Abstract

While a small changes approach to weight management has shown promise in helping participants lose weight, the psychological impact of this approach has yet to be determined. The present study examines changes in depression, body satisfaction, and life satisfaction of participants in two separate small changes studies (ASPIRE II and III). Overweight female adults participating in a 12-week treatment phase with 6-month follow-up completed the Beck Depression Inventory, Multidimensional Body-Self Relations Questionnaire, and the Satisfaction with Life Scale. A repeated measures analysis of variance with completers revealed significant improvements in depression in both ASPIRE II, $F(2, 40) = 5.52$, $p = .008$, $\eta_p^2 = 0.22$; and ASPIRE III, $F(2, 50) = 9.43$, $p < .001$, $\eta_p^2 = 0.27$; as well as body satisfaction in ASPIRE II, $F(2, 40) = 3.78$, $p = .031$, $\eta_p^2 = 0.16$; and ASPIRE III, $F(2, 50) = 9.92$, $p < .001$, $\eta_p^2 = 0.28$. Improvements in life satisfaction were limited to the initial treatment phase of ASPIRE II, $t(20) = 3.30$, $p = .004$. Findings suggest that a small changes approach to weight management may be a viable option for promoting and maintaining significant weight loss as well as improvements in psychological function. Future research should focus on discovering the mechanisms of psychological improvement and confirming findings with longer studies, which include direct comparison to other behavioral treatments for weight management.

Psychological Implications of a Small Changes Approach to Weight Loss

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By

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Psychological Implications of a Small Changes Approach to Weight Loss

In order to be considered "overweight," an individual must surpass the standard weight for his or her height. However, "obese" is a term used to describe an individual with excessive body fat and is often operationally defined using body mass index (BMI), a ratio of weight to height. A BMI at or above 25 is considered overweight, at or above 30 is considered obese, and a BMI at or above 40 is considered morbidly obese. Due to the fact that those who are extremely athletic may surpass standard weight ranges for their height, this system of classification is not flawless. Clinically, it is a useful tool to help determine who may be at risk for excess body fat; those whose ratio of weight to height (BMI) is above 30 are likely to have excess body fat. It is obvious that an extremely athletic individual does not have excess fat and thus would not be considered obese (Field, Barnoya, & Colditz, 2002). This system of classification also provides a useful measure for estimating the prevalence of obesity.

International rates of obesity have increased considerably throughout the last two decades. Back in 1998, the World Health Organization declared obesity a worldwide epidemic (World Health Organization [WHO], 2008). Today, at least 1 billion adults worldwide are overweight and 300 million of those are classified as obese (WHO). In the United States alone, obesity has increased dramatically. Data from the National Health and Nutrition Examination Survey (NHANES) shows that approximately 68% of adults in the United States are currently classified as overweight while 32% of men and 36% of women are currently classified as obese (Flegal, Carroll, Ogden, & Curtin, 2010). Obesity has become a major public health concern because of its physiological health, socio-cultural and psychological implications.

Although traditional treatment programs have shown initial success in helping individuals to reach clinically significant weight loss and make related improvements in physiological and

psychological health, weight regain is common and leads to the reversal of health and psychological gains. One innovative approach to promote continued weight loss using small lifestyle changes has shown promise as an effective means to achieve weight loss. However, little is known about the psychological impact of this approach.

Physical Health Implications

The National Institute of Child Health and Human Development (NICHD) has named obesity one of the three major causes of preventable death in the United States (http://www.nih.gov/news/pr/jan2006/nichd-11.htm). Obesity increases an individual's risk of developing cardiovascular disease, type II diabetes, some cancers, gallstones, and osteoarthritis. According to the Surgeon General's Report (Public Health Service [PHS], 2001), approximately 300,000 deaths each year in the United States are obesity related. In fact, obesity is linked to increased risk of both heart disease and cancer, the first and second causes of death in the United States.

Overweight and obese individuals are at an increased risk of developing Cardiovascular Heart Disease (CHD). Overweight and obese adults are two to three times more likely to develop CHD than normal weight men (Rimm et al., 1995) and women (Harris, Ballard-Barbasch, Madans, Makue, & Feldman, 1993). In addition, overweight adults are three times more likely to die from CHD than normal weight individuals (Seidell, Verschuren, van Leer, & Kromhout, 1996).

Several types of cancers are more common among obese individuals. For example, obesity increases risk of endometrial cancer by two to three times for women (Kulie, et al., 2011; Shoff & Newcomb, 1998). Other research on obesity and cancer is less conclusive but suggests increased risk of ovarian cancer (Farrow, Weiss, Lyon, & Daling, 1989), esophageal cancer

(Lagergren, Bergstrom, & Nyren, 1999), colon cancer (Ford, 1999), and breast cancer in postmenopausal women (Field, Barnoya, & Colditz, 2002). In addition, obesity can lead to type II diabetes. In fact, obese individuals are 11-12 times more likely to develop type II diabetes than normal weight individuals (Kulie, et al., 2011). Excess weight also adds strain on joints (Arthritis Foundation, 2000), and increases the risk of osteoarthritis by 36% with every two unit increase in Body Mass Index (Kulie, et al., 2011). Overweight adults are at an increased risk of developing osteoarthritis in both the hip (Cooper et al., 1998) and knee (Cicuttini, Baker, & Spector, 1996; Hart & Spector, 1993; Manninen, Riihimaki, Heliovaara, & Makela, 1996).

Gallbladder disease is more common in obese individuals (Must, et al., 1999) with obese women being seven times more likely to develop gallstones than normal weight women (Stinton, Myers, & Shaffer, 2010). Various respiratory problems are also more common among obese individuals, including hypoxia, the Pickwickian syndrome, and sleep apnea (Hochstrasser, 2004).

In conjunction with health implications, obesity-related costs are estimated at over 100 billion dollars per year (PHS, 2001). In addition, obese individuals are subject to the social implications of obesity. Research shows that obese individuals may be at a disadvantage occupationally (Carr & Friedman, 2005; Larkin & Pines, 1979; Roe & Eichwort, 1976; Viner & Cole, 2005), socio-economically (Gortmaker, Must, Perrin, Sobol, & Dietz, 1983; Sonne-Holme & Sorensen, 1986), and romantically (Gortmaker, et al., Viner & Cole) regardless of race. For these heath and social reasons, establishing effective treatments to decrease the prevalence of obesity is of crucial importance.

Psychological Implications

While health and social repercussions of excess weight emphasize a need for intervention, the psychological implications of obesity warrant that successful treatments need to

address psychological function as well. Sullivan and colleagues (1993) demonstrated a negative relationship between BMI and general mental health. In other words, the greater an individual's BMI, the poorer his or her mental health. Three of the psychological factors that have been consistently associated with obesity include depression, body satisfaction, and life satisfaction.

Depression. Past research shows that in the general population, obese individuals are more likely to be depressed than normal weight individuals (Carpenter, Hasin, Allison, & Faith, 2000). Similarly, obese women are more likely to experience suicidal ideation or attempt suicide (Carpenter, et al.). In a review of research studies, McElroy, et al. (2004) concluded that there was an association between obesity and Major Depressive Disorder among community women. The odds for developing depression increases with increasing BMI across both race and gender, even after controlling for chronic illness and family history of depression (Dong, Sanchez, & Price, 2004). In fact, increasing BMI significantly increased the risk of depression greater than the effects of race, gender, marital status, education, chronic illness, and family history of depression combined. Roberts, Strawbridge, Deleger, and Kaplan (2002) also found obese men and women to be at increased risk for depression. Other studies have suggested that the effect of obesity on psychological well-being may play a long-term role in the risk for depression. For example, Herva, et al., (2006) found that at age 31, those who had been obese as adolescents were more likely to be depressed than those who were normal weight in adolescence. Furthermore, older adults categorized as obese were at an increased risk of depression at a five-year follow-up than non-obese adults (Roberts, et al.), supporting the notion of long-term psychological consequences of obesity.

Obesity has clearly been established as a risk factor for depression in the present and future. However, studies with only male participants suggest that the impact may be different for

men. Obese men, in contrast with women, are not necessarily subject to similar increases in risk for depression (Carpenter, Hasin, Allison, & Faith, 2000). McElroy, et al. (2004) concluded that only abdominal obesity was associated with depressive symptoms for men, whereas obese women were at increased risk for depression regardless of body type. It is possible that women experience more psychological impact as a result of being overweight due to of society's emphasis on the female body and the thin ideal. However, the psychological consequences for extremely obese (BMI > 40) men and women may be more similar. Wadden and Stunkard (1985) found that men and women with a BMI of 40 or above displayed significantly more symptoms of depression than individuals with a BMI less than 40. It could be posited that the extremely obese experience more social negativity, regardless of gender, which may lessen the disparity in psychological consequences.

Perhaps more importantly, McElroy, et al. (2004) concluded that obese individuals seeking treatment for weight management in clinical populations display a significantly increased rate of depression than the general population. This is notable given that those seeking treatment for weight management are those who will be participating in weight loss programs. Therefore, these findings are most relevant and applicable to future weight management efforts and highlight the importance of an intervention's ability to impact depressive symptoms.

Body Satisfaction. Given society's emphasize on the thin ideal, it stands to reason that obese individuals would display higher rates of dissatisfaction with their body's size and shape than normal weight individuals. In fact, overweight women report more body dissatisfaction than normal weight women (Annis, Cash, & Hrabosky, 2004; Sarwer, Wadden, & Foster, 1998). Similarly, there exists a strong positive correlation between obesity and body dissatisfaction in

both male and female Caucasians and African Americans (Smith, Thompson, Raczynski, and Hilner, 1999).

The origin of body dissatisfaction may be well before adulthood. Allen, Byrne, Blair, and Davis (2006) found that children who were overweight were more concerned with weight and the shape of their body than normal weight children. Additionally, increased concern with weight and body shape was associated with increased body dissatisfaction. These findings suggest that overweight individuals may have decreased body satisfaction beginning in childhood. Further, Wardle, Waller, and Fox (2002) discovered that women who became obese before the age of 16 (early-onset) demonstrated more body dissatisfaction than women who developed the same degree of obesity in adulthood. Other studies have confirmed that obesity impacts body satisfaction in adolescence (Duncan, Al-Nakeeb, Nevill, & Jones, 2006; Mertens & Vandereycken, 1998; Thompson et al., 2007) with overweight adolescents displaying increased body dissatisfaction when compared to normal weight adolescents. Specifically, a positive relationship exists between body fat percentage or BMI and body dissatisfaction, such that body dissatisfaction increases with increasing percentage of body fat or BMI in adolescents (Duncan et al., Mertens & Vandereycken).

