

WRITTEN EMOTIONAL EXPRESSION:
EFFECTS ON WEIGHT LOSS AND MAINTENANCE

By

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TABLE OF CONTENTS

List of Tables	v
List of Figures	vii
Acknowledgements.....	viii
Abstract.....	xii
Introduction	
The Obesity Epidemic.....	1
Measurement and Classification.....	2
Treatment for Obesity.....	4
Weight Maintenance.....	6
Theories of Stress.....	7
Measurement of Stress.....	12
Stress and Weight Change.....	15
Coping Theories.....	16
Stress, Coping and Emotion.....	18
Stress, Coping and Obesity.....	19
Overview of Emotional Eating.....	21
Models of Stress-Induced Eating.....	22
Review of the Emotional Eating Literature.....	23
Characteristics of Emotional Eating.....	29
Measurement of Emotional Eating.....	30
Overview of Emotional Self-Regulation.....	32
Emotional Expressive Writing.....	34
Limitations of Previous Research.....	39
The Present Study.....	42
Hypotheses.....	43
Method	
Research Design.....	45
Participants.....	45
Measures.....	46
Procedure.....	53
Recruitment.....	53
Study Visit Procedures.....	57
Intervention.....	59
Analytic Strategy.....	61

Results	
Data Screening.....	64
Attrition.....	65
Descriptive Characteristics	72
Pretest Comparisons.....	79
Manipulation Checks	79
Primary Analyses: Main Effects	85
Secondary Analyses: Interaction Effects	93
Qualitative Analyses: Essay content.....	103
Discussion.....	105
References.....	119
Appendix A: Manipulation Check #1	135
Appendix B: Informed Consent Form	137
Appendix C: Informed Consent Form	141

LIST OF TABLES

1. Classification of overweight and obesity by BMI, waist circumference and associated disease risk.....	3
2. Recruitment survey results.....	56
3. Study timeline and procedures.....	58
4. Reasons for attrition by group assignment.....	68
5. Differences between study completers and non-completers.....	71
6. Characteristics of sample by group.....	73
7. Weight loss intervention characteristics	75
8. Baseline health assessment	77
9. Journal writing behavior	78
10. Manipulation check #1.....	81
11. Manipulation check #2.....	83
12. Covariate-adjusted means for weight change	85
13. Covariate-adjusted means for LES total scores	87
14. Covariate-adjusted means for WSI event and impact scores.....	89
15. Covariate-adjusted means for TFEQ Disinhibition scores	90
16. Covariate-adjusted means for EES subscales and total scores	92
17. Correlational matrix of predictor and criterion variables	95
18. Regression analysis for the moderating effect of baseline major life event stress (LES total score) on group assignment and weight change	96
19. Regression analysis for the moderating effect of baseline minor life event stress (WSI event score) on group assignment and weight change.....	99

20. Regression analysis for the moderating effect of baseline minor life event stress (WSI impact score) on group assignment and weight change	100
21. Regression analysis for the moderating effect of baseline emotional eating (EES anger/frustration subscale score) on group assignment and weight change.....	101
22. Regression analysis for the moderating effect of baseline emotional eating (EES total score) on group assignment and weight change	102
23. Essay themes within the EEW group.....	104

LIST OF FIGURES

1. Study Profile	69
2. Weight change across study assessments	86
3. Interaction between Group and Stress (LES).....	98

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ABSTRACT

The consequences of the current obesity epidemic are taking a serious toll on the health and the economics of our society. The prevention and treatment of obesity remain a challenge for researchers and society. Over the past 15-20 years behavioral treatments have been developed which have been successful in helping people lose weight, but individuals struggle to maintain this weight loss. Several studies provide evidence that emotional and psychological factors may play an important role in weight loss and maintenance. However, most behavioral treatment approaches do not adequately address the role of emotional factors. Interventions specifically designed to help individuals who are overweight or obese better cope with emotional distress may attenuate the negative effects of distress on weight loss and maintenance through improved emotional self-regulatory processes. This study examined the effects of expressive writing on weight regain, stress, and emotional eating among individuals who have recently lost weight. Men and women ($N = 64$) who recently lost weight were recruited and randomized to either an emotional expressive ($n = 31$) or to a placebo control writing intervention ($n = 33$). Baseline assessments were completed followed by writing sessions that took place once weekly across four consecutive weeks. Follow-up assessments of weight, stress and emotional eating were completed at the end of the final writing session, and again at 1 and 3 months. Results from this study indicated that there was no support for expressive writing to impact the rate of weight regain among individuals who have recently lost weight. However, there was partial support for expressive writing to decrease stress levels.

No support was found, however, for expressive writing to decrease emotional eating. The results from this study provide poor support for the beneficial effects of written emotional disclosure on buffering weight regain and decreasing emotional eating following weight loss treatment. There is, however, minimal evidence that expressive writing may produce favorable effects on stress levels in individuals who are attempting to maintain weight loss. Implications of these findings and ideas for future research to improve weight loss and maintenance outcomes are discussed.

INTRODUCTION

The Obesity Epidemic

Obesity rates continue to be on the rise in the United States. Obesity is projected to overtake smoking as the number one cause of preventable death in the United States (Mokdad, Marks, Stroup, & Gerberding, 2004). Currently, two out of three adults in the United States are now considered overweight or obese, compared to one out of four in the 1960's (Ogden et al., 2006). This increase has occurred regardless of sex, age, race, and educational status. Being overweight or obese significantly increases risk for premature mortality and serious health problems (e.g., diabetes, cardiovascular disease, hypertension, cerebrovascular disease, cancer, and osteoarthritis). In addition to the health consequences stemming from the obesity epidemic, the economic consequences are also cause for alarm. According to Finkelstein, Fiebelkorn, and Wang (2003), the medical costs of obesity in 1998 were estimated at 78.5 billion (92.6 billion in 2002 dollars). This figure translates to approximately 9% of the total national health care expenditures in the United States.

Statistics show demographic differences in obesity rates. Data from 1999-2000 National Health and Nutrition Examination Survey (NHANES) show that obesity rates are higher in women (33.4%) compared to men (27.5%; Flegal et al., 2002). However, according to a more recent report of NHANES data, rates of obesity are continuing to rise in men, but may be stabilizing in women. Prevalence data obtained in 2003-2004 show that 33.2% of women were obese (essentially unchanged

from 1999-2000), whereas 31.1% of men were obese in 2003-2004 data (a 3.6% increase; Ogden et al., 2006).

The incidence of overweight and obesity are also higher among minority populations (i.e., Non-Hispanic blacks = 76.1%; Mexican Americans = 75.8%) compared to Non-Hispanic white populations (64.2%). Minority women have the highest prevalence rates of obesity (i.e., Non-Hispanic black women = 81.6%; Mexican American women = 75.4%). These rates compare to 58% of Non-Hispanic white women who are overweight or obese. Obesity also disproportionately affects individuals of low socioeconomic status (Ogden et al., 2006; Wadden, Brownell, & Foster, 2002).

Measurement and Classification

The most common measure of overweight and obesity in epidemiological studies has been Body Mass Index (BMI). BMI is a formula that accounts for both weight and height (i.e., weight [in kilograms] divided by height [in meters] squared). Table 1 outlines the BMI, waist circumference and related health risks defined by the World Health Organization (1998) and the National Heart, Lung, and Blood Institute (NHLBI, 1998). These classifications have been derived based on the associated health risks with BMI relative to waist circumference measurements. Greater health risks are related to BMI's in the overweight and obese ranges, and these health risks are even greater with higher waist circumference measures (i.e., men > 102 cm and women > 88 cm) associated with increasing overweight and obesity classes.

Table 1

Classification of overweight and obesity by BMI, waist circumference and associated disease risk

Classification	BMI (kg/m ²)	Obesity Class	Disease risk relative to normal weight and waist circumference	
			Men ≤ 102 cm (≤ 40 in) Women ≤ 88 cm (≤ 35 in)	> 102 cm (> 40 in) > 88 cm (> 35 in)
Underweight	< 18.5			
Healthy range	18.5-24.9			
Overweight	25.0-29.9		Increased	High
Obesity	30.0-34.9	I	High	Very High
	35.0-39.9	II	Very High	Very High
Extreme obesity	≥ 40	III	Extremely High	Extremely High

(Adapted from NHLBI Guidelines, 1998).

Treatment for Obesity

The average weight loss resulting from comprehensive behavioral treatment, combining diet, exercise, and psychoeducation have remained unchanged over the last 15 years. In the early 1970s behavioral treatment programs were brief, and consisted of teaching basic principles of learning (e.g., changing environmental antecedents and consequences to improve eating and exercise behaviors) without additional diet and exercise intervention. Most individuals were mildly overweight, and weight loss was modest, approximately 4.5 kg over 10 weeks. Behavioral programs began to evolve and lengthen over the next 20 years to include attention to energy balance and additional behavioral components (e.g., relapse prevention, self-monitoring). Typical 6-month programs during the 1990s produced an average weight loss of 9.0 kg or approximately 10% of initial weight. Weight loss outcomes since 1996 have only been able to produce a minimal average increase in the amount of weight loss – 9.6 kg over 21 weeks. Even though more attention has been paid to long-term follow up to promote weight maintenance, most individuals regain over one third of their original weight lost in the 12 months after treatment (see Wadden, Brownell, & Foster, 2002 for review; Wing, 2002).

Pharmacotherapy and surgical treatments are also used in the treatment for obesity, particularly for obese individuals with the highest risk for health problems (Yanovski & Yanovski, 2002). Currently, there are two FDA approved medications for the treatment of obesity – sibutramine (Meridia) and orlistat (Xenical). Sibutramine is an appetite suppressant that enhances satiety by blocking the reuptake

of serotonin and norepinephrine (Wirth & Krause, 2001). Orlistat is a fat blocker, which binds to lipases in the stomach preventing the absorption of free fatty acids (Davidson et al., 1999). These medications have demonstrated weight losses of 7-10% of initial weight (Wirth & Krause, 2001; Davidson, 1999). To summarize, studies have shown the effectiveness of weight loss medications in short-term weight loss, but have not established their effectiveness in long-term weight loss maintenance.

Surgical treatment for obesity is most often reserved for the most extreme cases of obesity, defined as individuals with a BMI $\geq 40\text{kg/m}^2$. Bariatric surgery has been advancing over the last fifty years. The most widely used procedure is gastric bypass (RYGBP) in which a small gastric pouch is created at the base of the esophagus that limits caloric intake. Furthermore, a section of the stomach and duodenum of the small intestine are bypassed so contents of the small gastric pouch can be directly emptied into the jejunum of the small intestine. Gastric bypass typically produces an average loss of two-thirds of excess weight during the first 1-2 years with good long-term weight maintenance (Latifi, Kellum, DeMaria, & Sugerman, 2002). Despite the increasing use of pharmacotherapy and surgical treatments for obesity, behavioral treatment remains the most commonly prescribed treatment approach, due to the fact that these approaches are reserved for more severe cases. In addition, the National Heart, Lung, and Blood Institute's (1998) guidelines recommend the use of adjunctive behavioral interventions, even when pharmacological and surgical approaches are utilized.

Weight Maintenance

Developing strategies to improve weight maintenance following weight loss treatments for obesity continues to be a challenge for obesity researchers. Without continued treatment, it is common for individuals to regain approximately one third of their weight lost within a year following treatment and to continue to exhibit weight gain over time (Wadden, Brownell, & Foster, 2002). The Institute of Medicine (IOM) has defined criteria for assessing “successful” weight maintenance as a weight loss of $\geq 5\%$ of body weight that is maintained for one or more years (IOM, 1995). The majority of efforts to improve long-term weight maintenance have been related to physiological processes and basic behavioral strategies (e.g., obtaining larger initial weight losses, increases in physical activity levels, extending treatment, increasing incentives, relapse prevention training, and peer support; Jeffrey, Drewnowski, Epstein, Stunkard, Wilson, Wing, & Hill, 2000; Perri & Corsica, 2002).

However, these efforts have yielded mixed results using the IOM (1995) criteria. For example, maintenance strategies incorporating additional peer-led group meetings (without continued therapist contact), relapse prevention training (without continued therapist contact), telephone prompts (by non-therapists), monetary incentives, and some exercise strategies have not been found to be effective in achieving successful weight maintenance. There has been more promise in extending treatment beyond six months through providing ongoing, scheduled therapist contacts with relapse prevention training or peer support meetings (Perri & Corsica, 2002).

Taken together, weight regain is prevalent in the absence of continued intervention over an indefinite period of time (NHLBI, 1998). More in-depth psychological assessment such as obtaining more comprehensive assessment of individuals' quality of life including stress and emotional well-being, and using this information to guide treatment may improve weight maintenance efforts (see Perri & Corsica, 2002 for review). More thorough assessment of psychological and emotional factors that may impede success could be valuable in informing intervention approaches. Many behavioral programs minimally address the relationship between weight control and emotional factors during the course of treatment, but more thorough assessment of these emotional issues may reveal that more emphasis should be placed on exploring emotional processes during weight loss and maintenance intervention programs. However, to date there is little research examining the psychological mechanisms involved in successful weight maintenance. Stressful life events and coping skills have been cited in both prospective and retrospective studies as being major psychological factors that are associated with weight maintenance and relapse in obesity, but few researchers have fully explored these factors (Byrne, 2002).

Theories of Stress

Modern theories of stress have been evolving since the days of Hippocrates in ancient Greece. Basic science researchers created the foundation of stress research. Claude Bernard (1815-1878), the French physiologist further advanced the concept of stress by proposing that the internal environment of living organisms must remain

stable despite alterations in the external environment. This idea was elucidated by William Cannon in 1939, the American physiologist who coined the term “homeostasis”, which he defined as “the coordinated physiologic processes, which maintain most of the steady states in the organism.” He believed that stress was a disturbance in homeostasis due to conditions such as cold temperature, lack of oxygen, or low blood sugar. He also labeled the human reaction to a threat or “stress” as a “fight or flight” response in which emotions trigger the body to prepare for action against some threat (c.f. Seyle, 1993; Cooper & Dewe, 2004).

Hans Seyle, a pioneer researcher in the field of stress, defined stress as the “nonspecific result of any demand upon the body, be the effect mental or somatic.” This definition was the result of his research that concluded that any toxic substance (e.g., heat, infection, trauma, hemorrhage, and emotional arousal) could induce a “syndrome of just being sick.” Three major physiological effects could be observed in this syndrome: enlarged and hyperactive adrenal glands, shrinkage of lymphatic organs, and ulcers of the stomach and intestines. This syndrome later became known as General Adaptation Syndrome (GAS). The GAS consists of three stages: alarm reaction, the stage of resistance, and the stage of exhaustion. Seyle considered stress to be a set of physiological symptoms that are caused by some demand (or stressor). Examining the different effects of stress on the body led Seyle to make the distinction between good stress (eustress) and bad stress (distress). He incorporated Cannon’s idea of “homeostasis” by adding that it was important to balance the distress on the body with eustress (Seyle, 1993; Cooper & Dewe, 2004).

Currently, there is widespread interest in the study of stress by both biological and social science researchers. In addition to the academic study of stress, stress is a term that is commonly discussed in the general public. Establishing a universally agreed upon definition of stress remains a challenge given the varying opinions concerning the definition of stress among researchers. The major theories defining the nature of stress can be grouped into three general categories: stimulus, response, and interactional theories.

Stimulus Theories. The most common, simplest definition of stress accepted by social scientists has viewed stress as a stimulus. The stimulus of stress can be from external events that impinge on a person or from internal events that affect a person (e.g., hunger). Selye referred to these events as “stressors.” Elliott and Eisdorfer (1982) outline four types of stressors based on duration and chronicity: (1) acute, time-limited; (2) stressor sequences; (3) chronic intermittent; and (4) chronic.

Response Theories. Unlike social science researchers, most biological researchers conceptualize stress as a response. Selye defined stress as a “nonspecific result of any demand upon the body...” Defining stress as a response refers to a living organism reacting with stress or being under stress. As a result, stress response theorists believe it is difficult to identify what stimuli will be stressors until a bodily reaction is produced (Selye, 1993). Since Selye’s stress discoveries in the 1930’s, several physiological mechanistic responses have been uncovered.

The modulation of the sympathetic-adrenal-medullary (SAM) and the hypothalamic-pituitary-adrenal (HPA) response systems are hypothesized to be

responsible for the link between psychological responses to stress and their subsequent bodily reactions. The actions of both the SAM and HPA axes are orchestrated by the hypothalamus, a brain structure in the limbic system. When the body is faced with an immediate threat, the sympathetic nervous system prepares the body for action by signaling the SAM to release catecholamines (i.e., epinephrine and norepinephrine) via the adrenal medulla into the bloodstream (Clow, 2001).

In contrast to the SAM, which is activated almost immediately when an organism is faced with a threat and has short-lived effects, the HPA axis is more difficult to activate and has longer-lasting effects. The HPA axis normally requires a more intense or chronic stressor than the SAM. Activation of the HPA axis results in a chain of neuroendocrine events. This chain of events begins with the activation of the hypothalamus by a stressor, which results in the release of corticotropin-releasing hormone (CRH). CRH stimulates the pituitary gland to release adrenocorticotropic hormone (ACTH) into the bloodstream. ACTH is designed to specifically target the adrenal cortex of the adrenal glands, resulting in the release of corticosteroids (e.g., cortisol) into the bloodstream. The HPA axis is carefully regulated under a negative feedback system such that once cortisol is released into the bloodstream it inhibits the continued release of CRH (Clow, 2001). Repeated activation of the HPA axis (e.g., via chronic, uncontrollable stress) can disrupt the normal functioning of this negative feedback system so that increased levels of cortisol are no longer detected to inhibit the release of CRH. This dysregulation of the HPA axis can have deleterious effects on both the psychological and physical well-being of an individual.

Interactional Theories. Both stimulus and response theories provided important contributions to the understanding of stress, but were deficient in incorporating individual differences and more complex psychological processes. Interactional or relational theories of stress emphasize the interaction between the person and environment. Harold Wolff (1953) was the first person to identify the importance of the “dynamic state” between an individual and his or her environment by stating that the result of stress is primarily the way the person perceives the situation according to his or her personal life experiences (c.f. Cooper & Dewe, 2004). Lazarus and Folkman (1984) delineated this idea by defining stress as “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being.”

