis of dieting preoccupation, not BMI. Thus, several of the women included in the study were not classified as obese (BMI > 30), limiting our ability to generalize these findings to an obese sample. Further, subjects changed their eating habits and subsequently lost a significant amount of weight as measured at the 2-year follow-up. Thus, it is difficult to conclude whether improvements in body image were attributable to the body image treatment component rather than weight loss.

Using an alternative approach, Rosen, Orosan, and Reiter (1995) developed an 8-week cognitive-behavioral treatment program designed specifically to improve body image in an obese sample. Cognitive-behavioral therapy has been found to be an effective treatment for negative body image in normal weight college-aged females (Butters &

Cash, 1987). The program goals focused on altering appearance assumptions, exposing subjects to avoided body image situations, and eliminating body checking behaviors. No attempt was made to modify exercise or eating habits. Fifty-one obese subjects were randomized into a CBT-treatment condition and control condition.

Results showed that body image improved in approximately 70% of the participants, with scores falling from a clinical range to a normal range on several measures of body image and satisfaction, including the Body Shape Questionnaire (Cooper, et al., 1987) and Body Dysmorphic Disorder Examination (Rosen & Reiter, 1996). No change in weight occurred, and the study did not address eating patterns. This study may provide preliminary evidence that weight loss may not be the only route to producing change in body image in obese individuals.

Summary of Research Findings

To review, several conclusions can be drawn from the existing literature. Overall, this literature is marked with inconsistent findings and methodological problems, such as high attrition rates, lack of control groups, and the overreliance on select samples such as surgical patients. As the majority of individuals seeking weight loss will likely achieve and maintain losses of 5-10%, our ability to extend findings from the existing literature base is hindered. However, it does appear that surgery and very-low-calorie-diets are effective for short-term body image improvement in at least some individuals. Improvement in body image does not appear to be a universal effect and is possibly mediated by other factors, such as age of onset of obesity and binge eating. The issue of whether prognostic variables exist which can predict body image improvement in weight loss samples has not been systematically examined.

Further, no meaningful studies have been conducted to investigate whether modest weight losses alone can produce improvement in negative body image. It is possible that there is a “weight loss threshold,” after which no additional weight loss can be expected to produce change (Foster, et al., 1997). Interestingly, a recent study suggested that the simple act of making a resolution to diet might bring an immediate improvement in self-image, regardless of the eventual outcome (Polivy & Herman, 1999). It is possible that the act of engaging in a diet may yield some initial benefit to body image, independent of actually losing weight.

Preliminary findings from “undieting” approaches that include a cognitive-behavioral component specifically targeting body image appear to hold some promise. However, these findings should be considered tentative until more studies are conducted which specifically target obese individuals. Undieting approaches without a body image component do not appear to be effective for producing change in body image. In conclusion, several questions remain regarding the nature of the relationship between weight loss and body image in obese individuals.

PILOT STUDY

In addition to a review of the literature, a pilot study was conducted to assist in the formulation of hypotheses and planning of the present study. Using a retrospective design, the objective of this study was to examine the relationship of body image and weight loss in a sample of obese men and women seeking weight loss at the Pennington Biomedical Research Center between 1993-1997. Research questions were as follows:

1. Do participants' estimates of current and ideal body size change after weight loss?
2. Does the amount of weight loss correlate with body image improvement?
3. Are there baseline variables that are predictive of improvement in body image?

Participants

Between 1995 and 1997, 107 participants that enrolled in the Pennington Weight Loss Program received a psychological screening conducted by a master's level graduate student enrolled in a clinical psychology Ph.D. program. The purpose of the screening was to evaluate participants for non-compliance or psychopathology, such as depression and binge eating, which may have interfered with their participation in the weight loss study.

Procedure

Pennington Weight Loss Program

The treatment program consisted of weight loss medication and group behavioral therapy. Medications included combinations of either fenfluramine/mazindol or fenfluramine/phentermine. After 1996, dexfenfluramine was occasionally substituted for fenfluramine. Behavioral treatment components were based on the LEARN manual (Brownell, 1994), and included techniques such as self-monitoring and stimulus control to

improve eating and exercise patterns. Groups were conducted by a licensed clinical psychologist and conducted in single gender groups of 8 to 14 participants formed during intervals of 2 to 6 months. Participants visited the clinic every week for the first 12 weeks and every 2 weeks thereafter for at least 1 year. At each clinic visit, patients met with a nurse, and on a monthly basis, a physician.

Assessment Measures

Participants were asked to complete a demographic questionnaire as well as the questionnaires described below at baseline and again at follow-up. As this was a retrospective study using archival data, no attempt was made to systematically assess participants at specified times during treatment. The assessment measures that the participants completed at baseline and follow-up are as follows:

Body Image Assessment-Obesity (BIA-O; Williamson, Womble, Zucker, Reas, White, Blouin, & Greenway, 2000).

The BIA-O was developed to measure body image in males and females ranging from very thin to obese, utilizing 18 silhouettes of female body shapes that range from very thin to very large in size (Williamson, et al., 2000). Participants are instructed to select the figure that represents an estimate of their current body size (CBS) as well as their ideal body size (IBS). Body size dissatisfaction, as defined by the BIA-O, is the discrepancy between current and ideal body size estimates. The discrepancy between CBS and IBS has been validated as a measure of dissatisfaction with body size (Williamson, Gleaves, Watkins, Schlundt, 1993). Satisfactory reliability and validity of the BIA-O has been established (Williamson, et al., 2000). Norms have been developed for the BIA-O, controlling for BMI, gender, and ethnicity.

For the pilot study, the BIA-O was used to operationally define body size dissatisfaction, as indicated by the discrepancy between participant's selection of current body size and ideal body size (CBS-IBS). The BIA-O was administered at baseline and again at follow-up to assess change in 1) current body size, 2) ideal body size, and 3) discrepancy score over time. Again, body image dissatisfaction was defined as size of the discrepancy between current and ideal size estimations.

Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961).

The BDI is a 21-item questionnaire that assesses the cognitive, behavioral, somatic, and affective symptoms of depression. The BDI has been established as a valid measure of depression (Beck, Steer, & Garbin, 1988). The BDI is the most common instrument used in studies with obese participants to measure depression. The BDI was used in the present study to measure depression at baseline and follow-up. This allowed for pre-post comparisons of depression after weight loss. Additionally, the BDI score was entered as a predictor variable, to evaluate whether depression level mediated the relationship between body image and weight loss.

Body Mass Index (BMI).

The body mass index is calculated from measurements of height in meters and weight in kilograms using the following formula: $\text{weight (kg)} / \text{height squared (meters)}$. The BMI has been found to have validity as a measure of adiposity (Garrow, 1983). BMI was measured at baseline and at follow-up in the present study to assess changes in weight.

Three Factor Eating Questionnaire (TFEQ; (Stunkard & Messick, 1985).

The TFEQ is a 51-item questionnaire developed to measure 3 factors of dietary restraint, including 1) behavioral restraint, 2) disinhibition, and 3) perceived hunger. Validity studies of the TFEQ have shown the dietary restraint scale measures dieting behavior and the intention to diet (Allison, Kalinsky, & Gorman, 1992). Since the TFEQ was administered both at pre- and post-treatment, it was included to assess participant's eating habits and evaluated as a predictor variable.

State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

The STAI is a self-report instrument that measures both state and trait anxiety. State anxiety is defined as a transitory condition of perceived tension, and trait anxiety is assumed to be a relatively stable condition of anxiety proneness. The STAI was used to measure anxiety both at pre-and post-treatment and was evaluated as a predictor of body image improvement.

Results

Only participants with complete data on body image and body mass index (kg/m) at baseline and at least one follow-up assessment were included in the pilot study. Based on this criterion, 51 people were excluded from the study, leaving a total of 56 participants for inclusion in the present study. On average, participants were 52.7 years old, with a range of 24 years to 69 years. Initial body mass index was 39.2, with a range of 30 to 60. Thus, all participants were considered to be obese, with a BMI equal or greater to 30. The sample was comprised of 35 (62%) females and 21 (37%) males, and the overwhelming majority of the sample was Caucasian (98.2%).

Overall, the mean follow-up period was 19 weeks (4.7 months), with a bimodal distribution of 11.1 and 28.8 weeks. Thus, participants were classified into 2 groups based on follow-up length, Group 1 and Group 2, allowing for between-group analyses. No significant baseline differences in weight, age, gender, degree of body image dissatisfaction, or any of the psychological questionnaires existed between the two groups ($p < .05$). Total weight loss for the entire group was 16.7 kg, or a 14% loss of initial body weight. This weight loss equals an improvement in BMI (kg/m) from 39 to 33.6. An examination of group differences indicates that the group with the longer follow-up (Group 2) lost significantly more weight than the short follow-up group. Specifically, Group 1 lost 14.8 kg (12.5%) after 11 weeks, compared to a loss of 18.8 kg (16.6%) achieved by Group 2 after 29 weeks.

Body Image Assessment

Overall sample means and standard deviations for the BIA-O Current, Ideal, and Discrepancy scores at the initial assessment and at follow-up are shown in Table 1. There were no group differences on the body image measures either at baseline or follow-up between persons receiving a shorter or longer follow-up. At follow-up, selections of current body size estimates (Current BIA-O) were very similar for the two groups (11.6 vs. 12.4; 8.4 versus 8.1), despite significant differences in weight loss during treatment. Ideal body size and discrepancy scores mirrored this trend. Due to the finding that no baseline or follow-up group differences existed on any BIA-O measurement (current, ideal, or discrepancy score), the two groups were combined and the overall group mean for body image is presented below.

At baseline, group means for current, ideal, and discrepancy BIA-O raw scores were 12.0, 5.5, and 6.4, respectively. At follow-up, group means for current, ideal, and discrepancy BIA-O scores were 8.3, 3.3, and 4.9, respectively. Paired t-tests between initial and follow-up BIA-O scores for the entire group found a significant difference in current and discrepancy scores over time ($F(1, 55) = 12.05$ and $F(1, 55) = 9.1$; $p < .01$). These results reveal an improvement in body image over time, as indicated by decreasing estimates of current BIA-O size, and the resulting decrease in the discrepancy score. Examination of the ideal body size estimations at baseline and follow-up also revealed a slight, but significant decrease over time (5.4 versus 4.9; $F(1,55) = 3.03$ $p < .05$). By dividing average weight loss by change in BIA-O score, it was determined that a minimal weight loss of approximately 2.5 BMI units was required to yield a significant change in the selection of body size. In terms of pounds, this finding implies that a 10-pound loss was necessary to produce a 1 unit change in current body size estimate.