A similar relationship exists in young adults. Neighbors and Sobal (2007) found that overweight college students articulate more body weight and shape dissatisfaction than do normal weight college students, with the most body dissatisfaction occurring in overweight female students. A study of college men, (Watkins, Christie, & Chally, 2008) established that male students who were underweight, overweight, or obese also exhibited higher amounts of body dissatisfaction than normal weight men.

While most would consider body dissatisfaction a negative psychological state in its own right, there are implications of body dissatisfaction. Studies have consistently shown that the increased body dissatisfaction associated with obesity is also associated with lower self-esteem in both the present (Annis, Cash, & Hrabosky, 2004; Johnson & Wardle, 2005; Olivardia, Pope, Borowiecki, & Cohane, 2004; Wardle, Waller, & Fox, 2002) and future (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006). In addition, body dissatisfaction has been associated with an increased drive for thinness (Edman, Yates, Aruguete, & DeBord, 2005) and increased dieting attempts (Cattarin & Thompson, 1994; Crow, Eisenberg, Story, & Neumark-Sztainer, 2006) such that patients seeking weight management intervention are those with the greatest body dissatisfaction.

Perhaps even more salient to clinical practice, is the finding that body dissatisfaction may lead to depression. Body dissatisfaction is a predictor of increased depressive symptomology (Stice & Bearman, 2001), and is directly correlated with depression (Johnson & Wardle, 2005; Phares, Steinberg, & Thompson, 2004). In 2002, Ohring, Graber, and Brooks-Gunn discovered a long term association between adolescent body dissatisfaction and an increase in depressive symptoms during both adolescence and young adulthood. Paxton, Neumane-Sztainer, Hannan, & Eisenberg (2006) concluded that body dissatisfaction could lead to increased depression at 5 year follow-up. Newman, Sontag, and Salvato (2006) suggest that body *dis*satisfaction may be related to poorer psychological health in the long-term. Similarly, McCaulay, Mintz, and Glenn (1988) determined that increased body *satisfaction* leads to decreased depressive symptomology, suggesting than an increase in body satisfaction (and thus a decrease in body dissatisfaction) is associated with less depressive symptoms.

In sum, obese individuals are at an increased risk for body dissatisfaction beginning even before adulthood. Body dissatisfaction results in increased drive for thinness, increased dieting attempts, low self-esteem, and depression in the present and future. Developing efficacious treatment is necessary to help reduce the detrimental impact of excess weight on body dissatisfaction, self-esteem, and depression.

Quality of Life. A person's health-related quality of life (HRQOL) is defined as their perceived physical and mental health over time (Centers for Disease Control and Prevention [CDC], 2008). HRQOL is typically measured via self-report and demonstrates the extent to which a chronic illness is interfering with a patient's occupational and social functioning. Obese individuals report both physical and social challenges as a result of their excess weight (Barofsky, Fontaine, & Cheskin, 1998; Doll, Petersen, & Stewart-Brown, 2000). These challenges increase as BMI increases (Karlsson, Sjostrom, & Sullivan, 1998). Obese individuals score significantly lower than non-obese individuals on the 36-item Short-Form Health Survey (SF-36), a self-report measure of quality of life (LePen, Levy, Loos, Bunzet, and Basdevant,1998). Some findings suggest that the negative impact of excess weight on quality of life may exist as early as childhood (Tsiros et al., 2009).

It is clear that HRQOL is reduced in obese individuals. However, research investigating the relationship between weight loss and quality of life has yielded mixed results. While some research supports the hypothesis that weight loss results in improved HRQOL (Rippe, et al., 1998; Williamson, et al., 2009), other studies did not find significant improvement in HRQOL (Damschroder, Lutes, Goodrich, Gillon, & Lowery, 2010; Maciejewski, Patrick, & Williamson, 2005). Accordingly, it has been suggested that HRQOL may not be the most appropriate measure for determining perceived changes in physical and psychological symptoms. Despite the lack of

change in quality of life, Damschroder, et al. found significant improvements in life satisfaction with weight loss. Although similar in concept, life satisfaction measures reflect a more global evaluation of perceived well-being and contentment with one's current life (Diener, Scollon, Oishi, Dzokoto, & Suh, 2000), as opposed to the more specific focus on current symptomology that a quality of life measure provides. This global focus may make life satisfaction a more valuable determinant of the psychological impact of weight loss on global levels of perceived well-being.

Life Satisfaction. Until recently, social psychologists widely accepted the notion that life satisfaction can fluctuate, but does not change significantly over time (Brickman & Campbell, 1971). However, more recent studies have led psychologists to doubt this notion. Researchers have reported that various life events can cause long-term alterations in an individual's life satisfaction level (Lucas, 2005; Lucas, Clark, Georgellis, & Diener, 2004; Lucas, Clark, Georgellis, & Diener, 2003). Interestingly, individuals who engage in physical activity show long term increases in life satisfaction, a relationship that is partially mediated by positive affect (Elavskey, et al., 2005); which supports previous findings that positivity impacts levels of life satisfaction (Diener, Scollon, Oishi, Dzokoto, & Suh, 2000). Pavot and Diener (2008) concluded that while personality factors and positive affect may influence one's perceived satisfaction with life, situational factors such as health and other life circumstances have the power to change an individual's long term satisfaction with life. This conclusion contradicts the original view of life satisfaction as a stable trait, and introduces the possibility that life satisfaction may be improved through intervention.

Unlike the literature on obesity and quality of life, little research currently exists on the relationship between obesity and life satisfaction. A few studies support the hypothesis that obesity impacts life satisfaction. Zullig, Pun, and Huebner (2007) found that among male and female college students, extreme worry about weight was associated with decreased life

satisfaction. In addition, Greeno, Jackson, Williams, and Fortmann (1998) found a negative correlation between BMI and life satisfaction in women. Finally, in a longitudinal study, Ball, Crawford, and Kenardy (2004) demonstrated that obese women had lower levels of life satisfaction than normal weight women both initially and at 4-year follow-up. Although more research is needed in this area, the several existing studies suggest a relationship between obesity and life satisfaction, such that increased weight has a negative impact on life satisfaction.

As clearly established in the literature, obese individuals have an increased susceptibility to a number of unfavorable physical, social, and psychological outcomes. As a result, the most pressing issue for researchers is the determination of treatments that are effective in achieving weight loss as well as alleviating or minimizing the effects of these secondary outcomes. Currently, the standard recommended intervention is a behavioral weight loss program.

Behavioral Weight Loss Programs

Behavioral weight loss programs first emerged in the late 1960s, when the idea was put forth that weight regulation behaviors had a learned component. These programs applied behavioral principles to eating and exercise. Although behavioral weight loss programs have evolved significantly since the 1960s, some of the most basic principles are still used today and consistent findings have emerged on how to further maximize weight loss.

For overweight to moderately obese individuals, the current standard treatment is a 6-month behavioral weight-loss program, usually implemented in a weekly group format, consisting of restricted caloric intake and a regimen of physical activity (Wadden & Osei, 2002). These programs, sometimes referred to as a “low-calorie diets”, recommend between 1,200 and 1,500 kilocalories per day for women and 1,500 to 1,800 kilocalories per day for men. In conjunction with dietary changes, participants are encouraged to reach energy expenditure goals

of around 1,000 kilocalories per week. Other behavioral and cognitive components frequently incorporated into these programs include self-monitoring (recording food intake and exercise on a daily basis), stimulus control (learning to pay attention to things that trigger eating), problem solving (ways to overcome barriers to adherence), cognitive restructuring (changing maladaptive thoughts), and relapse prevention (education to avoid weight gain after program completion). (Wadden & Osei, 2002; Wing, 2002). The effectiveness of these types of programs has been thoroughly assessed.

Weight outcomes. Traditional behavioral weight loss programs help patients who complete them to lose an average of 10% of their initial bodyweight (Cooper & Fairburn, 2002). This amount of weight loss has been associated with improvements in health and reduction in health risks related to being overweight or obese, such as heart disease, hypertension, cholesterol levels, diabetes, respiratory problems, gallbladder disease, and arthritis (Goldstein, 1992; Kanders & Blackburn, 1992; National Heart, Lung, and Blood Institute (NHLBI), 1998; Pi-Sunyer, 1996; Tremblay et al., 1999; Wing, 1998). In fact, the Institute of Medicine (IOM) considers weight loss to be a success if 5% of body weight is lost and maintained for at least a year (Institute of Medicine, 1995).

Unfortunately, though they are successful at initiating weight loss at an average of 10% of baseline weight per person, research shows that the majority of the lost weight is typically regained within the first 3 years (Perri, 1998; Perri & Corsica, 2002). The Institute of Medicine reported (1995) that completers of weight loss treatment programs gained two-thirds of their initial weight back within the first year and almost all of it back by the 5 year post-treatment mark. Perri and Corsica reviewed nine studies of behavioral weight loss programs. In all of the studies where data for 1 year post-treatment was available (8 of 9), participants had lost an

average of at least 5% of their initial body weight, meaning that they met the IOM criteria for success. However, at the final follow-up, which varied from 2 to 12 years post-treatment, in only two of the nine studies did participants maintain an average net weight loss. Moreover, in two other studies, participants weighed more on average at follow-up than they did before beginning treatment. Of the two studies that showed maintained weight, one was the study with the shortest follow-up (at 2 years) and the other was the only study that included an extended maintenance program for an additional 4 years post-treatment. This review highlights the typical pattern of weight loss during and following behavioral treatment. Weight is successfully lost but gradually regained after treatment completion (Cooper & Fairburn, 2002; Perri & Corsica; Wadden & Osei, 2002; Wilson, 1994). In fact, even when weight loss maintenance is achieved through extension of behavioral treatment or an extended maintenance program, weight regain begins upon completion of the extended program (Perri, 1998). Although the exact reason for this pattern has not been pinpointed, a psychological perspective would lend speculation that it has to do with the intense restrictive methodology that may not be feasible on a long term basis without the aid of constant direction and accountability provided by a treatment program. However, this speculation has yet to be empirically proven. Although the psychological mechanisms behind weight regain have yet to be determined, the psychological implications of weight loss and regain have been extensively investigated.