Lazarus (1966) suggested that cognitive appraisal determines why and to what degree an interaction between the person and the external demands of the environment are stressful to an individual. According to Lazarus, appraisal involves a two-pronged evaluative approach that links personal meaning to the stressful situation. Primary appraisal is concerned with identifying whether a stressor is threatening or benign. If a stressful appraisal is made, then it may be construed as harm/loss that has already occurred, a threat anticipated to cause harm, or a challenge that could be an opportunity for growth or alternatively result in harm. Secondary appraisal refers to the evaluative process of examining coping options to deal with the stressful situation. Personal (e.g., commitments and beliefs), and situational (e.g.,

novelty, predictability, uncertainty, timing, and ambiguity) factors have been shown to strongly influence appraisal (Lazarus & Folkman, 1984).

Coping is the final component to Lazarus's interactional theory of stress defined as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984). Problem-focused coping includes strategies that involve problem-solving with the intention to change or manage the stressful situation, whereas emotion-focused coping is utilized when an appraisal has been made that little can be done to change the stressful situation so the goal becomes regulating emotional states.

Measurement of Stress

Given the differing conceptualizations of stress, it is not surprising that there is also much disagreement concerning the measurement of stress. The measurement of major life events, minor life events, and chronic stressors are the three main approaches to conceptualize different types of stressors. Both physiological and self-report methods have attempted to measure stress in the laboratory and natural environment. Laboratory studies of stress create artificial stressful conditions by having individuals engage in a variety of physical, mental, and social stressors (e.g., cold pressor test, mental arithmetic, and public speaking, respectively). Whereas laboratory environments provide superior experimental control, recreating the essence of "real life" stressors is quite limited by these methods. Prospective, naturalistic

research designs more accurately assess the variety and chronicity of stress that individuals experience.

Physiological Assessment. The goal of physiological measures of stress has been to obtain relatively objective measures of stress, particularly when examining the role stress plays in different disease processes. Cardiovascular reactivity, assessment of stress hormones (e.g., cortisol), and measures of immunity (e.g., natural killer cells) are commonly used biological indicators of the stress response. Despite the value of assessing physiological markers of stress, self-report methods remain the most generalizable and commonly used measure for assessing stress.

Self-Report Assessment. The pioneer scale for measuring stressful life events is the Social Readjustment Rating Scale (SRRS), a life event checklist developed by Holmes and Rahe (1967). It was developed to examine the relationship between stress and illness. A flood of research followed the publication of the SRRS and it soon became the most commonly used measure for assessing major life events. The premise is that life changes or events requiring adaptation are stressful. The SRRS originated by collecting a list of 43 events gathered from clinical experience, followed by asking people to rate how much readjustment each event required. Life change units (LCUs) are calculated to assess the magnitude of stress, and when summed yield a total life stress score. Despite the important contribution of the SRRS to the self-report assessment of stress, several criticisms have been identified. For instance, the SRRS assumes life events are stressful regardless of the desirability of the events, it neglects to account for the chronicity of stress, and events are often

confounded with outcomes of events (e.g., illness; Turner & Wheaton, 1995).

Furthermore, the SRRS is an adequate measure of overall stress, but its weaknesses lie in accurately assessing the stress of individuals given that LCUs were originally group-derived. The Life Experiences Survey, a 57-item self-report measure of major life events (LES; Sarason, Johnson & Siegel, 1978), addressed these shortcomings by incorporating the individual's appraisal of major life events. Specifically, the LES asks individuals to rate the desirability and personal impact of events on a 7-point Likert scale ranging from extremely negative (-3) to extremely positive (+3).

Interest in examining minor life events was triggered by the idea that major life events (e.g., job loss, divorce, death of a loved one) were limited in their ability to understand the processes by which stressful life events impact health and illness. Minor life stressors include events such as misplacing things, experiencing too many interruptions or having problems with employees. Research has shown that minor life events or daily hassles are more predictive of health outcomes than major life events because they happen more frequently and are more "proximal" to the individual. In addition, major and minor life events may interact with one another, emphasizing the importance in assessing both types of stressors when examining stress-illness relationships (Kanner, Coyne, Schaefer, & Lazarus, 1981; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982).

The first measure of minor life events was the 117-item Hassles Scale by Kanner and colleagues (1981), which assesses the frequency and severity of minor stressors over the past month. Critics have argued that many items on the Hassles

Scale refer more to an individual's internal state rather than specific, daily stressors. The Daily Stress Inventory (DSI) allowed for minor stress assessment with only 58 items that could be administered on a daily basis (Brantley, Waggoner, Jones, & Rappaport, 1987). Scale items are grouped into six different domains (e.g., interpersonal and environmental stressors). Similarly, the 87-item Weekly Stress Inventory (WSI) was developed to measure the frequency and impact of stress in different life domains occurring in the past week (Brantley, Jones, Boudreaux, & Catz, 1997). Individuals rate the perceived stressfulness of an event on a 7-point Likert scale ranging from *Happened, but not stressful (1)* to *Extremely stressful (7)*. The WSI-Event score is calculated by summing the number of stressful events reported and a WSI-Impact score is calculated by summing the perceived stressfulness ratings of the events reported. The WSI has been used in studies involving many different disease states and its psychometric properties of the WSI have been shown to be excellent.

Stress and Weight Change.

Researchers have postulated that the connection between stress and weight gain occurs through elevated activity in the hypothalamic-pituitary-adrenal axis (HPA axis). Specifically, an excessive amount of glucocorticoids (e.g., cortisol) are released in response to stress, which may disrupt an individual's metabolic processes. The theory states that too much cortisol causes the body to release glucose, creating an insulin response that results in increased fat storage and a decreased ability to metabolize these excess energy stores (Peeke & Chrousos, 1995).

Ferreira and colleagues (1995) retrospectively examined the relationship between neuroendocrine measures, stressful life events and weight gain in women who gained at least 5 kg in the previous year compared to women without such weight gain. Women who experienced weight gain had positively correlated levels of serum cortisol, and these same women reported significantly more stressful life events in the previous year compared to control women. This study provided further evidence that environmental stressors can activate an abnormal neuroendocrine response that is related to weight gain (Ferreira, Sobrinho, Pires, Silva, Santos, & Sousa, 1995).

Vitaliano and colleagues (1996) documented a link between chronic stress and weight gain in spousal caregivers of individuals with Alzheimer's disease. Both male and female spousal caregivers reported lower levels of perceived control, higher depression scores, and higher psychological burden compared to male and female controls across a 15-18 month time period. In addition, caregivers gained significantly more weight over time. Women with the greatest weight gain were caregivers with increases in anger control and caloric intake, whereas men with the greatest weight gain were caregivers with decreases in perceived control and increases in fat intake (Vitaliano, Russo, Scanlan, & Greeno, 1996).

Coping Theories

Historically, our understanding of coping can be traced back to the psychoanalytic tradition, particularly to the idea of defense mechanisms used to cope with anxiety (see Snyder & Dinoff, 1999). However, research specifically targeting

coping did not emerge until the 1970s (Lazarus & Folkman, 1984). According to Lazarus (1998, p. 202), “stress itself as a concept pales in significance for adaptation compared with coping.” Within his interactional view of stress, he defined coping as “constantly changing cognitive, behavioral, [and emotional] efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984; Lazarus, 1991). This definition has allowed for a process approach that conceptualizes coping as changing over time, rather than as a stable trait. Central to this coping process is a function of continuous appraisals, reappraisals, and emotional processes by the individual within his or her environment (Lazarus & Folkman, 1984).

Lazarus and Folkman (1984) further delineated two forms of coping: problem-focused coping, consisting of efforts to directly control or modify stressor(s), and emotion-focused coping consisting of efforts to regulate emotions related to the stressor(s). Examples of problem-focused coping strategies include defining the problem, generating and analyzing alternatives, and taking action to change the problem. On the other hand, emotion-focused coping strategies encompass methods to reduce distress (e.g., avoidance, seeking support, and positive reappraisals). In general, the context and appraisal of the stressor by the individual guides the use of a specific coping strategy. Furthermore, problem- and emotion-focused coping are not necessarily meant to be dichotomous types of coping, but rather are meant to work in concert with one another. Unfortunately, researchers in the field of stress and coping have often oversimplified the conceptualization of problem- and emotion-focused

coping as detached styles, which was not the intention of Lazarus's original conceptualization (Lazarus, 1999).

Much research has shown that emotion-focused coping is associated with poorer outcomes on several psychological outcomes compared to problem-focused coping, however Stanton and colleagues argue that emotion-focused coping scales have been confounded with distress and self-deprecation (Austefeld & Stanton, 2004; Stanton & Franz, 1999). Additionally, they point out that coping measures often do not assess emotional processing and expression, activities associated with health benefits in the emotion literature and in experimental demonstrations of emotional disclosure (Mayne, 1999; Smyth, 1998).

Stress, Coping and Emotion

During the 1960s and 1970s while stress was gaining attention from researchers, the concept of emotion was being abandoned, leading to a separation of the two constructs. However, Lazarus (1993) believed that "psychological stress should be considered part of a larger topic, the emotions." For when there is stress, there are also emotions that can be attached to it – positive and negative emotions (Lazarus, 1999). He went on to state (1998) that "a fuller understanding and appreciation of normal, ordinary adaptation, and even optimal adaptation, requires that we learn much more about the ways people and peoples in our society manage their lives, and about the place of both positive and negative emotional experiences in their lives." According to Lazarus (1991), emotions are in response to a "relational meaning," a person's appraisal of the harms and benefits in person-environment

interactions. Each emotion has been identified as having a “core relational theme” (e.g., anger = a demeaning offense against me or mine and anxiety = facing uncertain, existential threat). Likewise, coping has historically been detached from emotion, when in fact emotions inform us of our approach to coping. Again, emotions richen the appraisal and coping process. In summary, it is more accurate to think of stress, coping, and emotion as a unified set of concepts, with emotion being considered the higher order concept because it encompasses both stress and coping (Lazarus, 1999).

Stress, Coping and Obesity

Experiencing major life stressors following the completion of a weight loss program has also been related to weight regain (Dubbert & Wilson, 1984; Gormally, Rardin, & Black, 1980; Gormally & Rardin, 1981). Following the completion of a weight loss program, Rhode and colleagues (2005) found that higher stress and depression scores predicted weight regain. More specifically, this regain was found to be the result of greater stress and depressive symptoms leading to women consuming more high fat, calorie dense foods. Interestingly, this is one of the first studies to demonstrate this mechanism of weight regain, linking emotional states and stress to a pattern of caloric consumption that leads to weight regain. Currently, it is unclear what types of stressors are most likely to adversely affect weight maintenance efforts. Furthermore, there is evidence that it is the ability to cope with stressful events, rather than the actual stressors themselves, that is associated with successfully maintaining weight loss. Gormally and Rardin (1981) classified individuals as either maintainers or regainers. Both of these groups reported experiencing a similar

number of major life stressors after completion of weight loss treatment, but 81% of regainers reported eating poorly and/or exercising less during the time of the stressor compared to only 20% of maintainers. Moreover, 82% of regainers reported stress-induced eating in response to daily stressors, whereas 80% of maintainers reported using active coping strategies learned in treatment (e.g., stimulus control, self-reinforcement, and engaging in alternative activities).

Consistent with the smoking literature, Drapkin, Wing, and Shiffman (1995) concluded that individuals who generate any kind of coping responses in the face of stress, rather than the numbers or types of coping responses, are predictive of better weight maintenance one year following treatment. Compared to successful maintainers, regainers tend to under-utilize active problem solving skills and engage in more passive forms of coping (e.g., eating in response to negative emotional states and stressors; Kayman, Bruvold & Stern, 1990). Grilo, Shiffman, and Wing (1989) identified three common relapse situations obese dieters find themselves in: (a) during mealtime; (b) during low-arousal states; and (c) during emotionally upsetting situations. These relapse situations were identified through cluster analyses as situations that most commonly triggered temptations to overeat in a group of obese dieters. In addition, while emotionally upsetting situations occurred less frequently than the mealtime and low-arousal states, they had the strongest effects; that is, they almost inevitably led to overeating.

Currently, it is unclear whether overeating helps dieters cope with the uncomfortable experience of strong, negative emotion, or whether strong, negative

emotion interferes with attempts to cope in other ways besides overeating. These specific mechanisms are not yet fully understood. If overeating helps individuals cope with strong, negative emotion, there may be two major regulatory processes that are involved when individuals emotionally eat in response to stress and negative emotion. An under- or over-regulation of emotions may explain much of this emotional eating behavior. For some individuals, eating may be a coping strategy by providing a calming effect for negative emotions that feel out of control (under-regulation). For others who over-control, suppress, or avoid negative emotions, eating may serve as a distractive coping strategy that allows them to continue to avoid negative emotion (over-regulation). Individuals may have a prominent emotional self-regulation style, or may possess a combination of under- and over-regulation depending on the specific negative emotion and/or situation (Lepore, Greenberg, Bruno, & Smyth, 2002).

Overview of Emotional Eating

The concept of emotional eating was first reviewed by Kaplan and Kaplan (1957) who developed the psychosomatic theory of obesity, stating “the ultimate cause of the great majority of cases of obesity is psychologically determined hyperphagia.” This theory originated from clinical observations that many obese individuals overeat in response to negative emotional states. This response is in contrast to the inhibition of food intake often associated with emotional arousal. From a learning perspective, they theorized that overeating is maintained by negative reinforcement with its anxiety-reduction consequences. The idea that emotions

influence eating behavior later became known as “emotional eating” (Ganley, 1989). Ganley’s (1989) review of emotional eating found that approximately 75% of mild to severely obese individuals undergoing weight-loss treatment engage in emotional eating regardless of socioeconomic status. Similarly, there is strong evidence for emotional eating behavior in obese individuals not involved in weight loss programs (e.g., Holland, Masling, & Copley, 1970; Lowe & Fisher, 1983; van Strien & Ouwens, 2003). Much attention was given to the concept of emotional eating during the 1970’s and 1980’s, with recent renewed interest in the underlying role of emotions in the problem of obesity.

Models of Stress-Induced Eating

Two major models of stress and eating have been studied in the literature – the general effect model and individual-difference models. The general effect model posits that organisms have a general physiological response to stress that increases eating behavior. Most research examining the general effect model has been conducted with rats using acute stressors such as the tail pinch or electric shock, and has yielded inconsistent results on eating and weight. Studies of acute stressors in animals have been shown to increase, decrease, and not affect eating. Inducing stressful housing conditions (i.e., isolation) have been used to simulate a chronic stress situation in rats and consistently have shown to increase both eating and weight in rats (see Greeno & Wing, 1994 for review).

Individual-difference models have been developed to better understand stress and eating behavior in humans. These models suggest that differences in human

learning history, attitudes and/or biology determine one's vulnerability to eating as a response to stress. In contrast to the general effect model, individual-difference models include psychological in addition to physiological mechanisms for changes in eating behavior. Based on individual difference models, two specific explanations have been given to explain why individuals differ in their eating in response to stress. First, it is suggested that normal-weight individuals decrease their eating in response to stress unlike obese individuals whose eating behavior either increases or does not change in response to stress (Kaplan & Kaplan, 1957; Schachter, Goldman, & Gordon, 1968). Second, it is hypothesized that restrained eaters, people who consistently exert effort to control their eating, eat more when stressed, whereas non-restrained eaters are unaffected by stress (Herman & Polivy, 1975). Both of these theories to explain eating behavior in response to stress have been examined empirically.

Review of the Emotional Eating Literature

The psychosomatic theory proposed by Kaplan and Kaplan (1957) suggested that overeating is a learned behavior that reduces stress. According to this theory, obese individuals eat more when stressed than when not stressed, and exhibit a greater decrease in stress as a result of eating compared to normal weight individuals. Theorists partially attributed this increase in eating due to an inability to recognize internal hunger cues. Upon further examination, studies testing the psychosomatic theory have produced mixed support (Schachter, Goldman, & Gordon, 1968; McKenna, 1972; van Strien & Ouwens, 2003).

The first experimental test of the psychosomatic theory of obesity was conducted by Schachter and colleagues (1968) who found that emotional arousal affects eating in obese individuals differently than in normal weight individuals. Normal weight and obese male undergraduates were stressed prior to eating using an experimental fear manipulation. Additionally, food deprivation was manipulated in that some undergraduates were instructed to come to the laboratory on an empty stomach while others were instructed to arrive on a full stomach. They hypothesized that obese individuals are less able to distinguish between stress and hunger cues and predicted that they would eat regardless of their stress levels and food deprivation state, whereas normal weight individuals would eat less when both stressed and hungry. This study's hypotheses were confirmed in that significant interactions were found between weight, stress, and hunger. Normal weight individuals ate less when food deprived and stressed, but obese individuals' eating did not change in response to stress or hunger. As a result, Schachter and colleagues concluded that external cues in the environment, in addition to internal cues, play an important role in determining eating behavior in obese individuals. However, the majority of studies that followed continued to use laboratory stressors to examine the effect of stress on eating and did not provide strong support for Schachter's "internal-external" theory of obesity (e.g., Abramson & Wunderlich, 1972; Ruderman, 1983).

Follow-up studies have found that additional factors may be important in better understanding the relationship between obesity, stress, and eating such as the ambiguity and controllability of the stress. Slochower (1976) tested the effects of

providing obese and normal weight males labels for the false-heart-rate feedback they were given to induce high or low arousal on food consumption in the laboratory. Highly aroused obese males ate more than three times more food when they had difficulty labeling the source of their stress compared to highly aroused males given a label to explain their arousal. Food consumption of normal weight males was unaffected by labeling or level of arousal. Additionally, highly aroused obese males exhibited significantly greater anxiety reduction following eating compared to normal weight counterparts. This study provides evidence that diffuse, unidentifiable sources of distress may be a key factor that impacts emotional eating behavior. In a follow-up study, a dimension of perceived control was added and it was found that obese individuals ate significantly more when they were anxious, unable to label their emotion, and did not feel a sense of control over their distress (Slochower & Kaplan, 1980).

Many studies examining psychosomatic theories of obesity have been conducted in the laboratory and it may be that experimental stressors do not adequately simulate the types, intensity, and chronicity of stress experienced in the natural environment. For example, when comparing various levels of laboratory-induced anxiety and eating behavior among obese and normal weight female undergraduates, Ruderman (1983) found that highly anxious obese females ate significantly less than mildly anxious obese females, whereas normal weight females did not exhibit any differences in eating across different anxiety levels.