Other Measures of Psychological Functioning

Comparisons of BDI, TFEQ, and STAI scores indicate significantly different scores at follow-up for all scores when compared to baseline. There were no significant differences between those participants who were assessed at 11 weeks versus those followed-up at 29 weeks. Thus, total group scores are illustrated in Table 1. Results suggest that participant's ratings of depression, perceived hunger, disinhibition, and trait anxiety decreased significantly as a function of treatment. Significant increases in scores were detected for behavioral restraint and state anxiety. It is likely that decreases in perceived hunger and disinhibition (likelihood to overeat), as well as the increase in behavioral restraint may reflect changes directly incurred by the weight loss treatment.

Relationship Between Weight Loss and Body Image

To explore the relationship between weight loss and body image, a Pearson's correlation coefficient was computed using weight loss and change in discrepancy score over time. As mentioned above, the discrepancy score (current BIA-O minus ideal BIA-O) has been validated as a measure of body image dissatisfaction. There was a linear relationship between weight loss and body image improvement ($r = .47$; $p < .001$). Thus, shared variance between weight loss and body image improvement was approximately 22%. A presentation of these results can be seen in Figure 1.

Table 1: Overall group means for BDI, TFEQ, STAI, BIA, & BMI before and after weight loss.

	Initial Score	Follow-up Score	F-test
BDI	6.5 (4.8)	4.7 (3.3)	2.4 *
TFEQ			
Restraint	8.0 (3.7)	15.7 (3.5)	-11.4**
Disinhibition	11.1 (2.8)	7.4 (3.6)	6.6**
Perceived Hunger	8.1 (3.5)	4.7 (3.7)	6.2**
STAI			
State	43.8 (7.6)	52 (18.1)	-3.13 **
Trait	48.8 (10.1)	46.5 (8.5)	2.1 *
Current BIA-O	12.01 (2.6)	8.3 (2.3)	12.0 **
Ideal BIA-O	5.5 (1.4)	4.9 (1.6)	3.03*
Discrepancy Score	6.4 (2.7)	3.3 (1.8)	9.1 **
BMI	39.2 (6.1)	33.5 (5.9)	17.7**

Note: BDI = Beck Depression Inventory; TFEQ = Three Factor Eating Questionnaire; STAI = State-Trait Anxiety Inventory; BIA-O = Body Image Assessment-Obesity; BMI = Body Mass Index; * indicates that group means differ ($p < .05$). ** indicates that group means differ ($p < .01$).

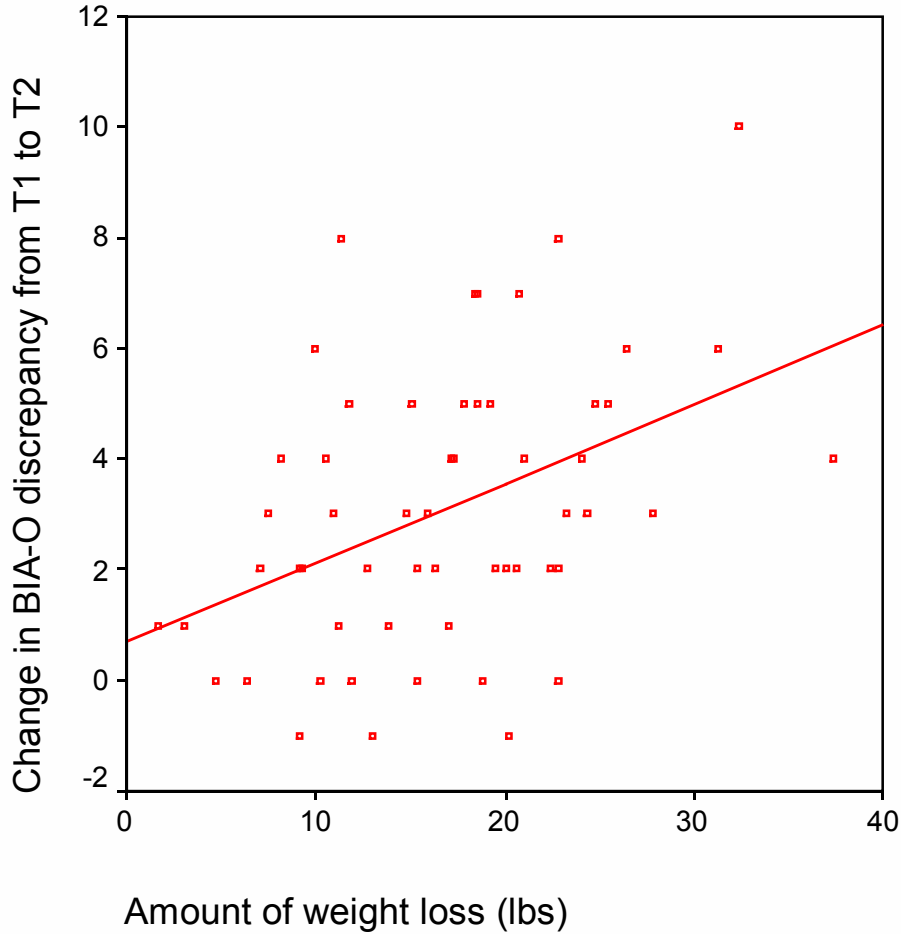


Figure 1. Relationship between Weight Loss and BIA-O Discrepancy Score.

Upon further examination, it appears that the change in discrepancy score across time was due to the change in current size estimation, rather than any change in ideal size estimation. On average, CBS decreased significantly for the total group, from an average CBS estimation of 12.0 (2.2) to 8.3 (2.6). Ideal body size remained relatively unchanged, from an initial mean IBS of 5.5 (1.4) to 4.9 (1.8) at follow-up. As seen in Figures 2 and 3, change in CBS correlated significantly with weight loss, ($r = .43$; $p < .001$), whereas IBS demonstrated no significant relationship with weight loss ($r = -.04$; $p > .76$).

These results provide support that weight loss does have an impact on body image improvement, and the agent of change appears to be the decrease in current body size estimations (CBS), rather than a change in ideal body size estimations (IBS).

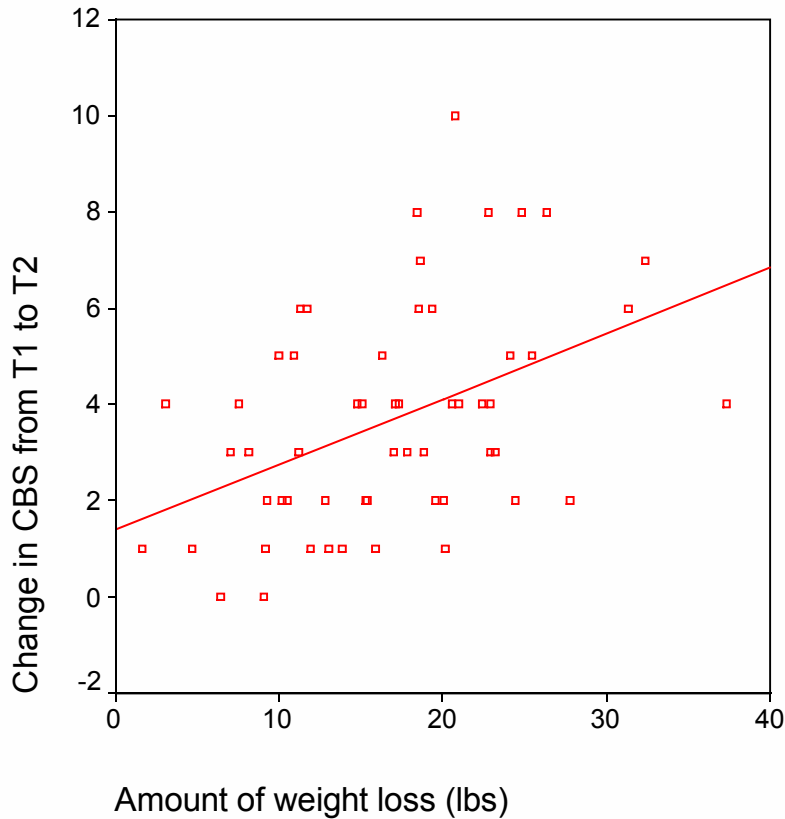


Figure 2. Relationship between CBS and Weight Loss.

This finding is consistent with prior research demonstrating that IBS is a stable construct, whereas CBS is subject to change. A 1-way ANOVA was conducted to explore whether any group differences existed in body image improvement between the two groups. Since the group with the longer-follow-up lost significantly more weight than

the shorter follow-up group, it was hypothesized that they may experience more improvement in body image. Results indicated that despite the significant difference in weight loss, there were no group differences existed between those assessed at 11 weeks versus 29 weeks ($F_{(,55)}=3.21, p>.05$). These results suggest that even smaller amounts of weight loss can produce significant improvement in body image. However, it should be noted that both groups lost over 10% of their body weight, on average (12.5% and 16.6% for week 11 and week 29 group, respectively), which is generally considered a weight loss success.

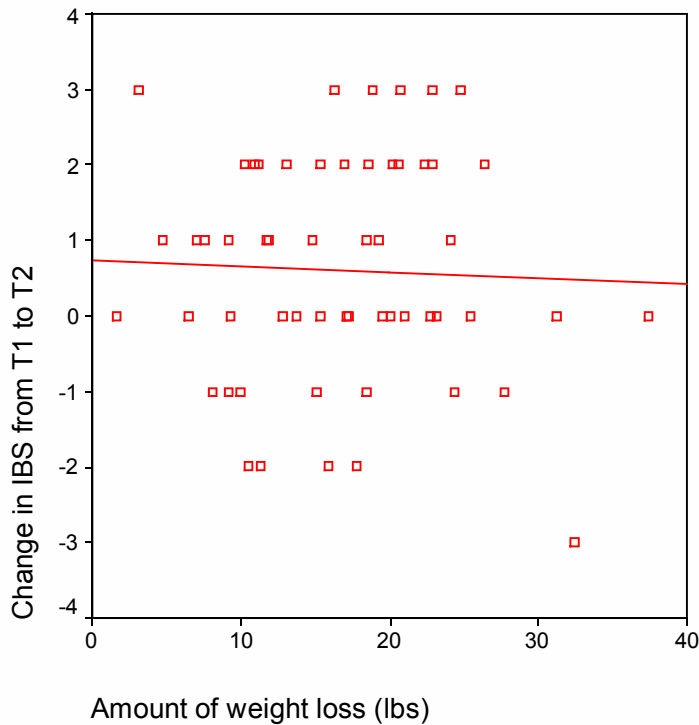


Figure 3. Relationship between IBS and Weight Loss.