Psychological outcomes. In general, research suggests that the 10% weight loss achieved via traditional approaches is associated with increased psychological well-being (NHLBI, 1998). More specifically, research indicates that weight lost via traditional behavioral treatment leads to improvements in mood and reduction in symptoms of both depression and anxiety (Taylor,

Ferguson, & Reading, 1978; Wadden & Stunkard, 1986; Wing, Blair, Marcus, Epstein, & Harvey, 1994; Wing, Marcus, Epstein, & Kupfer, 1983).

While some research has concluded that body dissatisfaction may persevere after weight loss (Cash, Counts, & Huffine, 1990), more recent studies have reported improvements in body satisfaction following weight lost via behavioral treatment (Cash, 1994; Foster, Wadden, & Vogt, 1997; Rosen, Orosan, & Reiter, 1995). Adami, Gandolfo, Bauer, & Scopinaro (1995) posit that the discrepancy may be determined by the age-of-onset. They found that women with adult-onset obesity showed significant improvements in body satisfaction, while women with early-onset obesity did not. They theorize that body image becomes more fixed during adolescence, making a negative body image acquired during adolescence more resistant to changes after weight loss in adulthood.

Current literature on life satisfaction and weight lost via traditional behavioral programs is lacking. Although research has established that obese individuals are likely to have decreased life satisfaction, the impact of weight loss has yet to be examined. It has been suggested that weight loss may play a beneficial role through alleviating health problems and reducing social stigma as well as anxiety in social situations and relationships (Wadden, Womble, Stunkard, & Anderson, 2002) but research is needed to determine the efficacy of this speculation.

Given that psychological improvements are associated with weight lost during treatment, one would naturally question the psychological impact of weight regain. Unfortunately, little research to date has examined the psychological impact of weight regain. However, one study examined women who had participated and succeeded in a 6-month weight loss program, comparing those who regained weight with those who lost additional weight and those who maintained weight lost (Yankura et al., 2008). Researchers found that those who maintained or

continued losing during the 12 months following the program showed improved mental health and social functioning, yet those who regained weight demonstrated decreases in mental health and social functioning scores. Although many research studies have failed to find a link between weight regain and clinically significant depression using the Beck Depression Inventory (BDI) (Wadden, Womble, Stunkard, & Anderson, 2002), others argue that the BDI may not be the best measure of depression factors associated with weight regain. Yet patients do report a negative impact of weight gain on their body satisfaction, self-esteem, and self-confidence (Wadden, Stunkard, & Liebschutz, 1988).

Although standard behavioral weight loss programs are successful at helping participants lose weight and are associated with improvements in health and psychological factors, the weight regain which is characteristic post-treatment is associated with a decay in psychological improvements. As a result, more recently developed approaches have sought to utilize less traditional strategies.

Non-dieting Approaches

One alternative approach to traditional behavioral programs are non-dieting programs which seek to educate participants against the adverse consequences of dieting and help them to accept themselves while improving their physical and psychological health. While these programs have demonstrated great success in improving self-esteem, mood, and body image, they have not been shown to result in significant weight loss (Foster & McGuckin, 2002). Although maintainable improvements in psychological well-being are a necessary and important goal of weight management, weight loss is necessary for improvement in physical health. Newer approaches to weight loss are seeking ways to help participants lose and maintain significant

weight and thus simultaneously enhance psychological well-being. Among these new approaches to weight loss are small changes approaches.

Small Changes Approaches

Although traditional weight loss programs are successful at helping participants to achieve significant initial weight loss, the regain rates are disconcerting and are associated with relapse in psychological function (Yankura et al., 2008). Recently, the Joint Task Force of the American Society for Nutrition, Institute of Food Technologists, and International Food Information Council met to discuss a small changes approach to help prevent the spread of the obesity epidemic (Hill, 2009). The task force considered the problem of obesity and the nature of the current knowledge and research in the field. They concluded that a small changes approach, emphasizing small lifestyle changes in diet and physical activity, combined with cooperation from the private sector to reduce environmental factors, should help to reduce the ever-increasing rates of obesity by preventing further weight gain in those who are not yet obese. Still, other research is suggesting that small changes may be effective as a weight management tool for those who are already overweight or obese.

In a recent randomized controlled pilot study, Das et al. (2009) compared a low energy restriction (10% reduction from baseline) weight loss group with a moderate energy restriction (30% reduction from baseline) weight loss group. Mean percentage of weight lost was not significantly different between the two groups at 6 or 12 months. This finding suggests that a low energy restriction may result in a similar amount of weight loss as moderate energy restriction over time. Social psychologists have been examining this notion of restriction and report that those with higher levels of restriction may be less likely to succeed because those who restrain their eating must deal with the inherent conflict of eating enjoyment and weight control. In fact,

research shows that among restrained eaters, eating enjoyment inhibited thoughts of weight control (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2007). Therefore, feelings of restriction may complicate or compromise ability to lose weight. This finding provides further support for an approach that promotes lower levels of energy restriction as a means of weight loss.

Lutes and Winett, et al. (2008) have suggested that a small changes approach could be used as an intervention for overweight or obese individuals. They propose that smaller behavioral changes may be successful in producing more gradual weight loss accompanied by less restriction and deprivation that is easier to maintain in the long term. According to the Small Changes Model, participants who select their own small and manageable behavioral changes that are relative to baseline will experience initial behavior change, increases in self-efficacy, and decreases is deprivation (Lutes & Steinbaugh, 2010). Thus, weight lost via a small changes approach should reduce the risk of relapse and increase the amount of weight lost and maintained while also providing improvements in psychological function. Lutes et al. have recently been assessing the utility and efficacy of this small changes approach to weight loss using different modalities.

Weight outcomes. In a study to test the aforementioned hypothesis, trained lifestyle coaches assisted overweight university employees in selecting and implementing small life-style changes in diet and physical activity that accumulated throughout a 4-month intervention (Lutes and Winett, et al., 2008). Participants in the small changes treatment group were compared to an exercise with education group as well as a waitlist control group. At the end of the 12-week intervention, the small changes group lost an average of 4.5 kg, which was significantly greater than both the USDA education and control groups. More importantly, participants were able to maintain these positive changes when assessed at the 3-month follow-up. Although this approach

resulted in smaller initial weight loss (5% of body weight) than traditional behavioral approaches (10% of body weight), it is unique in its ability to help participants sustain lost weight as opposed to the regain that is typical of traditional behavioral approaches. However, because successful maintenance of weight loss is defined as 6 months, it is currently unclear whether this approach is successful in helping participants to maintain weight loss long-term.

In a similar, subsequent study, obese women (*M* BMI = 32) participated in a 12-week group-based small changes treatment program with a 6-month follow-up program consisting of bi-weekly telephone calls using problem-solving therapy (Lutes, Daiss, et al., In Press). At the end of the initial 12-week treatment period, participants had lost an average of 3.2 kg (using intent-to-treat analyses). At the end of the 6-month follow-up (9 months after baseline), participants had lost an average of 5.4 kg (carrying baseline forward for non-completers). A similar 12-week small changes program was delivered to veterans via telephone (ASPIRE-VA) and resulted in an initial average loss of 3.8 kg (Damschroder, Lutes, Goodrich, Gillon, & Lowery, 2010).

Finally, researchers compared the same 12-week small changes treatment program with 6-month follow-up delivered in-person versus internet. Similarly, participants lost an average of 2.5 kg (intent-to-treat) at the end of the active treatment phase (12-weeks), with an average loss after the 6-month follow-up (9 months after baseline) of 3.3 kg (carrying last weight forward non-completers), regardless of treatment modality. These significant changes in weight across several studies suggest that it is possible for an overweight or obese individual to maintain and even continue losing weight after completion of the small changes active treatment period. Although these findings are ground-breaking with regard to weight outcomes, psychological outcomes have yet to be determined.

Psychological outcomes. Although not yet analyzed, psychological outcomes of the small changes intervention should be expected to follow the SCM and thus exhibit a pattern similar to weight loss. In concurrence with this notion, improvements in psychological factors would be more gradual but sustained over time, as opposed to the pattern of psychological impact with traditional weight loss and regain. However, this has yet to be determined. **Therefore, the purpose of the current study is to examine whether a small changes approach to weight loss yields significant and sustained psychological improvement.** If so, a small changes approach may be a preferred treatment for long-term behavioral weight management.

Current Study

The purpose of the current study is to determine the psychological impact of weight loss achieved via the small changes approach in a population of overweight and obese women. More specifically, the study seeks to determine if participants in two separate small changes weight loss programs show significant improvements in depression, body satisfaction, or life satisfaction at the conclusion of the active treatment program and at a 6-month post-treatment follow-up. Additionally, the study seeks to determine the impact of baseline levels of psychological variables on an individual's ability to lose weight. For example, depression is known to influence motivation level, appetite, and energy level (American Psychiatric Association, 2000) in ways that may interfere with an individual's ability to lose weight. As a result, we will seek to determine if initial levels of depression, body satisfaction, and life satisfaction impact an individual's ability to lose weight by comparing weight lost with baseline psychological variables.

With regards to psychological outcomes of weight lost via a small changes program, we hypothesize that in both studies 1) the small changes program will yield decreases in depression at the conclusion of the active treatment phase (12 weeks); 2) the small changes program will yield increases in body satisfaction at the conclusion of the active treatment phase; 3) the small changes program will yield increases in life satisfaction at the conclusion of the active treatment phase; and 4) these changes will be maintained or further improved at the 6-month follow-up (9 months post-baseline). In addition, we hypothesize that these changes in psychological factors will be influenced by the relative change in weight. Therefore, we expect to find 5) a positive correlation between weight change and change in depression; 6) a negative correlation between weight change and change in body satisfaction; and 7) a positive correlation between weight change and change in life satisfaction. Finally, we hypothesize a converse relationship between psychological variables and weight such that psychological function may influence weight loss. As a result, we expect to find 8) significant correlations between weight change and baseline levels of psychological variables.

Method

Participants

Participants included individuals who participated in one of two interventions utilizing a small changes approach to weight loss (ASPIRE II & ASPIRE III) at Northern Arizona University. A total of 78 women, ages 25-75 signed consent and completed baseline in either of the two interventions (30 women in ASPIRE II and 49 in ASPIRE III).