Unlike the psychosomatic theory of obesity and Schachter's "internal/external" theory of obesity, restraint theory attributes overeating under stress to dietary restraint (Herman & Polivy, 1975). Dietary restraint is defined as consistently making attempts to restrain eating and weight. Robinson and colleagues (1980) found that obese individuals who fasted prior to consuming a high-calorie shake reported a significant decrease in anxiety after eating compared to normal weight controls. Baucom and Aiken (1981) found that dietary restraint, rather than weight category, predicted stress-induced eating in the laboratory. Schotte, Cools, and McNally (1990) presented normal weight women who were classified as either high or low on dietary restraint with a mood induction procedure using a neutral or stressful film. Results indicated that high restraint participants exposed to the stressful film ate significantly more than high restraint participants who watched the neutral film, and more than low restraint participants who watched either type of film. However, Ruderman's (1986) review found that dietary restraint by itself is not sufficient to explain overeating behaviors in obese individuals.

More recently, instead of comparing weight categories, van Strien & Ouwens (2003) examined the moderating roles of emotional, external, and restrained eating on food deprivation and food consumption in a sample of obese undergraduate women. Participants completed a questionnaire that assessed three types of eating (i.e., emotional, external, and restrained), were randomized to a milkshake preload condition, and food consumption was measured by the amount of cookies eaten. Results showed that emotional eating moderated the relationship between food

deprivation and food consumption. Women high on emotional eating ate more after the milkshake preload, rather than less. Furthermore, controlling for external eating strengthened the moderating effect of emotional eating. There was also a main effect for emotional eating on food consumption such that women scoring high on emotional eating ate more regardless of the preload condition. This study provides evidence that supports the psychosomatic theory of obesity. Previous studies have not directly compared the moderating roles of emotional, external, and restrained eating between food deprivation and food consumption.

The mixed results across studies may be due to several factors, including the laboratory nature of much of the research examining emotional eating behavior. For example, most study participants were college undergraduates, thus they may not have been representative of the general population of obese individuals. In addition, laboratory studies are limited in their ability to assess emotional eating given the time constraints in an artificial setting. Studies with null findings may not be able to capture emotional eating behavior, given this behavior often has an episodic pattern related to stress that may not be triggered during the course of an experiment. Similarly, the potency of stress and mood induction procedures to simulate the types of stressors and negative emotions experienced in the natural environment is questionable. Furthermore, the types of foods used for consumption may bias results given that studies using foods that are considered more appetizing (e.g., high sugar, high fat foods) found stronger effects for emotional eating in obese individuals compared to normal weight individuals. Finally, research demonstrates that

emotional eating most often occurs in private, so individuals may purposely minimize emotional eating due to the social influences inherently present in laboratory studies (see Ganley, 1989 for review).

As a result of many of these limitations, non-laboratory studies of emotional eating have been conducted to more clearly understand emotional eating behavior in the natural environment. Leon & Chamberlain (1973) retrospectively compared the responses of individuals who regained previous weight loss to individuals who successfully maintained weight loss and to a control group. Both maintainers and regainers were more likely to eat in response to emotion especially between meals compared to controls. However, regainers ate in response to a wider variety of negative emotional states compared to maintainers. Likewise, emotionally eating in response to negative emotion was positively correlated with BMI in a military population (Hoiberg, Berard, & Watten (1980). This relationship was particularly strong for women after controlling for weight history, obsession with food, and physical activity. Lowe and Fisher (1983) obtained similar findings when they prospectively examined the emotional reactivity and emotional eating in overweight female college students through the use of daily mood and food self-monitoring. Overweight females were more emotionally reactive and more likely to emotionally eat during snacks. There was a trend toward significance for overweight women to consume more calories during snacks and meals in response to negative emotional states compared to normal weight women. Overall, differences in emotional eating behavior were evident for negative emotions, but not positive emotions. Similarly,

Costanzo and colleagues (2001) found that the relationship between positive emotion and eating was mediated by dietary restraint, whereas a significant relationship between negative emotion and eating remained after controlling for dietary restraint. Finally, longitudinal data has found self-identified stress-driven eaters to have significantly higher BMIs in adulthood (Laitinen, Ek, & Sovio, 2002).

Characteristics of Emotional Eating. Much evidence exists that emotional states influence eating behavior among overweight and obese individuals. Ganley (1989) reviewed several characteristics associated with emotional eating behavior, concluding that decreasing emotional distress appears to be the primary role of emotional eating among overweight and obese individuals and that emotional eating is most often triggered by negative emotional states (Ganley, 1989; Macht & Simons, 2000). Robert Thayer (2001) coined this negative emotional state as “tense tiredness.” Anxiety, anger, and sadness are the most common negative emotional triggers, but it is unclear whether there is a differential effect among these specific negative emotions (Macht & Simons, 2000). The role of positive emotions on emotional eating has received less attention and is less conclusive in the emotional eating literature. However, Patel and Schlundt (2001) found that food consumption was greater while in a negative or positive emotional state compared to a neutral emotional state.

As for the relationship between stress and emotional eating, there is evidence that emotional eating has an intermittent quality related to stressful periods of life. Obese individuals have been reported to gain significantly more weight when faced

with major life stressors (e.g., marriage, divorce, death of family member) compared to normal weight individuals (Rand, 1978, 1982). Stress has been shown to moderate the effects of depressed mood on changes in BMI over a 5 year period such that higher stress leads to weight gain (Banthia, Epel, Burke, St. Jeor, Cutter, & Brownell, 2005). In addition to regulating mood, it is hypothesized that social stress and relationship problems may be particularly involved in the process of emotional eating although more research is needed in this area to better understand these processes and how they interact with emotions (Ganley, 1986; 1988).

Gender differences in emotional eating also appear in the literature. Research suggests that emotional eating is more prevalent among females (e.g., Laitinen, Ellen, & Sovio, 2002; Kenardy et al, 2003). Furthermore, Laitinen and colleagues (2002) reported that the strongest predictor of emotional eating among women was a lack of social support. Another characteristic of emotional eating is that individuals typically emotionally eat privately and tend to consume calorically-dense foods (i.e., high fat, high sugar; e.g., Loro & Orleans, 1981; Laitinen, Ek, & Sovio, 2002). Finally, it should be noted that emotional eating is evident regardless of socioeconomic status.

Measurement of Emotional Eating. Development of measures to assess emotional eating stemmed from Herman and Polivy's (1980) 10-item Restraint Scale, which was determined to be psychometrically weak. In addition to assessing dietary restraint, the Restraint Scale was found to tap into other factors of eating behavior – concern for dieting and weight fluctuation (Ruderman, 1986). As a result, developing

other instruments was deemed necessary to accurately assess multiple facets of eating behavior, including emotional eating.

Stunkard and Messick (1985) constructed the Three-Factor Eating Questionnaire (TFEQ) that measures three factors of eating: (1) Dietary restraint, (2) Disinhibited eating, and (3) Perceived hunger. The Disinhibited eating factor measures the extent to which emotional and social influences interfere with an individual's conscious control over eating. The Disinhibition factor on the TFEQ has been shown to be a better predictor of eating behavior than dietary restraint or hunger, however it has been best described as containing two factors – weight lability and emotional eating, with need of further refinement (Ganley, 1988; Stunkard & Messick, 1985). Furthermore, there are only 6 items included to specifically assess emotional eating.

The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986) was developed at the same time as the TFEQ and contains a 13-item emotional eating scale, which inquires about emotional eating in response to both vague and clearly labeled emotions. The DEBQ allows for a more detailed assessment of eating, but does not differentiate among specific emotions and eating behavior.

The Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995), another commonly used emotional eating measure, asks individuals to report the intensity of their desire to eat in response to 25 specific negative emotional states, of which three subscales have been derived – (1) Anger/Frustration, (2) Anxiety, and (3) Depression.

More recently, the Emotional Eating Scale was revised to include several positive emotions (e.g., happiness, satisfied, and elation) in addition to negative emotions (EES-II; Kenardy, Butler, Carter, & Moor, 2003). Unlike the original EES, which was first administered to a clinical sample of obese females, the EES-II was tested in a sample of non-obese female undergraduates.

Overview of Emotional Self-Regulation

Emotional eating can be conceptualized as serving an emotional self-regulatory function. The broad concept of self-regulation has been defined as the process by which the human self exerts effort (consciously or unconsciously) to alter internal states and/or responses (Vohs & Baumeister, 2004). There has been tremendous growth over the past 15-20 years in the research regarding the regulatory processes of emotion, otherwise referred to as emotional self-regulation. Emotional self-regulation is a specific process within self-regulation, and has been defined as the process of monitoring and evaluating affective states in which individuals act either to maintain or to change the intensity of emotion, or to prolong or shorten the length of the emotional episode (Gross, 1999). Larsen and Prizmic (2004) propose that the goal of emotional regulation is to achieve an overall sense of subjective well-being by regulating both positive and negative affect, with the primary goal of decreasing negative affect and increasing positive affect. This definition is akin to the idea of emotional homeostasis, which is concerned with monitoring and adjusting the frequency, intensity, or duration of experiential, expressive, or physiological pathways of emotional reactions (Bonnano, 2001).

Bonnano (2001) proposes a three-part model of emotional self-regulation: (1) control, (2) anticipatory, and (3) exploratory regulation. If emotional homeostasis has not been achieved, control regulation is implemented to immediately regulate emotional and/or physiological states through involuntary processes and behaviors. Once emotional homeostasis has been achieved, anticipatory regulation operates to maintain homeostasis by identifying threats to emotional homeostasis and adjusting behaviors as needed. Finally, exploratory regulation involves developing new skills or ways of coping that will improve emotional regulatory processes in the future.

Generally, individuals engage in behaviors that benefit their overall self regulatory efforts when they feel good, whereas this balance is more likely to deteriorate during states of emotional distress (Tice, Baumeister, & Zhang, 2004). Much research has demonstrated that negative emotional states have a stronger impact on human behavior than positive emotional states, and as a result there is more motivation to decrease negative affective states (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Tice and colleagues (2004) propose that regulating negative emotion takes priority over other forms of self-regulation such as behavioral regulation. For instance, if someone is trying to maintain weight loss and they experience emotional distress, there is suddenly a conflict between the behavioral regulatory efforts of eating healthy and the emotional regulatory efforts of ridding oneself of his or her distress. In the case of this conflict, Tice and colleagues (2004) posit that emotional regulation takes precedence over other forms of self-regulation, which they refer to as the “priority hypothesis.” As in the case of weight loss and

maintenance, optimal self-regulation often requires the delay of immediate gratification of eating appetizing, high calorie foods for behaviors that promote long-term goals, like exercising and eating well for improved health and well-being. However, when people feel bad they want to feel better, and often long-term goals may be pushed aside for the sake of feeling better in the short-term. This effect may be particularly salient for behaviors that have been effective in the past in providing immediate emotional relief such as emotional eating of high caloric foods.

Tice, Bratslavsky, and Baumeister (2001) demonstrated in a laboratory study that participants ate more fattening foods after feeling upset, but when participants were led to believe that eating would not change their negative emotional state they did not eat more. Interestingly, negative emotion did not create a breakdown in self-regulation when participants did not think it would improve their mood. This study suggests that behavior such as emotional eating is often performed in the hopes of regulating emotion. Given these findings, future research is needed to explore alternative strategies to regulate emotion other than through emotional eating, which can compromise successful weight maintenance.

Emotional Expressive Writing

The literature on the role of stress and coping in successful weight maintenance suggests the importance of incorporating alternative strategies to help individuals deal with negative emotionality post-treatment in order to improve weight loss and maintenance efforts. Strategies that foster emotional regulation may be

promising approaches to help counteract and/or buffer emotional eating behavior when experiencing stress and negative emotion.

Emotional expressive writing (EEW; writing about stressful and/or traumatic events) developed by Pennebaker and Beall (1986) may be one strategy that could be effective in helping individuals who have lost weight better regulate their emotions, which in turn may reduce the frequency and/or severity of emotional eating contributing to weight regain. The first EEW study was conducted with college students who were simply asked to write about their deepest thoughts and feelings regarding a traumatic experience (Pennebaker & Beall, 1986). Surprisingly, writing had a positive effect on physical health – compared to control participants, students who wrote about traumatic experiences had significantly fewer student health center visits in the months following the writing exercise, leading researchers to further explore the potential health benefits of expressive writing. The first meta-analysis of expressive writing conducted by Smyth (1998) using a fixed effects approach revealed a mean weighted effect size of $d = .41$ ($r = .20$) over 13 studies using this writing paradigm in healthy individuals. Across studies, this statistic represents a 20% improvement in health outcomes for the emotional expressive writing groups compared to control groups.

Several researchers intrigued by the beneficial effect of writing on health sought to extend these findings over the past 10 years in clinical populations. For example, Smyth and colleagues investigated the effects of writing about stressful life events in individuals with asthma or arthritis and found clinically significant health

improvements in both groups of patients (Smyth, Stone, Hurewitz, & Kaell, 1999). At a four-month follow-up, both asthma and arthritis patients showed significant improvements in lung function and physician ratings of disease severity, respectively. Both the evidence of health benefits and the self-administered potential of this intervention suggest that writing about stressful or traumatic life events could be an effective stress management technique.

Other recent studies have examined the effects of writing in individuals with various chronic illnesses. Stanton et al. (2002) conducted a randomized controlled trial of written emotional disclosure in women with early stage breast cancer. Women were randomly assigned to an EEW condition, a positive writing condition (i.e., benefit-finding), or to a fact-control writing condition. Results indicated that women who were low in avoidance assigned to the expressive writing condition had significantly lower levels of distress. Furthermore, women who engaged in expressive writing reported significantly fewer physical symptoms at 3-months post-intervention compared to the fact-control group. Additionally, both the expressive and positive writing groups had significantly fewer cancer-related medical appointments compared to the fact-control group at 3-months post-intervention. More recently, Petrie and colleagues (2004) tested the effects of emotionally expressive writing in HIV-infected patients. At 6-months, expressive writing patients had significantly higher CD4⁺ lymphocyte counts.

The most recent meta-analysis conducted by Frattaroli using a random-effects approach across 146 studies (2006) continues to suggest that written emotional

disclosure produces health benefits in several different health outcome types (i.e., physiological functioning, psychological well-being, reported health, general functioning, and subjective impact of the intervention in college student, community, and clinical populations). Frattaroli (2006) revealed a mean (unweighted) effect size of $d = .15$ ($r = .075$), which is somewhat smaller than the Smyth (1998) meta-analysis. This decrease in effect is most likely due to the use of different meta-analytic procedures and the inclusion of more unpublished studies in the Frattaroli (2006) review (48% unpublished) compared to the Smyth (1998) review (23% unpublished). Given this effect size, expressive writing can be estimated to account for 0.56% of the variance in associated outcomes. Fratteroli (2006) concluded that despite this lower effect size, it is still considered to be a meaningful intervention when compared to effects sizes of interventions deemed valuable in related research areas (e.g., taking an aspirin to prevent future heart attacks, $r = .034$). Furthermore, the fact that writing is considered a cost-effective (free), supplemental intervention that can produce even small health improvements seems noteworthy.

Despite the accumulating evidence that written emotional disclosure produces physical and psychological benefits in several clinical populations, it is currently unclear whether expressive writing is beneficial for individuals engaging in weight loss maintenance. Given the research that suggests emotional distress is a major contributor to overeating and weight regain, writing may help ameliorate distress through emotional regulation processes, thus decreasing emotional eating behavior and subsequent weight regain.

Lepore, Greenberg, Bruno, and Smyth (2002) speculate that writing may promote emotion regulation through three mechanisms – redirecting attention, habituation processes, and cognitive restructuring, which in turn may affect the subjective, physiological, and behavioral expression of emotion and result in improved mental and physical health. Writing instructions begin the emotional regulation process by directing attention to stress-related thoughts and feelings that may otherwise be avoided, initiating the process of habituation. The structure of emotional expressive writing allows individuals to be exposed to personal stressful events on multiple occasions. This repeated exposure serves to desensitize individuals to the negative thoughts and emotions that are associated with the stressful event. In other words, strong negative emotions are expected to gradually decrease over the course of writing sessions, while positive emotions are predicted to increase.

In addition, cognitive reappraisal and finding meaning to stressful events have been cited as strategies to promote optimal emotional regulation (Larsen & Prizmic, 2004). Writing is a relevant intervention to encourage cognitive reappraisal and construct meaning from stressful events. Emotional expressive writing may influence cognitive restructuring by changing how individuals view the stressful event itself and/or how individuals view their reactions to the stressful event. Again, writing may be beneficial given that labeling and making sense of stress have been shown to be important factors in emotional eating behavior (Slochower 1976; Slochower & Kaplan, 1980).

By improving emotional regulation, writing may simply be one more strategy individuals can add to their "toolbox" of coping skills learned in multidisciplinary weight management programs. This coping strategy may be useful either during the experience of stress when an individual is feeling overwhelmed, or on a regular basis when incorporated into an individual's regular routine. For instance, one may derive benefits when he or she decides to write weekly at a designated time. As stated earlier, the weight maintenance literature has demonstrated that providing ongoing, scheduled therapist contacts for weight loss patients tends to aid in weight maintenance success (see Perri & Corsica, 2002 for review). Writing could fill a niche by serving as a cost-effective, supplemental therapy for individuals to express their thoughts and feelings. Emotional expressive writing could promote a more balanced emotional framework that may help individuals better cope with challenges that often lead to high-risk behaviors that contribute to weight regain after treatment, such as emotional eating and poor exercise adherence.

Limitations of Previous Research

Given the rapid rise in obesity rates combined with the disappointing outcomes of successfully maintaining weight loss in behavioral treatment programs, it has become a serious research priority to improve long-term weight maintenance. Byrne (2002) reviewed the literature on weight maintenance and concluded that the evidence that biological factors lead to weight regain is inconsistent, suggesting that more closely examining psychological processes may provide further explanations regarding successful versus unsuccessful weight maintenance. To date little research

has been conducted examining these psychological mechanisms, by comparing individuals who regain most of their weight loss to individuals who successfully maintain their weight loss. A better understanding of these processes is important in enhancing behavioral interventions to improve individuals' ability to maintain weight loss. For example, research has shown that individuals who experience more major life stressors and higher levels of chronic stress are more likely to gain weight, but it is unclear how these factors impact individuals who complete weight loss programs, and who are attempting to maintain weight loss (Ferreira, Sobrinho, Pires, Silva, Santos, & Sousa, 1995; Vitaliano, Russo, Scanlan, & Greeno, 1996). Similarly, it is unclear how minor stressors affect weight maintenance efforts.

