

THE PREDICTIVE POWER OF POSITIVE PSYCHOLOGICAL FACTORS ON WEIGHT  
CHANGE AMONG TREATMENT-SEEKING OBESE ADULTS

By

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Bachelor of Science in Psychology  
Florida State University  
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2013

Submitted to the Faculty of the  
Graduate College of the  
Oklahoma State University  
in partial fulfillment of  
the requirements for  
the Degree of  
MASTER OF SCIENCE  
December, 2018

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Title of Study: THE PREDICTIVE POWER OF POSITIVE PSYCHOLOGICAL FACTORS  
ON WEIGHT CHANGE AMONG TREATMENT-SEEKING OBESE ADULTS

Major Field: PSYCHOLOGY

Abstract: Behavioral weight loss interventions are considered to be the gold standard treatment in helping overweight and obese individuals achieve clinically significant weight loss. Although standard behavioral interventions produce short-term weight loss success, most do not yield successful long-term outcomes. Positive psychology is the study of positive emotion, character, and institutions in relation to mental health and well-being, and data suggest positive psychological factors are associated with better health outcomes. Few studies have examined the association between positive psychological factors and excess adiposity, or the effects of these factors as they relate to weight-loss treatment outcomes. The goal of this thesis is to examine five positive psychological factors concurrently (i.e., hope, optimism, grit, gratitude, and positive affect) as predictors of weight change (i.e., percent weight loss, percent change in body fat) among obese individuals enrolled in a behavioral weight loss intervention. A series of hierarchical linear regressions were conducted to evaluate the predictive ability of the positive psychological factors on weight change while controlling for age, sex, and pre-intervention body mass index. A total of 123 participants ranging in age from 21-65 years old ( $45.32 \pm 11.08$ ) participated in the study and were included in the present analyses. No significant associations were found between the positive psychological factors and either weight change outcome. Implications, limitations, and areas for future research are discussed.

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## CHAPTER I

### INTRODUCTION<sup>1</sup>

#### *The Obesity Epidemic*

One of every three adults in the United States is obese (Centers for Disease Control and Prevention [CDC], 2016). Additionally, obesity-related medical conditions, such as heart disease, stroke, and type 2 diabetes, are some of the leading causes of preventable death (CDC, 2016). Thus, the financial burden of obesity is very costly as current healthcare costs for obesity range from \$147 billion to nearly \$210 billion per year (Cawley & Meyerhoeffer, 2012; Finkelstein, Trogdon, Cohen, & Dietz, 2009).

According to the CDC, obesity is defined conceptually as weight that is higher than what is considered healthy given an individual's height with the assumption that the excess weight is due to accumulation of fat not muscle or fluid retention. Both obesity and extreme obesity are estimated using the body mass index (BMI), which is used as a screening tool for obesity. BMI is calculated using an individual's weight (kg) divided by height (m<sup>2</sup>) and has been shown to correlate with body fat percentage in most people (CDC, 2015; Freedman, Horlick, & Berenson, 2013; Garrow & Webster, 1985). As BMI does not account for body fat percentage in its calculation, it may not be the best measure of actual body fat among individuals with high muscle mass, older adults, or children (CDC, 2015). Operationally, obesity is defined as a BMI  $\geq$  30 kg/m<sup>2</sup> and can be categorized by severity (see Table 1 for BMI classifications) with Class I obesity as least severe and Class III obesity as most severe (CDC, 2016). The severity levels

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<sup>1</sup> A complete review of the literature can be found in Appendix A.

correspond to medical risk as adults living with obesity are more susceptible to developing heart disease, type 2 diabetes, certain types of cancer, and stroke, all of which are among the leading causes of preventable death (CDC, 2016).

### *Behavioral Interventions for Obesity*

Among individuals living with obesity, weight loss is recommended in order to reduce risk for the array of negative health outcomes mentioned above (e.g., heart disease, stroke, type 2 diabetes, etc.). Most behavioral weight-loss interventions have been shown to lead to reductions in weight ranging from 7-10%, which in turn reduces some of the health risks associated with being overweight or obese (Butryn, Webb, & Wadden, 2011; McTigue et al., 2003). The most effective behavioral weight-loss interventions have been shown to involve a combination of reduced caloric intake, increased physical activity, and some type of behavior therapy (NIH, 1998). While the majority of standard behavioral weight-loss interventions are successful in helping overweight and obese individuals achieve 8-10% weight loss in the short-term, it is known that most weight loss interventions do not have successful long-term outcomes (Kearney et al., 2012). Of the individuals who lost weight as part of a behavioral weight loss intervention, on average 50% of the weight lost is regained within the first year. Further, an estimated 80% of individuals return to or exceed their initial weight within 3-5 years following the intervention (Byrne et al., 2003). The bottom line is that some – if not all – weight is almost always regained over time; therefore, future intervention efforts need to identify the factors that promote or facilitate sustained weight loss over the long term. Of specific interest in this project, psychological factors may play a role in weight loss and weight loss maintenance, as described below.

### *Psychological Factors and Obesity*

Psychological factors, such as depression and stress, are related to obesity onset and maintenance (NIDDK, 2012). For example, a study conducted by Byrne and colleagues (2003) examined weight loss maintainers in comparison with those who regained their lost weight and healthy-weight women. Several psychological factors characterized those who regained lost weight. These characteristics were: failure to achieve initial weight loss goals, dissatisfaction with the weight achieved, tendency to evaluate self-worth in terms of weight and shape, lack of vigilance with regard to weight control, black-and-white thinking style, and the tendency to use eating to regulate mood. Other psychological factors associated with weight loss maintenance include greater self-efficacy, stress management skills, and self-monitoring (Elfhag & Rossner, 2005). As this past research suggests, adaptive and maladaptive psychological factors may play a role in weight loss success and maintenance, which may help explain why many people with obesity regain weight following a weight loss intervention. As will be discussed in more detail below, certain psychological factors (e.g., positive psychological factors) have not been widely examined, despite their potential protective ability in preventing or mitigating the adverse impact of the negative psychological factors mentioned above.

#### *Positive Psychological Factors, Health, and Adiposity*

Positive psychology is the study of positive emotion, character, and institutions in relation to mental health and well-being (Seligman & Csikszentmihalyi, 2000). Positive psychological factors are defined broadly as those relating to positive human functioning and psychological health (Aspinwall & Tedeschi, 2010; Aspinwall & Staudinger, 2003; Seligman & Csikszentmihalyi, 2000). Evidence suggests that such positive factors may be associated with better health outcomes, such as improved neuroendocrine and immune functioning and attention to preventative behaviors and health risks (Rasmussen, Scheier, & Greenhouse, 2009; Howell,



Kern, & Lyubomirsky, 2005; Aspinwall & MacNamara, 2005; Pressman & Cohen, 2005). For example, optimism has been shown to predict preventative health behaviors such as increased exercise, eating a healthier diet, and not smoking (Steptoe, Wright, Kunz-Ebrecht, & Iliffe, 2006; Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). However, despite this evidence, few research studies have examined the association between positive psychological factors and excess adiposity. Results from studies examining positive psychological factors in relation to weight indices are discussed below.

*Optimism.* Optimism is defined as general positive outcome expectancies (Scheier & Carver, 1985). In total, only eight studies have examined the association between optimism and weight. Optimism has been shown to be positively related to physical well-being and positive health behaviors, such as decreased tobacco use and increased exercise (Steptoe et al., 2006; Scheier & Carver, 1992). As a result, it may be the case that optimism predicts or relates to healthy weight and/or weight control efforts. Studies have found higher dispositional optimism to be related to engaging in physical activity (Taylor et al., 2004), and lower dispositional optimism to be related to increased adiposity (Khullar, Oreskovic, Perrin, & Goodman, 2011). Within the eight studies examining optimism and weight, only five assess optimism as a predictor or correlate of changes in adiposity over time. Results from these five studies are mixed. Two studies suggest that optimism may be related to weight control efforts (Finch et al., 2005; Oettingen & Wadden, 1991), while the other three studies found optimism was not directly related to weight loss (Benyamini & Raz, 2007; Fontaine & Cheskin, 1999; Linde et al., 2004).

*Positive Affect and Grit.* Positive affect reveals the degree to which an individual feels enthusiastic, active, and alert (Watson, Clark, & Tellegen, 1988). Only one study has examined the association between positive affect and obesity (Carr, Friedman, & Jaffe, 2007). Results

indicated that individuals in obese class I reported higher levels of positive affect when compared to individuals of normal weight, suggesting that individuals in this category of mild-moderate obesity may not be as susceptible to negative affect or depressed mood. Grit is best defined as the persistence and perseverance to work towards long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). Similarly to positive affect, only one study has examined grit's role in relation to adiposity (Thomas, Seiden, Koffarnus, Bickel, & Wing, 2015). Results indicated that higher grit scores were associated with lower BMI. Though limited, these research findings suggest that positive affect and grit may be associated with lower weight.

*Synthesizing Limitations and Rationale for Present Study: Positive Psychological Factors in Weight Loss*

To date, ten studies in total have been conducted within this area and only five have examined change in adiposity as part of weight-loss treatment, yielding mixed findings. As a result, additional research is needed to delineate the association between positive psychological factors and weight loss. Further, no research exists examining hope, grit, gratitude, or positive affect as they relate to weight-loss treatment outcomes. There is currently a huge gap in the literature with regards to positive psychological factors as they relate to obesity and weight change. Therefore, the goal of the present study seeks to address this gap by examining five positive psychological factors concurrently (i.e., hope, optimism, grit, gratitude, and positive affect) as predictors of weight change among obese individuals enrolled in a behavioral weight loss intervention. Given that few studies have examined the role of positive psychological variables in relation to obesity and that the majority of research thus far has focused on optimism, the proposed study makes a contribution by examining how multiple positive

psychological factors predict weight change in a treatment-seeking obese population engaging in behavioral weight loss treatment.

## CHAPTER II

### METHOD

#### *Overview*

The data that were collected for the present study were from a large, ongoing randomized control trial (RCT) for behavioral weight loss among obese adults (K23DK103941-01A1), *Cognitive and Self-Regulatory Mechanisms of Obesity Study (COSMOS)*. The Consolidated Standards of Reporting Trials (CONSORT) recommendations were employed throughout this study, which ensure complete and transparent reporting of trial methodology and data. A CONSORT diagram detailing all methodology and data are presented in Figure 1. All measures utilized in the present study are located in Appendix B.

#### *Participants*

*Participant Recruitment.* Participants were recruited from a random selection of faculty and staff at Oklahoma State University as well as from the tribal community affiliated with Cherokee Nation. For this targeted American Indian arm, participants were recruited from within geographic regions associated with Cherokee Nation. For both tribal and non-tribal samples, a variety of snowball sampling techniques were used to recruit participants (e.g., social media posts, emails from employers, flyers, etc.). Individuals who were interested in participating in the study were invited to complete an online screening questionnaire to assess for eligibility. Inclusion criteria for this study were: a) age  $\geq 21$  years old and  $\leq 65$  years old, b) speak English fluently, and c) have a BMI within the range of 27.0 kg/m<sup>2</sup> and 52.0 kg/m<sup>2</sup>. Exclusion criteria were as follows: a) individuals out of the stated age or BMI range, b) those who were currently

or planning to become pregnant, c) history of a neurological disorder, d) history of or planning to receive bariatric surgery, e) current major medical condition, f) impaired sensory function, g) non-English speaking, h) controlling weight via the use of laxatives or vomiting, and/or i) history or current psychotic disorders. For American Indian participants, inclusion criteria were the same as those listed above, with the additional criteria that individual had to identify their race as American Indian/Native American.

The final sample consisted of 155 participants ranging in age from 21-65 years old. Participants were primarily female and Caucasian. Approximately 48 of the 155 participants were recruited from Cherokee Nation and identified as either American Indian/Alaskan Native or multiracial. In total, 25.8% of the sample identified as American Indian/Alaskan Native and 15.5% identified as other or multiracial (see Participants Characteristics, Table 2 for full demographic data).

### *Measures*

#### *Positive Psychological Variables*

*Positive and Negative Affect Schedule (PANAS).* The PANAS (Watson et al., 1988) consists of twenty self-report items that describe different feelings and emotions that people may experience. Approximately half of the items are positive feelings and emotions, while the other half are negative. In the present study, the positive affect subscale score was examined as a predictor of %WL, and the negative affect subscale score served as a covariate. Participants rated each item on a 1 (Very slightly or Not at all) to 5 (Extremely) Likert-type scale, with higher scores being indicative of greater experience of a given feeling or emotion. The PANAS is a reliable and valid measure of both positive and negative affect (Crawford & Henry, 2004; Watson et al., 1988). The positive affect subscale demonstrated high internal consistency in the

present study ( $\alpha = .90$ ), while the negative affect subscale demonstrated adequate internal consistency ( $\alpha = .78$ ). See Appendix B, page 46.