In the first clinical trial (ASPIRE II), participants included 25 women between the ages of 25 and 75, with a body mass index (BMI) between 25 and 40. In order to participate, participants were required to be willing to meet weekly for 3 months and bi-weekly over the telephone for the next 6 months, complete medical assessments, and pay an enrollment fee.

In the second clinical trial (ASPIRE III), participants included 49 female employees of the university between the ages of 25 and 60, with a BMI between 25 and 40. In order to participate, participants were required to be willing to commit to weekly meetings either in-person or via the internet for 3 months of active treatment as well as 6 months of follow-up, be medically stable, and have internet access but did not pay an enrollment fee.

Design & Procedure

In both studies, participants were recruited using announcements in both the community newspaper and the health psychology clinic website. Interested individuals were directed to call the clinic, where they received more information and answered eligibility questions. If eligible, individuals were scheduled to attend an interest meeting. At the interest meetings, participants learned about the program in detail and were instructed to take some time to consider the requirements and commitment before returning to sign the consent form.

The 12-week small changes program included identical content in both studies, including weekly group meetings with a trained lifestyle coach who emphasized and encouraged small, gradual changes in both nutrition and physical activity. Each participant recorded food intake on a daily basis and wore a pedometer to monitor physical activity. During weekly meetings, participants were provided materials on cognitive and behavioral topics relating to weight management (e.g. cognitive distortions, slips and lapses, mindful eating, communication, social support, nutrition, and physical activity). They also learned to problem-solve, anticipating obstacles or challenges, as well as set goals regarding nutrition and physical activity for the upcoming week. In ASPIRE II, all participants met in-person each week. In ASPIRE III, participants were randomized to either in-person or internet chat room groups. The only difference in the two groups was the modality of treatment.

Both clinical trials included a 6-month follow-up program beginning immediately after completion of the active treatment phase. In study one (ASPIRE II), lifestyle coaches contacted participants on a bi-weekly basis via telephone. Participants reported their average kilocalorie and step counts as well as their current weight. In addition, lifestyle coaches utilized problem solving therapy to help participants recognize challenges and brainstorm strategies to overcome obstacles. In study two (ASPIRE III), the same therapeutic strategies were used, but with different modalities. All participants met bi-weekly with their group and group leader, either in-person or in an internet chat room, consistent with the modality they used in the initial treatment phase.

Assessments

At baseline, participants completed height and weight assessments, as well as several psychological measures, including the Beck Depression Inventory, Second Edition (BDI-II), the

Multidimensional Body-Self Relations Questionnaire (MBSRQ), and the Satisfaction with Life Scale (SWLS). At the end of the active treatment phase, participants completed the same physical assessments and questionnaires to determine any changes in psychological factors as well as weight during active treatment. Participants completed the physical assessments and questionnaires again at the 6-month follow-up (9 months post-baseline) to assess maintenance.

Height and Weight. In both studies, participants' height was measured using a height rod on a spring scale to the nearest 0.05 cm. Weight was measured in pounds on a Health-O-Meter Body Fat and Hydration Monitoring Scale (Sunbeam Products, Boca Raton, Fl., USA) to the nearest 0.1 pound. Participants were measured without shoes and measurements were taken by trained graduate students.

Beck Depression Inventory, Second Edition. The BDI-II is a 21-item questionnaire used to categorize an individual's level of depression as minimal, mild, moderate, or severe (Beck & Steer, 1984). Scores on the BDI-II can range from 0 to 63. Categorizations are based on the individual's responses to questions regarding symptoms that are associated with Major Depressive Disorder, based on the diagnostic criteria outlined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV).

Multidimensional Body-Self Relations Questionnaire (MBSRQ). The MBSRQ is a 34-item self-report inventory designed to measure multiple facets of an individual's body image. The MBSRQ consists of five subscales, including: appearance evaluation, appearance orientation, overweight preoccupation, self-classified weight, and the Body Areas Satisfaction Scale (BASS). Participants will complete the 22 items of the appearance evaluation and orientation subscales using a 5-point likert scale to rate agreement with statements (agree-

disagree) relating to their appearance evaluation and orientation. Scores can range from 22 to 110 with higher scores indicating more satisfaction with one's body.

Satisfaction with Life Scale (SWLS). The SWLS (Diener, Emmons, Larson, & Griffin, 1985) is a 5-item measure designed to measure an individual's overall satisfaction with the current state of their life. The individual rates each of the five statements on a 7-point likert scale where 1 is strongly disagree and 7 is strongly agree. Ratings are then totaled to yield an overall life satisfaction score, which can range from 5 to 35 with higher scores indicating greater satisfaction with life.

Statistical Analyses

Data was analyzed using the Statistical Package for the Social Sciences (SPSS for Windows, Version 17 SPSS Inc, Chicago, IL), with statistical significance set at $p < .05$. Each data set was analyzed separately to better determine whether small changes approaches yielded consistent results. Primary analyses included only those participants who completed the initial treatment phase as well as the follow-up phase in order to determine treatment effects. As a conservative measure, secondary analyses were intent-to-treat, including those who did not complete treatment assuming their baseline numbers as their final numbers. Descriptive statistics were used to describe the characteristics of each group; including age, weight, marital status, and education. Repeated measures univariate analysis of variance (ANOVA) was used to assess differences by time point in psychological variables. In addition, paired samples *t*-tests were used to determine significant differences in psychological variables between specific assessment points (baseline, post-treatment, follow-up) for both completers-only and all participants. Pearson's product moment correlations were calculated between weight change and change in depression; weight change and change in body dissatisfaction; and weight change and change in

life satisfaction for both the treatment phase and across the 9 month treatment with follow-up period. Initial levels of depression, body satisfaction, and life satisfaction were correlated with change in weight to determine any differences in success based on baseline factors. Finally, *t*-tests were utilized to determine any differences in improvement by treatment modality for participants in ASPIRE III.

Results

Completers Only

ASPIRE II. Baseline characteristics of the ASPIRE II completers are displayed in Table 1. Participants were predominately Caucasian, married and well educated. Average age at the beginning of the study was 51.09 years (*SD* = 11.41). These baseline characteristics are typical, given that advertising targeted university employees. The average baseline BMI was 30.82 (*SD* = 3.88). Twenty-five participants who completed the initial treatment enrolled in the study. Of those 25, 22 (88%) completed the follow-up phase and 3 dropped out during follow-up (12%). Results are presented for the 22 participants who completed the follow-up phase. Weight outcomes are presented previously (Lutes et al., In Press) and are included in Table 2. A repeated measures Analysis of Variance (ANOVA) demonstrated significant weight loss among time points, $F(2, 40) = 22.13$, $p < .001$, $\eta_p^2 = .525$. Results for psychological variables are reported in Tables 3-5 and are described below.

Depression. A repeated measures Analysis of Variance (ANOVA) revealed a significant reduction in scores on the BDI between baseline, post-treatment, and follow-up time points, $F(2, 40) = 5.52$, $p = .008$, $\eta_p^2 = 0.216$). A paired samples *t*-test to compare differences between each time point revealed a significant reduction in depression from baseline ($M = 7.43$, $SD = 5.95$) to the end of active treatment ($M = 4.14$, $SD = 4.05$), $t(20) = 2.99$, $p = .007$, suggesting an improvement in depression during the initial treatment phase. There was no significant difference in depression from the end of initial treatment to the end of follow-up ($M = 4.67$, $SD = 5.49$), $t(20) = 0.82$, $p = .42$) suggesting that although participants did not significantly improve depression scores across follow-up, they were able to maintain improvements made during initial treatment. Overall, the reduction in depression from baseline to the end of follow-up was

significant, $t(21) = 2.15$, $p = .044$, suggesting an overall improvement in depression across treatment and follow-up. In addition to statistical significance, improvements in depression were clinically significant. Of the 22 completers, two reduced from average to minimum, another three participants reduced depression level from minor to minimum. Only two participants moved upward, but only from minimum to minor.

Body Satisfaction. A repeated measures ANOVA revealed a significant improvement in body satisfaction between baseline, post-treatment, and follow-up time points, $F(2, 40) = 3.78$, $p = .031$, $\eta_p^2 = 0.16$. A paired samples *t*-test revealed a marginally significant improvement in body satisfaction from baseline ($M = 61.81$, $SD = 10.87$) to the end of the active treatment phase ($M = 65.48$, $SD = 12.54$), $t(20) = 1.99$, $p = .06$, suggesting a trend in increasing body satisfaction during active treatment. The difference in body satisfaction from the end of initial treatment to the end of the follow-up phase ($M = 65.95$, $SD = 10.95$) was not significant, $t(20) = 0.40$, $p = .70$, suggesting that there was not much change in body satisfaction throughout the follow-up phase. However, the increase in body satisfaction from baseline to the end of the follow-up phase was significant, $t(21) = 2.32$, $p = .031$, suggesting an overall improvement in body satisfaction across treatment and follow-up for completers.

Life Satisfaction. A repeated measures ANOVA indicated a marginally significant increase in life satisfaction between baseline, post-treatment, and follow-up time points, $F(2, 40) = 2.94$, $p = .064$, $\eta_p^2 = 0.13$. This is a noteworthy trend, given that life satisfaction is typically viewed as a stable factor, more resistant to change. Paired samples t-tests revealed a significant difference between baseline ($M = 25.00$, $SD = 6.91$) and the end of initial treatment ($M = 27.95$, $SD = 4.57$), $t(20) = 3.30$, $p = .004$ suggesting an improvement in life satisfaction during the active treatment phase. The small decrease in life satisfaction from treatment conclusion through

the end of follow-up (M = 26.00, SD = 6.50) was not significant, $t(20) = 1.64$, $p = .117$. However, the small decrease was enough to yield an overall change that did not reach statistical significance, $t(21) = 0.55$, $p = .586$.

Weight Correlations. A Pearson product-moment correlation coefficient was computed in order to further explore the relationship between weight and each of the psychological outcomes. A statistically significant positive correlation was found between change in weight across 9 months and change in depression, $r(21) = .49$, $p = .026$. In other words, the more weight a participant lost, the more improvement they displayed on the depression measure. The correlation between weight change across 9 months and change in body satisfaction was not statistically significant, $r(21) = -.29$, $p = .20$. Nor was the correlation between weight change across 9 months and change in life satisfaction, $r(21) = -.26$, $p = .26$, suggesting that something else may be influencing these variables.