In addition, there is evidence that a breakdown in active coping strategies in response to life stress is a key psychological factor in predicting weight maintenance. One passive approach to coping, emotional eating, has been found to be a common strategy to cope with negative emotion among obese individuals, but it is unclear how significant its role is in weight regain following treatment for obesity. Ironically, eating may be one of the most common human behaviors illustrating a self-regulatory process, yet is still considered to be one of the least understood (Herman & Polivy, 2004). It also remains an open question whether various negative emotions differentially affect eating behavior.

Given the growing body of research providing evidence for the relationship between negative emotion and eating, it appears necessary to develop more emotion-focused weight maintenance interventions. The majority of behavioral interventions

spend minimal amounts of time focusing on the impact of negative emotion on weight loss and maintenance. Furthermore, in-depth, individualized assessment of emotional obstacles is not a routine procedure upon entrance into behavioral treatment programs for obesity. More comprehensive assessments of psychological and emotional factors may be needed to better inform treatment approaches, and it may be the case that behavioral weight control programs need to place more emphasis on the relationships between emotional factors and weight control. In conclusion, while it may be speculated that emotional eating serves an emotional regulatory function, there has been no research examining specific interventions that may help individuals who have completed weight loss programs better regulate their emotions.

The Present Study

Taken together, these findings suggest that emotional and psychological factors, specifically stress and coping with negative emotion via emotional eating may contribute to the widespread difficulties individuals have in maintaining weight loss following behavioral treatment for obesity. Interventions designed to improve emotional regulation processes may attenuate the adverse effects of stress and emotional eating on the ability to successfully maintain weight loss. The current investigation sought to evaluate the effects of an emotionally expressive writing intervention on weight loss and maintenance among individuals who completed weight loss programs. There is potential utility of this writing intervention to serve as a cost-effective, supplemental intervention that may improve weight loss maintenance outcomes. This study used a randomized, prospective design, incorporating the use of well-validated measures in a clinical sample of individuals who were attempting to maintain weight loss.

HYPOTHESES

Specifically, it was hypothesized that following the completion of a weight loss program:

Primary Hypotheses

1. Individuals assigned to the placebo-writing group would regain significantly more weight at follow-up assessments than individuals assigned to the emotional expressive writing (EEW) group.
2. Individuals assigned to the EEW group would show significant decreases in stress levels at follow-up assessments compared to individuals assigned to the placebo-writing group.
3. Individuals assigned to the EEW group would show significant decreases in emotional eating behavior at follow-up assessments compared to individuals assigned to the placebo-writing group.

Secondary Hypotheses

4. There would be a significant interaction between baseline stress and group assignment such that individuals assigned to the placebo-writing group would regain significantly more weight than individuals assigned to the EEW group, and this effect would be stronger for those individuals reporting at higher stress levels at baseline.

5. There would be a significant interaction between baseline emotional eating and group assignment such that individuals assigned to the placebo-writing group would regain significantly more weight than individuals assigned to the EEW group, and this effect would be stronger for individuals reporting higher levels of emotional eating at baseline.

METHOD

Research Design

This study employed a between-groups experimental design. Participants were randomly assigned to one of two conditions: 1) an emotional expressive writing condition ($n=31$) or 2) placebo control writing condition ($n=33$). A power analysis was calculated using an effect size of 0.40, which was based on the findings of the Smyth (1998) meta-analysis examining the effects of written emotional expression on several health outcomes. Using this 0.40 effect size for analysis of covariance with two groups, it was determined that 30 participants would be needed in each condition to yield power of 0.86 (note: the approved proposal for this study was completed prior to the more recent Fratteroli (2006) meta-analysis). A rolling recruitment strategy was utilized such that recruitment was ongoing until the participant goal was reached. The emotional expressive writing group was asked to write about their thoughts and feelings associated with stressful events in their life and the placebo control writing group wrote about how they spent their time (i.e., a time management writing task).

Participants

Participants were men and women, between the ages of 22 and 68 years old, recruited among individuals who completed a variety of weight loss interventions within both the community and a university setting. Participants lost an average of 21.03 pounds (9.56 kg) upon completion of these weight loss interventions, prior to

study entry. In order to be eligible for the current study, participants had to be engaged in a weight loss program and have lost at least 5% of their initial weight.

Measures

Demographic Information. Demographic information was collected at the initial study visit including age, sex, race, marital status, educational level, general health history, (e.g., health conditions, medications, smoking status, hormone replacement therapy), weight and weight loss history, and current writing behavior (e.g., “journaling”). Smoking, hormone replacement therapy, and medications are all variables that have been shown to impact weight in previous studies; therefore these variables among others were collected to serve as potential control variables. Additionally, writing behavior was evaluated at baseline and follow-up assessments to determine whether participants either engaged in writing in the past, or continued writing after the completion of the intervention.

Primary Outcome Variables

Body Weight (kg). Participants were weighed on an electronic scale at each assessment point without shoes and heavy clothing. Weight change in kilograms (kg) during weight maintenance was calculated by examining the difference between baseline weight and weight at the writing intervention follow-ups.

Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985). The TFEQ was used to assess emotional eating behavior at baseline, post-writing intervention, 1 and 3 months. The TFEQ is a 51-item questionnaire that measures three factors of human eating behavior: Dietary Restraint (21 items), Disinhibited

Eating (16 items), and Susceptibility to Hunger (14 items). Questions consist of both true/false items and items rated on 4-point Likert scales for frequency. The Disinhibited Eating factor, which measures to what degree emotional and social influences interfere with an individual's conscious control over eating, was used to assess emotional eating. The Disinhibited Eating factor assesses eating behavior triggered by emotional and/or social cues that occur in one's life. Scores on this measure range from 0 to 16, with higher scores indicating higher levels of Disinhibited Eating. The following are example items from the Disinhibited Eating scale of the TFEQ: "I usually eat too much at social occasions, like parties and picnics" (true or false); "When I feel anxious, I find myself eating" (true or false); "When I feel blue, I often overeat" (true or false); "Do you go on eating binges even though you are not hungry?" (1 = *never* to 4 = *at least once a week*). The internal consistency reliability coefficient was .91 for the Disinhibited Eating factor in a sample of dieters and free eaters. The Dishinhibited Eating factor has previously correlated highly with overeating in the laboratory when participants were subjected to ambiguous situations ($r = .77, p < .01$). In the present study sample, the Disinhibited Eating factor coefficient alpha ranged from .75-.77 across study visits.

Emotional Eating Scale (EES; Arnow, Kenardy, & Agras, 1995). The EES served as an additional measure of emotional eating at baseline, post-writing intervention, 1 and 3 months. Individuals reported the intensity of their desire to eat in response to 25 specific negative emotional states. Individuals rated their desire to eat by marking the most appropriate descriptor on a 5-point Likert scale ranging from

“no desire to eat,” “an overwhelming urge to eat,” “a small desire to eat,” “a moderate desire to eat,” and “a strong desire to eat.” Three subscales were derived from the EES (1) Anger/Frustration (11 items), (2) Anxiety (9 items), and (3) Depression (5 items). Past studies have found a coefficient alpha for the total scale score to be .81, with coefficient alphas of .78, .78, and .72 for the Anger/Frustration, Anxiety, and Depression subscales, respectively. The EES has demonstrated 2-week test-retest reliability of .79. The EES has also been shown to have good construct and discriminative validity. In the present study sample, coefficient alpha ranged from .90-.94 across study visits for the total scale score. Regarding EES subscales, the coefficient alpha ranged from .89-.92 for the Anger/Frustration subscale, .75-.85 for the Anxiety subscale, and .67-.80 for the Depression subscale across study visits.

Weekly Stress Inventory (WSI; Brantley, Jones, Boudreax & Catz, 1997). The WSI was used to assess the number and impact of minor life stressors at baseline, post-writing intervention, 1 and 3 months. There are 87 items covering eight general domains of potential minor life stressors that may have occurred in the past week. These domains include: work/school, money, transportation, marital/family, household, social, personal, and leisure. Participants were asked to rate whether an event occurred in the past week. If an event did occur participants rated the perceived stressfulness of the event on a 7-point Likert scale ranging from *Happened, but not stressful (1)* to *Extremely stressful (7)*. Two scores were derived from the WSI. First, a WSI-Event score was calculated by summing the number of stressful events reported. Second, a WSI-Impact score was calculated by summing the perceived

stressfulness ratings of the events reported. The psychometric properties of the WSI have been shown to be excellent with internal consistency ($\alpha = .92-.97$), test-retest reliability ($r = .80-.83$), and concurrent validity with the Hassles Scale ($r = .61-.69$; Kanner, Coyne, Schaefer & Lazarus, 1981). The following are example items from the WSI: “Unable to finish job, task, or chore”; “Had problems paying bills”; “Argued with a friend.” In the present study sample, coefficient alpha ranged from .90-.93 across study visits.

Life Experiences Survey (LES; Sarason, Johnson & Siegel, 1978). The LES is a 57-item scale that was used to assess the number and impact of major life events experienced in the past year at baseline, post-writing intervention, 1- and 3-month assessment periods. Participants reported the major life stressors they experienced in the past year (specifically indicating the time period of either the past 0-6 months or 7 months -1 year) and rated the type (positive or negative) and extent of impact the event had on their life on a 7-point Likert scale ranging from *Extremely negative* (-3) to *Extremely positive* (+3). Three summed scores were calculated: a positive change score, a negative change score, and a total change score. The total LES change score was calculated by summing the positive and negative change scores. The LES has been well-validated with a variety of stress measures. Significant correlations of .46 and .40 have been found between negative change scores and state and trait anxiety, respectively. Positive change scores have not been correlated with the State-Trait Anxiety Inventory. Significant correlations have been found between negative change scores and the Beck Depression Inventory ($r = .24$) and the Locus of Control

Scale ($r = .32$). Reliability coefficients have ranged from .56 to .88 for the negative change score and .63-.64 for the total change score. The following are example items from the LES: “death of a spouse”; “divorce”; “retirement from work.” Due to method of data entry, the coefficient alpha level was unable to be calculated for the LES in the present study.

Secondary Variables

Center for Epidemiologic Studies of Depression Scale (CES-D; Radloff, 1977). The CES-D was used to assess symptoms of depression at baseline, post-writing intervention, 1 and 3 months. The CES-D is a 20-item self-report scale that assessed depressive symptomatology experienced in the past week. Frequency of depressive symptoms was rated on a 4-point Likert scale ranging from *Rarely or none of the time (less than 1 day)* to *Most of the time or all of the time (5-7 days)*. Scores range from 0-60 with a score of 16 or greater indicating an individual who is at increased risk of meeting criteria for Major Depressive Disorder. The CES-D has solid psychometric properties with internal consistency ($\alpha = .85$) and split-half reliability ($r = .85$). Test-retest reliability was moderate ($r = .45-.70$) as would be expected with depressive symptomatology that is likely to vary over time. The CES-D has correlated moderately with the Hamilton Clinician’s Rating scale and the Raskin Rating scale (.44 to .54). The CES-D was developed for use in the general population rather than psychiatric populations. The following are example items from the CES-D: “I felt that I could not shake off the blues even with help from my family and friends”; “I had trouble keeping my mind on what I was doing”; “I

thought my life had been a failure.” In the present study sample, coefficient alpha ranged from .89-.91 across study visits.

State-Trait Anxiety Inventory (STAI; Spielberger, 1983). The STAI was used to measure participants’ state and trait anxiety at baseline, post-writing intervention, 1 and 3 months. The State Anxiety scale assessed participants’ temporary or momentary feelings of anxiety, whereas the Trait Anxiety scale measured participants’ more general or long-standing feelings of anxiety. Each scale contains 20 items that are rated on a 4-point Likert scale. The State Anxiety scale ratings range from *Not at all (1)* to *Very much so (4)* while the Trait Anxiety scale ratings range from *Almost never (1)* to *Almost always (4)*. The STAI has been widely used and has been shown to be reliable and well-validated in a variety of populations. In terms of reliability, Cronbach’s coefficient alphas have ranged from .83 to .92 for the State Anxiety scale and .86 to .92 for the Trait Anxiety scale. The State Anxiety scale has been shown to be positively correlated with the negative affect scale ($r = .51$) and negatively correlated with the positive affect scale ($r = -.35$) of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The following are example items from the State Anxiety scale based on how individuals *feel in the moment*: “I am tense”; “I am worried.” The following are example items from the Trait Anxiety scale based on how individuals *generally feel*: “I feel nervous and restless”; “I worry too much over something that doesn’t matter.” In the present study sample, coefficient alphas ranged from .92 to .93 for the State Anxiety scale and .91 to .95 for the Trait Anxiety scale.

International Physical Activity Questionnaire – Short Form (IPAQ-SF; International Consensus Group for the Development of an International Physical Activity Questionnaire, 2002 revised). The IPAQ-SF was used to assess physical activity levels at baseline, post-writing intervention, 1 and 3 months. The IPAQ-SF asked individuals to report frequency (days per week) and time spent (in hours and minutes) doing vigorous and moderate physical activities in the past 7 days. In addition, individuals reported frequency and time spent walking and sitting in the past 7 days. The IPAQ-SF has demonstrated good test-retest reliability ($r = .80$). Criterion validity was measured using an accelerometer that individuals wore for 7 consecutive days. The IPAQ-SF demonstrated a median $r = .30$ against the accelerometer for minutes of vigorous, moderate, walking and sedentary behaviors.

Mood Measure. Mood was assessed at baseline, immediately before and after writing, post-writing intervention, and at 1 and 3 month assessment periods. Mood was assessed to provide a process measure of mood and arousal throughout the study, and to provide a manipulation check of the writing intervention. Specific emotions were assessed using the following nine descriptors: anxious, restless, happy, irritable, miserable, tense, content, frustrated/angry, and sad. Arousal was assessed with the following two descriptors: tired and energetic. Both sets of emotion and arousal descriptors were rated on a 1-10-point Likert scale (1 = *not at all*; 10 = *extremely*). After individuals rated specific emotions and arousal, they provided a rating of “overall feeling” on a 1-10 point Likert scale (1 = *negative*; 10 = *positive*) and “overall arousal” on another 1-10 point Likert scale (1 = *extremely low*; 10 =

extremely high). This method of assessing mood was adapted from a measure of positive and negative affect developed by Diener and Emmons (1984), which has been shown to have satisfactory psychometric properties.

Procedure

Recruitment. Multiple methods of recruitment were utilized in this study including the following: in-person presentations of the study to men and women completing a university-based weight loss program, community flyers, and letters sent to men and women involved in individual and group treatment conducted by a doctoral level nurse specializing in weight management. A release of information was obtained from interested individuals to be contacted by the study team and a list of potential study participants was compiled. Interested individuals were contacted to participate in the study immediately after they completed their respective weight loss program to schedule their first study visit.

It should be noted that the original recruitment plan consisted of recruiting all participants from one source – 9-12 month group weight loss interventions within a clinical research university setting. However, following the proposal of this study to the faculty committee and prior to beginning study recruitment, there were significant programmatic changes in this university clinical research setting. For example, there were significantly fewer groups being conducted than anticipated, fewer individuals being enrolled in each intervention group than anticipated and structural changes in the weight loss interventions being delivered (e.g., length of interventions). During the early phases of recruitment, it became apparent that other recruitment sources

would need to be generated in order to reach the proposed study sample size. As a result, the study investigator researched and contacted several additional area health care providers and commercial-based weight loss programs. In addition, flyers were posted in several community locations including area fitness centers. These unexpected recruitment issues obviously impacted the internal validity of the proposed study, but does offer increased external validity by increasing the generalizability of study findings to a more varied group of overweight and obese individuals who sought weight loss treatment.

A qualitative assessment was instituted into the study procedures after recruitment difficulties were fully realized. This assessment was used only while recruiting within the university-based weight loss intervention programs to better understand reasons that individuals decided not to participate in the study. When study investigators attended the final weight loss group meetings to recruit participants, a brief presentation introducing the study was delivered. Following this presentation, group members were asked to complete a brief study interest form. If group members were interested in participating in the study, they would provide their name and contact information. However, if they were not interested they were asked to anonymously endorse reasons for why they chose not to participate. Several reasons for not participating were listed as well as an “other” category where individuals could offer a reason not listed on the recruitment form. In addition, those not interested in participating in the study were asked what would make it more likely to participate in the future. Again, this data is only available for a subset of

individuals from the study's recruitment pool ($n = 101$), but provided greater insight into individuals' decision-making processes regarding participation. Out of the 101 individuals surveyed to participate, 43.6% ($n = 43$) agreed to participate, whereas 57.4% ($n = 58$) of individuals declined to participate in the study. Seventeen people who declined participation had initially said "yes" or "maybe" to participating, but ultimately decided against participating in the study. Only 16 people of those who declined participation answered the question about what factors would increase the likelihood of them participating in a similar study in the future. Over half (56.3%) of these 16 people said receiving monetary compensation would increase the chances of them participating in the future. Table 2 highlights more detailed information gathered from the recruitment survey regarding the reasons that individuals decided not to participate.

Finally, a one-way ANOVA was conducted to examine if there were any differences in the outcome of participating or not participating based on the length of group members' weight loss intervention protocol. Participants who completed this recruitment survey were either in a 3-month ($n = 51$) or 9-month ($n = 50$) intervention. Results indicated that individuals who completed a shorter weight loss intervention were more likely to participate in the current study [$F(1, 99) = 12.26, p = .001$], suggesting that there may be a fatigue factor involved in participants' willingness to participate in a study immediately after completing a structured weight loss program. This provides some evidence that individuals may struggle with the

long-term commitment that is often involved with successful weight loss maintenance.