*Revised Trait Hope Scale (HS-R2)*. The HS-R2 (Shorey & Snyder, 2004) is an 18-item self-report measure that assesses hope, with scores ranging from 1 (Definitely False) to 8 (Definitely True). Higher scores on each lower order construct indicate greater levels of trait-based hope. The HS-R2 has high reliability and good measurement properties, and demonstrated high internal consistency in the present study ( $\alpha = .87$ ). See Appendix B, page 47.

*Revised Life Orientation Test (LOT-R)*. The LOT-R (Scheier, Carver, & Bridges, 1994) is a ten item self-report measure that assesses dispositional optimism. Scores on each item range from 0 (Strongly Disagree) to 4 (Strongly Agree), with higher scores demonstrating greater amounts of dispositional optimism. Only six of the ten items on the LOT-R scale are included in the final scoring, as the remaining four items are filler items. The LOT-R demonstrated good inter-rater reliability in previous samples ( $\alpha = .78$ ). Adequate internal consistency, test-retest reliability, and convergent and discriminant validity were established within the validation sample of the original life orientation test as well (Scheier & Carver, 1985). In the present study, optimism demonstrated high internal consistency ( $\alpha = .89$ ). See Appendix B, page 48.

*12 Item Grit Scale (GRIT)*. The GRIT scale (Duckworth et al., 2007) is a 12-item self-report measure that assesses persistence and perseverance for long-term goals. Scores on each item range from 1 (Not like me at all) to 5 (Very much like me) and items are averaged to create an overall assessment of grit on a 1 to 5 scale. Higher scores indicate greater levels of grit, or persistence and perseverance. The GRIT scale demonstrated good inter-rater reliability within the validation sample ( $\alpha = .79$ ) and adequate internal consistency in the present sample ( $\alpha = .78$ ). See Appendix B, page 49.

*Gratitude Questionnaire (GQ-6)*. The GQ-6 (McCullough, Emmons, & Tsang, 2002) is a six-item self-report measure designed to assess temperament and the ability to experience gratitude. Responses range from 1 (Strongly Disagree) to 7 (Strongly Agree), with higher scores indicating greater likelihood with which an individual experiences gratitude. The GQ-6 has demonstrated good internal consistency within other samples, with alphas ranging from .82 to .87 (McCullough et al., 2002). In the present study, the GQ-6 demonstrated good internal consistency ( $\alpha = .85$ ). See Appendix B, page 51.

#### *Weight Variables*

*Percentage Weight Loss (%WL)*. Weight was measured for all participants as they attended weekly group treatment sessions over the span of twenty-five weeks. Additionally, weight was measured at baseline (or pre-treatment) and again at post-treatment at the conclusion of the weekly group treatment sessions. A digital Tanita scale (TANITA Body Fat Analyzer Model TBF-105 K930599) was used to measure weight at baseline, post-treatment, and across the twenty-five weeks of treatment. Weight was transformed into %WL comparative to weight at baseline ( $weight_0$ ). %WL was calculated via the following formula:

$([weight_{pt} - weight_0] / weight_0) \times 100\%$ , where  $pt$  = post-treatment weight (6 months) and  $0$  = baseline.

*Body Fat Percentage Change (%BFC)*. Similar to weight, body fat percentage was calculated for all participants throughout the twenty-five weeks of treatment and at baseline and post-treatment. The same digital Tanita scale captured body fat percentage at each time point. %BFC was calculated relative to body fat percentage at baseline ( $body\ fat_0$ ) via the following formula:  $([body\ fat_{pt} - body\ fat_0] / body\ fat_0) \times 100\%$ , where  $pt$  = post-treatment body fat percentage (6 months) and  $0$  = baseline.

### *Demographic Factors and Covariates*

Participants provided information regarding a variety of demographic factors on the online screening questionnaire and via the Weight and Lifestyle Inventory (WALI; Wadden & Foster, 2006) that was completed before the study. See Appendix B, page 52. On the online screening questionnaire, participants self-reported demographic information such as age, sex, height, and weight. The height and weight variables were used to calculate BMI to determine if inclusion criteria were met. Height and weight were later confirmed using a body composition analyzer during the participants' baseline assessment visits. Participants provided race, ethnicity, highest level of education completed, and a comprehensive weight history as part of the WALI as well.

Additional variables served as covariates in the proposed analyses. Covariates included the demographic variables of age and gender and negative psychological variables. These psychological variables collected were depression, negative affect, and pessimism. Any study seeking to determine whether positive psychological factors are uniquely associated with weight and weight change needs to adjust for the influence of negative psychological factors. Such adjustment helps to establish that the contributions of positive factors are not functioning merely as the absence of negative factors.

### *Procedure*

Recruitment for the larger ongoing study was conducted in four waves, resulting in four cohorts of participants. The total number of participants were evenly balanced across all cohorts. Prospective participants were first invited to complete an online screening questionnaire that took approximately twenty minutes. The online screening questionnaire assessed for inclusion and exclusion criteria (mentioned above). Eligible participants were then invited to attend a one-



hour long information session detailing study requirements, including study duration (18 months) with 6-month post-treatment and a 1-year follow-up. See Figure 2 for study timeline. For the purposes of this study, only baseline and 6-month post-treatment data were utilized.

Prior to enrollment in the study, participants were required to have a medical clearance form signed by their medical provider if it was deemed necessary based on their responses on the online screening questionnaire. The purpose of this medical clearance form was to ensure safety of participation in a weight loss trial. Upon enrolling in the study and before the start of treatment, participants were asked to complete a number of take-home survey questionnaires and attend a two-hour baseline assessment appointment. Take-home survey questionnaires included measures that assess the positive psychological factors and demographic factors. Weight variables were assessed during the baseline laboratory appointment.

Following the baseline assessment appointment, participants in the larger trial were randomized to one of two treatment groups, either a standard behavioral treatment (SBT) or an acceptance-based treatment (ABT). The targeted American Indian arm was an open trial design, such that only ABT was employed. Since the American Indian arm was only given ABT, the total number of participants in the ABT treatment group is unbalanced. In total, 53 participants (15 male, 38 female) were randomized to SBT and 102 participants (22 male, 80 female) were randomized or allocated to ABT. Both treatments have been shown to be successful in helping individuals lose weight. Additionally, the cognitive-behavioral and acceptance-based principles of which both treatments were founded on have been empirically supported and validated (Forman et al., 2016; Forman, Butryn, Hoffman, & Herbert, 2009). Once randomized to treatment, participants began the active treatment phase of the study where they attended weekly group-based weight-loss treatment sessions spanning the course of twenty-five weeks. At the

conclusion of the treatment phase, participants completed another battery of take-home survey questionnaires (identical to the measures completed prior to the baseline assessment) and returned to the laboratory for their two-hour post-treatment assessment (at approximately 6 months following the start of treatment). Weight variables were again assessed during the post-treatment assessment.

All participants provided informed consent prior to participating in any part of the study. The study procedures and protocol are approved by the Oklahoma State University Institutional Review Board (IRB; AS1546). Participants were compensated for their time and received \$75.00 for the completion of each of each assessment visit (\$225 total for completion of all three assessments).

#### *Data Cleaning and Analyses*

The planned analyses were two multiple linear regressions examining all five positive psychological variables as predictors of %WL and %BFC while covarying for age, gender, depression symptoms, negative affect, and pessimism. To ensure that the data met assumptions for multiple regression, all data were thoroughly cleaned prior to data analysis. Missing data were addressed using a mean substitution approach and missing data were imputed when appropriate. Frequency tables were then generated to ensure that all values were within the correct range for each measure. All variables were also assessed for evidence of skewness and kurtosis. According to Kline (1998), it is recommended that skewness be less than 3.0 and kurtosis be less than 10.0. All variables met these recommendations. Finally, given the close theoretical and methodological similarities between the predictor variables (i.e., positive and negative psychological measures), these variables were assessed for multicollinearity using

bivariate correlation analyses. Several variables showed signs of potential multicollinearity issues: positive affect and hope ( $r = .64, p < .01$ ), and optimism and pessimism ( $r = -.72, p < .01$ ).

Variables showing signs of multicollinearity were examined further using the variance inflation factors (VIF) and tolerance (TOL) collinearity statistics from the originally planned regressions. When conducting these analyses, optimism showed potentially problematic VIF values (2.95, 3.00) as well as low TOL values (.34, .33) for both the %WL and %BFC models, respectively. These values were likely due to the high correlation between optimism and pessimism ( $r = -.72$ ). Thus, in an effort to address this issue, pessimism as a separate subscale was dropped from the analyses. Given that these items were no longer needed for the separate subscale, the items were reversed scored and added to the optimism subscale to create a six item scale of dispositional optimism that has been used in prior literature and has higher reliability (i.e.,  $\alpha = .78$  for the 3-item vs.  $\alpha = .89$  for the 6-item scale in the present study) (Scheier & Carver, 1985). As an additional multicollinearity correction, a composite negative affectivity score was created that consisted of averaged z-scores from the BDI-II and PANAS-NA. Analyses were then re-run using the alternate scoring of the optimism variable and the composite negative affectivity. Collinearity statistics improved such that VIF (1.73, 1.78) and TOL values (.58, .56) were no longer problematic for %WL and %BFC.

In sum, given the multicollinearity concerns and corrections, the final analyses conducted were as follows: Two multiple regressions were conducted such that demographic covariates of age and gender were entered in to the analysis in Step 1 along with the negative affectivity composite variable to ensure that any observed effects between positive psychological variables and weight indicators were independent from these covariates. All positive psychological variables were then entered in Step 2. Either %WL or %BFC was entered as the dependent (or

outcome) variable. To correct for testing of two correlated weight outcomes ( $r = .62$ ), a partial Bonferroni correction was applied yielding a  $p < .025$  required for significance in analyses of %WL and %BFC.

## CHAPTER III

### RESULTS

#### *Participant Characteristics*

A total of 155 participants enrolled in the COSMOS behavioral weight loss trial. After data cleaning, which is described in greater detail above, it was determined that 123 participants had sufficient data for analyses. Participants were excluded due to incomplete data for weight and/or body fat percentage. The final 123 participants included in the present analyses ranged in age from 21-65 years old ( $45.32 \pm 11.08$ ). Participants were primarily female (78.0%) and Caucasian (56.1%). Table 2 includes demographic data for participants and descriptive data for study measures, including %WL and %BFC. Bivariate correlations for all study measures are presented in Table 3.

#### *Primary Analyses*

Omnibus results from Step 1 of the model (with age, gender, and negative affectivity as predictors) were significant for both %WL ( $F(3, 104) = 4.52, p < .01$ ) and %BFC ( $F(3, 103) = 4.35, p < .01$ ), suggesting that age, gender, and negative affectivity accounted for 12% of the variance in both %WL (see Table 4) and %BFC (see Table 5). When evaluating Step 2 of the models to determine if the inclusion of the positive psychological factors explained additional variance for each outcome variable, results for %WL ( $\Delta R^2 = .02, p = .87$ ) and %BFC ( $\Delta R^2 = .06,$

$p = .22$ ) were non-significant. After accounting for the partial Bonferroni correction yielding a statistically significant finding of  $p < .025$ , none of the positive psychological factors significantly predicted %BFC.

#### *Sensitivity and Exploratory Analyses*

In addition to the two multiple regression analyses that were conducted to assess the primary aims of the study, sensitivity analyses were conducted to determine whether treatment condition (ABT vs. SBT) moderated the relationship between the positive psychological variables and weight indicators. Moderation analyses were conducted for each positive psychological factor by treatment group for both outcomes (%WL and %BFC). Results indicated no significant interaction effects were present for any of the positive psychological factors by treatment group for both outcomes ( $\beta = -.26-.93, p = .19-.89$ ).

Similar to the sensitivity analyses, exploratory analyses were conducted to determine if any of the positive psychological factors predicted %WL or %BFC when carrying forward the last known weight and body fat percentage. One additional exploratory analysis also examined if any of the positive psychological factors predicted treatment adherence, which was indexed as a percentage of the treatment sessions attended. Given that the last weight carried forward and last body fat percentage carried forward are correlated ( $r = .39$ ), the partial Bonferroni correction was also applied in these analyses yielding a  $p < .025$  required for significance. Results indicated that none of the positive psychological factors significantly predicted last weight carried forward ( $\Delta R^2 = .06, p = .21$ ) or last body fat percentage carried forward ( $\Delta R^2 = .09, p = .04$ ). Results predicting treatment adherence were also non-significant ( $\Delta R^2 = .04, p = .58$ ).

Post-hoc power analyses were also conducted utilizing parameters from the primary analyses (described above). Specifically, post-hoc power was calculated using F tests with fixed

models for  $R^2$  increase. Effect sizes were calculated for each multiple regression analysis:  $f^2 = 0.02$  for %WL,  $f^2 = 0.08$  for %BFC. These effect sizes, along with an alpha error probability of  $p < .025$  to account for the correlated outcome variables, were used to calculate power. For %WL, it was determined that with the present sample size ( $N = 123$ ) with eight predictors, power ( $1 - \beta$ ) was 0.08. Power was higher for %BFC, power ( $1 - \beta$ ) was 0.40 though still below recommended cut-offs. Taken together, post-hoc power analyses suggest that the primary analyses had an 8% chance of detecting an effect for %WL and a 40% chance for %BFC. Using the above effect sizes and 80% power, it was determined that 957 participants would have been needed to detect an effect for for %WL, and 242 participants would have been needed for %BFC. Given that the power hoc power analyses indicate we were underpowered to detect the effects between positive psychological variables and obesity treatment outcomes, especially for %WL, the following discussion is presented with acknowledgment of this critical limitation.