Prediction of Body Image Improvement

To determine whether any baseline variables were predictive of improvement in body image, a stepwise multiple regression analysis was conducted. The criterion variable was the change in BIA-O discrepancy score from initial screening to follow-up. Predictor variables included age, gender, and initial scores on the BDI, TFEQ, and STAI. Using the change in discrepancy score as the dependent variable and a forward selection procedure with a significance level of .05 as the criteria for entrance into the equation, behavioral restraint as measured by the TFEQ (Factor 1) at baseline was the only variable which entered the equation. This variable was found to account for 19.1% of the variance in body image improvement ($R^2 = .191$). The negative direction of this correlation indicates that persons who were actively attempting to restrain their eating at the time of initial presentation to the study were found to be less likely to experience an improvement in body image at follow-up. Similarly, these individuals were less likely to lose weight.

Discussion

Based on these data, it appeared that body image improved following a weight loss of 12% to 17% of initial body weight. Body image improvement was indicated by a decrease in the size of the discrepancy between participants' estimations of current and ideal body size over time. The bulk of this change appears related to participants' selection of a smaller current body size estimate (BIA-O), rather than an increase in the selection of an ideal body size. In fact, selections of ideal body sizes remained fairly stable before and after weight loss, although a trend toward a smaller ideal was noted.

The question of whether obese individuals lower their standards during weight loss is important, as it may reflect previous findings that obese individuals often have

unrealistic goals that are larger than can be produced by behavioral treatments (Foster, Wadden, Vogt, & Brewer, 1997). Similarly, others have reported that the pursuit of unattainable goals has negative psychological and behavioral effects (Cervone, Jirvani, & Wood, 1991). Recent research on the BIA-O has added a third body size called “reasonable body size”, which is an estimate of a body size considered to be reasonable for one to maintain for a long period of time (Williamson, et al., 2000). Results from this study indicated that Caucasian men and women selected significantly larger reasonable body size compared to estimates of ideal body size. Further research investigating the effects of weight loss on body image would benefit from the inclusion of a reasonable body size estimation in addition to ideal body size.

Results suggested that weight loss correlated significantly with improvement in body image. A positive correlation with a moderate magnitude was found between amount of weight loss and change in discrepancy score ($r^2 = 22\%$). More research is necessary to better identify other variables which may account for the remaining variance. Interestingly, findings from the pilot study revealed that despite the significant difference in weight loss between groups, no group differences in body image existed between those who were followed-up at an average of 3 months versus 7 months. These results may indicate that smaller amounts of weight loss are sufficient in producing significant improvement in body image. However, as the participants had already incurred a loss of 12% at 3 months, an amount considered to be very successful, it is unknown whether persons losing little or no weight would experience a similar improvement in body image satisfaction. More variability in weight loss amounts is necessary to determine whether there is a cut-off, after which no further weight loss impacts body image improvement.

The finding that a higher level of restraint, as measured by the restraint scale of the TFEQ, predicted less improvement in body image is an unexpected finding. A higher level of restraint at baseline was indicative of persons who were actively attempting to restrain their eating by dieting at the time of initial presentation to the study. Persons already dieting at the beginning of the weight loss study lost less weight. Although this relationship was found to be non-significant upon examination, it is possible that less weight loss accounted for the finding that a higher restraint predicted less improvement in body image. Alternatively, it is possible that persons who repeatedly attempt weight loss and fail may be less likely to achieve satisfaction with their body size. Perhaps persons who repeatedly attempt dieting and fail are more susceptible to feelings of low self-esteem and depression, which may adversely impact the malleability of their body image. One study found that fewer previous diets were significantly related to more positive body image (Foster, Wadden, & Vogt, 1997), lending some support to this hypothesis. Additionally, Polivy and Herman (1999) found that chronic dieters were often less hopeful and more depressed when engaging in a diet than persons who were first-time dieters. Future studies should include direct questions regarding weight and dieting history to better clarify this issue.

The finding that all measures of psychological functioning and eating behavior differed significantly between the initial screening and follow-up may reflect some effects of the weight loss treatment, such as the use of medication. For example, it was found that levels of perceived hunger and disinhibition decreased, while the level of restraint increased at follow-up. Medications used in the weight loss program included combinations of either fenfluramine/mazindol or fenfluramine/phentermine. These drugs

reduce appetite by directly affecting the reuptake or stimulation of the noradrenergic or serotonergic neurotransmitter systems in the brain. Specifically, fenfluramine stimulates serotonergic (5HT) release in the brain, while mazindol and phentermine act to block norepinephrine (NE) or stimulate the release of NE. Because these drugs actively suppress appetite, a decrease in participant hunger and a decrease in the propensity to overeat would be expected.

In conclusion, results from this pilot study documented the presence of a relationship between weight loss and body image. However, many questions remain regarding the nature of this relationship which cannot be addressed due to the retrospective nature of the pilot study design. Based on the literature review and pilot results, several research questions are proposed for the current dissertation study.

DISSERTATION STUDY

Study Purpose and Rationale

The purpose of this study included the following objectives: 1) investigate nature of changes in body image during weight loss therapy, 2) identify predictors of initial body image discrepancy, and 3) test the strength of the association between weight loss and body image improvement while examining the influence of other variables hypothesized to moderate this relationship. A ubiquitous assumption about body image in obese individuals is that dissatisfaction with body shape and size is a natural consequence of obesity and improvement will automatically occur as a result of weight loss. As a consequence of this general assumption, our understanding of this issue has lagged behind other related issues, such as the effects of weight loss on physical health or quality of life, which have been more broadly examined. Although the presumed beneficial effects of weight loss on body image remain popular among clinicians and are a leading reason for obese persons enrolled in weight loss treatment, research is necessary to develop a scientific basis for this claim.

Results from the pilot study indicated that weight loss correlated significantly with body image improvement. However, it accounted for only one-quarter of the variance in improvement in body image, and appeared to be negatively associated with restrictive dietary practices (i.e., dieting) prior to enrollment in the weight loss program. Similar to findings from prior research, results suggested that other variables may play a role in the extent to which persons seeking weight loss treatment experience body image improvement. Discerning the influence of other factors, such as dieting history and

psychological functioning, may contribute to our understanding of the extent to which changes in body image parallel changes in weight.

Participants in the current study were recruited from a variety of weight loss programs, including those that use surgical and non-surgical procedures. The inclusion of participants enrolled in different treatment programs was expected to yield a high level of variability in weight loss, enabling a comprehensive examination of the relationship between weight loss and body image. A shortcoming of the pilot study was the relatively high level of weight loss experienced by all participants (over 10%), minimizing a test of the effects of little or no weight loss on body image. A primary goal of the present study was to investigate the effects of weight loss in a sample consisting of both minor and large weight loss amounts. Indeed, it was anticipated that several participants recruited from PBRC would be randomized into a placebo condition, and therefore expected to lose a negligible amount of weight. A 6-month follow-up was planned which was expected to capture variable weight loss amounts within the sample.

Based on the extant literature and preliminary data produced from the pilot study, several measures of psychosocial functioning were administered at baseline and follow-up and these scores were investigated as predictors of both initial body image discrepancy and improvement. These measures pertained to dieting behavior, weight and teasing history, and psychological functioning. As previous research has indicated that current body size estimation is reactive to negative mood states, a measure of depression, self-esteem, and anxiety were administered to assess these aspects of psychological functioning.

Information gleaned from these assessment measures was intended to prove useful in

future treatment planning and making prognoses regarding the impact of weight loss on body image.

Primary Research Questions and Hypotheses

This study addressed the following major research questions:

- Hypothesis 1. This hypothesis examined the nature and extent of changes in body image (BIA-O current, reasonable, ideal, discrepancy) before and after weight loss treatment. Based on the pilot study as well as prior literature, it was hypothesized that participant estimations of current body size would show a significant decrease after weight loss, whereas estimations of ideal and reasonable body sizes would remain stable. In addition to body image, several measures of psychological functioning were administered which were expected to improve over time (depression, anxiety, self-esteem, overconcern with body shape/size, and disinhibition). Level of restrictive eating, as measured by the TFEQ was expected to increase due to the changes in eating patterns resulting from weight loss treatment. A repeated-measures multivariate analysis of covariance was performed to measure changes from pre- to post-treatment, with change in BMI as a covariate to control for the predicted effects of weight loss.

- Hypothesis 2. This hypothesis investigated predictors of initial body image discrepancy prior to weight loss. Based on the literature, it was hypothesized that a higher BMI, and early age of onset, history of teasing and dieting failure, a tendency to overeat, and higher levels of depression and anxiety, would be associated with greater body image dissatisfaction at baseline. For the purpose of this study, body image dissatisfaction was operationally defined as the discrepancy between the participant's selection of current body size and ideal body size (CBS-IBS) on the Body Image

Assessment- Obesity (BIA-O; Williamson, et al., 2000). A stepwise multiple regression analysis was planned to investigate this hypothesis using body image discrepancy at baseline as the criterion variable.

- Hypothesis 3. This hypothesis tested the strength of association between body image improvement and weight loss while examining the influence of variables which were hypothesized to moderate this relationship. Specifically, weight loss was expected to account for a significant portion of variance in body image improvement, but high levels of psychopathology, binge-eating, and an early age of onset were also hypothesized to be associated with improvement. To investigate this question, a series of multiple regression analyses was planned to examine the prognostic value of weight loss in relation to the following sets of variables assessed at the two timepoints: 1) scores on measures of psychological functioning at baseline, 2) scores on measures of psychological functioning at follow-up, and 3) change scores on measures of psychological functioning (from baseline to follow-up). Based on its significance as a predictor in prior studies, age of onset was also included as a dependent variable. Change in BIA-O discrepancy score was chosen to operationally define body image improvement and was selected as the criterion variable for each of these regression analyses.