When correlations were computed between changes in psychological variables and change in weight in the initial treatment, a similar pattern emerged. The correlation between weight change across initial treatment and change in depression was significant, $r(21) = .51$, $p = .018$, suggesting that more improvement in depression was associated with more weight loss. The correlation between change in weight across initial treatment and change in body satisfaction was not significant, $r(21) = -.21$, $p = .37$; nor was the correlation between change in weight across initial treatment and change in life satisfaction, $r(21) = .07$, $p = .77$, suggesting no association between amount of weight lost and improvements in life satisfaction or body satisfaction.

Additional correlations were computed between baseline levels of each of the psychological outcomes and weight change across 9 months in order to determine the impact of

initial levels of these variables on ability to lose weight in a small changes program. The correlation between initial level of depression and weight change was not statistically significant, $r(21) = .021$, $p = .93$; nor was the correlation between initial level of body satisfaction and weight change, $r(21) = -.31$, $p = .17$; or the correlation between initial level of life satisfaction and weight change, $r(21) = -.27$, $p = .24$. The lack of relationship between initial levels of psychological variables and treatment success suggest that initial differences in depression, body satisfaction, and life satisfaction do not hinder or enhance weight loss via a small changes approach.

ASPIRE III. Baseline characteristics of the ASPIRE III completers are displayed in Table 1. Like the participants in ASPIRE II, participants of ASPIRE III were predominately Caucasian, married and well educated. Average age at the beginning of the study was 46.70 years (SD = 9.90), about 5 years less than participants in ASPIRE II. The average baseline BMI was 30.25 (SD = 5.07), strikingly similar to those in ASPIRE II. Forty-nine participants enrolled in the study and 39 completed the end-of-treatment assessment (79.5%). Twenty-seven (55%) completed the follow-up assessment. Results are presented for the 27 participants who completed follow-up assessment. Weight outcomes are included in Table 2. A repeated measures Analysis of Variance (ANOVA) demonstrated significant weight loss among time points, $F(2, 50) = 30.60$, $p < .001$, $\eta_p^2 = .550$. Results for psychological variables are reported in Tables 3-5 and are described below.

Depression. A repeated measures Analysis of Variance (ANOVA) revealed a significant difference in depression scores (on the BDI) by time of assessment, $F(2, 50) = 9.43$, $p < .001$, $\eta_p^2 = 0.27$. A paired samples t-test to compare differences of each assessment yielded a significant reduction in depression from baseline (M = 8.27, SD = 5.90) to the end of the active treatment

phase (M = 4.85, SD = 6.25), $t(25) = 2.16$, $p = .041$. The change in depression from the end of initial treatment to the end of the follow-up phase (M = 2.50, SD = 3.46) was not significant, $t(25) = 1.74$, $p = .09$. Overall, the reduction in depression from baseline to the end of follow-up was statistically significant, $t(26) = 5.79$, $p < .001$. These findings are consistent with those from ASPIRE II, suggesting an improvement in depression during initial treatment and maintenance of these improvements throughout follow-up. Improvements in depression were also clinically significant. Of the 27 completers, three reduced from average to minimum, one from average to minor, and six from minor to minimum. Only one participant became more depressed, moving from minimum to severe, likely influenced by some external event.

Body Satisfaction. The ANOVA also revealed a significant improvement in body satisfaction by time of assessment, $F(2, 50) = 9.92$, $p < .001$, $\eta_p^2 = 0.28$. A paired samples t-test to examine differences between time points yielded a significant change in body satisfaction between baseline (M = 62.73, SD = 8.53) and the end of active treatment (M = 66.12, SD = 5.87), $t(25) = 2.66$, $p = .013$. The change in body satisfaction between the end of initial treatment and end of follow-up (M = 67.54, SD = 4.92) was not statistically significant, $t(25) = 1.88$, $p = .072$. The overall improvement in body satisfaction across treatment and follow-up was significant, $t(26) = 3.97$, $p = .001$. These results are consistent with the findings from ASPIRE II, suggesting significant overall gains in body satisfaction from baseline to follow-up as well as during initial treatment. As in ASPIRE II, there was a small but insignificant decline in body satisfaction throughout follow-up. However, levels of body satisfaction at the end of follow-up were still significantly improved from baseline levels.

Life Satisfaction. The ANOVA indicated that the small change in life satisfaction did not reach statistical significance across time points, $F(2, 50) = 0.66$, $p = .52$, $\eta_p^2 = 0.026$. The

improvement in life satisfaction between baseline (M = 26.38, SD = 6.31) and the end of active treatment (M = 27.38, SD = 4.44) was not significant, $t(25) = 0.81$, $p = .43$; nor was the improvement from the end of initial treatment to the end of follow-up (M = 27.73, SD = 6.05), $t(25) = 0.34$, $p = .74$. The overall change in life satisfaction across treatment and follow-up was also not significant, $t(26) = 1.10$, $p = .28$. These findings differ slightly from ASPIRE II in that ASPIRE II participants showed improvements in life satisfaction during initial treatment.

Weight Correlations. Pearson product-moment correlation coefficients were computed in order to further explore the relationship between weight and each of the psychological outcomes. Surprisingly, the correlations for weight change with change in depression, $r(27) = -.026$, $p = .896$; weight change with change in body satisfaction, $r(27) = -.28$, $p = .17$; and weight change with change in life satisfaction, $r(27) = .033$, $p = .87$ were not statistically significant. This finding suggests that although we see improvements in these variables during initial treatment, improvements are not dependent on the weight loss itself.

When correlations were computed between changes in psychological variables and change in weight in the initial treatment, results were similar. Correlations between change in weight and change in depression, $r(26) = .27$, $p = .19$; change in weight and change in body satisfaction, $r(26) = -.36$, $p = .08$; and change in weight and change in life satisfaction, $r(26) = -.043$, $p = .84$ were still not significant.

As with ASPIRE II, additional correlations were computed between baseline levels of each of the psychological outcomes and weight change across 9 months in order to determine the impact of initial levels of these variables on ability to lose weight in a small changes program. The correlation between initial level of depression and weight change was not statistically significant, $r(27) = .15$, $p = .47$; nor was the correlation between initial level of body satisfaction

and weight change, $r(27) = .23$, $p = .25$; or the correlation between initial level of life satisfaction and weight change, $r(27) = .15$, $p = .46$. These findings are consistent with those of ASPIRE II, and further suggest that initial differences in depression, body satisfaction, and life satisfaction do not hinder or enhance weight loss via a small changes approach.

Since ASPIRE III participants were randomized to either in-person or internet treatment modality with match follow-up modality, a secondary analysis was employed to determine any differences in improvements between treatment modalities. An independent samples *t*-test comparing changes in weight, depression, body satisfaction, and life satisfaction across both active treatment and from baseline to follow-up revealed no significant differences by treatment modality.

Intent-to-Treat Analyses

As a secondary analysis and in order to scrutinize results most carefully, an intent-to-treat analysis was performed on each data set. For this analysis, those who did not complete the study were assigned their baseline values as final values, assuming no improvements. This type of analysis sheds light on the average overall improvements for everyone who begins the study, not just those who complete the program. In general, we found similar results using intent-to-treat analyses.

ASPIRE II. Baseline characteristics of all those who consented for ASPIRE II are displayed in Table 6. The averages were not much different from completers, with participants being predominately Caucasian, married and well educated. Average age at the beginning of the study was 49.76 years ($SD = 11.40$). The average baseline BMI was 31.79 ($SD = 4.92$). Results are presented for all 25 participants who consented to participate. Weight outcomes are presented previously (Lutes et al., In Press) and are included in Table 7. A repeated measures Analysis of

Variance (ANOVA) demonstrated significant weight loss among time points, $F(2, 48) = 19.71$, $p < .001$, $\eta_p^2 = .451$. Results for psychological variables are reported in Tables 8-10 and are described below.

Depression. As in completers only analyses, the intent-to-treat repeated measures Analysis of Variance (ANOVA) revealed a significant reduction in scores on the BDI between baseline, post-treatment, and follow-up time points, $F(2, 48) = 6.19$, $p = .004$, $\eta_p^2 = 0.205$). A paired samples *t*-test to compare differences between each time point revealed a significant reduction in depression from baseline ($M = 7.76$, $SD = 6.17$) to the end of active treatment ($M = 4.52$, $SD = 3.96$), $t(24) = 3.27$, $p = .003$, suggesting an improvement in depression during the initial treatment phase. There was no significant difference in depression from the end of initial treatment to the end of follow-up ($M = 5.36$, $SD = 6.09$), $t(24) = 1.21$, $p = .24$) suggesting that although participants did not significantly improve depression scores across follow-up, they were able to maintain improvements made during initial treatment. Overall, the reduction in depression from baseline to the end of follow-up was significant, $t(24) = 2.12$, $p = .044$, suggesting an overall improvement in depression across treatment and follow-up.

Body Satisfaction. An intent-to-treat repeated measures ANOVA revealed a significant improvement in body satisfaction between baseline, post-treatment, and follow-up time points, $F(2, 48) = 3.99$, $p = .025$, $\eta_p^2 = 0.14$. A paired samples *t*-test revealed a significant improvement in body satisfaction from baseline ($M = 62.08$, $SD = 10.03$) to the end of the active treatment phase ($M = 65.76$, $SD = 11.63$), $t(24) = 2.24$, $p = .035$, suggesting an increase in body satisfaction during active treatment. This increase was only marginally significant in completers. The difference in body satisfaction from the end of initial treatment to the end of the follow-up phase ($M = 65.64$, $SD = 10.16$) was not significant, $t(24) = 0.10$, $p = .92$, suggesting that there

was not much change in body satisfaction throughout the follow-up phase. However, the increase in body satisfaction from baseline to the end of the follow-up phase was significant, $t(24) = 2.29$, $p = .031$, suggesting an overall improvement in body satisfaction across treatment and follow-up.