## CHAPTER IV

### DISCUSSION

The present study examined five positive psychological factors (hope, optimism, grit, gratitude, and positive affect) as concurrent predictors of weight and body fat percent change among obese individuals enrolled in a behavioral weight loss intervention. Contrary to the study hypotheses, greater positive affect and grit did not predict percent weight loss or percent change in body fat. Although no *a priori* hypotheses were made with regards to the other positive psychological factors, no associations were found for these variables with either outcome (%WL or %BFC). Results from the present study might suggest that positive psychological factors are not indicative of greater percent weight loss or percent change in body fat among obese individuals participating in a behavioral weight loss intervention. In particular, these null results may reflect the state of nature, such that there is no relationship between positive psychological factors and weight loss. However, key methodological limitations of the current study may also contribute to these null results. Both of these potential reasons for null findings (i.e., state of nature vs. methodological issues) are discussed below as well as the consistency of the current results with prior literature.

First, with regards to consistency with previous literature, our findings are consistent with prior findings by Fontaine & Cheskin (1999), Linde et al., 2004, and Benyamini & Raz (2007) suggesting that optimism does not directly relate to weight loss prospectively. These studies propose that positive psychological factors (i.e., optimism) do not have a direct effect on weight



loss. Results from the present study also suggest that optimism is not predictive of weight loss or change in body fat percentage across a six-month intervention. It may be possible that high levels of optimism may translate to greater confidence in the ability to lose weight, but this confidence may not translate to actual reductions in weight or body fat percentage over time (Benyamini & Raz, 2007).

However, conflicting evidence is also available. For example, one study examining the association between grit and BMI found that higher grit scores corresponded to lower BMI (Thomas et al., 2015). Similarly, though not an intervention study, another study has shown that individuals in obese class I (BMI ranging from 30.0-34.9 kg/m<sup>2</sup>) reported higher levels of positive affect compared to individuals of normal weight, suggesting that individuals in obese class I may not be as susceptible to negative mood states (Carr et al., 2007). Other cross-sectional studies suggest that optimism predicts or relates to healthy weight and/or weight control efforts (Taylor et al., 2004; Khullar et al., 2011; Sutin, 2013). Taken together, results from these five cross-sectional studies indicate that positive psychological factors may be associated with adiposity variables; however, these cross-sectional results cannot tell us whether positive psychological variables predict change in weight over time or due to intervention.

Two prior studies have utilized longitudinal designs (Oettingen & Wadden, 1991; Finch et al., 2005) and suggest that optimistic expectations may be key factors for weight change. However, both of these studies have key methodological differences from the current study which may account for the discrepant findings. For example, Oettingen & Wadden (1991) found optimistic expectations regarding weight loss success in women to be predictive of greater percent weight loss. Similarly, Finch et al., 2005 randomized participants to either an intervention centered on emphasizing optimistic messages or balanced messages and found that

participants with positive outcome expectations lost more weight. In both of these studies, optimism was either assessed in direct association with weight loss success (i.e., optimistic about weight loss outcomes) or intervened on directly. In the present study, optimism was measured as a trait level variable that was not specific to optimism about perceived weight loss outcomes. Therefore, it may be the case that trait level optimism alone is not predictive of weight change. In sum, half of the studies finding a link between positive psychological factors and adiposity are cross-sectional, and the existing longitudinal studies either find no relationship between positive factors and weight loss outcomes or only find support for positive factors as they predict weight change when measured specifically in the context of weight loss.

The above studies allude to the fact that positive factors may not be related to weight loss in reality. Several reasons may explain why positive psychological factors were not predictive of changes in weight or body fat percentage over time. First, as mentioned above, the present findings support prior research suggesting that greater levels of optimism may translate to greater confidence but perhaps not overt corresponding behavioral changes. These findings may extend to include other positive psychological factors as well. Second, the most successful behavioral weight loss interventions attribute their success to some combination of reduced caloric intake, increased physical activity, and implementation of a behavioral therapy. The present study included all of these elements; therefore, it may be the case that any changes in weight or body fat percentage are a result of these key intervention factors and not as a result of positive factors, though it is clear that variability in weight loss outcomes were found (i.e., not all participants lost weight nor had the same magnitude of weight loss). Finally, exploratory analyses suggest that positive psychological factors were not predictive, even when utilizing last weight or body fat percentage carried forward (i.e., intent-to-treat approach) or treatment adherence as the outcome

variables. These findings imply that positive psychological factors were not associated with weight loss outcomes even when including individuals who did not complete the treatment. Though a higher percentage of variance in percent change in body fat was detected (9% intent-to-treat vs. 6% completers sample), this change in variance also failed to reach significance.

Despite the fact that some evidence, including the present study, suggests that positive factors are not related to weight loss, it is also possible that methodological limitations of the current study and previous literature have contributed to the inability to detect an association between these variables and weight outcomes. For instance, several limitations regarding the present findings should be noted. First and foremost, the post-hoc power analyses conclude that the final analyses have an 8% chance of detecting an effect for percent weight loss and a 40% chance for percent change in body fat, indicating that the analyses are largely underpowered. Future studies should attempt to replicate these findings in an adequately powered sample in order to ascertain whether these positive psychological factors are predictive of changes in weight or body fat over time or not. Second, the sample was predominately female (78%) and participants endorsed elevated levels of some positive psychological factors (i.e., grit, gratitude). Future studies should attempt to recruit more men and participants with low, moderate, and high levels of each positive psychological factor. Third, the present study did not examine changes in positive psychological factors across treatment, so it is unknown if changes in these factors would correspond to greater changes in weight or body fat percentage. Future research should analyze whether changes in positive thinking styles have an impact on reductions in weight. If this relationship emerges, there may be utility in developing targeted interventions designed to promote positive thinking styles (or positive psychological factors) to aid with weight loss efforts. Fourth, the present study was conducted with outcomes measured at a 6-month interval.

While results suggest that positive psychological factors are not predictive of weight loss, future studies should examine whether they are predictive at longer intervals (e.g., 12, 24, 48 months) to determine if there is any impact on potential weight loss maintenance. Finally, the present study utilized self-report measures to assess baseline levels of positive psychological factors. Future research should attempt to develop more robust evaluations of these factors in order to combat the inaccuracies or biases that may result from self-report data.

Although the results of the present study are null, possibly due to methodological concerns, the data still have important strengths and potential implications. These findings help clarify the mixed literature with regards to the association between optimism and changes in weight, further supporting the studies that found that optimism may not be a key indicator of weight change over time. Also, the racial and ethnic composition of the present sample is more diverse in comparison to samples of other behavioral weight loss interventions, which is a strength of the study. Additionally, this study is the first to assess whether positive psychological factors concurrently predict changes in weight or body fat percentage within a structured intervention setting with strong experimental design. Given that the results are null and have small effects, if these findings truly reflect the state of nature it can be concluded that these factors may in fact not yield *clinically* significant reductions in weight or body fat even if *statistical* significance is achieved when using a larger sample.

In conclusion, positive psychological factors among individuals enrolled in a behavioral weight loss intervention did not predict reductions in weight or body fat percentage at the conclusion of a six-month intervention. Firm conclusions cannot be drawn given methodological weaknesses of the current study, especially low power to detect an effect. Given that the present study is the first to examine whether concurrent positive psychological factors predict changes in

weight and body fat percentage within an intervention setting, future research is needed to confirm and replicate these findings. Results from the present study suggest that positive psychological factors may not be necessary intervention targets to aid with weight loss success or potential long-term weight loss maintenance, although additional research that addresses some of the abovementioned methodological flaws is needed before drawing this conclusion definitively.

## REFERENCES

- Ahima, R. S., & Flier, J. S. (2000). Adipose tissue as an endocrine organ. *Trends in Endocrinology & Metabolism*, *11*(8), 327-332.
- Anderson, D. A., & Wadden, T. A. (1999). Treating the obese patient: suggestions for primary care practice. *Archives of Family Medicine*, *8*(2), 156.
- Aspinwall, L. G., & MacNamara, A. (2005). Taking positive changes seriously. *Cancer*, *104*(S11), 2549-2556.
- Aspinwall, L. G., & Staudinger, U. M. (2003). *A psychology of human strengths: Fundamental questions and future directions for a positive psychology*. American Psychological Association.
- Aspinwall, L. G., & Tedeschi, R. G. (2010). The value of positive psychology for health psychology: Progress and pitfalls in examining the relation of positive phenomena to health. *Annals of Behavioral Medicine*, *39*(1), 4-15.
- Benyamini, Y., & Raz, O. (2007). "I can tell you if I'll really lose all that weight": dispositional and situated optimism as predictors of weight loss following a group intervention. *Journal of Applied Social Psychology*, *37*(4), 844-861.
- Bond, D. S., Phelan, S., Leahey, T. M., Hill, J. O., & Wing, R. R. (2009). Weight-loss maintenance in successful weight losers: surgical vs non-surgical methods. *International Journal of Obesity*, *33*(1), 173-180.
- Butryn, M. L., Webb, V., & Wadden, T. A. (2011). Behavioral treatment of obesity. *The Psychiatric Clinics of North America*, *34*(4), 841.

- Byrne, S., Cooper, Z., & Fairburn, C. (2003). Weight maintenance and relapse in obesity: a qualitative study. *Int J Obes*, 27: 955–962.
- Carr, D., Friedman, M. A., & Jaffe, K. (2007). Understanding the relationship between obesity and positive and negative affect: the role of psychosocial mechanisms. *Body Image*, 4(2), 165-177.
- Carr, D., & Friedman, M. A. (2005). Is Obesity Stigmatizing? Body Weight, Perceived Discrimination, and Psychological Well-Being in the United States. *Journal of Health and Social Behavior*, 46(3), 244-259.
- Cawley, J., & Meyerhoeffer, C. (2012). The Medical Care Costs of Obesity: An Instrumental Variables Approach. *Journal of Health Economics*, 31(1): 219-230.
- Centers for Disease Control and Prevention. (2016).
- Centers for Disease Control and Prevention. (2015).
- Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 43(3), 245-265.
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), 1087.
- Dunlop, W. P., Cortina, J. M., Vaslow, J. B., & Burke, M. J. (1996). Metaanalysis of experiments with matched groups or repeated measures designs. *Psychological Methods*, 1, 170–177.
- Elfhag, K., & Rössner, S. (2005). Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obesity reviews*, 6(1), 67-85.

- Farooqi, I. S., & O'Rahilly, S. (2007). Genetic factors in human obesity. *Obesity Reviews*, 8(s1), 37-40.
- Farooqi, I. S., & O'Rahilly, S. (2005). Monogenic obesity in humans. *Annu. Rev. Med.*, 56, 443-458.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Finch, E.A., Linde, J.A., Jeffery, R.W., Rothman, A.J., King, C.M., & Levy, R.L. (2005). The Effects of Outcome Expectations and Satisfaction on Weight Loss and Maintenance: Correlational and Experimental Analyses – A Randomized Trial. *Health Psychology*, 24(6), 608-616.
- Finkelstein, E. A., Trogon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs*, 28(5), w822-w831.
- Fontaine, K. R., & Cheskin, L. J. (1999). Optimism and obesity treatment outcomes. *Journal of Clinical Psychology*, 55(1), 141-143.
- Flegal, K. M., Carroll, M. D., Kit, B. K., & Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *Jama*, 307(5), 491-497.
- Forman, E. M., Butryn, M. L., Hoffman, K. L., & Herbert, J. D. (2009). An open trial of an acceptance-based behavioral intervention for weight loss. *Cognitive and Behavioral Practice*, 16(2), 223-235.



- Forman, E. M., Butryn, M. L., Manasse, S. M., Crosby, R. D., Goldstein, S. P., Wyckoff, E. P., & Thomas, J. G. (2016). Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. *Obesity, 24*(10), 2050-2056.
- Freedman, D. S., Horlick, M., & Berenson, G. S. (2013). A comparison of the Slaughter skinfold-thickness equations and BMI in predicting body fatness and cardiovascular disease risk factor levels in children. *The American Journal of Clinical Nutrition, 98*(6), 1417-1424.
- French, S. A., Story, M., & Jeffery, R. W. (2001). Environmental influences on eating and physical activity. *Annual Review of Public Health, 22*(1), 309-335.
- Garrow, J. S., & Webster, J. (1985). Quetelet's index (W/H<sup>2</sup>) as a measure of fatness. *International Journal of Obesity, 9*(2), 147-153.
- Hill, J. O., & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science, 280*(5368), 1371-1374.
- Howell, R. T., Kern, M. L., & Lyubomirsky, S. (2007). Health benefits: Meta-analytically determining the impact of well-being on objective health outcomes. *Health Psychology Review, 1*(1), 83-136.
- Hu, F. (2008). *Obesity epidemiology*. Oxford University Press.
- Kearney, D.J., Milton, M.L., Malte, C.A., McDermott, K.A., Martinez, M., & Simpson, T.L. (2012). Participation in mindfulness-based stress reduction is not associated with reductions in emotional eating or uncontrolled eating. *Nutr Res, 32*: 413–420.