Methodology

Participants

Participants were 89 obese individuals recruited from the Pennington Biomedical Research Center in Baton Rouge, LA, the Scripps Clinic in San Diego, CA, and the Weight Management Center at the St. Charles Hospital in New Orleans, LA. Participants from the Pennington Biomedical Research Center were volunteers enrolled in one of two

pharmaceutical trials. Participants from Scripps Clinic and the Weight Loss Management Center in New Orleans were surgical patients undergoing either gastric bypass or lap-band surgical procedures. Men and women between the ages of 18 and 65 years with a body mass index (BMI kg/m) of 30 or above were included in the study. Participants were offered monetary compensation (\$10) if they participated in both phases of the study (i.e., baseline and 6-month follow-up).

Despite recruitment and enrollment in the initial stage of the study, eleven participants were excluded retrospectively from the dataset for the following reasons: 4 individuals had a pre-treatment BMI of less than 30, 4 patients failed to undergo surgery due to insurance reasons, and 3 patients had missing weight or body image data at baseline. Of the remaining 78 participants, 53 (68%) participated in the 6-month follow-up, yielding a 33% attrition rate. Reasons for attrition for the 25 persons who did not participate in the follow-up phase included: lost contact (n= 7), moved overseas (n=1), pregnancy (n=2), developed adverse side effects from the weight loss trial (n = 8), time conflict (n=2), and no information (n = 5). To determine whether baseline differences existed between those participants who did and did not participate in the follow-up, socio-demographic characteristics, weight data, and initial scores on all clinical measures were compared. No significant differences were found on measures of psychopathology (BDI, STAI, RSES, POTS, TFEQ), weight (both groups BMI = 40), or body image data (BIA-O). However, analyses revealed a significant difference for age, such that individuals who participated in the follow-up were significantly older than persons who were not followed up (46.2 versus 37.7 years, $F=13.01$, $p< .001$).

Procedure and Site Descriptions

Each site appointed a study coordinator who received training (by DR) in data collection procedures, obtainment of informed consent, and appropriate methods to store and handle data. Throughout the duration of the study period, close and consistent contact was maintained between DR and the study coordinators to monitor progress and provide assistance with methodological problems, especially during the study implementation and follow-up phase. Two site visits were made by DR to the Weight Management Center in New Orleans to personally meet with those involved in data collection. During the planning phase of the study, the study coordinators were provided with the necessary materials to seek approval by the site institutional review boards (IRB) and assisted in the acquisition of IRB approval at each site. All participants received oral and written information regarding the purpose and procedures of the study, their rights and benefits, and possible risks. Informed consent was read and signed by all participants. A copy of the consent form can be found in Appendix A. After informed consent was obtained, height and weight measurements were recorded. Participants were asked to complete a demographic questionnaire and the assessment materials. The demographic questionnaire assessed age, gender, race, age of onset of obesity, and number of previous diets (defined as intentional weight loss attempts; see Foster, et al., 1997). All assessment materials (described below) were administered at baseline and, with the exception of the Perception of Weight Loss Teasing (POTS), again at follow-up. The POTS provides a measure of historical weight teasing, thus, scores were not expected to change over time.

- Pennington Weight Loss Programs. Participants recruited from the Pennington Biomedical Center in Baton Rouge were enrolled in either a weight loss program examining the effects of Leptin and Caffeine/Ephedrine on weight loss and body composition, or a study investigating the effects of an investigational drug called Axokine in the treatment of obesity. The Leptin and Caffeine/Ephedrine study involved a comparison of three forms of treatment: 1) leptin only, 2) caffeine with ephedrine pills, or 3) leptin and caffeine/ephedrine. Leptin is a protein assumed to play a role in the regulation of body weight by modulating eating behavior and low levels of leptin in laboratory animals have been shown to exhibit extreme obesity. Ephedrine and caffeine are thermogenic agents which increase energy expenditure and suppress appetite, thus stimulating weight loss. The study was conducted on an outpatient basis over the course of 28 weeks. Participants visited the clinic every week for the first 4 weeks and monthly thereafter. Side effects and physical discomforts associated with leptin, caffeine, and ephedrine include: skin reactions at injection site, headache, fatigue, diarrhea, nausea, nervousness, difficulty sleeping, and rapid heart beat. Seventeen of 42 (40%) participants recruited from the Leptin study were lost to follow-up, primarily due to the development of adverse side effects.

Nine subjects recruited from a study investigating the safety and effectiveness of Axokine were included in the present study. Axokine is a protein that has been shown to produce weight loss and reduced food intake in laboratory animals. The study is designed as a double-blind, randomized-control trial in which participants either received a placebo or axokine. The study is being conducted in the outpatient clinic and participants visited the clinic weekly for the first month and monthly thereafter for 12 months. Adverse side

effects associated with the injection of axokine included the development of cold sores, cough, nausea, and skin reactions at the injection site. All participants (n=9) recruited from this study were available for the follow-up (0% attrition rate). As the PBRC drug trials were randomized and controlled, approximately 50% of these participants were assumed to be taking placebo medication.

- New Orleans Weight Management Center and Scripps Clinic. All but one participant recruited from the two surgical sites underwent a gastric bypass operation. Gastric bypass is a stomach reduction procedure that alters the physiology of the stomach and digestive processes. The most common type of gastric bypass is called a “Roux-en-Y” procedure, in which 90% of the stomach is bypassed by rerouting the direction of food by the creation of a small gastric pouch (“new stomach”) by stapling the stomach, dividing the intestines, and attaching the distal section of the intestine to the newly created pouch. The subsequent gastric restriction and malabsorption of food result in decreased food consumption and improved eating habits, producing a significant amount of weight loss, up to 60% excess weight at 5-year follow-up (Bray, 1998; Sugerman, et al., 1992). One participant recruited from the New Orleans site underwent a surgical procedure called laparoscopic banding (Lap-Band Adjustable Gastric Banding System). This procedure involves the placement of a silicone band around the upper portion of the stomach to create a small pouch. The band is adjustable, which allows for inflation or deflation, to accommodate changes in weight without further surgery. Results from initial studies conducted by the manufacturer, BioEnterics, suggest that weight loss averages 36-38% of excess weight at 2-3 year follow-up.

Assessment Measures

Body Image Assessment-Obesity (BIA-O; Williamson, Womble, Zucker, Reas, White, Blouin, & Greenway, 2000).

As mentioned above, the BIA-O was developed to measure body image in males and females ranging from very thin to obese, utilizing 18 silhouettes of male and female body shapes that range from very thin to very large in size (Williamson, et al., 2000). The BIA-O was chosen to operationally define body size dissatisfaction, as indicated by the discrepancy between participant's selection of current body size and ideal body size (CBS-IBS). The discrepancy between CBS and IBS has been validated as a measure of dissatisfaction with body size (Williamson, Gleaves, Watkins, Schlundt, 1993).

Recent research on the BIA-O has added a third body size called "reasonable body size," which is an estimate of a body size considered to be reasonable for one to maintain for a long period of time (Williamson, et al., 2000). The BIA-O was administered at baseline and again at follow-up to assess change in 1) current body size, 2) ideal body size, 3) reasonable body size, and 4) discrepancy scores over time.

Beck Depression Inventory-Short Form (BDI; Beck & Beck, 1972).

The 13-item short-form of the BDI was chosen to assess the cognitive, behavioral, somatic, and affective symptoms of depression. Both the original version of the BDI and the short-form have been established as reliable and valid measures of depression (Beck, Steer, & Garbin, 1988; Gould, 1982). The BDI is the most common instrument used in studies with obese participants to measure depression. Pre-treatment and post-treatment comparisons of depression were conducted, and the BDI was examined as a predictor

variable to evaluate whether depression level moderates the relationship between body image and weight loss.

Body Mass Index (BMI).

The body mass index is calculated from measurements of height in meters and weight in kilograms using the following formula: $\text{weight (kg)} / \text{height squared (meters)}$. The BMI has been found to have validity as a measure of adiposity (Garrow, 1983). BMI was measured at baseline and at follow-up in the present study to measure changes in body weight.

Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985).

The TFEQ is a 51-item questionnaire developed to measure 3 factors of dietary restraint, including 1) restraint, 2) disinhibition, and 3) perceived hunger. Validity studies of the TFEQ have shown the dietary restraint scale measures dieting behavior and the intention to diet (Allison, Kalinsky, & Gorman, 1992). The disinhibition scale measures loss of control of eating (i.e., overeating/binge eating). The restraint and disinhibition scales of the TFEQ were chosen to measure cognitive and behavioral restraint of food intake as well as the tendency to overeat (disinhibition). The TFEQ was administered at pre-and post-treatment and used as a predictor variable in this study.

State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

The STAI is a self-report instrument that measures both state and trait anxiety. State anxiety is defined as a transitory condition of perceived tension, and trait anxiety is assumed to be a relatively stable condition of anxiety proneness. Several reliability and validity studies have been conducted, demonstrating adequate test-retest validity as well as

concurrent, convergent, and divergent validity (Spielberger, et al., 1983). The STAI was chosen as a measure of anxiety in the present study and was included as a prognostic variable.

Body Shape Questionnaire-Short Version (Cooper, Taylor, Cooper, & Fairburn, 1987).

The 8-item version of the Body Shape Questionnaire is an alternate form of the original 32-item BSQ designed to measure overconcern with body size/shape. The shorter version was found to have good internal consistency and convergent and discriminant validity against several other measures of body dissatisfaction (Evens & Dolan, 1993). The BSQ has been used as an attitudinal self-report measure of body dissatisfaction in several studies investigating body image. Higher scores on the BSQ represent more negative body attitudes and more concerns. The short-form of the BSQ was selected as a measure of overconcern with body shape/size and was measured pre-and post-treatment to assess change in body attitudes across time.

Rosenberg Self-Esteem Scale (Rosenberg, 1979).