Life Satisfaction. An intent-to-treat repeated measures ANOVA indicated a significant increase in life satisfaction between baseline, post-treatment, and follow-up time points, $F(2, 48) = 3.85$, $p = .028$, $\eta_p^2 = 0.14$. This was only marginally significant in completers and is worth mentioning, given that life satisfaction is typically viewed as more resistant to change. Paired samples t-tests revealed a significant difference between baseline ($M = 25.48$, $SD = 6.58$) and the end of initial treatment ($M = 28.28$, $SD = 4.50$), $t(24) = 3.64$, $p = .001$ suggesting an improvement in life satisfaction during the active treatment phase. The decrease in life satisfaction from treatment completion through the end of follow-up ($M = 26.20$, $SD – 6.06$) for all participants reached statistical significance, $t(24) = 2.06$, $p = .050$, suggesting that maintenance of improvements was better in completers than in all study participants. The overall change in life satisfaction across treatment and follow-up was not significant, $t(24) = 0.55$, $p = .585$.

Weight Correlations. As with completers, a Pearson product-moment correlation coefficient was computed in order to further explore the relationship between weight and each of the psychological outcomes. Similar to findings with completers, a statistically significant positive correlation was found between change in weight across 9 months and change in depression, $r(25) = .50$, $p = .01$, signifying that the more weight a participant lost, the more improvement they displayed on the depression measure. The correlation between weight change across 9 months and change in body satisfaction was not statistically significant, $r(25) = -.33$, $p = .10$. Nor was the correlation between weight change across 9 months and change in life

satisfaction, $r(25) = -.27$, $p = .19$, suggesting that something else may be influencing these variables.

When correlations were computed between changes in psychological variables and change in weight in the initial treatment, a similar pattern emerged. The correlation between weight change across initial treatment and change in depression was not quite significant, $r(25) = .37$, $p = .076$, suggesting a trend toward more improvement with more weight loss. The correlation between change in weight across initial treatment and change in body satisfaction was not significant, $r(25) = -.20$, $p = .35$; nor was the correlation between change in weight across initial treatment and change in life satisfaction, $r(24) = .04$, $p = .86$, suggesting no association between amount of weight lost and improvements in life satisfaction or body satisfaction.

Correlations were computed between baseline levels of each of the psychological outcomes and weight change across 9 months in order to determine the impact of initial levels of these variables on ability to lose weight in a small changes program. The correlation between initial level of depression and weight change was not statistically significant, $r(25) = .080$, $p = .71$; nor was the correlation between initial level of body satisfaction and weight change, $r(25) = -.26$, $p = .20$; or the correlation between initial level of life satisfaction and weight change, $r(25) = -.18$, $p = .39$. The lack of relationship between initial levels of psychological variables and treatment success are consistent with completers only analyses and suggest that initial differences in depression, body satisfaction, and life satisfaction do not hinder or enhance weight loss via a small changes approach.

ASPIRE III. Baseline characteristics of all of the ASPIRE III participants are displayed in Table 6. Like the participants in ASPIRE II, participants of ASPIRE III were predominately Caucasian,

married and well educated. Average age at the beginning of the study was 44.14 years (*SD* = 9.58), about 5 years less than participants in ASPIRE II, $p = .027$. The average baseline BMI was 31.82 (*SD* = 5.04), similar to those in ASPIRE II. Results are presented for the 49 participants who consented to the study. Weight outcomes are included in Table 7. A repeated measures Analysis of Variance (ANOVA) demonstrated significant weight loss among time points, $F(2, 96) = 19.21$, $p < .001$, $\eta_p^2 = .286$. Results for psychological variables are reported in Tables 8-10 and are described below.

Depression. An intent-to-treat repeated measures Analysis of Variance (ANOVA) revealed a significant difference in depression scores (on the BDI) by time of assessment, $F(2, 94) = 8.14$, $p = .001$, $\eta_p^2 = 0.15$. A paired samples *t*-test to compare differences of each assessment yielded a significant reduction in depression from baseline (*M* = 9.92, *SD* = 7.09) to the end of the active treatment phase (*M* = 6.17, *SD* = 6.59), $t(47) = 3.34$, $p = .002$. The change in depression from the end of initial treatment to the end of the follow-up phase (*M* = 6.73, *SD* = 7.60) was not significant, $t(47) = 0.50$, $p = .62$. Overall, the reduction in depression from baseline to the end of follow-up was statistically significant, $t(47) = 4.67$, $p < .001$. These findings are consistent with those from completers analyses and intent-to-treat with ASPIRE II, suggesting an improvement in depression during initial treatment and maintenance of these improvements throughout follow-up.

Body Satisfaction. The intent-to-treat ANOVA also revealed a significant improvement in body satisfaction by time of assessment, $F(2, 92) = 8.31$, $p < .001$, $\eta_p^2 = 0.15$. A paired samples *t*-test to examine differences between time points yielded a significant change in body satisfaction between baseline (*M* = 62.85, *SD* = 8.26) and the end of active treatment (*M* = 65.15, *SD* = 6.55), $t(46) = 2.88$, $p = .006$. The change in body satisfaction between the end of initial

treatment and end of follow-up (M = 65.55, SD = 6.86) was not statistically significant, $t(46)$ = .711, p = .48. The overall improvement in body satisfaction across treatment and follow-up was significant, $t(46)$ = 3.57, p =.001. These results are consistent with completers analyses and findings from intent-to-treat with ASPIRE II, suggesting significant overall gains in body satisfaction from baseline to follow-up as well as during initial treatment.

Life Satisfaction. The ANOVA indicated that the small change in life satisfaction did not reach statistical significance across time points, $F(2, 92) = 0.830$, p = .44, $\eta_p^2 = 0.018$. The improvement in life satisfaction between baseline (M = 24.87, SD = 5.77) and the end of active treatment (M = 25.68, SD = 4.94) was not significant, $t(46) = 1.05$, p = .30; nor was the improvement from the end of initial treatment to the end of follow-up (M = 25.70, SD = 5.88), $t(46) = 0.031$, p = .98. The overall change in life satisfaction across treatment and follow-up was also not significant, $t(47) = 1.10$, p = .28. These findings differ slightly from intent-to-treat with ASPIRE II in that ASPIRE II participants showed improvements in life satisfaction during initial treatment.

Weight Correlations. Pearson product-moment correlation coefficients were computed in order to further explore the relationship between weight and each of the psychological outcomes. In contrast with completers only analyses but consistent with ASPIRE II intent-to-treat analyses, significant correlations were demonstrated between change in weight and change in depression across 9 months $r(49) = .354$, p = .012 as well as change in weight and change in body satisfaction across 9 months, $r(49) = -.473$, p = .001. These findings suggest associations between amount of weight lost and improvements in both depression and body satisfaction. The Correlation between weight change and change in life satisfaction, $r(49) = -.055$, p = .71 was not statistically significant.

When correlations were computed between changes in psychological variables and change in weight in the initial treatment, results were different. Interestingly, the association between change in weight and change in depression during initial treatment did not reach statistical significance, $r(49) = .18$, $p = .23$. However, the association between change in weight and change in body satisfaction remained significant when considering only initial treatment, $r(49) = -.33$, $p = .023$. Again, the correlation between change in weight and change in life satisfaction, $r(49) = -.079$, $p = .60$ was not significant.

As with ASPIRE II, additional correlations were computed between baseline levels of each of the psychological outcomes and weight change across 9 months in order to determine the impact of initial levels of these variables on ability to lose weight in a small changes program. The correlation between initial level of depression and weight change was not statistically significant, $r(49) = .25$, $p = .084$; nor was the correlation between initial level of body satisfaction and weight change, $r(49) = .14$, $p = .34$; or the correlation between initial level of life satisfaction and weight change, $r(49) = -.076$, $p = .61$. These findings are consistent with those of completers and intent-to-treat with ASPIRE II, and further suggest that initial differences in depression, body satisfaction, and life satisfaction do not hinder or enhance weight loss via a small changes approach.

All ASPIRE III participants were grouped by modality and compared to determine any differences in change in weight, depression, body satisfaction, and life satisfaction across both active treatment and from baseline to follow-up. Consistent with completers analysis, the analysis revealed no significant differences by treatment modality.

In addition, a significant drop-out rate in ASPIRE III (45%) led to a secondary analysis in order to determine differences at baseline between completers and non-completers. An

independent samples *t*-test revealed significant differences in weight and depression between completers and non-completers. Non-completers ($M = 12.29$, $SD = 7.92$) were significantly more depressed than completers ($M = 8.07$, $SD = 5.87$) at baseline, $t(47) = 2.55$, $p = .014$. Non-completers ($M = 91.00$, $SD = 14.33$) were also significantly heavier than completers ($M = 81.84$, $SD = 16.26$) at baseline, $t(47) = 2.07$, $p = .044$. Another noteworthy difference was a marginally significant difference in life satisfaction. Non-completers ($M = 23.14$, $SD = 4.61$) were less satisfied at baseline than completers ($M = 26.33$, $SD = 6.20$), $t(46) = 1.97$, $p = .055$. These findings suggest that those who dropped out of the program were initially heavier, more depressed, and less satisfied. Therefore, those at additional risk due to increased weight and poorer psychological function initially may be the most difficult to keep in treatment, adding an additional challenge to weight management providers.

Discussion

While a small changes approach to weight management has been shown to help participants lose weight (Damschroder, Lutes, Goodrich, Gillon, & Lowery, 2010; Lutes, Daiss, Barger, Read, & Winett, In Press; Lutes et al., 2008), the purpose of the current study was to determine its psychological implications. Specifically, the goal of this study was to determine whether a small changes approach to weight management has an impact on depression, body satisfaction, or life satisfaction. Analyzing results from two separate small changes studies, we predicted that a small changes approach would yield declines in depressive symptoms as well as improvements in both body satisfaction and life satisfaction at the end of the initial treatment phase (12 weeks) and that these improvements would be maintained at the 6-month follow-up. In addition, we predicted that these changes would be influenced by the amount of weight lost. As such, we expected to find positive correlations between change in weight and change in depression; change in weight and change in body satisfaction; and change in weight and change in life satisfaction.