Table 2

Recruitment survey results

Reasons for declining to participate	<i>n</i>	%
I'm too busy	19	32.7
The study doesn't appeal to me	9	15.5
The study is a bigger time commitment than I am willing to make	8	13.8
There is no monetary compensation for participating	7	12.1
I am tired of focusing on my weight loss	2	3.4
I am starting another program	2	3.4
I will be leaving town	1	1.7
I need a break from weekly group meetings	1	1.7
I live too far away	1	1.7

Study Visit Procedures. At the beginning of the first study visit, participants provided informed consent and were randomly assigned to either the treatment or placebo-control condition. Participants were then weighed, completed a demographic information form and psychosocial questionnaires. Following baseline assessments, participants in each group completed their respective writing assignments in private laboratory areas. The first writing session took place at the end of the baseline assessment visit. The subsequent writing sessions were scheduled once weekly for the next 3 consecutive weeks. Body weight was obtained during each week of writing. Participants completed the mood process measure at baseline, immediately before and after writing, and during each follow-up assessment. Follow-up assessments were completed at the end of the final writing session, and again at 1 and 3 months. At the follow-up sessions participants were weighed and completed the psychosocial questionnaires. All participants were debriefed upon completion of the study. There was no monetary incentive for participation in the study. See Table 3 for a summary of study procedures.

Table 3

Study timeline and procedures

Baseline & Intervention Phase (Week 1)	Intervention Phase (Weeks 2-4)	Post-Writing Assessment (Week 4)	1-Month Follow-Up (Week 8)	3-Month Follow-Up (Week 16)
Informed Consent				
Demographic Forms				
Body Weight	Body Weight	Body Weight	Body Weight	Body Weight
Psychosocial Questionnaires	Writing Intervention (Week 2) (Week 3) (Week 4)	Psychosocial Questionnaires	Psychosocial Questionnaires	Psychosocial Questionnaires
Writing Intervention (Week 1)				Debriefing

Intervention

Treatment Condition: Emotional Expressive Writing. Individuals engaged in four twenty-minute writing exercises in which they wrote about topics surrounding the experience of a stressful life event. The writing tasks took place in private areas. The basic instructional content of each writing exercise was structured as follows:

- 1) *Week one:* Identify an experience that continues to be the most stressful to you at this point in your life. Write for 20 minutes describing the experience in detail.
- 2) *Week two:* You should write again about the stressful experience you wrote about last week, especially your *deepest feelings* associated with the event.
- 3) *Week three:* You should continue to write about your stressful experience and the various emotions that you feel. This week you should also think and write about the *beliefs* you have developed as a consequence of the stressful experience.
- 4) *Week four:* You should continue to think and write about your stressful experience and your feelings, but this week you should *question or challenge the beliefs* you have had surrounding your stressful experience.

Placebo Control Condition: Time Management Writing. The placebo control writing group also engaged in four, twenty-minute writing exercises in which they wrote about topics surrounding personal time management plans (rather than stressful events). The instructions were framed to describe the time management writing exercise as a strategy to reduce stress making the writing task seem more therapeutic. This particular time management writing exercise had been shown to be an effective placebo-control condition in previous expressive writing intervention studies (e.g., Smyth, Stone, Hurewitz & Kaell, 1999). The basic instructional content of each placebo control writing exercise was structured as follows:

- 1) *Week 1:* You should write about your plans for the *previous week*. The goal is to list your *general plans* and discuss how you spent your time over this period of time.
- 2) *Week 2:* You should write about your plans for the *previous 24 hours*. The goal is to list your *general plans* and discuss how you spent your time over this period of time.
- 3) *Week 3:* You should write about your plans for the *upcoming 24 hours*. The goal is to list your *general plans* and discuss how you plan to spend your time.
- 4) *Week 4:* You should write about your plans for the *upcoming week*. The goal is to list your *general plans* and discuss how you plan to spend your time.

Analytic Strategy

1. Descriptive statistics for the sample were calculated using demographic information collected at the pre-writing intervention baseline assessment.
2. To evaluate random assignment, an examination of groups at baseline was performed using one-way analysis of variance. Variables that significantly differed between the EEW and placebo-writing groups at $p < .10$ were used as covariates in subsequent analyses (e.g., demographic variables, baseline psychosocial questionnaires). This liberal significance level was used to reduce the risk of Type II (beta) error among comparisons given the study's small sample size.

Primary Analyses: Main Effects

3. In order to test Hypothesis 1, that individuals assigned to the placebo-writing group would regain significantly more weight at follow-up assessments than individuals assigned to the EEW group, a change score in the dependent variable (body weight) was calculated. Individuals' body weight at the baseline assessment was subtracted from individuals' body weight at the mid-writing intervention (week 2), post-writing intervention, 1- and 3-month assessments. Positive scores indicated weight gain, whereas negative scores indicated weight loss. Analysis of covariance (ANCOVA) was used to examine the main effect of treatment on weight maintenance at the mid-

writing intervention (week 2), post-writing intervention, 1- and 3-month assessments.

4. In order to test Hypothesis 2, that individuals assigned to the EEW group would show significant decreases in stress levels at follow-up assessments compared to individuals assigned to the placebo-writing group, ANCOVAs were used to examine the main effects of treatment on stress levels at the post-writing intervention, and 1- and 3-month assessments. Separate analyses were conducted to examine differences between the frequency and impact of minor and major stressors and treatment using the WSI and the LES, respectively.
5. In order to test Hypothesis 3, that individuals assigned to the EEW group would show significant decreases in emotional eating behavior at follow-up assessments compared to individuals assigned to the placebo-writing group, ANCOVAs were used to examine the main effects of treatment on emotional eating scores at the post-writing intervention, 1- and 3-month assessments.

Secondary Analyses: Interaction Effects

6. In order to test Hypothesis 4, that there would be a significant interaction between baseline stress and group assignment, a linear regression model was used to examine the interaction effects between stress scores and treatment with respect to weight maintenance at the post-writing intervention, and 1- and 3-month assessments. Separate analyses were conducted to examine differences between the frequency and impact of minor and major stressors and treatment using the WSI and the LES, respectively.

$$\text{MODEL: Weight}\Delta = \text{Group} + \text{Stress} + \text{Group}*\text{Stress}$$

7. In order to test Hypothesis 5, that there would be a significant interaction between baseline emotional eating and group assignment, a linear regression model was used to examine the interaction effects between emotional eating scores and treatment with respect to weight maintenance at the post-writing intervention, and 1- and 3-month assessments.

$$\text{MODEL: Weight}\Delta = \text{Group} + \text{Emotional Eating} + \text{Group}*\text{Emotional Eating}$$

RESULTS

Data Screening

Data were analyzed using Statistical Package for the Social Sciences (SPSS), Version 15.0 (SPSS, Inc., 2006). Data screening was performed on the initial sample of 64 participants, in order to identify missing data, invalid data, and participants lost to follow-up. Validity checks were performed on a 25% random sample of participants to ensure accuracy of data entry procedures. No participants from the 25% sub-sample were found to have incorrect, missing, or invalid data.

Outlying scores were also identified and examined, defined as any standardized z-score greater than 3.29 (Tabachnick & Fidell, 1996). Data that met this criterion were also examined on a case-by-case basis through visual data inspection using histograms. Using both z-score cut-offs and histogram examination, only three weight change outcome values for one placebo control participant were eliminated given an unusual pattern of weight change compared to all other participants. It was determined that other outlying values were theoretically plausible and more likely a reflection of actual variability of data rather than true outliers.

Following the inspection of outlying variables, all variable distributions were then examined and assessed to test the assumption of normality. Calculating skewness, kurtosis, and visually inspecting histograms were used to assess normality of variables. Violations of normality were detected in the distributions of weight change, major life event (i.e., LES), and minor life event (i.e., WSI) stress measures. Several data transformation methods were considered, taking into account the pattern

of original data distributions. Log 10, natural logarithm, and square root transformations were then performed, adding constants to each transformation method due to variables having negative and/or zero values. Skewness, kurtosis, and histograms were re-examined in order to determine which transformation procedure produced the optimal data distribution (Tabachnick & Fidell, 1996; Howell, 2002). Most likely due to this study's small sample size, none of the transformations performed improved the data distributions on either weight change or stress variables. In fact, transformations actually worsened the distributions in some cases. Due to minimal to no benefit from data transformation and potential interpretation difficulties, it was determined to perform statistical analyses on the original data instead of using transformed data.

Attrition: Completers versus Non-completers

Figure 1 summarizes the study design and the pattern of participant attrition between conditions and across study visits. The final sample (those who completed the entire study) included 17 males (26.4%) and 47 females (73.4%). Regarding participants who dropped out of the study, available data for these participants prior to their respective drop out date was included in planned analyses. Of participants who dropped out of the study, 1 participant (3.0%) dropped out of the placebo control group, whereas 8 participants (25.8%) dropped out of the EEW group. Not surprisingly, a one-way ANOVA showed that the number of non-completers between groups was significant [$F(1, 62) = 7.45, p = .008$]. Due to the disproportionate number of participants who dropped out of the EEW group, missing data was treated

as missing data rather than performing data imputation, which might over- and/or under-interpret results depending on the variable in question. This decision was reinforced due to the primary outcome variable being weight change over time. Given that significantly more individuals dropped out of the EEW group, data imputation methods would likely bias results in favor of the EEW group given that the weight loss maintenance literature consistently demonstrates that individuals tend to gain weight over time (see Wadden, Brownell, & Foster, 2002 for review; Wing, 2002). Furthermore, the 7 EEW participants dropped out of the study after week 2 (i.e., completed first and second session of writing), 1 EEW participant dropped out after week 4 (i.e., completed entire writing intervention), and the 1 placebo control participant dropped out after week 1 (i.e., completed the first writing session). Based on this pattern of attrition, the decision was made to add an additional ANCOVA for weight change at week 2 – after completing 50% of the writing intervention, since data for almost all participants was available for analysis at this time point. An ANCOVA was performed for weight change only because assessments for stress and emotional eating were not collected at week 2 of the study. Reasons for attrition are summarized in Table 4.

Exploratory analyses were conducted to better understand possible explanations for the differential attrition rate based on data collected at week 2. One-way analysis of variance was conducted to examine the differences in weight change at week 2 between study completers and non-completers, but there were no significant differences found between groups [$F(1, 60) = 0.09, ns$]. Given that some

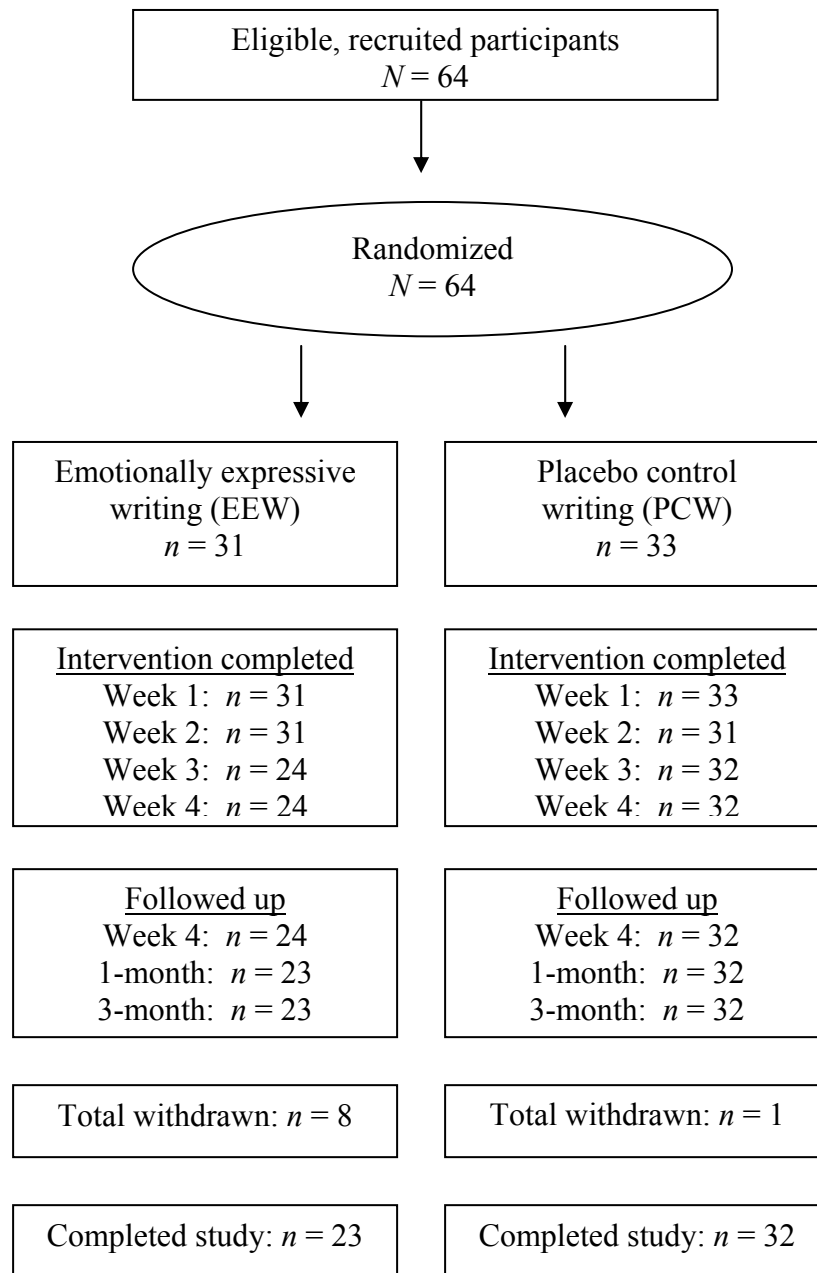
participants reported not enjoying the writing or felt it was too distressing, differences in pre- and post-writing mood were examined for differences between study completers and non-completers. One-way ANOVAs were conducted across participants' self-report ratings of different emotional states immediately before and after writing. No differences were found in emotional states at the week 2 pre-writing assessment between study completers and non-completers, but there were significant differences between groups at the week 2 post-writing assessment. After writing, participants who dropped out of the study reported being significantly less happy ($p = .040$), more miserable ($p = .038$), more tense ($p = .038$) and a trend toward being more sad ($p = .075$). These findings indicate that some participants who dropped out of the study may have minimized their report to study investigators about the negative emotional impact of the writing on their decision to withdraw from the study.

Table 4

Reasons for attrition by group assignment

Stated reasons for dropping out of study	<i>n</i>	Number of writing sessions completed
<u>EEW non-completers</u> (<i>n</i> = 8)		
Parking facility hassles	3	2
Study different than what expected; did not enjoy writing	2	2
Writing was distressing	1	2
Too busy to complete study	1	4
No explanation available	1	2
<u>Placebo non-completers</u> (<i>n</i> = 1)		
Too busy to complete study	1	1

Figure 1. *Study Profile*



In addition to the differences between non-completers and completers in group assignment, a one-way ANOVA using an alpha of $p \leq .10$ revealed additional significant differences on several baseline assessments including the following: race ($p = .04$), children ($p = .10$), number of children ($p = .07$), children living in home ($p = .09$), perceived overall health rating ($p = .10$), WSI event score ($p = .04$), and the average number of days walked for exercise in the past week ($p = .06$),

Further examination of these differences revealed that non-completers were more likely to have children, have significantly more children, and were more likely to have children living with them in their home compared to completers. Completers had a lower perceived overall health rating ($M = 4.79$, $SD = .93$) compared to non-completers ($M = 5.33$, $SD = .71$). In addition, completers had a higher WSI event score ($M = 28.71$, $SD = 11.45$) compared to non-completers ($M = 20.44$, $SD = 8.79$), and a higher number of walking days per week ($M = 4.93$, $SD = 2.27$) compared to non-completers ($M = 3.33$, $SD = 2.83$). See Table 5 for complete listing of means, standard deviations, frequencies, and percentages.

Table 5

Differences between study completers and non-completers at baseline ($p \leq .10$)

	Mean (SD)	Mean (SD)	<i>n</i> (%)	<i>n</i> (%)
Baseline assessments	Completers (<i>n</i> = 55)	Non-completers (<i>n</i> = 9)	Completers (<i>n</i> = 55)	Non-completers (<i>n</i> = 9)
<u>Race</u>				
Caucasian			50 (91%)	8 (89%)
Black			3 (5%)	--
Asian			1 (2%)	--
Latino			1 (2%)	--
Other			--	1 (11%)
Health rating	4.79 (0.93)	5.33 (0.71)		
<u>Children</u> (yes)				
# of children	1.55 (1.21)	2.33 (1.00)	42 (76%)	9 (100%)
# at home	0.80 (1.06)	1.44 (0.88)		
WSI event score	28.71 (11.45)	20.44 (8.79)		
Exercise (# days walking)	4.93 (2.27)	3.33 (2.83)		

Descriptive Characteristics

Descriptive statistics were calculated based on responses collected from all study participants in the study demographic questionnaire during the baseline study visit. Participants ranged in age from 22-68 years old, with an overall mean of 46.9 years old. As reflected in Table 2, 90.6% of the participants were Caucasian, 70.3% were married or living with someone as if they were married, 81.3% had a college degree or higher and over half of participants (59.4%) reported an average yearly income of at least \$50,000. Means and standard deviations of the sample characteristics by group assignment are presented in Table 6.

Table 6

Characteristics of sample by group

	<i>n</i>		<i>%</i>		Mean (SD)	
	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)
Demographics						
Age (years)					47.39 (9.93)	46.52 (9.96)
<u>Sex</u>						
Female	22	25	71%	76%		
Male	9	8	29%	24%		
<u>Race</u>						
Caucasian	28	30	90%	91%		
Black	1	2	3%	6%		
Asian	1	--	3%	--		
Latino	--	1	--	3%		
Other	1	--	3%	--		
<u>Marital status</u>						
Single	4	5	13%	15%		
Married	21	24	68%	73%		
Divorced	4	4	13%	12%		
Separated	1	--	3%	--		
Widowed	1	--	3%	--		
<u>Education</u>						
Some college	6	6	19%	18%		
College degree	12	17	39%	52%		
Graduate degree	13	10	42%	30%		
<u>Annual income</u>						
< \$35,000	5	6	16%	18%		
\$35,000-\$49,999	7	7	23%	21%		
\$50,000-\$75,000	9	7	29%	21%		
Over \$75,000	9	13	29%	39%		

Table 7 provides basic characteristics of the weight loss interventions that participants were recruited from including the multiple treatment delivery modes involved. The majority of participants completed behavioral weight loss programs delivered in a face-to-face group format (84.4%) with length of treatment ranging from 3-9 months for 78% of participants. Only one study participant in the EEW group did not complete a traditional behavioral weight loss program, but rather lost weight using a surgical approach (i.e., gastric bypass). Consideration was given to excluding this participant's data given one could argue the method of weight loss for this participant was qualitatively different from other participants. However, it was determined to include this participant's data in all analyses since there did not appear to be any differences in baseline characteristics compared to the rest of the sample.