The Rosenberg Self-Esteem Scale is a 10-item scale designed to measure attitudes of positive self-esteem, general self-worth, and global self-esteem. The RSES has acceptable test-retest reliability (.77) and internal consistency (.89) and correlates well with peer ratings of self-esteem (Demos, 1985). A low self-esteem has been implicated as a risk factor for the development of a negative body image (Polivy & Herman, 1992). The RSES was chosen as a measure of self-esteem and was examined as a predictor of body image.

Perception of Teasing Scale-Revised- Weight Related Teasing Factor (POTS-R-WT; Thompson, Cattarin, Fowler, & Fisher, 1995).

The POTS-R is a revision of the Perception of Appearance Related Teasing Scale (PARTS; Thompson, et al., 1991). The 6-item Weight Related Teasing factor contains appearance related questions specifically about teasing due to elevated weight/size. Thompson, et al. (1995) found adequate internal consistency and test-retest reliability ratios for the POTS-R. The POTS was administered only at baseline to assess history of weight teasing.

Results

Demographics of Total Sample

Socio-demographic data for the total sample are summarized in Table 2. The final sample was comprised of 53 participants with a mean age of 46.24 years (range 23-68 years). The average length of follow-up was 195 days, or 6.5 months (SD = 41.9 days), with a minimum follow-up of 160 days and a maximum of 300 days. The majority of the sample was female (n=47; 88.7%), with 6 male participants (11.3%).

With regards to ethnicity, the majority was Caucasian (n = 38; 71.7%), while the rest of the sample was African-American (n= 15; 28.3%). The educational breakdown of the sample was: 9-11 years (n=1; 1.9%), high school diploma (n=15; 28.3%), bachelor's degree (n=25, 47.2%), more than 16 years education (n=12, 22.6%). Regarding employment status, the majority was employed (n=45, 84.9%), whereas two (3.7%) were retired, three (5.6%) were disabled, and three (5.6%) were homemakers.

Table 2. Demographic Characteristics for Total Sample.

	n	% sample
Age (years)	x = 46.24	SD = 10.1
Gender Male	6	11.3%
Female	47	88.7%
Ethnicity		
Caucasian	38	71.7%
African-American	15	28.3%
Educational Level		
< 12 years	1	1.9%
High school diploma	15	28.3%
Bachelor's degree	25	47.2%
> 16 years	12	22.6%
Type of treatment		
Surgical Procedure	16	30.1%
Non-Surgical	37	69.8%

Eighty-five percent (n= 45) of the participants reported they had dieted prior to enrollment in the study and the average number of self-reported diets was 15.4 (SD = 18.9; mode = 10; median = 20). However, it should be noted that providing an exact number or estimate to this question proved difficult, as only 32 (60%) of the participants responded unambiguously. The remainder of the sample provided information similar to the following responses: “too many to count,” “all my life,” “lots,” “several,” “numerous.” Despite their qualitative information, these types of responses were coded as “missing” in the dataset. Mean age of self-reported onset of obesity was 25.4 years (SD= 13.8), with a range of 4 to 53 years. This data was assessed by the following question “At what age did you first develop obesity?” and was not substantiated by an objective measure (i.e., physician records, etc.).

Weight and body image data for the total sample is illustrated in Table 3. The mean weight in kilograms was 109.3 (SD = 26.9), with a range of 76.7 to 194.0 kilos, and average height was 1.64 meters. Converted to pounds and inches, the average weight was 240.6 lbs (SD = 59.2) and height averaged 64.96 inches. The average BMI (kg/m²) was 40.03 (SD= 8.36), indicating that on average, participants fell in the severe range, or class III, obesity. The median BMI was 37.6 and the range was 30.3 to 67.13.

Table 3. Overall group means for body image and weight data at baseline.

	Mean	Standard Deviation
Current BIA-O	11.39	3.04
Ideal BIA-O	5.37	1.78
Reasonable BIA-O	6.43	2.33
Discrepancy Score	6.02	2.39
Weight		
kg	109.3	26.9
lbs	240.4	59.2
Height		
meters	1.64	.084
inches	64.96	3.3
BMI	40.03	8.36
Age developed obesity (yrs.)	25.4	13.8
Been on prior diet?		
Yes	45 (85%)	
No	8 (15%)	
History of weight teasing (POTS)	10.5	7.0
# Prior diets	15.4	18.9
	mode = 10	
	median = 20	

Note: BIA = Body Image Assessment-Obesity, BSQ = Body Shape Questionnaire, BMI = Body Mass Index; POTS = Perception of Weight Teasing Scale

Changes in BIA-O, BMI, and Psychological Functioning between T1 and T2

In order to test the initial hypothesis, the nature and extent of changes in body image (BIA-O current, reasonable, ideal estimates) as well as changes in psychological functioning were examined. A MANCOVA was performed using SPSS 11.0 to investigate significant differences in body image and psychological functioning prior to and following weight loss treatment. Weight loss was included in the analysis as a covariate. Table 4 illustrates means and standard deviations for weight loss, BIA-O current, ideal, reasonable, and discrepancy scores, and all measures of psychological functioning administered at pre-treatment and follow-up. Regarding weight loss data, weight loss for the sample averaged 30.66 lbs, or a loss of 12.7% body weight. BMI decreased from an average of 40.03 (SD = 8.36) to 35.04 (SD = 5.3), indicating a change in classification from the severe to moderate range of obesity.

Table 4 summarizes means and standard deviation for scores on the BIA-O and other measures of psychological functioning at baseline and follow-up. Results showed a significant improvement in body image as was defined by the change in BIA-O discrepancy score from pre- to post-treatment ($F(1, 52) = 6.22; p < .02$). Upon an examination of BIA-O current and ideal scores, it appeared that improvement in body image was attributed to a significant decrease in subjects' estimates of current body size ($F(1, 52) = 14.5, p < .001$). Baseline means for current, ideal, reasonable, and discrepancy BIA-O scores were 11.39, 5.37, 6.43, and 6.02, respectively. At follow-up, group means for current, ideal, reasonable, and discrepancy BIA-O scores were 8.59, 4.98, 6.28, and 3.6, respectively. Estimates of ideal body sizes did not significantly differ over time, indicating that participants chose similar ideals between the two timepoints ($F(1, 52) = .095, p =$

.76). Therefore, the agent of change appeared to be the decrease in current body size estimations (CBS), rather than a change in ideal body size estimations (IBS). Additionally, estimates of reasonable body sizes remained stable at pre-and post-treatment ($F = .135, p = .71$). It appeared that on average, participants chose a reasonable body size that was approximately 1 size larger than their ideals ($T = -5.4, p < .05$). Results from measures of psychological functioning revealed a significant reduction in the tendency to overeat, as measured by the TFEQ disinhibition scale ($F(1,52) = 5.07, p = .03$), whereas level of restrictive eating significantly increased ($F(1,52) = 18.0, p < .001$). With regard to self-reported depression, results showed a significant decrease in BDI scores ($F(1,52) = 4.46, p < .04$) over time. A significant difference was also detected for scores on the Body Shape Questionnaire, with scores decreasing over time ($F(1,52) = 4.4, p = .04$). No significant differences were found for measures of state or trait anxiety, or self-esteem, as measured by the RSES.

Prediction of Body Image Discrepancy at Baseline

A stepwise multiple regression analysis was conducted to identify the strongest predictors of initial body image discrepancy prior to weight loss. Prior to conducting the regression analysis, correlation coefficients were computed to examine the correlations among predictor variables. The resulting correlation matrix is displayed in Table 5. Note that individual scores on CBS, IBS, and RBS were included in all matrices for descriptive purposes, but were not included as individual predictors in the model. Using the BIA-O discrepancy score as the dependent variable and baseline scores as the IVs, a stepwise method which combined the properties of forward selection ($p < .05$) and backward elimination ($p > .10$) was conducted. Body mass index, Beck Depression

Inventory, and the disinhibition (overeating) scale of the TFEQ entered into the equation. Combined, these three variables were found to account for 50.7% of the variance in body image discrepancy at baseline ($R = .712$). Results from the F-test ((3, 49) $F=25.41$, $p < .001$) indicate that these three predictors can be used to explain a significant amount of variance in the BIA-O discrepancy score. The largest contributor to the regression equation for correlates of baseline BIA-O discrepancy score was body mass index at baseline, which accounted for 38% ($r = .621$), followed by BDI on scores and the overeating scale on the TFEQ, which added 8% and 4% to the explanatory variance, respectively. These results suggest that persons with a higher body mass index, greater levels of depression at baseline, and a greater tendency to overeat at baseline demonstrated greater levels of body image discrepancy at baseline.

Prediction of Improvement in Body Image Discrepancy at Follow-up

A series of stepwise multiple regression analyses were conducted to investigate the contribution of weight loss to predict unique variance in body image improvement in relation to the measures of psychological functioning hypothesized to moderate this relationship. For each analysis, improvement in body image discrepancy, defined by change in BIA-O discrepancy score, was used as the criterion variable and a significance level of .05 as the criteria for entrance into the equation and .10 for elimination.

In the first regression model, amount of weight loss, age of onset, and initial scores on all measures of psychological functioning were included as predictor variables. The resulting correlation matrix is illustrated in Table 6. Results from the stepwise multiple regression analysis indicated a significant 2-variable model ($F(1, 52) = 16.25$, $p < .001$), with weight loss accounting for 34% of the variance in improvement and BDI score

adding an additional 5% to the multiple R ($R^2 = .628$). Overall, the model explained 39% of the variance in body image improvement. These findings indicate that weight loss was the strongest predictor of body image improvement, as it accounted for the largest portion of variance in improvement in discrepancy scores. Figure 4 shows a scatterplot graph to visually display the resulting semi-partial correlation between weight loss and body image after the influence of BDI was removed, as indicated by the higher-order partial correlation ($r = .48$).