- Khullar, D., Oreskovic, N. M., Perrin, J. M., & Goodman, E. (2011). Optimism and the socioeconomic status gradient in adolescent adiposity. *Journal of Adolescent Health, 49*(5), 553-555.
- Kline, R. B. (1998). Principles and practice of structural equation modeling.
- Lee, H. (2012). The role of local food availability in explaining obesity risk among young school-aged children. *Social Science & Medicine, 74*(8), 1193-1203.
- Linde, J. A., Jeffery, R. W., Finch, E. A., Ng, D. M., & Rothman, A. J. (2004). Are unrealistic weight loss goals associated with outcomes for overweight women? *Obesity Research, 12*(3), 569-576.
- Maes, H. H., Neale, M. C., & Eaves, L. J. (1997). Genetic and environmental factors in relative body weight and human adiposity. *Behavior Genetics, 27*(4), 325-351.
- Maggard, M. A., Shugarman, L. R., Suttorp, M., Maglione, M., Sugerman, H. J., Livingston, E. H., ... & Rhodes, S. (2005). Meta-analysis: surgical treatment of obesity. *Annals of Internal Medicine, 142*(7), 547-559.
- McCullough, M. E., Emmons, R. A., & Tsang, J. A. (2002). The grateful disposition: a conceptual and empirical topography. *Journal of Personality and Social Psychology, 82*(1), 112.
- McTigue, K. M., Harris, R., Hemphill, B., Lux, L., Sutton, S., Bunton, A. J., & Lohr, K. N. (2003). Screening and interventions for obesity in adults: summary of the evidence for the US Preventive Services Task Force. *Annals of Internal Medicine, 139*(11), 933-949.
- Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S., & Marks, J. S. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Jama, 289*(1), 76-79.

- National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2012.
- National Institute of Health [NIH], 1998.
- Oettingen, G., & Wadden, T.A. (1991). Expectation, Fantasy, and Weight Loss: Is the Impact of Positive Thinking Always Positive? *Cognitive Therapy and Research*, 15(2), 167-175.
- Ogden, J. (2000). The correlates of long-term weight loss: a group comparison study of obesity. *International Journal of Obesity*, 24(8), 1018.
- Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin*, 131(6), 925.
- Rasmussen, H. N., Scheier, M. F., & Greenhouse, J. B. (2009). Optimism and physical health: A meta-analytic review. *Annals of Behavioral Medicine*, 37(3), 239.
- Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, 67(6), 1063.
- Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research*, 16(2), 201-228.
- Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychology*, 4(3), 219.
- Seligman, M. E., & Csikszentmihalyi, M. (2000). Special issue: Positive psychology. *American Psychologist*, 55(1), 5-14.
- Sherwood, N. E., Morton, N., Jeffery, R. W., French, S. A., Neumark-Sztainer, D., & Falkner, N. H. (1998). Consumer preferences in format and type of community-based weight control programs. *American Journal of Health Promotion*, 13(1), 12-18.

- Shorey, H. S., & Snyder, C. R. (2004). Development and validation of the domain hope scale-revised. *Unpublished manuscript, University of Kansas, Lawrence, Kansas.*
- Slack, T., Myers, C. A., Martin, C. K., & Heymsfield, S. B. (2014). The geographic concentration of US adult obesity prevalence and associated social, economic, and environmental factors. *Obesity, 22*(3), 868-874.
- Sørensen, T. I., Price, R. A., Stunkard, A. J., & Schulsinger, F. (1989). Genetics of obesity in adult adoptees and their biological siblings. *Bmj, 298*(6666), 87-90.
- Steptoe, A., Wright, C., Kunz-Ebrecht, S. R., & Iliffe, S. (2006). Dispositional optimism and health behaviour in community-dwelling older people: Associations with healthy ageing. *British Journal of Health Psychology, 11*(1), 71-84.
- Stunkard, A. J., Sørensen, T. I., Hanis, C., Teasdale, T. W., Chakraborty, R., Schull, W. J., & Schulsinger, F. (1986). An adoption study of human obesity. *New England Journal of Medicine, 314*(4), 193-198.
- Sutin, A. R. (2013). Optimism, pessimism and bias in self-reported body weight among older adults. *Obesity, 21*(9).
- Taylor, W. C., Baranowski, T., Klesges, L. M., Ey, S., Pratt, C., Rochon, J., & Zhou, A. (2004). Psychometric properties of optimism and pessimism: results from the Girls' Health Enrichment Multisite Studies. *Preventive Medicine, 38*, 69-77.
- Taylor, S. E., Kemeny, M. E., Reed, G. M., Bower, J. E., & Gruenewald, T. L. (2000). Psychological resources, positive illusions, and health. *American Psychologist, 55*(1), 99.
- Thomas, J.G., Seiden, A., Koffarnus, M. N., Bickel, W. K., & Wing, R. R. (2015). Delayed reward discounting and grit in men and women with and without obesity. *Obesity Science & Practice, 1*(2), 131-135.

- Vasan, R. S., Pencina, M. J., Cobain, M., Freiberg, M. S., & D'Agostino, R. B. (2005). Estimated risks for developing obesity in the Framingham Heart Study. *Annals of Internal Medicine*, *143*(7), 473-480.
- Wadden, T. A., & Foster, G. D. (2006). Weight and lifestyle inventory (WALI). *Obesity*, *14*(S3), 99S-118S.
- Wadden, T. A., Sarwer, D. B., Fabricatore, A. N., Jones, L., Stack, R., & Williams, N. S. (2007). Psychosocial and behavioral status of patients undergoing bariatric surgery: what to expect before and after surgery. *Medical Clinics of North America*, *91*(3), 451-469.
- Wang, S. S., Brownell, K. D., & Wadden, T. A. (2004). The influence of the stigma of obesity on overweight individuals. *International Journal of Obesity*, *28*(10), 1333-1337.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063.
- Wing, R. R. (2002). Behavioral weight control. *Handbook of Obesity Treatment*, *2*, 301-317.

## APPENDIX A

### INTRODUCTION

#### Overview

One of every three adults in the United States is obese (Centers for Disease Control and Prevention [CDC], 2016). Additionally, obesity-related medical conditions, such as heart disease, stroke, and type 2 diabetes, are some of the leading causes of preventable death (CDC, 2016). Thus, the financial burden of obesity is very costly as current healthcare costs for obesity range from \$147 billion to nearly \$210 billion per year (Cawley & Meyerhoeffer, 2012; Finkelstein, Trogdon, Cohen, & Dietz, 2009). An array of research has been conducted in an effort to better understand the causes and potential treatments of this prevalent and costly disease. While there is no single cause of obesity, past research has identified a number of contributing factors, such as genes, lifestyle behaviors, and psychological factors (National Institutes of Health [NIH], 1998). Importantly, psychological factors not only play a role in both the development and maintenance of obesity but also contribute to weight loss treatment success (Byrne, Cooper, & Fairburn, 2003). Such findings are important because obesity is a treatment-resistant disease. On average, about 80% of individuals return to or exceed their initial weight within 3-5 years following a weight-loss intervention (Byrne et al., 2003). Although past research has identified several psychological factors (e.g., greater confidence and self-esteem, lower depressive symptoms) associated with weight loss success and maintenance, the role of positive psychological factors (e.g., positive affect, optimism, grit) as they relate to obesity and weight loss has been relatively sparse.

The focus of the current study is to examine whether multiple positive psychological factors predict weight loss success as part of a behavioral weight loss intervention for persons with overweight or obesity. The results of this study will evaluate the role of these positive psychological factors in predicting weight loss success, which will help inform future intervention efforts. Prior to describing the current project in detail, pertinent background research will be presented on the basic definitions, epidemiology, etiology, and current treatments for obesity.

### *The Obesity Epidemic*

*Definitions.* According to the CDC, obesity is defined conceptually as weight that is higher than what is considered healthy given an individual's height with the assumption that the excess weight is due to accumulation of fat not muscle or fluid retention. Both obesity and extreme obesity are estimated using the body mass index (BMI), which is used as a screening tool for obesity. BMI is calculated using an individual's weight (kg) divided by height (m<sup>2</sup>) and has been shown to correlate with body fat percentage in most people (CDC, 2015; Freedman, Horlick, & Berenson, 2013; Garrow & Webster, 1985). As BMI does not account for body fat percentage in its calculation, it may not be the best measure of actual body fat among individuals with high muscle mass, older adults, or children (CDC, 2015). Operationally, obesity is defined as a BMI  $\geq 30$  kg/m<sup>2</sup> and can be categorized by severity with Class I obesity as least severe and Class III obesity as most severe (CDC, 2016). The severity levels correspond to medical risk as adults living with obesity are more susceptible to developing heart disease, type 2 diabetes, certain types of cancer, and stroke, all of which are among the leading causes of preventable death (CDC, 2016).

*Prevalence Rates.* Roughly 36.5% of adults in the United States are considered obese using the BMI  $\geq 30$  kg/m<sup>2</sup> definition. Thus, obesity is a large-scale public health concern (CDC, 2016). While more than one in three adults are considered obese, approximately 6.3% of these adults have extreme obesity (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2012). Prevalence rates of obesity are similar for both men and women, although women are twice as likely to have extreme (Class III) obesity (NIDDK, 2012).

Prevalence rates of obesity differ by racial and ethnic groups as well. On average, 49.5% of African Americans, 43.5% of Native Hawaiians or Other Pacific Islanders, 39.9% of American Indians and Alaska Natives, 39.1% of Hispanics, and 34.3% of Caucasians are considered obese according to the NIDDK. In comparison to the abovementioned racial and ethnic groups, rates of obesity among Asian Americans are much lower at approximately 11.6% (NIDDK, 2012). When examining extreme obesity, roughly 13.1% of African Americans, 5.7% of Caucasians, and 5% of Hispanics qualify as Class III (NIDDK, 2012).

*Obesity Incidence.* Research has identified the need of longitudinal studies to examine incidence rates of obesity. One longitudinal study, the Framingham Offspring Study, ran from 1971 to 2001 and examined incidence rates for developing obesity across a four-year period (Vasan, Pencina, Cobain, Freiberg, & D'Agostino, 2005). The study concluded that incidence of developing obesity across the four-year period ranged from 5-7% among non-obese women and 7-9% among non-obese men. In assessing the long-term risks of developing obesity across a 30-year estimate, similar rates were found for both men and women. The study concluded that 1 in 4 individuals were at risk for developing obesity in their lifetime (Hu, 2008; Vasan et al., 2005).

*Obesity Trends.* The rate of obesity among adults in the United States has more than doubled since the early 1960s, from 13.4% in 1962 to 35.7% in 2010 (NIDDK, 2012). Overall



prevalence rates remained relatively stable from 1999 to 2010; however, rates of obesity among men, black women, and Mexican-American women increased during this time frame (NIDDK, 2012). Obesity rates gradually increased from 1962 up until the late 1970s, when rates began to rise more steeply so that 70% of adults were considered either overweight, obese, or extremely obese by 2010 (Flegal, Carroll, Kit, & Ogden, 2012). More recently, this percentage has grown to 70.7%, which is 24% higher than the 46% of adults who fell within these categories in 1962 (CDC, 2016; Flegal et al., 2012). Obesity trends have consistently increased since the early 1960s, with more and more people falling in the obese or extreme obesity range each year. In summary, these trends only continue to highlight the obesity epidemic that has been sweeping the United States over the past 50 years.

### *Etiology of Obesity*

Obesity is a condition in which the body carries excess adipose or fat tissue. The primary cause of excess adiposity and obesity development involves energy or caloric intake that exceeds expenditure (Hu, 2008). However, there are a number of factors that contribute to an individual's ability to regulate their energy intake and expenditure. Regulating adiposity involves genetic, endocrine, environmental, behavioral, and psychosocial factors, all of which contribute to one's body weight and fat distribution (Hu, 2008).

To begin, there is a strong genetic contribution with regards to adiposity amount and distribution. Heritable factors related to obesity have been shown to be responsible for 45-75% of the variance in BMI (Maes, Neale, & Eaves, 1997; Sorenson, Price, Stunkard, & Schulsinger, 1989; Stunkard et al., 1986). These heritable factors likely contribute to adiposity via a number of different mechanisms, namely an individual's baseline metabolic energy expenditure and the division of nutrients between fat and lean tissue cells (Farooqi & O'Rahilly, 2007). Additionally,

past research has identified both monogenic and polygenic contributions to adiposity. The monogenic form of adiposity is a common single-gene disorder that primarily impairs satiety, which suggests that obesity is not a disease that results simply from metabolic dysregulation (Farooqi & O'Rahilly, 2007; 2005). Polymorphisms in other candidate genes (e.g., Trp64Arg variant in the Beta-3 adrenergic receptor gene, Val103Ile variant in the MC4R receptor gene) have been identified as contributors to adiposity onset as well. Although genome-wide association studies are needed to fully determine the genetic contributions to adiposity, research thus far provides evidence that genetic factors do in fact play a role in both onset and maintenance (Farooqi & O'Rahilly, 2007).