Table 7

Weight loss intervention characteristics

	<i>n</i>		<i>%</i>		Mean (SD)	
Weight loss intervention characteristics	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)
<u>Delivery mode</u>						
Group	26	28	84%	85%		
Individual	3	3	10%	9%		
Telehealth	1	2	3%	6%		
Surgical	1	--	3%	--		
<u>Intervention length</u>						
3 months	12	18	39%	55%		
6 months	1	2	3%	6%		
9 months	7	10	23%	30%		
12 months	8	3	26%	9%		
24 months	3	--	9%	--		
Weight loss (kg)					18.84 (11.10)	15.09 (7.58)
Weeks since completing intervention					3.06 (1.63)	3.12 (1.85)

In addition to body weight, information about participants' general health history, and health behaviors were assessed during the first study visit (i.e., baseline assessment). Pertinent information regarding participant health status is summarized in Table 8. Participants were also asked whether they engage in journal writing and if so, how often they journal. Journal writing behavior, presented in Table 9 was assessed during both the baseline and the 3-month follow-up assessment. One-way ANOVAs did not detect significant differences between groups in journaling or frequency of journal writing.

Table 8

Baseline health assessment

	<i>n</i>		<i>%</i>		Mean (SD)	
	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)	EEW (<i>n</i> = 31)	Placebo (<i>n</i> = 33)
Baseline health assessment						
Weight (kg)					86.91 (21.38)	92.91 (22.56)
BMI					30.90 (7.10)	32.56 (6.76)
Health rating					5.03 (0.88)	4.71 (0.94)
<u># of current medications</u>					3.26 (3.13)	3.76 (4.37)
None	5	6	16%	18%		
1-3	16	17	52%	52%		
4-6	5	4	16%	12%		
7-9	2	4	6%	12%		
10 or more	1	4	3%	12%		
<u>Lifetime medical conditions</u>					2.90 (2.43)	3.09 (2.47)
None	2	1	7%	3%		
1-3	21	22	68%	67%		
4-6	3	6	10%	18%		
7 or more	5	4	16%	12%		
<u>Lifetime mental health conditions</u>					0.45 (0.72)	0.48 (0.76)
None	21	21	68%	64%		
1	6	9	19%	27%		
2	4	2	13%	6%		
3	--	1	--	3%		
Non-smoking	30	32	97%	97%		

Table 9

Journal writing behavior

Journal writing behavior	<i>n</i>		%	
	EEW	Placebo	EEW	Placebo
<u>Baseline assessment</u>	(<i>n</i> = 31)	(<i>n</i> = 33)	(<i>n</i> = 31)	(<i>n</i> = 33)
Journal (yes)	11	8	36%	24%
Daily	5	3	16%	9%
Weekly	2	1	7%	3%
Monthly	3	1	10%	3%
< 6 times per year	1	3	3%	9%
<u>3-month follow-up</u>	(<i>n</i> = 21)	(<i>n</i> = 30)	(<i>n</i> = 21)	(<i>n</i> = 30)
Journal (yes)	4	8	19%	27%
Daily	--	3	--	10%
Weekly	4	3	19%	10%
Monthly	--	2	--	7%
< 6 times per year	--	--	--	--

Pretest Comparison

To evaluate random assignment, an examination of groups at baseline across demographic and baseline assessments was performed using a one-way ANOVA with a liberal significance level ($p = 0.10$). The significance levels for length of weight loss intervention and total weight lost during the weight loss intervention were, $p = .034$ and $p = .117$, respectively. Consequently, length of weight loss intervention was used as a covariate in subsequent analyses. Total weight loss was only slightly above the significance cutoff of $p = .10$, and since it is both theoretically and practically reasonable to assume that it is an important variable to control for, it was also included as a covariate in subsequent analyses (Tabachnick & Fidell, 1996). In addition, baseline assessments of weight, stress, and emotional eating were used as covariates in their respective analyses.

Manipulation Check #1

The first manipulation check was performed to examine if participants in both the EEW and placebo control groups perceived the content of their respective writing instructions differently. Table 10 shows the means, standard deviations, and significance levels of participant responses to treatment credibility questions completed in the study exit questionnaire at the end of the 3-month follow-up visit (i.e., questions adapted from Borkovec & Nau, 1972). Ratings were based on a 1-10 rating scale (1 = Not at all and 10 = Extremely). Refer to Appendix A for complete listing of credibility questions. One-way ANOVAs did not reveal any significant differences between groups in their assessment of the credibility of the writing

instructions. These results suggest that, in many important areas, participants viewed the placebo writing instructions to be equally as credible as the EEW writing instructions in being a useful intervention. Total credibility scores were then calculated for each group by summing the first five items in Table 10. Consistent with above findings, a one-way ANOVA did not reveal any differences in overall credibility between groups [$F(1, 50) = 0.78, ns$], providing further evidence that the placebo control writing instructions served as an effective comparison group.

Regarding participants' perception of writing instructions in emotion-related areas, one-way ANOVAs revealed significant differences in several areas. For instance, EEW participants viewed their writing to be more personal ($M = 6.14$ vs. $M = 4.39$) [$F(1, 51) = 5.39, p = .024$], more emotional ($M = 5.95$ vs. $M = 4.13$) [$F(1, 51) = 5.53, p < .023$] and more stressful ($M = 4.00$ vs. $M = 2.52$) [$F(1, 50) = 4.54, p < .038$]. These perceptions are consistent with the content each condition's assigned instructions (i.e., EEW instructions were designed to elicit more emotion). Furthermore, these perceptions provide evidence that participants in the placebo control group adhered to their writing instructions (i.e., they refrained from writing about their feelings).

Table 10

Manipulation check #1: Credibility of the writing intervention and emotional responses to the writing intervention

	Mean (SD)	Mean (SD)
<u>Credibility questions</u>	EEW (<i>n</i> = 21)	Placebo (<i>n</i> = 30)
How logical...?	5.48 (2.46)	4.63 (2.37)
Confidence in managing stress...?	5.10 (2.63)	5.03 (2.64)
Confidence recommending to a friend...?	5.62 (2.62)	4.77 (2.70)
If feeling stress...willingness to perform exercises...?	5.57 (2.71)	5.48 (2.68)
How successful in helping with other difficulties...?	5.86 (2.52)	5.10 (2.75)
Total credibility score	15.81 (19.48)	22.82 (13.58)
<u>Emotion-related questions</u>		
How personal...?	6.14 (2.94)	4.39 (2.49)*
How emotional...?	5.95 (3.17)	4.13 (2.42)*
How meaningful...?	5.00 (2.65)	4.45 (2.36)
How valuable...?	5.05 (2.60)	4.39 (2.23)
How stressful or upsetting...?	4.00 (2.78)	2.52 (2.23)*

Note: * $p < .05$. Rating Scale: 1-10 (1 = Not at all and 10 = Extremely). The sample size for each condition differs from 3-month follow-up analyses. Due to a study procedural error, 2 completers in the EEW group and 2 completers in the Placebo Control group did not receive the exit questionnaire during their last study visit.

Manipulation Check #2

The second manipulation check was performed to more fully examine participants' emotional reactions to the EEW and placebo control writing conditions using the mood measure administered to participants immediately before and after writing. Separate means were calculated to obtain an overall negative emotion and positive emotion score. The negative emotion mean score was comprised participant ratings on eight emotion descriptors (i.e., anxious, restless, irritable, miserable, tense, frustrated/angry, sad, and tired), whereas the positive emotion mean score was comprised of ratings on three emotion descriptors (i.e., happy, content, energetic) using a 1-10-point Likert scale (1 = *not at all*; 10 = *extremely*). One-way ANOVAs were performed to examine group differences in emotional reactivity to their respective writing assignments. Results revealed that there was a significant difference between groups in negative emotion at the post-writing ratings during the first [$F(1, 62) = 10.72, p = .002$] and second [$F(1, 60) = 5.44, p = .023$] writing sessions. There were no significant differences in pre-post writing on either negative or positive emotion during the third and fourth writing sessions. Means and standard deviations for pre- and post-writing ratings of positive and negative emotions across writing study visits are presented in Table 11.

Table 11

Manipulation check #2: Emotional reactivity to the writing conditions

	Mean (SD)	Mean (SD)
	EEW (<i>n</i>)	Placebo (<i>n</i>)
<u>Writing session #1</u>	(<i>n</i> = 31)	(<i>n</i> = 33)
Pre-writing negative emotion	2.37 (1.25)	2.44 (1.33)
Post-writing negative emotion	3.71 (1.97)	2.41 (1.10)**
Pre-writing positive emotion	6.13 (2.07)	5.99 (1.80)
Post-writing positive emotion	5.22 (2.10)	5.86 (1.80)
<u>Writing session #2</u>	(<i>n</i> = 31)	(<i>n</i> = 31)
Pre-writing negative emotion	2.86 (1.40)	3.21 (1.55)
Post-writing negative emotion	3.62 (1.69)	2.73 (1.28)**
Pre-writing positive emotion	5.78 (1.55)	5.69 (1.86)
Post-writing positive emotion	5.32 (2.02)	5.87 (1.97)
<u>Writing session #3</u>	(<i>n</i> = 24)	(<i>n</i> = 32)
Pre-writing negative emotion	2.81 (1.35)	3.38 (1.96)
Post-writing negative emotion	3.06 (1.63)	2.93 (1.74)
Pre-writing positive emotion	5.80 (1.79)	5.98 (1.80)
Post-writing positive emotion	5.42 (1.64)	5.94 (1.95)
<u>Writing session #4</u>	(<i>n</i> = 24)	(<i>n</i> = 32)
Pre-writing negative emotion	2.79 (1.55)	2.76 (1.38)
Post-writing negative emotion	3.04 (1.83)	2.64 (1.36)
Pre-writing positive emotion	6.00 (1.34)	6.19 (1.77)
Post-writing positive emotion	5.65 (1.44)	6.02 (1.53)

Note. A significant overall *F* test is indicated at ***p* < .01.

Manipulation Check #3

Prior to study implementation there were concerns that the placebo control group writing instructions may be more therapeutic in this population (i.e., individuals focused on maintaining weight loss) compared to previous expressive writing studies using this placebo control manipulation. As a result, the final manipulation check examined whether the control group wrote about time management in a manner that integrated their efforts to meal plan and fit in regular exercise, which may point to this particular placebo writing exercise being an inappropriate control condition in a weight loss-related study. All placebo control essays were reviewed for references to food intake and physical activity, however, none of the participants in the placebo control group incorporated nutrition and exercise plans into their essays.

Primary Analyses: Main Effects

Weight Change. Table 12 presents the covariate-adjusted means for weight change by condition at the mid-writing intervention (week 2), post-writing intervention, 1- and 3-month assessments. ANCOVAs did not reveal any significant differences between groups in weight change over the course of the study – week 2 [$F(1, 58) = 0.11, ns$]; post-writing [$F(1, 51) = 0.98, ns$]; 1-month follow-up [$F(1, 50) = 0.01, ns$]; or 3-month follow-up [$F(1, 49) = 0.27, ns$]. Weight change across study assessments is visually depicted in Figure 2.

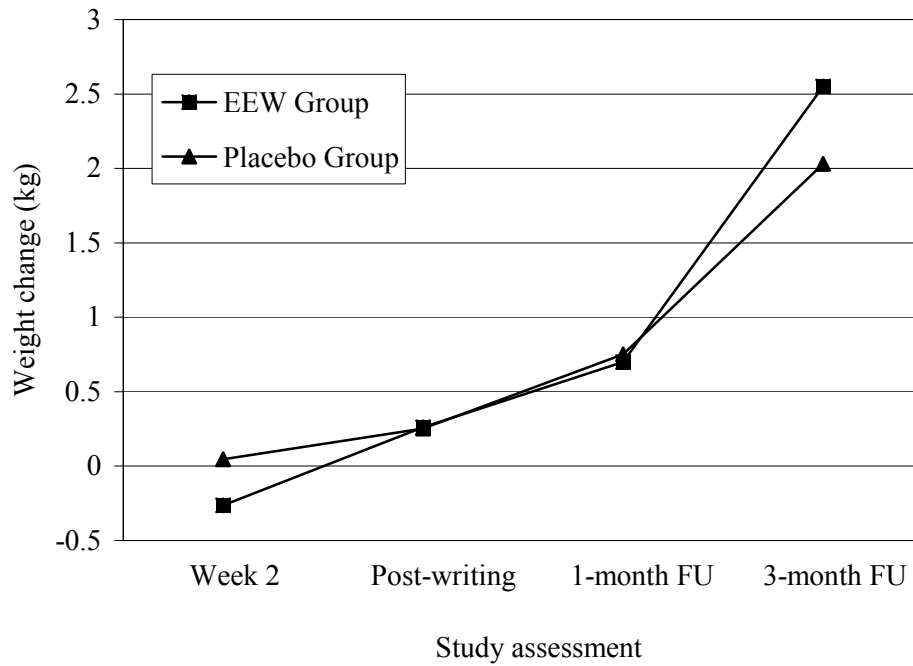
Table 12

Covariate-adjusted means for weight change (kg)

Assessment	<i>n</i>		Mean (SE)	
	EEW	Placebo	EEW	Placebo
Week 2	31	31	-0.18 (0.26)	-0.05 (0.26)
Post-writing	24	31	0.16 (0.33)	0.30 (0.29)
1-month follow-up	23	31	0.71 (0.51)	0.77 (0.44)
3-month follow-up	23	30	2.63 (0.78)	2.07 (0.68)

Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and baseline weight. Negative values indicate weight loss from baseline to subsequent assessments, whereas positive values indicate weight gain during the same period. Three placebo control group participants who completed the study are not included in certain analyses. One participant was unable to attend the week 2 writing visit, one participant had outlying data at the post-writing, 1- and 3-month follow-up assessments that was removed, and one participant declined to be weighed at the 3-month follow-up assessment.

Figure 2. Covariate-adjusted means for weight change across study assessments



Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and baseline weight.

Major Life Event Stress. Table 13 presents the covariate-adjusted means for participants' LES total scores by condition at the post-writing intervention, 1- and 3-month assessments. ANCOVA at the post-writing follow-up revealed a significant difference between groups in LES total scores [$F(1, 51) = 12.05, p = .001$]. There were no other significant differences detected between groups at the 1-month [$F(1, 50) = 0.09, ns$]; or 3-month follow-up assessments [$F(1, 50) = 0.31, ns$].

Table 13

Covariate-adjusted means for LES total scores

Assessment	<i>n</i>		Mean (SE)	
	EEW	Placebo	EEW	Placebo
Post-writing	24	32	-2.28 (1.08)	2.80 (0.93) ***
1-month follow-up	23	32	0.78 (1.22)	1.28 (1.02)
3-month follow-up	23	32	0.08 (1.29)	-0.90 (1.08)

Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and baseline LES total score. A significant overall F test is indicated at *** $p < .001$.

Minor Life Event Stress. Table 14 presents the covariate-adjusted means for the number of minor stressors reported (i.e., WSI event score) and the subjective impact of reported stressors (i.e., WSI impact scores) by condition at the post-writing intervention, 1- and 3-month assessments. An ANCOVA performed at the post-writing follow-up revealed a trend toward significance between groups in WSI event scores [$F(1, 51) = 3.64, p = 0.06$] with EEW participants reporting more stressful events. ANCOVAs, however, did not reveal significant differences between groups in WSI-event scores at the 1-month [$F(1, 50) = 0.10, ns$] or 3-month follow-up assessments [$F(1, 50) = 0.00, ns$].

Regarding participants' WSI impact scores, ANCOVAs revealed a trend toward significance at both the post-writing and 3-month follow-up assessments, [$F(1, 51) = 2.99, p = 0.09$] and [$F(1, 50) = 3.15, p = 0.08$], respectively. At the post-writing assessment EEW participants reported a greater negative impact from reported daily stressors. Interestingly, this pattern of results changed at the 3-month follow-up, which revealed that EEW participants reported less impact from reported daily stressors compared to placebo control participants. There was no significant difference detected between groups at the 1-month follow-up assessment [$F(1, 50) = .03, ns$].

Table 14

Covariate-adjusted means for WSI event and impact scores

Assessment	<i>n</i>		Mean (SE)	
	EEW	Placebo	EEW	Placebo
<u>WSI event scores</u>				
Post-writing	24	32	29.17 (2.19)	23.53 (1.88) #
1-month follow-up	23	32	25.21 (1.69)	25.91 (1.42)
3-month follow-up	23	32	24.12 (2.06)	24.26 (1.73)
<u>WSI impact scores</u>				
Post-writing	24	32	87.85 (9.21)	66.40 (7.93) #
1-month follow-up	23	32	72.17 (6.64)	73.82 (5.58)
3-month follow-up	23	32	57.09 (6.88)	73.47 (5.78) #

Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and respective baseline WSI scores. Trends ($p < .10$) are noted with #.

Emotional Eating (TFEQ). Table 15 presents the covariate-adjusted means for disinhibited eating by condition as measured by the TFEQ at the post-writing intervention, 1- and 3-month assessments. ANCOVAs did not reveal significant differences between groups in disinhibited eating over the course of the study – post-writing [$F(1, 51) = 0.03, ns$]; 1-month follow-up [$F(1, 50) = 0.18, ns$]; or 3-month follow-up [$F(1, 50) = 0.12, ns$].

Table 15

Covariate-adjusted means for TFEQ Disinhibition scores

Assessment	<i>n</i>		Mean (SE)	
	EEW	Placebo	EEW	Placebo
Post-writing	24	32	10.04 (0.33)	9.97 (0.28)
1-month follow-up	23	32	9.48 (0.47)	9.75 (0.40)
3-month follow-up	23	32	9.55 (0.48)	9.76 (0.40)

Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and baseline TFEQ – Disinhibition subscale score.