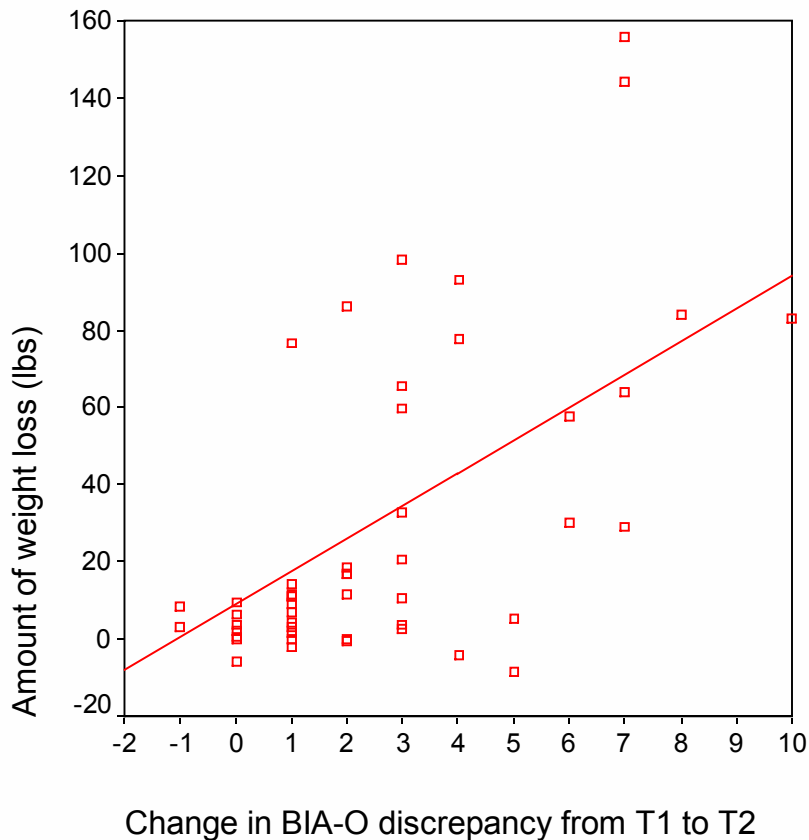


Figure 4. Relationship between body image improvement and weight loss at T2

Table 4. Means and Standard Deviations for BIA-O scores and Psychological Measures at Baseline and Follow-up.

Variable	Initial Score Mean (SD)	Follow-up Score Mean (SD)	F-Test and P-value
Discrepancy Score	6.02 (2.39)	3.61(2.05)	$F= 6.2, p < .001^{**}$
CBS	11.39 (3.04)	8.59 (2.3)	$F= 14.5, p <.001^{**}$
IBS	5.37 (1.78)	4.98 (1.9)	$F = .095, p > .76$
RBS	6.43 (2.33)	6.28 (2.08)	$F = .135, p > .71$
BSQ	31.0 (7.7)	26.0 (7.3)	$F =4.4, p < .04^*$
BDI	7.15 (4.9)	3.8 (4.5)	$F =4.42, p <.04^*$
RSES	19.8 (5.5)	17.65 (4.8)	$F =.66, p >.05$
STAI-State	51.0 (12)	47.7 (12.3)	$F = 1.3 , p >.05$
STAI-Trait	55.7 (12.9)	51.8 (11.9)	$F =.96 , p >.05$
TFEQ1-restrictive eating	9.38 (4.9)	13.8 (4.7)	$F = 18.0, p < .001^{**}$
TFEQ2-disinhibition	9.30 (3.9)	6.9 (3.5)	$F = 5.07, p <.04^*$
BMI loss	40.03 (8.36)	34.9 (5.34)	$F = 30.2, p <.001^{**}$
Weight loss (lbs)	240.9 (59.2)	209.8 (41.6)	$F = 30.2, p <.001^{**}$

Note: BDI = Beck Depression Inventory; TFEQ = Three Factor Eating Questionnaire; STAI = State-Trait Anxiety Inventory; BIA-O = Body Image Assessment-Obesity; CBS = Current Body Size; IBS = Ideal Body Size; RBS = Reasonable Body Size; RSES = Rosenberg Self-Esteem Scale; BSQ =Body Shape Questionnaire; BMI = Body Mass Index.

Table 5. Covariation Matrix for Body Image Discrepancy and Baseline Variables.

	DISC	CBS	IBS	RBS	Age	Onset	#prior diets	BMI	RSES	BSQ	BDI	TFEQ1	TFEQ2	POTS
DISC	---													
CBS	** .793	---												
IBS	-.049	** .561	---											
RBS	.070	** .538	** .799	---										
Age	.200	* .309	.243	.181	---									
Onset	-.243	-.282	-.109	-.102	* .291	---								
#prior diets	.335	* .350	.175	.189	.266	-.132	---							
BMI	** .613	** .771	** .405	* .271	.121	* -.335	.253	---						
RSES	** .591	* .419	-.105	-.041	-.121	* -.317	.140	* .339	---					
BSQ	* .315	.123	-.201	-.236	-.219	-.220	.303	.214	** .450	---				
BDI	** .443	.241	-.215	-.090	-.102	-.157	.093	.113	** .749	** .428	---			
TFEQ1	-.212	-.289	-.160	-.116	-.130	.068	-.158	-.138	-.078	.046	-.014	---		
TFEQ2	** .472	** .373	-.018	-.010	.122	-.207	.249	* .318	.443	** .570	*** .336	* -.294	---	
POTS	** .460	** .493	.173	.194	-.093	** -.611	.235	** .443	.358	* .305	.232	-.250	* .308	---
STAI-S	** .403	.200	-.209	-.092	-.107	-.094	.006	-.034	** .519	* .295	** .613	-.106	.207	.248

Table 6. Covariation Matrix for Body Image Improvement, Weight Loss, and Baseline Variables.

	DISC CHAN	BMI Loss	ONSET	POTS	RSES	BDI	BSQ	TFEQ1	TFEQ2	STAI-S	STAI-T	CBS PRE	IBS PRE
DISC CHAN	---												
BMI Loss	** .583	---											
ONSET	-.187	*-.338	---										
POTS	*.286	** .458	**-.586	---									
RSES	** .434	** .429	*-.202	** .395	---								
BDI	** .395	*.297	-.111	** .344	** .679	---							
BSQ	.153	.236	-.131	*.202	** .411	** .430	---						
TFEQ1	-.26	*-.278	-.004	-.099	-.112	-.032	.002	---					
TFEQ2	*.276	** .424	*-.207	** .366	** .404	** .330	** .511	**-.335	---				
STAI-S	** .384	.137	-.060	*.214	** .435	** .568	** .380	-.126	** .265	---			
STAI-T	** .311	.192	-.096	*.296	** .631	** .713	** .434	-.086	** .378	** .770	---		
CBS PRE	** .596	** .707	*-.221	** .482	** .416	** .358	** .248	*-.238	** .484	*.220	.289	---	
IBS PRE	-.058	*.302	-.049	.151	-.010	-.068	-.149	-.079	.095	-.138	-.146	** .518	---

In the second regression analysis, the prognostic value of weight loss in addition to all follow-up scores on measures of psychological functioning were examined as predictors of body image improvement (similarly defined as change in BIA-O discrepancy score). The resulting correlation matrix is illustrated in Table 7. A significant model was found ($F(1, 52) = 28.7, p < .001$) with weight loss as the only significant predictor of variance in body image improvement, accounting for 35% ($R = .59$) of the variance. All other variables failed to reach statistical significance, and were therefore excluded from the regression model. In the final model, the contribution of weight loss in relation to changes in psychological measures were examined as predictors of body image improvement. Correlation coefficients for this analysis are displayed in Table 8. Similar to the previous results, a 1-variable model was obtained, which included weight loss as the only significant predictor of the variance in body image improvement ($F = 27.33, p < .001$). Weight loss accounted for 35% of the variance in body image improvement ($R = .59$). No additional variables were included in the model. To determine whether an insufficient sample size limited the power to identify additional predictors, a power analysis using data derived from the regression analyses. Using SamplePower and an alpha level of .05 and beta of .80, a sample of approximately 1500 subjects was found to be necessary in order to produce a significant increment in R-squared above and beyond the variance explained by weight loss alone.

Discussion

The present study attempted to address the following research questions: 1) investigation of the nature and extent of changes in body image after weight loss treatment, 2) identification of predictors of initial body image discrepancy, and 3) test of

Table 7. Covariation Matrix for Body Image Improvement, Weight Loss, and Follow-up Variables.

	DISC CHAN	BMI Loss	RSES	BSQ	BDI	TFEQ1	TFEQ2	STAI-S	STAI-T	CBSPOST	IBSPOST	RBSPOST
DISC CHAN	---											
BMI Loss	** .583	---										
RSES	.118	.057	---									
BSQ	-.133	-.207	*.391	---								
BDI	-.043	-.156	** .732	** .493	---							
TFEQ1	-.013	.183	.056	*.348	.057	---						
TFEQ2	.057	-.021	.306	** .423	*.294	*-.224	---					
STAI-S	.162	.020	** .524	*.276	** .568	.097	*.262	---				
STAI-T	.071	-.066	.649	** .512	.639	.110	*.422	** .728	---			
CBSPOST	*-.214	-.041	.068	.089	-.019	-.023	.180	-.054	.027	---		
IBSPOST	** .380	.064	.076	-.139	-.050	-.141	.050	.011	.005	** .542	---	
RBSPOST	.062	-.028	.011	-.200	-.079	-.126	.014	-.078	-.018	.602	** .768	---

Note: DISCCHAN= Change in BIA-O Discrepancy score; BMI loss = weight loss; RSES = Rosenberg Self-Esteem Scale; BDI = Beck Depression Inventory; BSQ = Body Shape Questionnaire; TFEQ = Three Factor Eating Questionnaire; STAI = State-Trait Anxiety Scale; CBSPOST = BIA-O Current body size; IBSPOST = BIA-O Ideal body size; RBSPOST = BIA-O Reasonable body size.

Table 8. Covariation Matrix for Body Image Improvement, Weight Loss, and Change Scores for Psychological Measures.