In addition to genetic factors, endocrine factors also contribute to obesity maintenance. Ahima & Flier (2000) detail the impact of adiposity on the endocrine system. Adipose tissue consists of adipocytes (lipid-filled cells) that provide storage for triglycerides, or the primary constituent of body fat. Leptin is a hormone produced by these adipocytes and is primarily responsible for satiety. Obese individuals have a tendency for decreased sensitivity to leptin, which results in difficulty detecting satiety cues (Ahima & Flier, 2000). Leptin dysregulation has also been shown to lead to a number of chronic health conditions, including metabolic and/or cardiovascular diseases along with immune dysfunction. These diseases/dysfunctions are a common consequence of obesity; therefore, it is crucial to monitor associated hormones and endocrine factors that predispose obese individuals for developing these conditions.

Similar to genetic and biological factors, environmental factors greatly contribute to obesity prevalence. Primarily, food and recreational environments can facilitate obesity. When individuals have limited access to healthy food options and live in an environment that does not promote living an active lifestyle, susceptibility for obesity increases (Lee, 2012; French, Story,

& Jeffery, 2001). A recent study by Slack and colleagues, 2014, also found obesity prevalence to be positively associated with unemployment, lack of physical activity, less education, reduced access to healthcare, and economic hardship. Taken together, many aspects of the environment increase risk for obesity prevalence and maintenance. Although these environmental factors may not be readily modifiable by the individual, it is important to understand which factors increase risk for obesity and find ways to best address them via public policies or community change.

Although the above biological and social factors contribute to both obesity onset and maintenance, behavioral factors also play a role, particularly diet, physical activity, and sedentary time (Hill & Peters, 1998). Improving diet quality, increasing physical activity, and reducing sedentary time can help prevent obesity (Mokdad et al., 2003; Hill & Peters, 1998). In addition, engaging in these behaviors over time can help individuals reduce or maintain their weight. Structured programs, or interventions, are recommended to promote these behaviors in an effort to effect long-term lifestyle change. Overall, diet, activity, and sedentary time are primary risk factors for obesity onset and maintenance and, unless acted on via intervention or lifestyle change, will likely contribute to the development of negative health conditions in the future.

Lastly, psychological factors, such as depression and stress, are also related to obesity onset and maintenance (NIDDK, 2012). Obesity is a condition that is highly stigmatized, which may lend a view that individuals living with obesity are unmotivated or lazy (Anderson & Wadden, 1999). Obese individuals who are aware of this negative viewpoint may internalize these feelings, thus making them more susceptible to experience negative psychological outcomes such as anxiety and depression. In addition, research has shown that these individuals often experience low self-esteem and dissatisfaction with body image as a result of internalizing

these feelings (Wadden et al., 2007). A study conducted by Byrne and colleagues (2003) examined weight loss maintainers in comparison with those who regained their lost weight and healthy-weight women. Several psychological characteristics that were found to be consistent across those who regained lost weight. These characteristics were: failure to achieve weight loss goals, dissatisfaction with the weight achieved, tendency to evaluate self-worth in terms of weight and shape, lack of vigilance with regard to weight control, black-and-white thinking style, and the tendency to use eating to regulate mood. As past research suggests, psychological factors may play a role in weight loss success and maintenance, which may help explain why many people with obesity regain weight following a weight loss intervention. As will be discussed in more detail below, certain psychological factors (e.g., positive psychological factors) have not been widely examined, despite their potential protective ability in preventing or mitigating the adverse impact of the negative psychological factors mentioned above.

### *Interventions for Obesity*

*Behavioral Weight-Loss Interventions.* Among individuals living with obesity, weight loss is recommended in order to reduce risk for an array of negative health outcomes (i.e., heart disease, stroke, type 2 diabetes, etc.). Most behavioral weight-loss interventions have been shown to lead to reductions in weight ranging from 7-10%, which in turn reduces some of the health risks associated with being overweight or obese (Butryn, Webb, & Wadden, 2011; McTigue et al., 2003). The most effective behavioral weight-loss interventions have been shown to involve a combination of reduced caloric intake, increased physical activity, and some type of behavior therapy (NIH, 1998). These interventions typically result in a reduction of 8-10% of initial body weight within 4-6 months of the start of treatment (Wing, 2002). Most interventions are delivered in either individual or group based sessions face-to-face, with individuals attending

these sessions on a weekly basis. Previous research has also found group based behavioral weight loss interventions to be the most effective treatment method available for obesity (Sherwood et al., 1998). Despite these short-term successes, existing behavioral interventions for weight loss do not have lasting effects for most participants (see section on Weight Loss Maintenance below).

*Surgical Weight Loss Interventions.* Although behavioral weight-loss intervention is considered the gold standard in helping overweight and obese individuals achieve significant weight loss, one alternative involves the use of surgical treatments for individuals living with extreme obesity. A meta-analysis conducted by Maggard and colleagues (2005) examined the effectiveness of surgical methods in the treatment of obesity, primarily through the use of bariatric surgery. Most bariatric surgeries involve a reduction in the size of the stomach by the insertion of a gastric band, removal of a portion of the stomach, or via resecting and redirecting the small intestine to a smaller area of the stomach. Results from the meta-analysis indicated that bariatric surgery is more effective than non-surgical treatments among individuals with a BMI of 40 kg/m<sup>2</sup> or greater. Among individuals with a BMI ranging from 35-39 kg/m<sup>2</sup> results did support the effectiveness of surgical treatments; however, the authors noted that these results could not be considered conclusive. Therefore, the use of surgical treatments can in fact be an effective alternative to achieving significant weight loss among individuals living with extreme obesity.

*Weight-Loss Maintenance Following Intervention.* While the majority of standard behavioral weight-loss interventions are successful in helping overweight and obese individuals achieve 8-10% weight loss in the short-term, it is known that most weight loss interventions do not have successful long-term outcomes (Kearney et al., 2012). Of the individuals who lost

weight as part of a behavioral weight loss intervention, on average 50% of the weight lost is regained within the first year. Further, an estimated 80% of individuals return to or exceed their initial weight within 3-5 years following the intervention (Byrne et al., 2003). It is also known that the type of intervention employed, whether it is pharmacological or behavioral, does not make a difference in weight loss success or maintenance. In addition, weight loss maintenance does not differ when surgical interventions are compared to non-surgical interventions, suggesting that some weight regain is likely to occur regardless of the initial weight-loss method (Bond, Phelan, Leahey, & Wing, 2009). The bottom line is that some – if not all – weight is almost always regained over time; therefore, future intervention efforts need to identify the factors that promote or facilitate sustained weight loss over the long term. Although they have not been fully explored, positive psychological factors may be potential variables which help enhance successful weight loss and/or weight loss maintenance.

#### *Positive Psychological Factors, Health, and Adiposity*

Positive psychology is the study of positive emotion, character, and institutions in relation to mental health and well-being (Seligman & Csikszentmihalyi, 2000). Positive psychological factors are defined broadly as those relating to positive human functioning and psychological health (Aspinwall & Tedeschi, 2010; Aspinwall & Staudinger, 2003; Seligman & Csikszentmihalyi, 2000). Evidence suggests that such positive factors may be associated with better health outcomes, such as improved neuroendocrine and immune functioning and attention to preventative behaviors and health risks (Rasmussen, Scheier, & Greenhouse, 2009; Howell, Kern, & Lyubomirsky, 2005; Aspinwall & MacNamara, 2005; Pressman & Cohen, 2005). For example, optimism has been shown to predict preventative health behaviors such as increased exercise, eating a healthier diet, and not smoking (Stephoe, Wright, Kunz-Ebrecht, & Iliffe, 2006;

Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). However, despite this evidence, few research studies have examined the association between positive psychological factors and excess adiposity. To date, the majority of research in this area has focused on the relationship between optimism and adiposity, more specifically as optimism relates to BMI. Among factors other than optimism, one study assessed the link between positive affect and BMI (Carr, Friedman, & Jaffe, 2007) while another assessed grit and BMI (Thomas, Seiden, Koffarnus, Bickel, & Wing, 2015). Results from these studies are discussed below.

*Optimism.* Optimism is defined as general positive outcome expectancies (Scheier & Carver, 1985). In total, only eight studies have examined the association between optimism and weight (e.g., BMI, weight loss). Optimism has been shown to be positively related to physical well-being and positive health behaviors, such as decreased tobacco use and increased exercise (Stephoe et al., 2006; Scheier & Carver, 1992). As a result, it may be the case that optimism predicts or relates to healthy weight and/or weight control efforts. Several studies have found higher dispositional optimism to be related to engaging in physical activity (Taylor et al., 2004) and under-reporting of weight (Sutin, 2013), and lower dispositional optimism to be related to increased adiposity (Khullar, Oreskovic, Perrin, & Goodman, 2011). Within the eight studies examining optimism and weight, only five assess optimism as a predictor or correlate of changes in adiposity over time.

Oettingen & Wadden (1991) first examined whether optimistic expectations predicted weight loss of obese women participating in a behavioral weight loss program. Results suggested that women with positive, optimistic expectations of their success at the start of the program lost more weight at week 17 and week 52 follow-up. Additionally, women with negative expectations had the poorest treatment outcomes and lost the least amount of weight. This study

was the first to examine optimistic expectations as a predictor of weight change over time, and found that optimism translated to greater percent weight loss.

Fontaine & Cheskin (1999) then evaluated the trait of dispositional optimism and its ability to predict program attendance and weight loss among individuals enrolled in weight loss treatment. Results indicated that dispositional optimism was unrelated to either program attendance or weight loss. Surprisingly, pessimism on the other hand was positively associated with attendance but not with weight loss. Even though individuals who scored higher on pessimism were more likely to stay in treatment, they were no more likely to lose weight in comparison to individuals high on dispositional optimism. This study examined dispositional optimism in relation to weight loss, and found results contrary to Oettingen & Wadden (1991), suggesting that optimism does not relate to obesity treatment outcomes.

Following Fontaine & Cheskin (1999), a study by Linde and colleagues (2004) assessed the role of optimism in predicting realistic goal setting for weight loss. Weight change within this study was measured as BMI change from baseline to eight weeks, six months, and eighteen months. Optimism was positively correlated with setting a realistic dream BMI, or having realistic weight loss goals in terms of BMI change. Unlike Fontaine & Cheskin, results from Linde et al., (2004) suggest that optimism may be related to weight control efforts via goal setting.

Finch et al., 2005 was the first study to examine the effects of optimism on weight loss within a randomized trial. Participants were randomly assigned to one of two weight loss programs: the first emphasizing an optimistic message focusing on the positive aspects of weight loss, or the second other emphasizing a more balanced message addressing both the positive and negative aspects of weight loss. Results indicated there were no significant differences between



the programs with regards to short term (two-month, six-month) and long-term (eighteen month) weight loss. However, positive outcome expectations, or participants who thought losing weight would have a positive effect on different aspects of their lives, were associated with weight loss. This is the first study to utilize an optimism based intervention to predict weight loss, and results suggest that this type of intervention does not translate to greater weight loss over time in comparison to a more balanced intervention. The authors did find support for positive outcome expectations being associated with weight loss, which is in line with the findings by Oettingen & Wadden (1991) suggesting that optimistic expectations are key for weight loss.

The final study assessing optimism as it relates to weight change was conducted by Benyamini & Raz (2007), which hypothesized that individuals higher in optimism would be more successful in their efforts to lose weight. In addition to assessing dispositional optimism, Benyamini & Raz examined the function of situated optimism, which is related to more ambitious goals and an overall greater confidence in goal attainment. Therefore, a secondary hypothesis predicted that dispositional optimism would be related to higher goal setting and a greater overall confidence of attaining these goals. Results indicated that dispositional optimism was in fact related to higher levels of confidence; however, it was overall unrelated to weight loss. These results suggest that individuals high on dispositional optimism may exhibit higher levels of confidence in their ability to achieve their weight loss goals, but this confidence may not translate to actual weight loss itself. It appears that the findings on the role of dispositional optimism in relation to weight change or weight control efforts are mixed. Therefore, future research is needed to assess the function of dispositional optimism in predicting weight change over time.