In general, improvements in psychological variables were most pronounced during initial treatment, with maintenance during follow-up; similar to the pattern of weight loss achieved via a small changes approach. Overall, findings were consistent across studies, which strengthens confidence in conclusions. However, one noteworthy difference was that ASPIRE II participants yielded a significant improvement in life satisfaction during the initial treatment phase, while ASPIRE III participants demonstrated no significant changes in life satisfaction. This discrepancy warrants further investigation and should thus be a target of future study. The differences in findings between ASPIRE II and III raise some questions about whether or not something about ASPIRE II was more conducive to improvements in life satisfaction. The most

obvious difference in the two studies is the treatment sample and modality of treatment. Intuitively, one might speculate whether there is something about face-to-face treatment that is more likely to yield improvement in life satisfaction. However, our comparative analysis of those in the face-to-face arm of ASPIRE III with those in the internet arm of ASPIRE III did not yield any significant differences in amount of weight or psychological change. It is important to remember that the participants were in two separate studies, thus any number of factors could contribute to the difference, including interventionist, unrelated environmental events at the time, etc. Clearly, more research is needed to establish the impact of a small changes approach to weight loss on life satisfaction.

In both studies, participants demonstrated significant improvements in depression throughout the initial 12-week treatment. This is consistent with the notion that weight loss leads to improvements in depression (Taylor, Ferguson, & Reading, 1978; Wadden & Stunkard, 1986; Wing, Blair, Marcus, Epstein, & Harvey, 1994; Wing, Marcus, Epstein, & Kupfer, 1983) and confirms the hypothesis that the small changes approach is capable of yielding improvements in depression despite the fact that weight loss is slower. While no additional gains were made across follow-up, no significant losses were displayed either, suggesting that at 9 months post baseline, participants maintained the gains they had accrued during initial treatment. This is contrary to the results of traditional behavioral weight management, in which participants typically display a reversal of psychological gains upon regaining lost weight (Yankura et al., 2008). Helping participants to maintain weight lost and/or keep losing weight seems to protect and/or further psychological gains. Longer randomized trials utilizing the small change approach will determine its ability to help participants maintain weight and psychological gains over a longer period of time.

Participants in both studies showed a significant improvement in body satisfaction across initial treatment. This is consistent with the current literature suggesting that body satisfaction improves following weight loss (Cash, 1994; Foster, Wadden, & Vogt, 1997; Rosen, Orosan, & Reiter, 1995) and confirms the hypothesis that a small changes approach can lead to improvements in body satisfaction despite slower weight loss. Although one study showed a small decrease in body satisfaction from the end of treatment to follow-up, neither study yielded significant differences in body satisfaction from the end of treatment to follow-up, suggesting a relative maintenance of treatment gains. Again, this finding is promising because behavioral weight loss programs typically lead to regain and reversal of psychological gains following completion (Wadden, Stunkard, & Liebschutz, 1988). These findings suggest that participants in a small changes program may be able to maintain both weight and psychological improvements.

Results regarding life satisfaction were a little less straightforward. Although no significant changes in life satisfaction resulted in ASPIRE III, participants in ASPIRE II showed a slight improvement. In ASPIRE II, improvement in life satisfaction was significant during the initial treatment phase, supporting the most modern position of researchers that situational factors such as health can impact life satisfaction (Pavot & Diener, 2008). While changes in life satisfaction for ASPIRE III participants were not statistically significant, they were improving across both treatment and follow-up. However, despite significant improvement in life satisfaction across treatment, ASPIRE II participants demonstrated a significant reduction in life satisfaction during the follow-up phase, yielding averages similar to baseline. Social psychologists have theorized that life satisfaction may fluctuate around a genetic set point such that life events can temporarily alter one's life satisfaction but that it will ultimately adjust back to its baseline average (Fujita & Diener, 2005). In fact, researchers found that although 25% of

people significantly alter their baseline across time, 75% of people fluctuate around the same baseline level of life satisfaction across decades (Fujita & Diener). Perhaps ASPIRE II participants were strongly reacting to initial weight loss but then returned to their baseline life satisfaction. Yet, this pattern was not observed among ASPIRE III participants. As a result, further research is needed to confirm this hypothesis.

Surprisingly, few significant associations were discovered between changes in weight and changes in psychological variables. In ASPIRE II completers and intent-to-treat analyses as well as ASPIRE III intent-to-treat analyses, significant positive correlations between weight change and change in depression existed, suggesting that the more weight was lost, the more improvements were demonstrated in depression. This correlation was not demonstrated in ASPIRE III completers, which suggests that more research is needed to determine whether or not amount of weight loss is influencing psychological improvement. If true, these associations would confirm our prediction and suggest that improvements in depression are at least partially a result of weight loss itself.

A significant negative association was found between change in weight and change in body satisfaction, suggesting improvements in body satisfaction with weight loss, but only in ASPIRE III intent-to-treat analyses. These findings signify that improvements in body satisfaction may be linked to amount of weight loss; however, the lack of similar findings in ASPIRE II leads to speculation about results and clearly warrants future study.

On the other hand, there were no significant overall correlations found between weight change and life satisfaction. The fact that improvements for life satisfaction and body satisfaction were demonstrated in ASPIRE II but that they were not directly mediated by amount of weight lost suggests that there must be some other aspect of the small changes approach that is fostering

improvements in these psychological variables. These could range from lack of restriction or deprivation and bolstered self-efficacy as the small change model suggests (Lutes & Steinbaugh, 2010) or some other nonspecific factor such as social support, discussion of body image, increases in universality, empathy, and lack of deflation to name a few. Certainly, future research with a small changes approach should seek to determine the mechanism of change for psychological improvements so that we can utilize those mechanisms to promote and maximize improvement.

The lack of association found between initial levels of depression, initial body satisfaction, initial life satisfaction and change in weight imply that weight loss success throughout a small changes program is not dependent upon or mediated by initial levels of these variables. Given that obese individuals who seek treatment have increased rates of depression (McElroy et al., 2004) and body satisfaction (Cattarin & Thompson, 1994; Crow, Eisenberg, Story, & Neumark-Sztainer, 2006), this finding offers hope because it proposes that participants at varying levels of psychological function can utilize this adaptive program without hindrance from baseline functioning.

However, secondary analyses to compare completers with non-completers revealed that non-completers were significantly more depressed at baseline than completers. This is consistent with previous research demonstrating that those who are more depressed at baseline are more likely to drop-out from behavioral weight management programs (Dalle Grave, Suppini, Calugi, & Marchesini, 2006). Given that those seeking treatment for weight management typically have elevated depression scores (McElroy et al., 2004), this finding is concerning. Although lower psychological function at baseline did not result in inability to achieve success in the program and display improvement in psychological variables, it does increase risk for drop-out. As a

result, an additional challenge to weight management providers will be helping those most at risk (due to lower psychological function and increased weight) to avoid attrition. Our findings suggest that those at more risk who remained in the program were just as successful as others in the program who did not display elevated depression scores at baseline. Therefore, finding ways to maximize involvement and avoid drop-out will be paramount to successfully treating those who are most at risk.

Finally, non-completers were heavier at baseline than completers, suggesting that those who initially weighed more were more susceptible to drop-out. Past research on initial weight and attrition has yielded mixed results (Dalle Grave, Suppini, Calugi, & Marchesini, 2006). Some studies failed to find any relationship between initial body mass index (BMI) and attrition rates. Other studies demonstrated a positive correlation between BMI and attrition while still others found a negative correlation between BMI and attrition (Dalle Grave, Suppini, Calugi, & Marchesini). While our findings suggest that those who were most overweight were more likely to drop-out, we also found that those who dropped out were more depressed. Since a relationship has been established between obesity and depression, it is possible that depression is moderating the relationship between weight and attrition. Clearly, more research is needed in this area to clarify the relationship between weight and attrition. However, our findings further reinforce the importance of finding ways to minimize attrition especially for those who are initially at increased risk.

Limitations

There are several limitations to this study which impact our ability to generalize results. The first and most significant is the small sample size in each of the studies. With such small sample sizes in both studies and such large standard deviations on most of the dependent variable

measures, it is difficult to establish findings with confidence. For this reason, small effects sizes were common but could likely be bolstered with a larger sample size. Additionally, the lack of a comparison group makes it difficult to conclude with confidence that the findings were due to the small changes program itself and not to some other factor that might result from the passage of time or from weekly contact with any group, such as attention, social support, or sense of belonging. However, while it is likely that the passage of time and sense of support are partially responsible for psychological improvement, they most likely would not lead to improvements as substantial as we found in the current study alone. Further research is needed to confirm this hypothesis.

Several characteristics of our particular participants may impact our ability to generalize our results. First, our participants consisted of adult women. Although providers who often treat obesity may argue that adult women are most likely to seek treatment, including only these women as participants limits our ability to generalize findings to men or other age groups, such as adolescents. Additionally, average baseline depression scores of participants in both studies were not elevated to a clinical level. This limits our ability to generalize to all those seeking treatment for obesity because it has been established that most patients seeking obesity treatment display elevated levels of depression (McElroy et al., 2004). In addition, it is difficult to determine whether depression symptoms would improve with a small changes approach when initial levels were below clinical levels and below what one would typically expect.

Finally, the studies were limited in that they were relatively short-term in nature. Both studies included a 12-week initial treatment period, followed by a 6-month follow-up phase. This initial 3-month treatment phase is only half as long as the current recommended behavioral weight management treatments, which are usually 6-months in duration (Wadden & Osei, 2002;

Wing, 2002). A longer initial treatment phase would allow for more confident conclusions about treatment effects and may yield further improvement in psychological variables. Additionally, we found small trends or shifts in psychological variables between the end of initial treatment and the follow-up assessment point (6 months after completion). These trends would be more fully understood if examined again at a 12 and 24-month follow-up assessment.

In ASPIRE III, attrition rates were elevated (45%), especially in comparison to ASPIRE II attrition (12%). We believe this difference to be due to a several factors. First, participants in ASPIRE II were monetarily invested because they paid to be a part of the program. In addition, they did not consent to the study until the active treatment was over. Therefore, not all who initially signed up for the program participated in the study and follow-up – only those who were truly interested and likely still invested upon program completion. Not only did ASPIRE III participants not pay a fee, but they were randomized to either face-to-face or internet groups at baseline, which may have led to more dropouts than if they had all received face-to-face before randomization. However, it is important to note that these drop out rates are not untypical. Typical attrition rates for behavioral weight management programs have been stated to range from 10-80%, with rates above 50% not uncommon (Dalle Grave, Suppini, Calugi, & Marchesini, 2006; Inelmen et al., 2005). As previously discussed, attrition risk is increased for those with poor psychological function and increased weight, emphasizing the importance of improving attrition. Future studies would be wise to require monetary investment and personal accountability via face-to-face meetings in addition to seeking other possibilities for improved attrition rates.