	DISC CHANGE	pounds lost	BDI CHA	BSQ CHA	RSES CHA	STATE CHA	TRAIT CHA	TFEQ1 CHA	TFEQ2 CHA	CBS CHA	RBS CHA	IBS CHA
DISCCHAN	---											
BMI loss	** .583	---										
BDICHANG	** .435	** .440	---									
BSQCHANG	* .288	** .420	** .383	---								
RSECHAN	** .359	** .411	** .683	** .480	---							
STATECHA	* .438	-.052	** .544	.093	** .501	---						
TRAITCHA	** .361	** .371	** .719	** .362	** .585	* .398	1.00					
TFEQ1CHA	* -.275	** -.497	* -.296	-.216	-.164	-.275	-.171	---				
TFEQ2CHA	.259	** .514	** .424	* .313	* .281	-.355	.371	** -.368	---			
CBSCHA	** .824	** .802	** .451	** .387	** .416	.175	* .391	* .386	** .444	---		
RBSCHA	-.026	-.200	.031	.032	-.037	* -.408	-.049	.046	* .27	.230	---	
IBSCHA	* -.46	.234	-.056	.104	.023	* .424	-.019	-.122	.242	.123	* .405	---

Note: DISCCHAN= Change in BIA-O Discrepancy score; BMI loss = weight loss; RSES = Rosenberg Self-Esteem Scale; BDI = Beck Depression Inventory; BSQ = Body Shape Questionnaire; TFEQ = Three Factor Eating Questionnaire; STATECHA = State-Trait Anxiety Scale; TRAITCHA = State-Triat Anxiety Scale; CBSCHA = BIA-O Current body size; IBSCHA= BIA-O Ideal body size; RBSCHA = BIA-O Reasonable body size score.

the strength of relationship between weight loss and body image improvement in relation to other factors hypothesized to moderate the relationship. Based on the present data, it appeared that body image significantly improved following an average weight loss of 12% and the agent of change appeared to be the decrease in current body size estimations (CBS), which subsequently reduced discrepancy scores. These results are consistent with the initial hypothesis as well as findings from the pilot study, and suggest that weight loss brought perceptions of current body size closer in congruence with their ideal body size. Results indicated that selections of ideal body sizes remained fairly stable before and after weight loss, suggesting that perceptions of an ideal shape remained constant independent of weight status, consistent with a conceptualization of an ideal size as an “anchor” or a standard which may motivate individuals to lose weight (Williamson, 1996). Reasonable body size estimate also remained stable over time, and averaged one BIA-O unit larger than estimates of an ideal size at both timepoints ($t = -5.5, p < .05$; $t = -7.0, p < .05$, at T1 and T2, respectively). This finding implies that participants’ estimate of a size which is “reasonable to achieve and maintain over time” was larger than selections of their ideal sizes. This result is similar to a significant downward trend (kg) between participants’ selections of “dream,” “happy,” “acceptable,” and “disappointed” weights (Foster, Wadden, Vogt, & Brewer, 1997). This self-reported distinction may prove useful in identifying unrealistic beliefs and perceptions of body image ideals and weight goals that are unattainable for the majority of weight loss seekers.

An examination of changes in psychological functioning revealed a significant decrease in levels of depression, overconcern with body shape/size (BSQ), and the tendency to overeat. In contrast, levels of dietary restraint demonstrated a significant

increase, likely attributable to the process of the weight loss therapy. No change in self-esteem or in trait or state anxiety was detected, contrary to the initial hypothesis.

A second aim of the present study involved the examination of predictors of initial body image discrepancy. Results showed that a higher initial BMI, the tendency to overeat, and depression were significant predictors of body image discrepancy at baseline, accounting for 50.7% of the variance ($r^2 = .712$). Thus, the second hypothesis was partially supported. Prior research has documented a significant relationship between binge-eating behaviors, depression, and body image dissatisfaction in obese individuals (Cargill, Clark, Pera, Niaura, Abrams, 1999; Grilo, et al., 1994). Although the prevalence of full-criteria binge eating disorder as assessed by structured interviews appears to be relatively low in obese populations (circa 3%; Williamson & Martin, 1999), binge-eating behaviors are commonly associated with obesity, and in an extreme form, may contribute to increased adiposity.

With regard to the relationship between depression and binge-eating, some have contended that binge-eating behaviors may be negatively reinforced by escape from negative mood states (Heatherton & Baumeister, 1991). Many binge-eaters report a “numbing out” during binge eating episodes, which appears to temporarily minimize negative mood states, such as stress or depression. The present results may represent a subgroup of obese individuals who reported greater mood disturbances and thus, were predisposed to episodes of overeating, which subsequently increased BMI and consequently, body image dissatisfaction. One implication of these findings is the importance of routinely assessing obese individuals enrolled in weight loss programs for the presence of binge-eating behaviors, depression, and body image concerns.

An additional aim of this study was to clarify the strength of association between weight loss and body image improvement. An examination of the correlation matrices suggested a moderate bivariate correlation, such that over 30% of variance was shared between these two variables. To better assess the prognostic value of weight loss in the presence of other variables expected to moderate this relationship, a series of multiple regression analyses were conducted. Overall, results from these analyses showed that amount of weight loss consistently performed as the strongest predictor of improvement in body image. Indeed, weight loss performed as the only significant variable that accounted for variance in body image improvement in two of the analyses. Initial level of depression, as measured by the BDI, entered the equation as a significant predictor of improvement when examining baseline variables in conjunction with weight loss, but only contributed an additional 5% of explanatory variance to the model. Overall, it appeared that weight loss played a substantial role in the prediction of body image improvement and accounted for a majority of findings in the present study.

The strong performance of weight loss to the exclusion of other variables was not expected. To some degree, the study may have been limited by a lack of power due to an insufficient sample size. To investigate further, a power analysis was conducted to determine the amount of subjects needed in order for the psychological variables to have reached significance and been retained in the equation. As determined from the analysis, a sample of approximately 1500 subjects was found to be necessary in order to produce a significant increment in R-squared, using an alpha level of .05 and beta of .80. The increment represents the unique contribution of each additional variable to the equation, over and above the effect of weight loss alone. However, a sample of that magnitude may

have produced spurious findings, as all correlations were observed to become significant, thereby reducing the meaningfulness of the results.

Surprisingly, for example, age of onset of obesity was not found to be a significant predictor of body image dissatisfaction at either timepoint, despite the contention of its importance due to a “crystallization” of body image during youth (Stunkard & Mendelson, 1967). However, a recent study calls into question the importance of age of onset in the formation of body image, suggesting later-life onset, accompanied with adult weight teasing, may be as important in the development of body image (Matz, Foster, Faith, & Wadden, 2002) as early onset obesity and weight teasing during youth. Based on this finding, it may be argued that the mere occurrence of teasing and exposure to social discrimination is critical in shaping body image, irregardless of when in life it occurs. Thus, the assessment of adult weight teasing is recommended in future studies to delineate its importance as a predictor of body image dissatisfaction among obese individuals.

Several limitations of the present study are noteworthy. As determined from the pilot study, a weight loss of approximately 10 pounds was required to yield a 1-unit change in BIA-O current body size. It is important to specify that limitations inherently associated with the primary assessment measure may have inhibited the detection of changes in body image after smaller amounts of weight loss. In other words, changes occurring after relatively small weight losses may have gone undetected. Indeed, some have highlighted the methodological disadvantages to using “coarse” silhouette ratings of body image which are restricted in range (Gardner, Friedman, & Jackson, 1998), a contention which has cultivated advancements in the measurement of body image using technologically advanced assessment tools. A recently developed computerized

assessment procedure, the Body Morph Assessment (Stewart, Wiliamson, Smeets, & Greenway, 1999) was designed to overcome limitations associated with figural silhouettes by utilizing a morphing procedure that allows judgements of realistic body types from very thin to very large across small increments. Future research utilizing technologically advanced procedures such as the BMA is recommended to improve our understanding of more discrete changes in body image experiences.

Additionally, the present study may have been limited by the reliance on a single construct, rather than a composite, of body image concerns. Specifically, the discrepancy score on the BIA-O was utilized as the operational definition and primary indicator of a negative body image. It is important to note, however, that body image is multifaceted and complex construct, consisting of attitudinal, perceptual, and behavioral features. It is possible that weight loss may demonstrate a differential impact on the various aspects of body image. In fact, a recent study by Sorbara and Gorleibter (2002) investigated body image as a composite of three features (distortion, dissatisfaction, and discrepancy). Results demonstrated some differential results in relation to race, gender, age of onset, and binge eating. It is recommended that future studies addressing body image changes during weight loss should include broader definitions of body image disturbance.

An increased understanding of whether some features of body image are more easily modified by weight loss than others may assist in the development of treatment goals. Increased attention to the behavioral features of body image, such as body image avoidance and body checking, is also recommended in obese populations. Although these behaviors have been documented within eating disorder samples (Reas, et al., 2002), much less is known regarding their prevalence and clinical significance in obesity.

The present study sample consisted of a majority of Caucasian females, thus preventing a direct examination of the impact of race and gender as predictors of initial body image discrepancy or improvement. A converging line of evidence has emerged which suggests the presence of gender and ethnic differences in body image concerns. Men, for example, appear to show less body image disturbance than women (Friedman & Brownell, 1995; Williamson, et al., 2000). With regards to ethnic differences, African-American and Hispanic women have demonstrated lower levels of body image concerns than Caucasian women (Sorbara & Geliebter, 2000; Williamson, et al., 2000). Some have argued that the high body image concerns found in Caucasian female samples are attributable to greater cultural pressures to be thin in this population (Sorbara & Geliebter, 2002).

Whereas the present results support the finding that weight loss contributes significantly to improvement in body image, many individuals enrolled in weight loss programs fail to lose weight or lose less than desired. Findings from a recent study revealed an alarming disparity between patient weight goals and clinical standards for defining success in weight loss (Foster, et al., 2001).

Specifically, the authors argued that the amount of weight loss produced by the “best” behavioral and drug treatments were perceived as *less* than disappointing to the obese participants in this study. The process of achieving and maintaining weight loss involves drastic changes in lifestyle habits and those who fail will likely experience nominal improvement in body-related concerns. It has been argued that many obese persons seeking weight loss are driven largely by body image and weight goals which would require the larger amounts of weight loss typically produced by VLCD or surgical

interventions (Reinhardt, 2002). Thus, it is often necessary for clinicians to directly confront patient expectations and ideals regarding what constitutes an acceptable outcome. Shifting the focus to health enhancement, rather than a focus on an “ideal” weight, is often necessary to modify patient attitudes and definitions of success (Wadden & Phelan, 2002). Indeed, smaller amounts of weight loss have been shown beneficial to physical health and improvements in well-being, mood, and quality of life.

In addition to establishing realistic weight loss goals, it may be reasonable to assume that the routine addition of body image therapy to weight loss protocols may provide a viable solution in addressing body image concerns independent of weight loss. To date, only one controlled trial has been conducted to test the effectiveness of adding a body image component into a behavioral weight loss program (Ramirez & Rosen, 2001). The study included a 12-session cognitive-behavioral therapy program for body image (Cash, 1996; Rosen, et al., 1995) in conjunction with a behavioral weight control intervention based on the LEARN program (Brownell, 1994).