*Positive Affect.* Positive affect reveals the degree to which an individual feels enthusiastic, active, and alert (Watson, Clark, & Tellegen, 1988). Only one study has examined the association between positive affect and obesity. Carr et al., 2007, assessed the relationship between BMI and positive affect as mediated by health and psychosocial indicators (i.e., physical health, weight's impact on physical function, and interactions with other people). It was hypothesized that overweight and obese individuals would exhibit lower levels of positive affect when faced with negative interactions with others, given that this population has a tendency to be treated more negatively in comparison to individuals of normal weight (Carr & Friedman, 2005, 2006; Wang, Brownell, & Wadden, 2004). BMI was separated into categories based on overweight or obesity classification (e.g., obese class I, BMI = 30-34.9). Results indicated that individuals in obese class I reported higher levels of positive affect when compared to individuals of normal weight, suggesting that individuals in this category of mild-moderate obesity may not be as susceptible to negative affect or depressed mood. Health and psychosocial indicators did have an impact on mood though, even though individuals in obese class I reported both higher levels of positive affect and lower levels of negative affect. Therefore, health and psychosocial factors may play a role in affect regulation with regards to both positive and negative moods among overweight and obese individuals, and the extent to which positive affect may serve as a resilience factor in this relationship is unclear.

*Grit.* Grit is best defined as the persistence and perseverance to work towards long-term goals (Duckworth, Peterson, Matthews, & Kelly, 2007). Similarly to positive affect, only one study has examined grit's role in relation to adiposity. A study conducted by Thomas and colleagues (2015) assessed the relationship between delayed discounting, grit, and BMI among obese and non-obese individuals. The authors posit that grit may be an important predictor of

weight maintenance as maintaining a healthy weight involves a long-term commitment to lifestyle change. Results indicated that higher grit scores were associated with lower BMI, which suggests that grit may in fact play a role in implementing long-term lifestyle changes when it comes to weight control efforts.

*Synthesizing Limitations and Rationale for Present Study: Positive Psychological Factors in Weight Loss*

To date, ten studies in total have been conducted within this area and few have examined change in adiposity as part of weight-loss treatment. Within these studies, findings have been mixed with regards to optimism. Fontaine & Cheskin, 1999 and Benyamini & Raz, 2007 found dispositional optimism to be unrelated to weight loss, while results from Linde et al., 2004 suggest that optimism may be related to weight control efforts. As a result of these mixed findings, future research is needed to delineate the association between optimism and weight loss.

Further, no research exists examining hope, grit, gratitude, or positive affect as they relate to weight-loss treatment. Although one study has examined the association between positive affect and obesity (Carr et al., 2007), and another between grit and obesity (Thomas et al., 2015), neither of these studies evaluated changes in adiposity over time or as part of treatment. There is currently a huge gap in the literature with regards to positive psychological factors as they relate to obesity and weight change. Therefore, the goal of the present study seeks to address this gap by examining five positive psychological factors concurrently (i.e., hope, optimism, grit, gratitude, and positive affect) as predictors of weight change among obese individuals enrolled in an ongoing behavioral weight loss intervention.

## APPENDIX B

### PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word describing how you feel **right now**.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____	interested
_____	distressed
_____	excited
_____	upset
_____	strong
_____	guilty
_____	scared
_____	hostile
_____	enthusiastic
_____	proud
_____	irritable
_____	alert
_____	ashamed
_____	inspired
_____	nervous
_____	determined
_____	attentive
_____	jittery
_____	active
_____	afraid

## HS-R2

Directions: Read each item carefully. Using the scale shown below, please select the number that best describes YOU and put that number in the blank provided.

1	2	3	4	5	6	7	8
Definitely False	Mostly False	Somewhat False	Slightly False	Slightly True	Somewhat True	Mostly True	Definitely True

- \_\_\_\_\_ 1. I have trouble getting what I want in life.
- \_\_\_\_\_ 2. I clearly define the goals that I pursue.
- \_\_\_\_\_ 3. I can think of many ways to get out of a jam.
- \_\_\_\_\_ 4. I have many goals that I am pursuing.
- \_\_\_\_\_ 5. I prefer easy goals over hard goals.
- \_\_\_\_\_ 6. I have what it takes to get the job done.
- \_\_\_\_\_ 7. I have difficulty finding ways to solve problems.
- \_\_\_\_\_ 8. I give up easily.
- \_\_\_\_\_ 9. I'm not good at coming up with solutions.
- \_\_\_\_\_ 10. I create alternate plans when blocked.
- \_\_\_\_\_ 11. I do not try hard enough to overcome challenges.
- \_\_\_\_\_ 12. I go after goals that are difficult and challenging.
- \_\_\_\_\_ 13. I don't care about the goals I am pursuing.
- \_\_\_\_\_ 14. It is difficult to find ways to get what I want.
- \_\_\_\_\_ 15. As long as I have a chance, I'll keep trying.
- \_\_\_\_\_ 16. I cannot come up with new goals.
- \_\_\_\_\_ 17. I rarely get stuck finding a solution.
- \_\_\_\_\_ 18. I'm not very motivated.

## LOT-R

Please indicate the extent to which you agree with each item according to the following scale:

0  
Strongly  
Disagree

1  
Disagree

2  
Neutral

3  
Agree

4  
Strongly  
Agree

- \_\_\_\_\_ 1. In uncertain times, I usually expect the best.
- \_\_\_\_\_ 2. It's easy for me to relax.
- \_\_\_\_\_ 3. If something can go wrong for me, it will.
- \_\_\_\_\_ 4. I'm always optimistic about my future.
- \_\_\_\_\_ 5. I enjoy my friends a lot.
- \_\_\_\_\_ 6. It's important for me to keep busy.
- \_\_\_\_\_ 7. I hardly ever expect things to go my way.
- \_\_\_\_\_ 8. I don't get upset too easily.
- \_\_\_\_\_ 9. I rarely count on good things happening to me.
- \_\_\_\_\_ 10. Overall, I expect more good things to happen to me than bad.

## 12- Item Grit Scale

*Directions for taking the Grit Scale: Here are a number of statements that may or may not apply to you. For the most accurate score, when responding, think of how you compare to most people -- not just the people you know well, but most people in the world. There are no right or wrong answers, so just answer honestly!*

1. I have overcome setbacks to conquer an important challenge.  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all
2. New ideas and projects sometimes distract me from previous ones.\*  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all
3. My interests change from year to year.\*  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all
4. Setbacks don't discourage me.  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all
5. I have been obsessed with a certain idea or project for a short time but later lost interest.\*  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all
6. I am a hard worker.  
 Very much like me  
 Mostly like me  
 Somewhat like me  
 Not much like me  
 Not like me at all

7. I often set a goal but later choose to pursue a different one.\*

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

8. I have difficulty maintaining my focus on projects that take more than a few months to complete.\*

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

9. I finish whatever I begin.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

10. I have achieved a goal that took years of work.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

11. I become interested in new pursuits every few months.\*

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

12. I am diligent.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all



### The Gratitude Questionnaire-Six Item Form (GQ-6)

Using the scale below as a guide, write a number beside each statement to indicate how much you agree with it.

1 = strongly disagree

2 = disagree

3 = slightly disagree

4 = neutral

5 = slightly agree

6 = agree

7 = strongly agree

\_\_\_ 1. I have so much in life to be thankful for.

\_\_\_ 2. If I had to list everything that I felt grateful for, it would be a very long list.

\_\_\_ 3. When I look at the world, I don't see much to be grateful for.

\_\_\_ 4. I am grateful to a wide variety of people.

\_\_\_ 5. As I get older I find myself more able to appreciate the people, events, and situations that have been part of my life history.

\_\_\_ 6. Long amounts of time can go by before I feel grateful to something or someone

# **WEIGHT AND LIFESTYLE INVENTORY**



- 
- 
2. What has been your highest weight after age 21? \_\_\_\_\_ lbs. \_\_\_\_\_ yrs. old
  3. What has been your lowest weight (not due to illness) after age 21, which you have maintained for at least 1 year? \_\_\_\_\_ lbs. \_\_\_\_\_ yrs. old, maintained for \_\_\_\_\_ yrs.

Was this weight reached after a weight loss effort? (Circle one.) Yes No

4. Circle the number of the statement that best describes you. "During the past 6 months my weight has..."

- |  |   |
|--|---|
| 1. decreased more than 10 lbs. or more | 4. increased by 5 to 19 lbs.              |
| 2. decreased by 5 to 10 lbs.           | 5. increased by more than 10 lbs. or more |
| 3. been relatively stable              |   |

5. What was your weight: 6 months ago? \_\_\_\_\_ lbs. 1 year ago? \_\_\_\_\_ lbs. 2 years ago? \_\_\_\_\_ lbs.

**SECTION C: FAMILY**

1. Do you have children? \_\_\_ Yes \_\_\_ No

A. If yes, please list their ages: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**SECTION E: WEIGHT LOSS HISTORY**

1. Please record your major weight loss efforts, (i.e., diet, exercise, moderation, etc.) which resulted in a weight loss of 10 pounds or more. Take time to think over your previous efforts, starting with the first one, whether in childhood or adulthood. You may have difficulty remembering this information at first, but most people can if they take their time. Start with your first weight loss effort and proceed in order until you reach your most recent one.

	Age at time of effort	Weight at start of effort	# lbs. lost	Method used to lose weight
a.	_____	_____	_____	_____
	_____	_____	_____	_____

b. \_\_\_\_\_  
\_\_\_\_\_

c. \_\_\_\_\_  
\_\_\_\_\_

d. \_\_\_\_\_  
\_\_\_\_\_

e. \_\_\_\_\_  
\_\_\_\_\_

f. \_\_\_\_\_  
\_\_\_\_\_

g. \_\_\_\_\_  
\_\_\_\_\_

h. \_\_\_\_\_  
\_\_\_\_\_

i. \_\_\_\_\_  
\_\_\_\_\_

j. \_\_\_\_\_  
\_\_\_\_\_

**Please turn to the last page if you need additional space.**

2. In the past year, how many times have you started a weight loss program on your own that lasted for more than 3 days? \_\_\_\_\_
3. In the past year, how many times have you started a weight loss program that lasted for 3 days or less? \_\_\_\_\_
4. Have you ever experienced any significant physical or emotional symptoms while attempting to lose weight or after losing weight? (Circle one.) Yes    No

If yes, please describe your symptoms, how long they lasted and the type of professional help sought, if any.

Problem Help	Year	Duration	Type of Professional (wks.)
_____	_____	_____	
_____			

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SECTION F: WEIGHT LOSS GOALS**

1. How much weight would you like to lose at this time? \_\_\_\_\_ lbs.
2. This would bring you down to a body weight of \_\_\_\_\_ lbs.
3. When did you last weigh this amount? \_\_\_\_\_
4. How long was this weight maintained? \_\_\_\_\_ months
5. Was it achieved after a weight loss effort? (Circle one.) Yes No
6. If you are successful in our program, in changing your eating and exercise habits, how much weight do you realistically expect to lose after:
  - a. 6 months \_\_\_\_\_ lbs.
  - b. 12 months \_\_\_\_\_ lbs.

**SECTION G: TOBACCO AND ALCOHOL USE**

1. Do you currently smoke cigarettes? (Circle one.) Yes No  
If yes,
  - a. How many do you smoke a day? \_\_\_\_\_
  - b. How many years have you smoked? \_\_\_\_\_
2. Have you ever smoked cigarettes and stopped? (Circle one.) Yes No  
If yes,
  - a. When did you stop smoking? \_\_\_\_\_
  - b. How many cigarettes did you smoke? \_\_\_\_\_/day
  - c. Did you experience any weight gain after stopping smoking? (Circle one.) Yes No  
If yes, how many pounds? \_\_\_\_\_
3. During the past year:
  - a. How many glasses of wine did you typically drink a week? \_\_\_\_\_
  - b. How many bottles of beer did you typically drink a week? \_\_\_\_\_

- c. How many mixed drinks or liqueurs did you typically have a week? \_\_\_\_\_
4. Have you ever had a problem with alcohol consumption or the use of other drugs?  
(Circle one.) Yes No
- a. If yes, please describe the problem and any help you received for it.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**SECTION J: EATING PATTERNS I**

1. During the past 6 months, did you often eat an unusually large amount of food within a two hour period (an amount that most people would agree is unusually large)? (Circle one.) Yes No
2. During the times when you ate an unusually large amount of food, did you often feel you could not stop eating or control what or how much you were eating? (Circle one.) Yes No

**IF NO, SKIP TO QUESTION 11 in this section. Do not complete questions 3-10.**

3. During the past 6 months, how often, on average, did you have times when you ate unusually large amounts of food and felt that your eating was out of control? (There may have been some weeks when it was not present- just average those in.) (Circle one.)
- |                             |                             |
|-----------------------------|-----------------------------|
| a. Less than one day a week | d. Four or five days a week |
| b. One day a week           | e. Nearly every day         |
| c. Two or three days a week |                             |
4. Did you usually have any of the following experiences during these occasions? Complete all items.
- a. Eating much more rapidly than usual? (Circle one.)

Yes No

b. Eating until you felt uncomfortably full? (Circle one.)

Yes No

c. Eating large amounts of food when you didn't feel physically hungry? (Circle one.)

Yes No

d. Eating alone because you were embarrassed by how much you were eating? (Circle one.)

Yes No

e. Feeling disgusted with yourself, depressed or feeling very guilty after overeating? (Circle one.)