Emotional Eating (EES). Table 16 presents the covariate-adjusted means for EES subscales by condition at the post-writing intervention, 1- and 3-month assessments. ANCOVAs did not reveal significant differences between groups in anxiety- or depression subscales across all assessments (all *ns*). There were significant differences in the anger/frustration subscale at both the post-writing [$F(1, 51) = 6.21, p = 0.02$] and at 3-month follow-up assessments [$F(1, 50) = 4.79, p = 0.03$] with EEW participants reporting significantly more eating in response to anger/frustration compared to placebo control participants. There were no significant differences between groups in anger/frustration at the 1-month follow-up assessment [$F(1, 50) = 1.59, ns$]. Regarding total EES scores, there was a trend toward significance at the post-writing assessment [$F(1, 51) = 3.57, p = 0.07$] with EEW participants endorsing higher rates of overall emotional eating. No differences, however, were detected at the 1- and 3-month follow-up assessments [$F(1, 50) = 1.97, ns$] and [$F(1, 50) = 1.77, ns$], respectively.

Table 16

Covariate-adjusted means for EES subscales and total scores

Assessment	<i>n</i>		Mean (SE)	
	EEW	Placebo	EEW	Placebo
<u>Post-writing</u>	24	32		
Anger/Frustration			14.83 (1.20)	10.79 (1.04) *
Anxiety			12.23 (1.14)	10.54 (0.98)
Depression			9.02 (0.52)	8.86 (0.45)
Total score			36.19 (2.39)	30.11 (2.06) #
<u>1-month follow-up</u>	23	32		
Anger/Frustration			15.54 (1.57)	12.89 (1.32)
Anxiety			13.55 (1.12)	12.04 (0.94)
Depression			9.88 (0.73)	8.74 (0.62)
Total score			39.05 (2.88)	33.62 (2.42)
<u>3-month follow-up</u>	23	32		
Anger/Frustration			14.76 (1.39)	10.67 (1.17) *
Anxiety			11.23 (1.08)	10.80 (0.91)
Depression			8.83 (0.69)	8.69 (0.58)
Total score			34.97 (2.75)	30.05 (2.31)

Note. Means are adjusted for the following covariates: weight lost during prior weight loss intervention, length of prior weight loss intervention, and baseline EES scores.

Significant overall *F* tests are indicated at **p* < .05.

Trends (*p* < .10) are noted with #.

Secondary Analyses: Interaction Effects

Hierarchical multiple regression analyses were performed to examine possible interactions between baseline measures (stress or emotional eating) and group assignment (EEW and placebo groups) with respect to weight change to determine if baseline stress or emotional eating served as moderating variables with respect to group assignment and subsequent weight change. Regression analyses were informed by the results from previous main effects analyses that indicated either statistical significance or a trend toward significance (i.e., LES total, WSI event, WSI impact, EES total, and EES anger/frustration scores at the post-writing assessment; WSI impact and EES anger/frustration scores at the 3-month follow-up assessment). Only continuous predictor variables, which included all identified baseline stress and emotional eating scores, were mean centered prior to conducting regression analyses (Aiken & West, 1991). Group assignment, a dichotomous variable, was not mean centered to simplify interpretation of slopes for each group (Holmbeck, 2002). Using these criteria, separate hierarchical regression analyses were performed using group assignment, the appropriate baseline stress or emotional eating measure, and an interaction term created by multiplying group assignment and baseline stress or emotional eating measure as appropriate. “Post-hoc probing” of significant interactions was performed to obtain more specific information about the conditions of the moderating relationship and was used to plot regression lines (see Aiken & West, 1991; Holmbeck, 1997; Holmbeck, 2002 for more information about post-hoc probing methods).

In order to test for violations of the statistical assumptions for multiple regression, the residual plots of observed versus predicted values for the dependent variable were analyzed for each analysis described below, as recommended by Tabachnick & Fidell (1996). Findings for all standardized residual plots were null, thus indicating that all analyses met assumptions for lack of multicollinearity, linearity of the relationships, and constant variance of the error term (homoscedasticity). Finally, the multiple regression assumption that there is normality of the error term distribution was tested by examination of the normal probability plots for the observed versus expected values of the standardized residuals, thus the error terms did not deviate significantly from normal.

LES Total Score x Group. The following blocks were entered into the regression analysis: 1) group assignment, 2) baseline LES total score, 3) interaction term created between group assignment and baseline LES score. Weight change at the post-writing assessment was entered as the dependent variable. Incremental $R^2\Delta$ values in weight change were calculated for each block. After controlling for the variance from covariates in block 1 and the main effects for group and baseline LES total scores in blocks 2 and 3, respectively, analyses revealed that the interaction between group and baseline LES total scores approached significance, $R^2\Delta = .02$, $F(5, 49) = 2.09$, $p = .08$. In sum, the interaction between group and baseline LES total scores predicted 9.1% of the variance in weight change at the post-writing assessment. Bivariate correlations between the interaction variables and weight

change are presented in Table 17 followed by the hierarchical regression model illustrated in Table 18.

Table 17

Correlational matrix of predictor and criterion variables (r)

Variables	Group	LES	Group x LES	Wt chg
Group	--	-.10	-.08	-.03
Baseline LES score		--	.76***	.30*
Group x Baseline LES score			--	.09
Weight change				--

Note: * $p < .05$; *** $p < .001$

Table 18

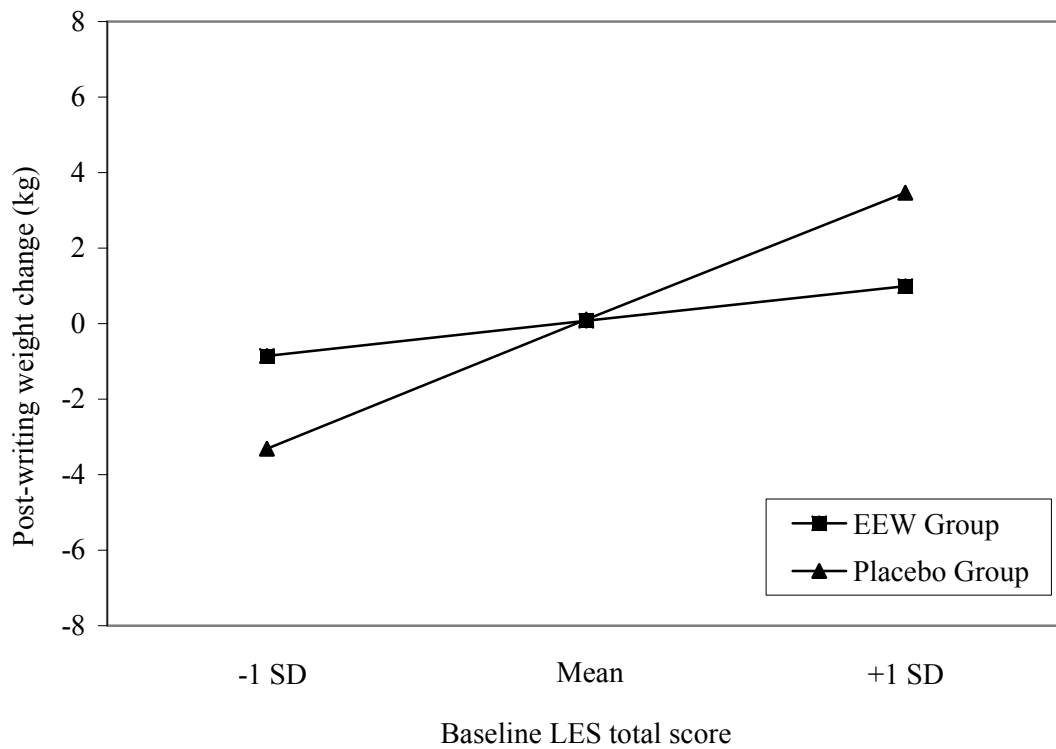
Summary of hierarchical regression analysis examining the moderating effect of baseline major life event stress (LES total score) on group assignment and weight change at the post-writing assessment

Step and predictor variables	R^2	$Adj R^2$	$R^2\Delta$	B	β
<u>Step 4 (2-way interaction)</u>					
Group x Baseline LES total score	.175	.091	.023	-.068	-.247

Given there was a trend toward significance, post-hoc probing was conducted to better understand the potential moderation between group and baseline LES scores on post-writing weight change. Initially, group was coded 0 for the placebo group and 1 for the EEW group. As described in Holmbeck (2002), when there is a variable that is dichotomous, one needs to compute two new conditional variables where one group is assigned a value of 0 in one analysis (i.e., re-coded GroupEEW: EEW group = 0 and Placebo group = 1) and the other group is coded 0 in the other analysis (i.e., re-coded GroupPC: Placebo group = 0 and EEW group = -1). A post-hoc regression analysis was run by simultaneously entering the main effect for baseline LES scores, the conditional group variables (GroupEEW) and the interaction term created between baseline LES and GroupEEW. This procedure was repeated using the conditional group variable GroupPC instead of GroupEEW. Each of these analyses

generated the simple slope for each treatment group (Holmbeck, 2002). A graphical depiction of the slopes for each group is presented in Figure 2. Since baseline LES scores were mean centered, the baseline LES mean was equal to 0. Weight change for each treatment group was predicted at 1 standard deviation above and 1 standard deviation below the mean for baseline LES scores (Aiken & West, 1991). As reflected in Figure 3, both groups regained weight with higher stress reported at baseline as measured by the LES at the post-writing assessment as indicated by the increasing slopes. However, individuals with baseline LES scores below the mean had less weight regain in the placebo control group relative to the EEW group, whereas individuals with baseline LES scores above the mean had less weight regain in the EEW group relative to the placebo control group. These findings suggest that the impact of baseline LES scores on weight regain may have been attenuated for individuals in the EEW group as compared to individuals in the placebo control group.

Figure 3. *The moderating effect of baseline major life event stress (LES total score) on group assignment and weight change at the post-writing assessment*



WSI Event Score x Group. The following blocks were entered into the regression analysis: 1) group assignment, 2) baseline WSI event score, 3) interaction term created between group assignment and baseline WSI event score. Weight change at the post-writing assessment was entered as the dependent variable. Incremental $R^2\Delta$ values in weight change were calculated for each block. The interaction term was not statistically significant, thus the moderating hypothesis was not supported. The regression model is illustrated in Table 19.

Table 19

Summary of hierarchical regression analysis examining the moderating effect of baseline minor life event stress (WSI event score) on group assignment and weight change at the post-writing assessment

Step and predictor variables	R^2	$Adj R^2$	$R^2\Delta$	B	β
<u>Step 4 (2-way interaction)</u>					
Group x Baseline WSI event score	.097	.004	.001	.009	.042

WSI Impact Score x Group. The following blocks were entered into the regression analysis: 1) group assignment, 2) baseline WSI impact score, 3) interaction term created between group assignment and baseline WSI impact score. Weight change at the post-writing and 3-month follow-up assessments were entered as the dependent variables (in separate regression analyses). Incremental $R^2\Delta$ values in weight change were calculated for each block. The interaction term was not statistically significant, thus the moderating hypothesis was not supported. The regression model is illustrated in Table 20.

Table 20

Summary of hierarchical regression analysis examining the moderating effect of baseline minor life event stress (WSI impact score) on group assignment and weight change at the post-writing and 3-month follow-up assessments

Step and predictor variables	R^2	$Adj R^2$	$R^2\Delta$	B	β
<u>Post-writing assessment</u>					
Step 4 (2-way interaction)					
Group x Baseline WSI impact score	.098	.006	.000	-.001	-.029
<u>3-month follow-up assessment</u>					
Step 4 (2-way interaction)					
Group x Baseline WSI impact score	.090	-.007	.001	-.005	-.043

EES Anger/Frustration Subscale x Group. The following blocks were entered into the regression analysis: 1) group assignment, 2) baseline EES anger/frustration subscale score, 3) interaction term created between group assignment and baseline EES anger/frustration subscale score. Weight change at the post-writing and 3-month follow-up assessments were entered as the dependent variables (in separate regression analyses). Incremental $R^2\Delta$ values in weight change were calculated for each block. The interaction term was not statistically significant, thus the moderating hypothesis was not supported. The regression model is illustrated in Table 21.

Table 21

Summary of hierarchical regression analysis examining the moderating effect of baseline emotional eating (EES anger/frustration subscale score) on group assignment and weight change at the post-writing and 3-month follow-up assessments

Step and predictor variables	R^2	$Adj R^2$	$R^2\Delta$	B	β
<u>Post-writing assessment</u>					
Step 4 (2-way interaction)					
Group x Baseline EES anger/frustration subscale	.098	.006	.000	.003	.012
<u>3-month follow-up assessment</u>					
Step 4 (2-way interaction)					
Group x Baseline EES anger/frustration subscale	.083	-.014	.002	.037	.064

EES Total Score x Group. The following blocks were entered into the regression analysis: 1) group assignment, 2) baseline EES total score, 3) interaction term created between group assignment and baseline EES total score. Weight change at the post-writing assessment was entered as the dependent variables. Incremental $R^2\Delta$ values in weight change were calculated for each block. The interaction term was not statistically significant, thus the moderating hypothesis was not supported. The regression model is illustrated in Table 22.

Table 22

Summary of hierarchical regression analysis examining the moderating effect of baseline emotional eating (EES total score) on group assignment and weight change at the post-writing assessment

Step and predictor variables	R^2	$Adj R^2$	$R^2\Delta$	B	β
<u>Step 4 (2-way interaction)</u>					
Group x Baseline EES total score	.104	.012	.008	-.016	-.132

Qualitative Analyses

Essay Content. All EEW group essays were reviewed to summarize the themes of individuals' essays. Essays themes reflected similar themes identified in Greenberg & Stone (1992). Approximately 42% of EEW participants wrote about problems concerning sexuality or intimacy, reproductive-related issues, and death of a loved one. Table 23 lists all essay themes along with the number and percentage of participants' that wrote about each theme.

Table 23

Essay themes within the EEW group

Essay themes	n (%)
Problems concerning sexuality or intimacy	5 (16.1%)
Reproductive-related issues	4 (12.9%)
Death of a loved one	4 (12.9%)
Serious illness of a loved one	3 (9.7%)
Physical or sexual abuse-attack (actual or threatened; not including mild physical punishment)	3 (9.7%)
Change in life phase (e.g., aging)	2 (6.5%)
Divorce-separation	1 (3.2%)
Frightening or dangerous non-personal event (e.g., car accident, fire)	1 (3.2%)
Conflict between parents	1 (3.2%)
Admitting to doing something bad, shameful, or stupid	1 (3.2%)
Difficulties involving school or job	1 (3.2%)
Financial concerns	1 (3.2%)
Serious injury-illness of self	1 (3.2%)
Problems in relationship with family members	1 (3.2%)
Witness of life-threatening event of another person	1 (3.2%)
Other (writing several categories in the same essay)	1 (3.2%)

DISCUSSION

The present study is the first known study evaluating the effects of written emotional disclosure within the context of weight loss and maintenance. The primary purpose of this study was to examine if expressive writing positively impacted weight loss and maintenance in individuals who have recently lost weight. The second and third objectives examined whether written emotional disclosure had beneficial effects on stress levels and emotional eating behavior, respectively. The final, more exploratory study objectives were to examine whether levels of stress and/or emotional eating moderated the relationship between expressive writing and weight regain.

Five hypotheses were tested in this study, each predicting health improvement in individuals within the treatment group relative to those individuals in the placebo control condition: 1) individuals assigned to the placebo-writing group will regain significantly more weight at follow-up assessments than individuals assigned to the emotional expressive (EEW) group; 2) individuals assigned to the EEW group will show significant decreases in stress levels at follow-up assessments compared to individuals assigned to the placebo-writing group; 3) individuals assigned to the EEW group will show significant decreases in emotional eating behavior at follow-up assessments compared to individuals assigned to the placebo-writing group; 4) there will be a significant interaction between baseline stress and group assignment such that individuals assigned to the placebo-writing group will regain significantly more weight than individuals assigned to the EEW group, and this effect will be stronger

for those individuals reporting at higher stress levels at baseline; and 5) there will be a significant interaction between baseline emotional eating and group assignment such that individuals assigned to the placebo-writing group will regain significantly more weight than individuals assigned to the EEW group, and this effect will be stronger for individuals reporting higher levels of emotional eating at baseline.

Overall, results from the present study indicated that there was no support for written emotional disclosure to differentially impact the rate of weight regain among individuals who have recently lost weight through various weight loss approaches. Essentially both groups regained weight at similar rates following weight loss. There was, however, partial support for expressive writing to produce favorable effects on stress levels relative to the placebo control group. Finally, no support was found for expressive writing to decrease emotional eating behavior. Results relevant to each study hypothesis are discussed in more detail below.

Hypothesis 1: Weight Regain.

There was no support for the impact of written emotional disclosure on weight regain. Both groups showed a pattern of weight regain that is remarkably consistent with the pattern of weight regain following weight loss treatment found in the literature. That is, both groups steadily gained weight at each assessment over the 4-month study duration. This temporal pattern of weight regain has been illustrated by Kramer et al. (1989) who found that after treatment individuals steadily gain weight until their weight stabilizes slightly below their baseline weight (i.e., weight prior to treatment). This lack of an effect is not surprising given recent findings from a large

expressive writing meta-analysis by Fratteroli (2006) who found that writing did not improve health behavior outcomes. In fact, health behavior change appeared to be the least supported outcome of all health outcomes examined (i.e., psychological health, physiological functioning, reported health, and general functioning). More broadly, this points to the issue that human behavior change continues to be a challenging task among psychologists. Furthermore, long-term behavior change maintenance is especially difficult and complex, particularly within the area of weight loss maintenance. It has been well established that behavioral weight loss treatments are successful in helping people make the behavioral changes necessary to lose weight, but are far from helping people make behavioral changes that are long-lasting to successfully maintain weight loss (Jeffrey et al., 2000). Rothman (2000) argues that part of this puzzle in producing improved long-term maintenance of behavior changes, lies in scientists operating under the assumption that the processes involved in the initiation of behavior change are basically the same as those involved in behavioral maintenance when in fact, behavior change maintenance processes may be quite different. However, to date there is little empirical research to shed light on these processes within behavior maintenance, especially within long-term weight management.

Hypothesis 2: Stress.