Interestingly, results suggested that the combined approach neither detracted from nor benefited body image improvement. Specifically, the weight control versus weight loss plus CBT condition incurred similar weight loss amounts as well as similar improvement in body image. Several aspects of this study are worth mentioning. First, the use of the LEARN program as the core weight loss intervention may have confounded the ability to detect improvements attributable to the body image therapy. Specifically, the LEARN manual is a CBT approach to weight loss which teaches participants similar skills which can be used to modify body image attitudes and negative beliefs. Second, the

equivalent weight loss incurred by the two groups (app. 13% and 9%) may have been sufficient in producing body image improvement.

The authors argued, however, that the addition of a body image component may have provided substantial benefit for some individuals, especially those losing smaller amounts. Also, a lower attrition rate was reported for the combined group in comparison to the weight-reduction only group, suggesting that the addition of a body image component may have a beneficial effect on retaining participants in the weight loss program. Future studies addressing the effect of adjunct body image therapy on treatment satisfaction, adherence, participation, and attrition is recommended to better determine the value of adding a body image component.

Further, Cash (1994a) has argued that although larger amounts of weight loss appear to facilitate improvement in body image, these changes may be unstable and prone to relapse should weight regain occur. Future research is warranted to determine the extent to which body image changes parallel weight losses and gains. Further studies are also recommended to assess the benefits of adjunct body image therapy as a protective measure in reducing patient vulnerability to distress associated with weight gain.

Cooper and Fairburn (2001, 2002) recently proposed a cognitive-behavioral model of weight maintenance which emphasizes the importance of addressing body image concerns during the weight maintenance phase of a weight loss program. According to this model, the failure of weight loss seekers to achieve body image goals contributes to discouragement (i.e., “giving up”), abandonment of weight loss efforts, and consequently, the failure to maintain losses.

Despite the benefits of large amounts of weight loss on body image, many of the surgical patients in this sample may develop untoward consequences of the rapid weight loss produced by bariatric surgery. Common related side effects associated with surgery include loss of muscle mass, transient hair loss, and excess skin, which are often treated with cosmetic surgery. Due to the extent and variety of changes associated with losing massive amounts of weight in a short time period, attention to body image concerns is warranted. A dearth of literature exists regarding the nature of body image concerns secondary to bariatric surgery and subsequently, future studies are recommended to improve our knowledge and ability to provide support to this unique patient population.

Given the reality of discrimination against overweight individuals in today's society, it is argued that changes must occur both on an individual and societal level to decrease stigma and encourage acceptance of body weights not espoused by our "thin ideal" in order to reduce body image disparagement in obese persons. The rigid adherence to a thin ideal body size in western cultures is so pervasive that non-obese samples of younger women have reported a "normative discontent" with body weight (Rodin, Silberstein, & Striegel-Moore, 1985). Efforts concentrated on decreasing appearance-related distress, reducing self-defeating "body-talk", and loosening rigid ideas of an acceptable weight and shape may be effective in achieving improvements in body image independent of weight loss. From a cultural standpoint, the growing popularity of size acceptance groups, weight-management programs focused on health enhancement, and increased publicity of stereotypes and hardships encountered by obese individuals may eventually lead to sweeping changes in societal attitudes and practices. Given our history of shifting cultural standards for attractiveness and the expected global increase in obesity,

it is possible that the future will witness a major shift in cultural standards towards a broader range of “acceptable” body sizes.

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APPENDIX A

CONSENT FORM

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Title of Study: Psychosocial Correlates of Changes in Body Image During Weight Loss Therapy

What you should know about a research study

- We give you this consent form so that you may read about the purpose, risks and benefits of this research study.
- The main goal of research studies is to gain knowledge that may help future patients.
- You have the right to refuse to take part, or agree to take part now and change your mind later on.
- Please review this consent form carefully and ask any questions before you make a decision.
- Your participation is voluntary.
- By signing this consent form, you agree to participate in the study as it is described.

1- Who is doing the study?

Investigator Information:

Principal Investigator: Donald A. Williamson, Ph.D.
225-763-6022

Medical Investigator: Frank Greenway, M.D.
Day Phone: 225-765-2672
24-hr. Emergency Phone.:
765-2672 (Weekdays 8:00a.m.-5:00 p.m.)
765-4644 (After 5:00 p.m. and Weekends)

Co-Investigators: Deborah L. Reas, M.A.

Dr. Williamson directs this study, which is under the medical supervision of Dr. Greenway. We expect about 250 people recruited from PBRC and 4 surgical sites will be in this study. The study will take place over a period of 2 years.

Your expected time in this study will be 6 months. This study is a Pennington Biomedical Research Study.

2- Where is the study being conducted? This study takes place in the clinic area of the Pennington Biomedical Research Center.

3- What is the purpose of this study? This study will attempt to determine whether weight loss improves body image in obese individuals.

4- Who is eligible to participate in the study? Who is ineligible? All men and women between the ages of 18 and 65 years are eligible to participate. Minors (< 18 years) are not eligible. Women who are pregnant or planning to become pregnant are not eligible.

5- What will happen to you if you take part in the study? You will be asked to complete several paper and pencil questionnaires that should take no longer than 30 minutes to 1 hour. You will be given these questionnaires before you begin your weight loss trial and again after 6 months. Participants who participate in the 6-month follow-up will be invited to attend additional follow-up assessments at 6-month intervals for a period of 2 years.

6- What are the possible risks and discomforts?
There are no apparent risks to the participants.

7- What are the possible benefits? This study will not benefit the participant directly, but will provide relevant information regarding the nature of body image before and after weight loss has occurred. We cannot promise any benefits from your being in the study. However, the participant will get the opportunity to participate in the research process. There are no medical benefits to you from your taking part in this study. Please see Item #14 for information on financial compensation.

8- If you do not want to take part in the study, are there other choices?

This study does not evaluate treatments. Therefore, alternatives are not applicable. You have the choice at any time to not participate in this study.

9- If you have any questions or problems, whom can you call? If you have any questions about your rights as a research volunteer, you should call the Institutional Review Board Office at 225/763-2693 or Dr. Claude Bouchard, Executive Director of PBRC at 225/763-2513. If you have any questions about the research study, contact Dr. Donald Williamson, Ph.D. (PI) at #225-763-3122. If you think you

have a research-related injury or medical illness, you should call Dr. Frank Greenway at 225-763-2576 during regular working hours. After working hours and on weekends you should call the answering service at 225/765-4644. The on-call physician will respond to your call.

10- What information will be kept private?

Every effort will be made to maintain the confidentiality of your study records. However, someone from the Food and Drug Administration, the National Institutes of Health, and the Pennington Biomedical Research Center may inspect and/or copy the medical records related to the study. Results of the study may be published; however, we will keep your name and other identifying information private. Other than as set forth above, your identity will remain confidential unless disclosure is required by law.

11- Can your taking part in the study end early?

Dr. Williamson or the study sponsor can withdraw you from the study for any reason or for no reason. You may withdraw from the study at any time without penalty. Possible reasons for withdrawal include becoming pregnant. The sponsor of the study may end the study early.

12- What if information becomes available that might affect your decision to stay in the study?

During the course of this study there may be new findings from this or other research which may affect your willingness to continue participation. Information concerning any such new findings will be provided to you.

13- What charges will you have to pay?

Participation in this study is free.

14- What payment will you receive?

If you agree to take part, we will pay you \$10.00. You will be paid following the completion of your participation in the study after the 6-month follow-up. If you are or have been an employee of LSU within the current calendar year, the normal employee payroll deductions will be withheld.

15- Will you be compensated for a study-related injury or medical illness?

No form of compensation for medical treatment is available from the Pennington Biomedical Research Center. In the event of injury or medical illness resulting from the research procedures in which you participate, you will be referred to a treatment facility. Medical treatment may be provided at your expense or at the expense of your health care insurer (e.g., Medicare, Medicaid, Blue Cross-Blue Shield, Dental Insurer, etc.)

which may or may not provide coverage. The Pennington Biomedical Research Center is a research facility and provides medical treatment only as part of research protocols. Should you require ongoing medical treatments, they must be provided by community physicians and hospitals.

16- Signatures

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to the study investigators. I agree with the terms above and acknowledge that I have been given a copy of the consent form.

Signature of Volunteer

Date

Social Security No. of Volunteer

Signature of Person Administering Informed Consent

Date

Principle Investigator
Donald A. Williamson, Ph.D.

Date

Medical Investigator
Frank Greenway, M.D.

Date

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

Name: _____

Date of Birth: _____

Age: _____

Occupation: _____

Level of Education (please circle):

0-8 years 13-15 years

9-11 years 16 or more

12 years

Race (please circle)

White

Black

Hispanic origin (such as Mexican-American, Puerto Rican, or Cuban)

Asian

American Indian, Aleutian, Alaska native, or Eskimo

Pacific Islander

Other _____

Dieting and Weight History

1. At what age were you when you developed obesity? _____

2. Have you ever been on a diet previously? Y N

If yes, how many times? _____

(Pre) (Post)

CBS _____

IBS _____

RBS _____

Height _____

Weight _____

Date of Follow-up _____

VITA

Deborah Lynn Reas was born on May 19, 1973 in Indianapolis, Indiana. She attended Indiana University where she received a Bachelor of Arts degree in psychology in May of 1995. Shortly thereafter, she began her doctoral training in clinical psychology under the supervision of Donald A. Williamson, Ph.D., at Louisiana State University. She received a Master of Arts degree in psychology in May of 1998. After completing her master's degree, she traveled to Heidelberg, Germany, to work as a research assistant from August, 1998 to May, 1999 under the direction of Wolfgang Herzog, M.D. and Stefan Zipfel, M.D., at the Department of General Internal and Psychosomatic Medicine at the Medical University of Heidelberg. In 2001, she completed her pre-doctoral internship in clinical psychology at the University of Texas Medical School in Houston, Texas. She currently works as a research scientist at Sintef-Unimed, Division of Mental Health Services Research, Oslo, Norway. She will receive the degree of Doctor of Philosophy at the December Commencement, 2002.