Yes No

f. Eating large amounts of food throughout the day with no planned mealtimes? (Circle one.)

Yes No

5. Think about a typical time when you ate this way (that is, large amounts of food and feelings that your eating was out of control).

What time of day did the episode start? (Circle one.)

- a. Morning (8 AM to 12 Noon)
- b. Early afternoon (12 Noon to 4 PM)
- c. Late afternoon (4 PM to 7 PM)
- d. Evening (7 PM to 10 PM)
- e. Night (After 10 PM)

6. Approximately how long did this episode of eating last, from the time you started to eat until when you stopped and did not eat again for at least two hours? \_\_\_\_\_ hours  
\_\_\_\_\_ minutes

7. As best as you can remember, please list everything you might have eaten or drunk during that episode. If you ate for more than two hours, describe the food eaten and liquids drunk that you ate the most. Be specific- include amounts and brand names (when possible). Estimate as best as you can.

For example: 7 ounces Ruffles potato chips; 1 cup Breyer's chocolate ice cream with 2 teaspoons of hot fudge; two 8-ounce glasses of Coca-Cola; and 1 1/2 ham and cheese sandwiches with mustard.

FOOD	AMOUNT	BRAND (if possible)
_____	_____	
_____	_____	
_____	_____	

_____	_____
_____	_____
_____	_____




8. At the time this episode started, how long had it been since you had previously finished eating a meal or snack?  
\_\_\_\_\_ hours \_\_\_\_\_ minutes

9. In general, during the past 6 months, how upset were you by overeating episodes in which you ate unusually large amounts of food? (Circle one.)

- a. Not at all
- b. Slightly
- c. Moderately
- d. Greatly
- e. Extremely

10. In general, during the past 6 months, how upset were you by feeling that you could not stop eating or could not control what or how you were eating? (Circle one.)

- a. Not at all
- b. Slightly
- c. Moderately
- d. Greatly
- e. Extremely

11. In general, during the past 6 months, how important has your weight or shape been in how you feel about or evaluate yourself as a person-compared to other aspects of your life (i.e. how you do at work, as a parent, or how you get along with other people)?

Weight and shape...

- a. were not very important
- b. played a part in how I felt about myself
- c. were among the main things that affected how I felt about myself
- d. were the most important things that affected how I felt about myself

12. During the past 3 months, did you ever make yourself vomit in order to avoid gaining weight after binge eating? (Circle one.) Yes No

If Yes: How often, on average, was that? (Circle one.)

- a. Less than once a week
- b. Once a week
- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

13. During the past 3 months, did you ever take more than twice the recommended dose of laxatives in order to avoid gaining weight after binge eating? (Circle one.) Yes No  
If Yes: How often, on average, was that? (Circle one.)

- a. Less than once a week
- b. Once a week
- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

14. During the past 3 months, did you ever take more than twice the recommended dose of diuretics (water pills) in order to avoid gaining weight after binge eating? (Circle one.) Yes No

If Yes: How often, on average, was that?

- a. Less than once a week
- b. Once a week
- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

15. During the past 3 months, did you ever fast (not eat anything at all for at least 24 hours) in order to avoid gaining weight after binge eating? (Circle one.) Yes No

If Yes: How often, on average, was that?

- a. Less than once a week
- b. Once a week

- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

16. During the past 3 months, did you ever exercise for more than one hour specifically in order to avoid gaining weight after eating? (Circle one.)  
Yes    No

If Yes: How often, on average, was that?

- a. Less than once a week
- b. Once a week
- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

17. During the past 3 months, did you ever take more than twice the recommended dosage of a diet pill in order to avoid gaining weight after binge eating? (Circle one.) Yes    No

If Yes: How often, on average, was that?

- a. Less than once a week
- b. Once a week
- c. Two or three times a week
- d. Four or five times a week
- e. More than five times a week

## SECTION L: PHYSICAL ACTIVITY

1. To what extent do you enjoy physical activity? (Check one.)

- not at all
- slightly
- moderately
- greatly

2. Do you have any physical problems that limit your physical activity? (Circle one.) Yes No

If yes, please describe.

---

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3. Please check the types of physical activity that you enjoy. Check only those that you have participated in during the last year.

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> a. walking outside                        | <input type="checkbox"/> f. biking (stationary)  | <input type="checkbox"/> k. golf              |
| <input type="checkbox"/> b. walking (indoors, including treadmill) | <input type="checkbox"/> g. aerobic class        | <input type="checkbox"/> l. dancing           |
| <input type="checkbox"/> c. jogging                                | <input type="checkbox"/> h. tennis/racket sports | <input type="checkbox"/> m. strength training |
| <input type="checkbox"/> d. running                                | <input type="checkbox"/> i. swimming             |   |
| <input type="checkbox"/> e. biking outside                         | <input type="checkbox"/> j. basketball           |   |
| <input type="checkbox"/> n. other, Please describe                 |  |   |

---

4. For your most preferred activity, how many times have you participated in this activity in the past 6 months? \_\_\_\_\_ times

5. How many hours of TV do you watch on an average weekday? \_\_\_\_\_ hours

6. How many hours of TV do you watch on an average weekend day? \_\_\_\_\_ hours

7. Approximately how many city blocks or the equivalent do you regularly walk each day? \_\_\_\_\_ blocks (12 blocks = 1 mile)

8. How many flights of stairs do you climb up each day? \_\_\_\_\_ flights a day (1 flight = 10 steps)

9. Please describe your daily lifestyle activity (i.e., how active you are) by picking any number from 1 to 10 in which

1 = very sedentary and 10 = very active. Your number is: \_\_\_\_\_

**SECTION M: FAMILY AND LIVING ARRANGEMENTS**

1. I am currently: (Check one.)

- Single
- Married
- Divorced
- Separated
- Widowed

2. Currently, I am: (Check all that apply.)

- living alone
- living with a spouse/partner
- living with a significant other
- living with children
- living with parents/step-parents
- living with other relatives
- living with roommates

3. Please indicate the total number of persons living in your home. \_\_\_\_\_

4. If you are currently involved in an intimate relationship (significant other), please answer these questions.

What is this person's attitude towards your efforts to lose weight? (Circle one)

- a. strongly supports my efforts
- b. supports my efforts
- c. neutral
- d. opposes my efforts
- e. strongly opposes my efforts
- f. Please describe briefly what this person does either to help or hinder your efforts to lose weight.

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5. Will other people oppose or undermine your efforts to lose weight? (Circle one.) Yes No  
If yes, how many will? \_\_\_\_\_

a. Who are these people? \_\_\_\_\_

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**SECTION O: PSYCHOLOGICAL FACTORS**

1. Have you ever had any problems anytime with depression, anxiety, or other emotions that disrupted your normal functioning? (Circle one.) Yes No

2. Have you ever sought professional help for emotional problems? If yes, specify below.

Problem	Year	Duration (wks.)	Type of Professional Help
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. During the past month, have you felt depressed, sad, or blue much of the time? (Circle one.)

Yes No

4. During the past month, have you often felt hopeless about the future? (Circle one.)

Yes No

5. During the past month, have you had little interest or pleasure in doing things? (Circle one.)

Yes No

6. Have you ever been subjected to physical abuse? (Circle one.)

Yes No

7. Have you ever been subjected to sexual abuse? (Circle one.)

Yes No

8. Are any of your immediate family members alcoholic? (Circle one.)

Yes No

**SECTION P: TIMING**

1. Please indicate if you are currently experience any greater than usual stress in your life related to the following events. Complete each item by circling the appropriate box.

a. Work: (Circle one.) Yes No

- |  |     |    |
|--|-----|----|
| b. Health: (Circle one.)                                     | Yes | No |
| c. Relationship with spouse/significant other: (Circle one.) | Yes | No |
| d. Activities related to your children: (Circle one.)        | Yes | No |
| e. Activities related to your parents: (Circle one.)         | Yes | No |
| f. Legal/financial trouble: (Circle one.)                    | Yes | No |
| g. School: (Circle one.)                                     | Yes | No |
| h. Moving : (Circle one.)                                    | Yes | No |
| i. Other: _____  |     |    |

Please explain in a sentence any items to which you responded yes:

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2. Are you planning any major life changes (i.e., new job, moving, relationship, etc.) during the next 6 months?  
 (Circle one.) Yes No

If yes, please briefly describe below:

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3. How stressful has your life been during the past 6 months? (Circle one.)

1. much less stressful than usual
2. less stressful than usual
3. average level of stress
4. more stressful than usual
5. much more stressful than usual

4. How stressful do you think that your life will be in the next 6 months, excluding your efforts to lose weight. Pick a number from above. \_\_\_\_\_
5. How motivated are you to lose weight at this time? Pick a number between 1 and 10, in which 1 = not motivated and 10 = greatest motivation you have ever had. Your number is: \_\_\_\_\_
6. Why do you want to lose weight right now, as compared to 1 year ago? What has prompted you to lose weight now?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
7. What is the single most important thing that you hope to achieve as a result of losing weight?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
8. People who want to achieve long-term weight control need to spend at least 30 minutes a day, for a minimum of 6 months trying to change their eating, exercise, and thinking habits.

Please check the number below that best describes you:

- \_\_\_\_\_ 1. I definitely will not be able to devote 30 minutes daily to weight control.
- \_\_\_\_\_ 2. I'm not sure if I can find 30 minutes daily for weight control.
- \_\_\_\_\_ 3. I can definitely find 30 minutes daily for weight control.
- \_\_\_\_\_ 4. I can devote more than 30 minutes daily to weight control.
9. Rate how confident you are that you will be able to significantly change your eating and exercise habits. Pick a number from 1 to 10 in which 1 = not all confident and 10 = extremely confident. Your number is: \_\_\_\_\_

Please use this space to discuss any other information that you think is important to understanding you and/or your weight and your successful participation in the program. The last page provides additional space, if needed.

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## SECTION Q: MEDICAL HISTORY

1. Please indicate if you have had any of the medical conditions listed below:

	YES	NO
Heart Disease		
Angina (chest pains)		
Palpitations, heart beats fast or hard		
Stroke, mild stroke (cerebrovascular accident)		
Rheumatic fever		
Heart murmur		
Pacemaker		
Breathing problems (asthma, lung disease)		
High blood pressure		
Anemia		
Back problems		
Joint or bone problems		
Hiatal hernia		
Arthritis		
Gout (elevated uric acid)		
Gallbladder disease		
Thyroid problems		
Kidney disease		
Ulcers		
Bowel disease		
Liver disease		
Diabetes (type I or II)		
Sleep Apnea		
Bodily pain		

Other (specify)		
-----------------	--	--

2. List all medications you currently take (including vitamins and supplements). Please indicate the dosage and frequency (number of times a day) of each medication.

Medication	Dosage	Frequency	Reason for taking
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Please indicate your primary care physician’s name, telephone number, and address here.

Name: \_\_\_\_\_

Tel: \_\_\_\_\_

Address:

\_\_\_\_\_

\_\_\_\_\_

**ADDITIONAL INFORMATION** (Please use this space to provide any additional information that you think is important to understanding you or your weight problem, as well as the goals you seek.)

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Physical Activity Readiness Questionnaire (PAR-Q)

1. Has your doctor ever said that you have a heart condition and that you should only perform physical activity recommended by a doctor?

Yes

No

2. Do you feel pain in your chest when you perform physical activity?

Yes

No

3. In the past month, have you had chest pain when you were not performing any physical activity?

Yes

No

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

Yes

No

5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?

Yes

No

6. Is your doctor currently prescribing any medication for your blood pressure or for a heart condition?

Yes

No

7. Do you know of any other reason why you should not engage in physical activity?

Yes

No

**Oklahoma State University Institutional Review Board**

Date Wednesday, July 11, 2018 Protocol Expires: 7/10/2019  
IRB Application No: AS1546  
Proposal Title: Cognitive and self-regulatory mechanisms of obesity study(COSMOS)

Reviewed and Expedited  
Processed as: Continuation

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s)

Misty Hawkins

Stillwater, OK 74078

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Approvals are valid until the expiration date, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

- The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The following modifications are approved as part of this continuation:  
Blood Samples - Add Leptin to biomarkers being analyzed  
Consent - Electronic consent to reconsent subjects for the Leptin test  
No Changes in specimen storage.