Future directions

While several studies have examined the small changes approach's ability to help participants to lose weight through various modalities (Damschroder, Lutes, Goodrich, Gillon, & Lowery, 2010; Lutes, Daiss, Barger, Read, & Winett, In Press; Lutes et al., 2008), this is the first time the psychological outcomes have been inspected. Additional studies looking at the psychological impact of a small changes approach are needed to confirm and increase confidence in the current findings. Furthermore, future studies should specifically examine the relationship between weight and psychological variables, especially depression and body satisfaction, to determine whether improvements can be attributed to weight lost or components of the specific treatment. Correlations only imply association, not causation. For this reason, future studies should seek to determine if treatment and weight loss lead to psychological improvements or if these psychological improvements are mediating weight loss. Moreover, future studies should be longer in nature to determine if there are long-term implications and should include a control group for comparison purposes and to firmly establish that the program is leading to these changes. A study directly comparing a small changes approach to a traditional weight management program will help establish whether the psychological improvements yielded by each are comparable. Once these findings are established, the next step for researchers is to determine the mechanism of psychological change. Knowing what aspects of the small changes approach are directly leading to psychological improvement will help in further developing and planning intervention in general and also in tailoring to specific populations or individuals with varying psychological needs.

Conclusions

Findings from the current studies suggest that a small changes approach to weight management may lead to significant weight loss and maintenance and to significant improvements in depression and body satisfaction that are maintained across a 6-month follow-up. In addition, participants in one study showed significant improvements in life satisfaction during initial treatment, suggesting that a small changes approach to weight management may have an impact on life satisfaction as well. It is important to note that although traditional behavioral weight management has also been associated with significant improvements in psychological variables (Cash, 1994; Foster, Wadden, & Vogt, 1997; Rosen, Orosan, & Reiter, 1995; Taylor, Ferguson, & Reading, 1978; Wadden & Stunkard, 1986; Wing, Blair, Marcus, Epstein, & Harvey, 1994; Wing, Marcus, Epstein, & Kupfer, 1983), our participants showed significant psychological improvement while losing only half the weight of those in traditional programs. We hypothesize that participants in a small changes program are less frustrated, less deprived, and more satisfied but future research is needed to confirm these findings. If participants in a small changes program can lose weight in a slower manner but continue to maintain or keep losing after active treatment ends and can achieve similar improvements in psychological variables, then a small change program may provide a practical choice for the long term management of weight. Therefore, a small changes approach to weight management may be a viable option and alternative to traditional treatment for reducing weight and improving psychological function with sustained improvement. More long-term studies that include a 12-24 month follow-up phase as well as a comparison group are necessary to confirm these findings and determine long-term effects, as well as to compare psychological gains to a traditional behavioral program. In the future, researchers should focus on discovering the mechanisms of

psychological improvement and testing the Small Change Model to further improve treatment approaches and to tailor interventions based on psychological need.

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Table 1

ASPIRE II and ASPIRE III Participants' Baseline Characteristics for Completers Only.

	ASPIRE II N = 22	ASPIRE III N = 27	
Demographic	*M (SD)*	*M (SD)*	Difference *p* value
Age	51.09 (11.41)	46.70 (9.90)	.156
BMI	30.82 (3.88)	30.25 (5.07)	.667
Weight (kg)	84.96 (11.58)	81.84 (16.26)	.059
Ethnicity			.064
Caucasian	95.5%	70.4%	
Non-Caucasian	4.5%	22.2%	
Education (%)			.629
High school	13.6%	3.7%	
Some college	13.6%	25.9%	
College degree	40.9%	44.4%	
Grad/Prof degree	31.7%	25.9%	
Marital status (%)			.108
Single, never married	9.1%	7.4%	
Married	68.2%	88.9%	
Separated/Divorced	13.6%	3.7%	
Widowed	9.1%	0.0%	
Depression	7.23 (5.89)	8.07 (5.87)	.618
Body Satisfaction	62.09 (10.69)	62.81 (8.37)	.791
Life Satisfaction	25.36 (6.95)	26.33 (6.20)	.608

Note. *Indicates that the difference is significant at the $p < .05$ level.

Table 2

Change in Weight (KG) Across Treatment and Follow-up for Completers Only.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	-3.70 (2.22)*	-3.86 (2.67)*
Across Follow-up	-2.59 (4.35)*	-1.75 (3.05)*
Overall	-6.29 (5.73)*	-5.93 (5.22)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 3

Change in Depression Across Treatment and Follow-up for Completers Only.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	-3.29 (5.02)*	-3.42 (8.10)*
Across Follow-up	0.52 (2.94)	-2.35 (6.86)
Overall	-2.76 (6.11)*	-5.67 (5.08)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 4

Change in Body Satisfaction Across Treatment and Follow-up for Completers Only.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	3.67 (8.43)*	3.38 (6.48)*
Across Follow-up	0.48 (5.49)	1.42 (3.86)
Overall	4.14 (8.37)*	4.70 (6.15)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 5

Change in Life Satisfaction Across Treatment and Follow-up for Completers Only.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	2.95 (4.10)*	1.00 (6.29)
Across Follow-up	-1.95 (5.46)	0.35 (5.25)
Overall	1.00 (7.06)	1.44 (6.82)

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 6

ASPIRE II and ASPIRE III Participants' Baseline Characteristics of All Participants.

	ASPIRE II N = 25	ASPIRE III N = 49	
Demographic	*M (SD)*	*M (SD)*	Difference *p* value
Age	49.76 (11.40)	44.14 (9.38)	.027*
BMI	31.79 (4.92)	31.82 (5.04)	.982
Weight (kg)			.098
Ethnicity			.126
Caucasian	92%	78%	
Non-Caucasian	8%	22%	
Education (%)			.211
High school	16%	2%	
Some college	12%	21%	
College degree	44%	46%	
Grad/Prof degree	28%	29%	
Marital status (%)			.125
Single, never married	12%	14%	
Married	68%	78%	
Separated/Divorced	12%	8%	
Widowed	8%	N/A	
Depression	7.76 (6.19)	9.92 (7.09)	.202
Body Satisfaction	62.08 (10.03)	62.85 (8.26)	.728
Life Satisfaction	25.48 (6.58)	24.94 (5.73)	.716

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 7

Change in Weight (KG) Across Treatment and Follow-up using Intent-to-Treat.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	-3.17 (2.41)*	-2.47 (2.86)*
Across Follow-up	-2.19 (4.13)*	-0.80 (3.54)
Overall	-5.35 (5.68)*	-3.27 (4.86)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 8

Change in Depression Across Treatment and Follow-up using Intent-to-Treat.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	-3.24 (4.96)*	-3.75 (7.79)*
Across Follow-up	0.84 (3.46)	0.56 (7.85)
Overall	-2.40 (5.65)*	-3.12 (4.70)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 9

Change in Body Satisfaction Across Treatment and Follow-up using Intent-to-Treat.

	ASPIRE II	ASPIRE III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	3.83 (8.36)*	2.25 (5.42)*
Across Follow-up	-0.12 (6.02)	0.40 (3.90)
Overall	3.56 (7.77)*	2.65 (5.15)*

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 10

Change in Life Satisfaction Across Treatment and Follow-up using Intent-to-Treat.

	ASPIRES II	ASPIRES III
Time Period	*M (SD)*	*M (SD)*
Across Treatment	2.92 (3.89)*	0.79 (5.20)
Across Follow-up	-2.08 (5.04)*	0.02 (4.65)
Overall	0.72 (6.50)	0.85 (5.12)

Note. *Indicates that the change is significant at the $p < .05$ level.

Table 11

Completers versus Non-Completers (ASPIRE III).

	Completers N = 27	Non-completers N = 22	
Demographic	*M (SD)*	*M (SD)*	Difference *p* value
Age	46.70 (9.90)	41.00 (7.80)	.033*
Baseline BMI	30.25 (5.07)	33.74 (4.38)	.014*
Baseline Weight (kg)	81.84 (16.26)	90.99 (14.33)	.044*
Baseline Depression	8.07 (5.87)	12.29 (7.92)	.040*
Baseline Body Satisfaction	62.81 (8.37)	62.90 (8.32)	.973
Baseline Life Satisfaction	26.33 (6.20)	23.14 (4.61)	.055

Note. *Indicates that the difference is significant at the $p < .05$ level.

University and Medical Center Institutional Review Board
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Office **252-744-2914** • Fax **252-744-2284** • **www.ecu.edu/irb**
Chair and Director of Biomedical IRB: L. Wiley Nifong, MD
Chair and Director of Behavioral and Social Science IRB: Susan L. McCammon, PhD

TO: Marissa Errickson, BA, Dept of Psychology, ECU—Rawl Building 109 A

FROM UMCIRB

DATE: June 26, 2009

RE: Human Research Activities Determined to Meet Exempt Criteria

TITLE: "Psychological Implications of a Small Change Approach to Weight Loss"

UMCIRB #09-0505

This research study has undergone IRB review on 6.19.09. It is the determination of the IRB Chairperson (or designee) that these activities meet the criteria set forth in the federal regulations for exemption from 45 CFR 46 Subpart A. These human research activities meet the criteria for an exempt status because it is a research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. *NOTE: 1) This information must be existing on the date this IRB application is submitted. 2) The data collection tool may not have an identifier or code that links data to the source of the information.*. The Chairperson (or designee) deemed this **unfunded** study **no more than minimal risk.** This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any changes must be submitted to the UMCIRB for review prior to implementation to allow determination that proposed changes do not impact the activities eligibility for exempt status. Should it found that a proposed change does require more substantive review, you will be notified in writing within five business days.

The following items were reviewed in determination exempt certification:

- Internal Processing Form (dated 6.4.09)
- Informed Consent from Northern Arizona University, & Virginia Tech

It was furthermore determined that the reviewer does not have a potential for conflict of interest on this study.

The UMCIRB applies 45 CFR 46, Subparts A-D, to all research reviewed by the UMCIRB regardless of the funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies that fall under the purview of Food and Drug Administration regulations. The UMCIRB follows applicable International Conference on Harmonisation Good Clinical Practice guidelines.