Enrollment closed subjects still in follow up. No change in benefits, no reportable events, complaints or new/additional funding. Withdrawals: 1 participant was found to be ineligible after completing the first assessment (BMI <27), 2 participants consented to join the study, completed the baseline blood draw, but did not complete baseline assessment or initiate treatment, 16 participants were lost to follow-up with no known reason, 10 participants discontinued intervention for personal reasons

Signature:



Hugh Crethar, Chair, Institutional Review Board

\_\_\_\_\_  
Wednesday, July 11, 2018  
Date

## TABLES AND FIGURES

Table 1

*Body Mass Index (BMI) Classification*

Classification	BMI (kg/m <sup>2</sup> )
Underweight	< 18.5
Normal	18.5 to 24.9
Overweight	25.0 to 29.9
Class I Obesity	30.0 to 34.9
Class II Obesity	35.0 to 39.9
Class III Obesity	40 or higher

*Note:* Class III Obesity is often categorized as extreme or severe obesity (CDC, 2016)

Table 2

*Participant Characteristics and Descriptive Data for Study Measures*

	<i>M ± SD</i> or N (%)	
	Total Sample/Intent to Treat N = 155	Treatment Completers N = 123
Participant Characteristics		
Age	44.90 ± 11.13	45.32 ± 11.08
Gender (female)	118 (76.1)	96 (78.0)
Race/Ethnicity		
African American	5 (3.2)	4 (3.3)
American Indian/Alaskan Native	40 (25.8)	30 (24.4)
Asian/Pacific Islander	2 (1.3)	1 (0.8)
Caucasian	81 (52.3)	69 (56.1)
Other	18 (11.6)	14 (11.4)
Multiracial	6 (3.9)	4 (3.3)
Unknown	3 (1.9)	1 (0.7)
Treatment Group		
ABT	102 (65.8)	80 (65.0)
SBT	53 (34.2)	43 (35.0)
Positive Psychological Factors		
Positive Affect (10-50)	29.64 ± 8.72	29.48 ± 8.77
Hope (18-144)	104.83 ± 18.46	105.45 ± 17.72
Optimism (0-24)	15.09 ± 4.91	14.91 ± 4.97
Grit (1-5)	3.61 ± 0.50	3.56 ± 0.50
Gratitude (7-42)	34.47 ± 7.11	34.80 ± 7.12
Covariates		
Depressive Symptoms (0-63)	11.74 ± 8.24	11.88 ± 8.33
Negative Affect (10-50)	17.00 ± 5.74	16.39 ± 5.49
Negative Affectivity Composite	.01 ± .83	-.04 ± .82
Weight Indicators		
Percent Weight Loss	5.79 ± 6.14	6.64 ± 6.09
Percent Body Fat Change	5.04 ± 12.54	5.97 ± 12.88

*Note:* n = 155 for participants who enrolled with intent to treat. n = 123 for participants who completed treatment. ABT = Acceptance Based Treatment. SBT = Standard Behavioral Treatment. Continuous variables are presented as *M ± SD*. Categorical variables are presented as N (%). The range for each scale is presented in parentheses next to each positive psychological factor and covariate. The negative affectivity composite variable is comprised of averaged z-scores for depressive symptoms and negative affect.



Table 3

*Correlations between Positive Psychological Factors, Covariates, and Weight Indicators*

	1	2	3	4	5	6	7	8	9	10	11	12
<b>Positive Psychological Factors</b>												
1. Positive Affect	--											
2. Hope	<b>.64</b>	--										
3. Optimism	<b>.47</b>	<b>.43</b>	--									
4. Grit	<b>.24</b>	<b>.47</b>	<b>.25</b>	--								
5. Gratitude	<b>.44</b>	<b>.62</b>	<b>.44</b>	<b>.20</b>	--							
<b>Covariates</b>												
6. Age	.06	-.02	<b>.22</b>	<b>.21</b>	-.02	--						
7. Gender	-.08	.06	.03	.06	.11	-.13	--					
8. Depressive Symptoms	<b>-.29</b>	<b>-.30</b>	<b>-.50</b>	<b>-.26</b>	<b>-.20</b>	-.08	.01	--				
9. Negative Affect	<b>-.23</b>	<b>-.44</b>	<b>-.24</b>	-.13	<b>-.49</b>	-.14	.01	<b>.38</b>	--			
10. NA	<b>-.31</b>	<b>-.45</b>	<b>-.45</b>	<b>-.24</b>	<b>-.43</b>	-.12	.03	<b>.83</b>	<b>.83</b>	--		
<b>Weight Indicators</b>												
11. %WL	.05	.02	-.08	.02	-.00	.16	<b>-.22</b>	-.04	-.13	-.08	--	
12. %BFC	.15	.07	-.02	-.07	-.12	.07	<b>-.26</b>	-.08	-.11	-.11	<b>.62</b>	--

Note: NA is the negative affect composite variable and is an average of z-scores for depressive symptoms and negative affect. %WL = Percent Weight Loss. %BFC = Percent Body Fat Change. Bolded, shaded coefficients are significant at  $p < .01$  level. Bolded coefficients are significant at  $p < .05$  level.

Table 4

*Multiple Regression Analysis of Positive Psychological Factors Predicting Percent Weight Loss*

	$\beta$	SE	R <sup>2</sup>	$\Delta R^2$	<i>p</i>
Step 1			<b>.12</b>		<b>.005**</b>
Age	.09	.05			.362
Gender	<b>-.31</b>	<b>1.54</b>			<b>.002**</b>
Negative Affectivity	-.03	.70			.790
Step 2			.14	.02	.871
Age	.12	.06			.275
Gender	<b>-.29</b>	<b>1.64</b>			<b>.006**</b>
Negative Affectivity	-.07	.90			.580
Positive Affect	.01	.09			.944
Hope	.03	.05			.854
Optimism	-.16	.15			.196
Grit	-.001	1.46			.995
Gratitude	.05	.11			.679

*Note:* Standardized estimates are presented for all predictor variables. NA is the negative affect composite variable and is an average of z-scores for BDI-II and PANAS-NA.

\*\**p* < .01.

Table 5

*Multiple Regression Analysis of Positive Psychological Factors Predicting Body Fat Percent Change*

	$\beta$	SE	$R^2$	$\Delta R^2$	$p$
Step 1			<b>.12</b>		<b>.006**</b>
Age	-.01	.12			.956
Gender	<b>-.33</b>	<b>3.43</b>			<b>.001**</b>
Negative Affectivity	-.06	1.57			.527
Step 2			.18	.06	.222
Age	.03	.12			.765
Gender	<b>-.27</b>	<b>3.54</b>			<b>.010*</b>
Negative Affectivity	-.13	1.94			.287
Positive Affect	.10	.20			.432
Hope	.21	.12			.190
Optimism	-.08	.34			.514
Grit	-.16	3.17			.174
Gratitude	-.25	.23			.045

*Note:* Standardized estimates are presented for all predictor variables. NA is the negative affect composite variable and is an average of z-scores for depressive symptoms and negative affect.

\* $p < .025$ . \*\* $p < .01$ .

Figure 1

*CONSORT Diagram for COSMOS Study with Open Trial Pilot Arm in American Indians*

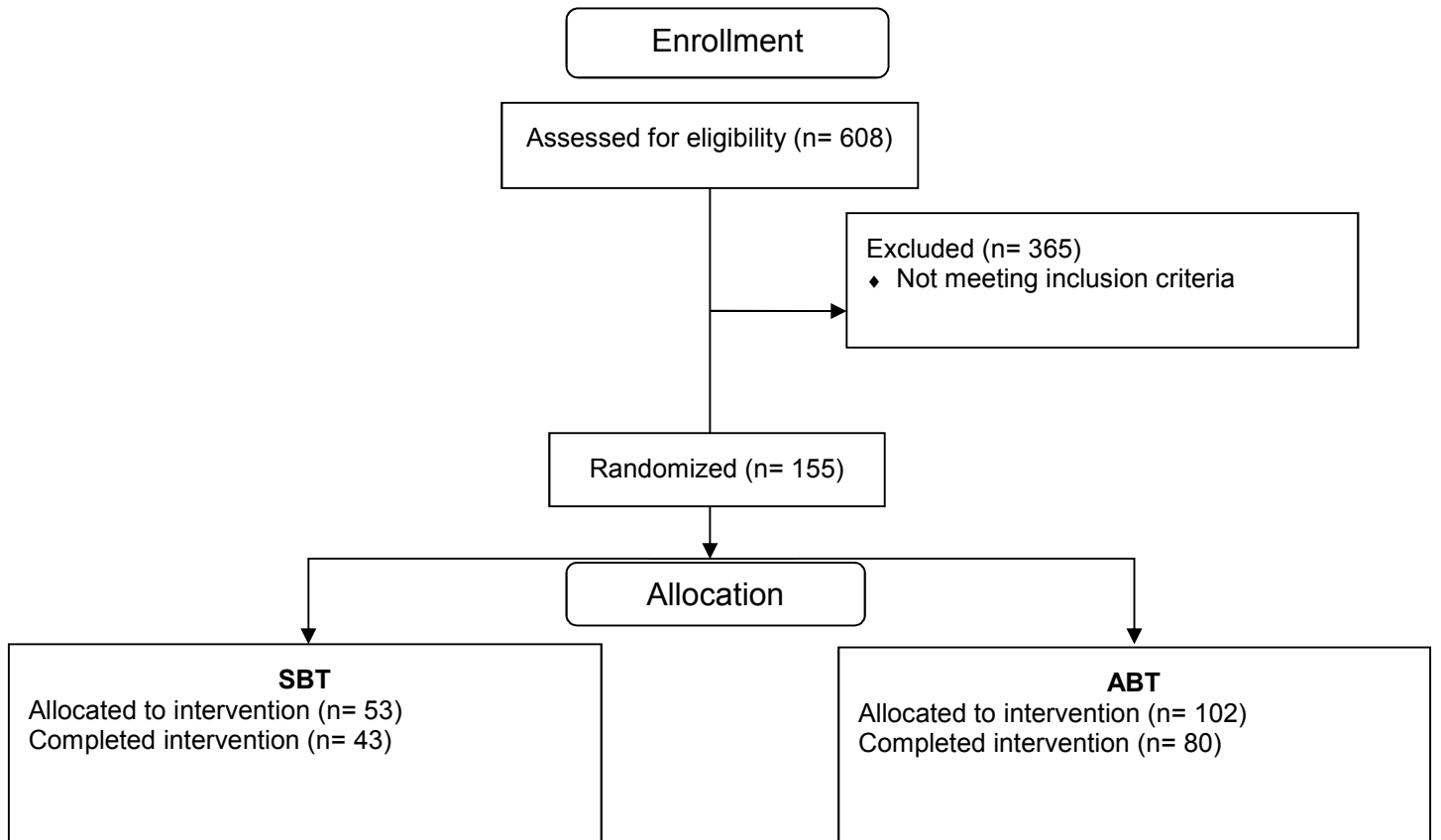


Figure 2

*Study Timeline*

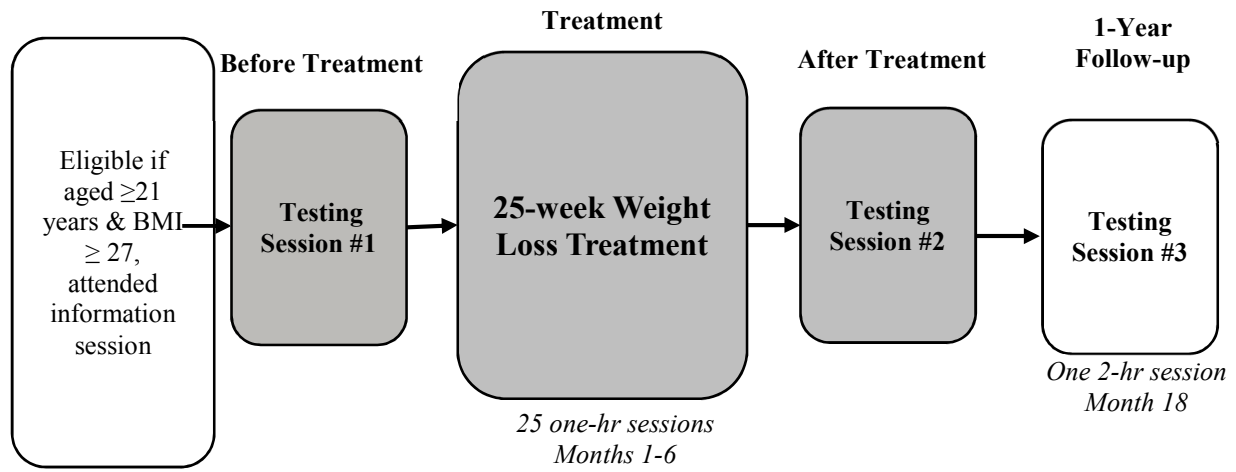


Figure 2. The proposed study will include data collected from the shaded regions only.

VITA

Caitlin Eileen Smith

Candidate for the Degree of

Master of Science

Thesis: THE PREDICTIVE POWER OF POSITIVE PSYCHOLOGICAL FACTORS ON  
WEIGHT CHANGE AMONG TREATMENT-SEEKING OBESE ADULTS

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Completed the requirements for the Master of Science in Psychology at Oklahoma State University, Stillwater, Oklahoma in December, 2018.

Completed the requirements for the Bachelor of Science in Psychology at Florida State University, Tallahassee, Florida in May, 2013.

Experience:

Graduate Research Assistant – Laboratory for Research on Emotions and Cognitions in Health (REACH), Oklahoma State University

Oklahoma Tobacco Research Center – Summer Scholars Program, Stephenson Cancer Center at the University of Oklahoma Health Sciences Center

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Professional Memberships:

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