There was partial support for the effect of expressive writing on decreasing stress. First, stressful major life events as measured by the LES showed initial increases in stress in the EEW group relative to the placebo group, but these group

differences dissipated at the 1- and 3-month follow-up. Stressful daily life events as measured by the WSI also revealed that the EEW group had a trend toward higher rates of minor life stress immediately after writing. Additionally, the EEW group revealed a trend toward appraising these events as more stressful immediately after writing. Interestingly, at the 3-month follow-up the EEW group appraised minor life events as being *less* stressful compared to the placebo control group. Again, this difference was only a trend toward significance, but the pattern of means is promising, especially considering that individuals' appraisal of stress may be a more important factor in improving health outcomes, rather than the objective measure of stress such as the number of stressful events one experiences (Lazarus & Folkman, 1984). Furthermore, the ability of written emotional disclosure to lessen the impact of minor life stress may be of more value given that research has shown that minor life events are more predictive of health and illness outcomes than major life events since they happen more frequently and are more "proximal" to the individual (Kanner, Coyne, Schaefer, & Lazarus, 1981; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). On a practical level, the appraisal of daily life stressors and/or hassles may have a more direct, immediate impact on individuals' daily eating and exercise behavior.

It has been documented that written disclosure produces short-term increases in distress (increases in negative mood and decreases in positive mood), but fortunately these increases have been shown to dissipate over time (Hockemeyer, Smyth, Anderson, & Stone, 1999). Consistent with the literature on mood congruent

memory, this increase in negative mood may also be one of the influences on individuals' report and appraisal of major and minor life stress (Blaney, 1986). This phenomenon may be one factor contributing to the EEW group reporting more stressful life events at the post-writing assessment when their potential distress is higher compared to the 1- and 3-month follow-up assessments when participants were no longer engaged in written disclosure. The trend of decreases in stress appraisal in the EEW group relative to the placebo control group at the 3-month follow-up may bolster support for the exposure and self-regulation theories underlying the health benefits of writing. Upon applying meta-analytic data to various theories underlying the efficacy of writing, Fratteroli (2006) found the most support for exposure theory relative to other mechanistic theories of writing (i.e., disinhibition, cognitive-processing, self-regulation, and social integration theory). There was some, but less support for self-regulation theory. Regarding self-regulation theory, there was some evidence for disclosure to reduce depressive symptoms (Fratteroli, 2006). In this study, stress appraisal could also be considered a self-regulatory process. Based on the pattern of results – the EEW group reporting less negative impact from reported minor life stressors (although not statistically significant) suggests an improved self-regulatory process following written disclosure. Additional research is needed to better understand the relationship between emotional expressive writing on stress as results in this study and others appear to be mixed (Fratteroli, 2006).

Hypothesis 3: Emotional Eating.

Regarding emotional eating, higher rates were found in the EEW group compared to the placebo control group on one measure of emotional eating (i.e., EES), but not on the other study measure used (i.e., TFEQ – Disinhibition Factor). These differences between groups in the EES were most pronounced at the post-writing assessment with significantly higher EES anger/frustration scores and a trend toward higher total EES scores at the post-writing assessments. Similar to the EEW group reporting more stress post-writing, a greater degree of emotional eating post-writing may also be associated with the increases in short-term distress produced by writing in addition to mood congruent memory. These explanations may be less applicable to the emotional eating findings, however, given that the EEW group continued to report eating more frequently in response to anger/frustration at the 3-month follow-up assessment.

Hypothesis 4: Baseline Stress x Group Assignment.

There was mixed support for the moderating effect of baseline stress and group on weight regain. There was minimal support for the interaction between major life stress and group assignment on weight regain, however, there was no support for the interaction between minor life stress and group assignment on weight regain. With regard to the interaction between major life stress and group on weight regain, both groups regained weight with higher baseline stress at the post-writing assessment. However, individuals with lower baseline stress scores had less weight regain in the placebo control group relative to the EEW group, whereas individuals

with higher baseline stress scores had less weight regain in the EEW group relative to the placebo control group. These findings suggest that the impact of major life event stress on weight regain may have been attenuated for individuals in the EEW group as compared to individuals in the placebo control group. These findings should be interpreted cautiously as the overall regression analysis indicated only a trend toward significance. Follow-up analyses were conducted to better understand the relationship between major life stress and group assignment on weight regain, but no firm conclusions can be drawn from this data.

Hypothesis 5: Baseline Emotional Eating x Group Assignment.

There was no support found for the moderating effect of baseline emotional eating level and group on weight regain. Emotional eating level at baseline did not appear to interact with the writing conditions and the subsequent impact of writing on weight regain.

Other Findings

There were a disproportionate number of non-completers from the EEW group in this study, which unfortunately lowered the study power and created unequal group sizes. However, this differential attrition rate also provided some insight into who may engage more in this type of expressive writing intervention. Differences were found between groups in baseline minor life event stress and perceived overall health ratings such that study completers reported significantly higher stress and lower perceived health at the baseline assessment. This may suggest that individuals with greater stress and lower perceived health to be more likely to perceive

expressive writing as helpful, and therefore more likely to fully engage in the disclosure process. This finding may be extrapolated to the results of Fratteroli (2006) who found that people with a history or trauma or stressors had larger subjective impact effect sizes (e.g., ratings of study enjoyment, perceived effectiveness of disclosure, and willingness to participate again). In sum, individuals who are “aren’t doing as well” psychologically and/or physically may be more motivated to engage in this type of intervention because there is a greater perceived need and/or belief that it could be helpful for them.

Manipulation checks used in this study provided additional support that emotionally expressive writing produces immediate and short-term increases in negative mood and decreases in positive mood, but this increase in distress dissipates across writing sessions. For instance, there were significant differences between groups in post-writing distress during the first and second writing sessions, but not in the third or fourth writing sessions, suggesting a habituation process occurring over the course of multiple written disclosure sessions.

Study Limitations

There are several limitations that require the results of the study to be viewed with caution. This study was unfortunately not funded, making for significant challenges in recruiting participants. The primary limitation of this study was the small sample size that resulted in low to insufficient power to adequately detect differences between groups. As previously stated, unanticipated recruitment difficulties arose when there were several programmatic changes in the original

recruitment source (e.g., fewer and smaller weight loss groups), drastically decreasing the ability to obtain a larger sample size and thus reducing the overall study power.

Then again, any effects detected in such a small sample are possibly more robust.

In addition, because the study recruited individuals from multiple types of weight loss interventions it would have been optimal to stratify randomization by weight loss program type at the outset. However, the recruitment difficulties arose at the same time the first participants were randomized and it was unknown what additional recruitment sources would be utilized so stratification by treatment was not possible. Unfortunately, this lack of stratification resulted in an important baseline difference between the EEW and placebo control group – length of weight loss treatment. As a result, length of treatment was included as a covariate in statistical analyses.

Methodologically, this research design did not include a no-treatment group. Consequently, not having a no-treatment condition did not allow for the assessment of the relative impact of the placebo control intervention and non-specific treatment effects it may have produced. It is possible that the "placebo" intervention actually provided some benefit for participants (thus obscuring, potential treatment effects), particularly in a weight loss-related study where writing about general time management may have an inherent therapeutic effect (i.e., organizing time to fit in exercise and meal planning).

Weight loss approaches prior to study entry varied across participants, which increased the “noise” in the baseline participant characteristics, decreasing the overall

internal validity of the study. As a result, it is difficult to adequately assess the skills taught and obtained in respective weight loss approaches. For instance, some participants received more intensive intervention that may have resulted in greater skill attainment, thus impacting weight loss maintenance outcomes over time.

It should be noted that this study's original goal was to evaluate the efficacy of a written emotional disclosure in individuals attempting to maintain weight loss. Efforts were made during recruitment to assess whether participants were continuing to actively lose weight, however, it was apparent that despite completing various weight loss programs, most of the study participants had not reached their "goal weight" and hoped not only to maintain weight loss, but also wanted to lose more weight. Therefore, establishing strict exclusionary criteria regarding participants' weight control efforts was difficult. As a result, the lines are blurred between weight loss and weight loss maintenance within participants in this study. This issue also represents a broader issue within the field of weight management – there may be no clear line between weight loss and maintenance.

Generalization of findings may be somewhat limited given the highly homogenous sample – both highly educated (over 80% of participants had a college degree) and primarily Caucasian sample. Furthermore, this study was relatively time-consuming (i.e., 4-5 hours of total time involved) and required a rather lengthy commitment (i.e., four months). Considering there was no monetary compensation provided for study participation combined with the significant personal time commitment, one can assume this study sample was extremely motivated and may

not be representative of the general population of individuals attempting to maintain weight loss.

Finally, participants' weight was not obtained at the end of their respective weight loss programs. On average participants attended their first study visit three weeks after completing their weight loss intervention. It would have been informative to calculate weight change between ending treatment and beginning this study to assess weight loss maintenance prior to study entry.

Implications & Future Research

This study does not provide support for emotionally expressive writing as an intervention to positively impact weight control or emotional eating behavior. There is, however, minimal evidence that written emotional disclosure may have a beneficial effect on stress outcomes in individuals who are attempting to maintain weight loss. Implications for these findings and directions for future research will now be discussed.

As previously discussed, during the early phases of recruitment, it became apparent that other recruitment sources would need to be generated in order to reach the proposed study sample size. As a result, this study's participant sample consisted of individuals who completed several types of weight loss approaches. These unexpected recruitment issues obviously impacted the internal validity of the proposed study, but does offer increased external validity by increasing the generalizability of study findings to a more varied group of overweight and obese individuals seeking to maintain weight loss in the general community. Glasgow and

colleagues (2006) recently made a call to behavioral medicine researchers, funding agencies, and grant reviewers to increase the attention given to external validity issues to improve research translation to clinicians practicing in the “real world.” Our ability to improve weight loss maintenance outcomes in the general population may in fact be enhanced through an increased willingness on the part of scientists and funding sources to incorporate more external validity criteria in addition to internal validity issues.

It appears that written emotional disclosure is not potent enough as a stand-alone psychosocial intervention to significantly impact a health behavior such as weight regain, but it is possible there is utility for such an intervention to be incorporated into multi-component weight loss and/or maintenance treatment programs. Even though this study did not produce notable findings, continued research is needed to examine interventions that more directly target and intervene on psychological variables related to weight regain. Psychological and emotional factors have historically been neglected in traditional behavioral weight loss interventions and may be key factors to improving the discouraging outcomes within the weight loss maintenance field. Given the compelling research evidence linking stress and emotional avoidance through emotional eating to weight gain, implementation of theoretically-based interventions that adequately address these psychological issues are warranted. One such intervention may be to include acceptance and mindfulness approaches that appear to actively address the issues of emotional avoidance through the promotion of mindful awareness of thoughts, feelings, and physical sensations

while also increasing acceptance of a wide-range of emotional processes and exploring individuals' life values (Hayes, Strosahl, & Wilson, 1999). Recent studies indicate promising preliminary evidence for the efficacy of acceptance and mindfulness strategies for weight loss maintenance and disease self-management more broadly (Lillis, Hayes, Bunting, & McPherson, 2006; Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007).

Finally, there was some indication in this study that people get “tired” of focusing on weight loss and maintenance as evident in the recruitment surveys that were administered. Unfortunately, the major predictors of successful weight loss maintenance are regular exercise and overall vigilance to eating and physical activity (Wing & Phelan, 2005). More specifically, Wing and colleagues (2006) report that daily weighing may be a critical component of successful weight loss maintenance. Researchers found that using this feedback from daily weighing to make necessary adjustments in dietary intake and physical activity were important self-regulatory behaviors in maintaining weight loss. Furthermore, secondary analyses from this study indicated daily weighing was not associated with negative psychological consequences (Wing et al., 2007). Given that weight management is a life-long endeavor, it is a formidable task among researchers and practitioners to better understand the processes involved in helping individuals maintain lifestyle changes. How do we help people maintain changes in a behavior they need to engage in everyday (i.e., eating)? This quality makes weight control quite different than changing a behavior such as smoking cigarettes, drinking alcohol, or using illicit

drugs – behaviors that are not necessary to sustain life. Again, more empirical research is needed to further elucidate the cognitive, behavioral, and emotional processes in behavioral maintenance and apply these theories to weight management (Rothman, 2000).

Taken together, the results of the present study provide poor support for beneficial effects of written emotional disclosure on buffering weight regain and decreasing emotional eating behavior following weight loss treatment. As previously stated, there was negligible support for improvements in stress outcomes. Eating continues to be one of the most common human behaviors illustrating a self-regulatory process, yet is still considered to be one of the least understood (Herman & Polivy, 2004). Given the current obesity epidemic and the struggle among researchers and clinicians to improve weight loss maintenance success, continued efforts are needed to develop alternative interventions designed to improve weight loss maintenance. It seems warranted to continue exploring interventions that target improving individuals' emotional regulation abilities that may attenuate the adverse effects of stress and emotional eating on weight gain particularly within our current “toxic” environment and ever increasing faced-paced, demanding society.

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APPENDIX A

Manipulation Check #1: Credibility Questions

Please answer the questions below according to the following 10-point scale (write your 1-10 rating on the blanks below):

1-----2-----3-----4-----5-----6-----7-----8-----9-----10
Not at all Extremely

1. _____ How logical did the writing exercises seem to you?
2. _____ How confident would you be that the writing exercises would be helpful in managing stress?
3. _____ How confident would you be in recommending this type of writing exercise to someone who was having difficulty managing stress in his/her life?
4. _____ If you were feeling a considerable amount of stress would you be willing to perform the writing exercises?
5. _____ How successful do you feel the writing exercises would be in helping you with other difficulties (e.g., managing feelings of depression or anxiety)?
6. _____ Overall, how *personal* did you feel your participation in this study was for you?
7. _____ Overall, how *emotional* did you feel your participation in this study was for you?
8. _____ Overall, how *meaningful* was your participation in this study to you?
9. _____ Overall, how *valuable* to you was your participation in this study?
10. _____ Overall, how *stressful or upsetting* was your participation in this study for you?

APPENDIX B

University of Kansas
Informed Consent Form

Informed Consent Form

Writing and Weight Loss Maintenance

Introduction: The Department of Psychology at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this program, the services it may provide to you, or with the University of Kansas.

Study Purpose: This study will explore the effects of written disclosure on factors that may impact weight loss maintenance and emotional well-being.

Explanation of Procedures: Participating in this study will require a total time commitment of approximately 4 hours. Your participation will involve the following:

- You asked to complete a variety of questionnaires and will be weighed.
- You will spend 20 minutes writing about a topic that is selected by us four times over the course of four weeks.
- You will be asked to return for two brief follow-up visits 1 and 3 months following the final writing session. At these visits you will be weighed and asked to complete a variety of questionnaires.

Potential Risks/Discomforts: It is possible that filling out questionnaires and writing sessions may be time consuming and potentially bothersome, but there are no anticipated risks in participating in this study.

Potential Benefits: You may find the writing sessions to be a helpful and valuable experience. In addition, your participation in this study may advance our understanding and development of weight loss programs.

Compensation for Participation: There is no compensation for participation in this study.

Participant Confidentiality: Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researcher(s) will use a study number instead of your name. If the results of this study are published or presented in public, information that identifies you will be removed. The researchers will not share information about you unless required by law or unless you give written permission. Permission granted on this date to use your information remains in effect indefinitely. By signing this form you give permission for the use your information for purposes of this study at any time in the future.

Refusal to sign consent and authorization: You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

Canceling this Consent and Authorization: You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about you, in writing, at any time, by sending your written request to: Jill R. Hockemeyer, M.S., 319 Fraser Hall, University of Kansas, Lawrence, KS 66045. If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use information that was gathered before they received your cancellation, as described above.

Questions about participation: Questions about procedures should be directed to Jill R. Hockemeyer, M.S. Her contact information is listed at the end of this consent form.

Participant certification: I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or write to the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, or email dhann@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

Participant's Name (PRINT)

Date

Participant's Signature

Researcher Contact Information:

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APPENDIX C

University of Kansas Medical Center

Informed Consent Form

**Statement of Informed Consent
University of Kansas Medical Center**

Writing and Weight Loss Maintenance

INTRODUCTION

We invite you to participate in a study exploring the process of writing and weight loss maintenance. This study is being conducted by principal investigator Paula C. Rhode, Ph.D., a clinical health psychologist in the Department of Preventive Medicine at the University of Kansas Medical Center. We hope to learn more about factors related to weight loss maintenance. We expect to recruit approximately 130 individuals in the Kansas City metro area.

You do not have to participate in this research study. It is important that before you make a decision to participate, you read the rest of this form. You should ask as many questions as needed to understand what will happen to you if you participate in this study.

BACKGROUND

Obesity rates continue to be on the rise in the United States. Obesity is projected to overtake smoking as the number one cause of preventable death in the United States. Currently, two out of three adults in the United States are now considered overweight or obese, compared to one out of four in the 1960's. The prevalence of obesity among U.S. adults increased 5.6% from the year 2000 to 2001 (19.8% to 20.9%). This increase has occurred regardless of sex, age, race, and educational status. Being overweight or obese significantly increases risk for premature mortality and serious health problems (e.g., diabetes, cardiovascular disease, hypertension, cerebrovascular disease, cancer, and osteoarthritis). In addition to the health consequences stemming from the obesity epidemic, the economic consequences are also cause for alarm. The direct and indirect economic cost of obesity was approximately \$100 billion in 1995.

Developing strategies to improve weight maintenance following weight loss treatments for obesity continues to be a challenge for obesity researchers. Without continued treatment, it is common for individuals to regain approximately one third of their weight lost within a year following treatment and they will continue to exhibit weight gain over time. Therefore, it is important that we consider examining additional approaches to helping people maintain their weight loss over time.

PURPOSE

The purpose of this study is to explore the effects of writing on factors that may impact weight loss maintenance and emotional well-being. This research is intended to help us understand how we can improve weight loss and weight loss maintenance programs and to develop approaches to better prevent and treat the problem of obesity.

PROCEDURES

If you are eligible and decide to participate in this study, your participation will last approximately four hours over the course of three months. Your participation will involve being weighed, filling out questionnaires and writing about topics selected by us 4 times over the course of 4 consecutive weeks. Participants will be randomly assigned by the research investigators to one of two groups. Each group will write about different topics. Randomization is like “flipping a coin” to decide what group participants will be assigned to. You will be asked to return for two brief follow-up visits 1 and 3 months following the final writing session. At these visits you will be weighed and asked to complete a variety of questionnaires. Each of these activities will be completed as followed during six brief study visits over the course of four months.

Visit 1: You will be weighed, fill out questionnaires and spend 20 minutes writing.
(Time = 75-90 min)

Visit 2: You will be weighed and spend 20 minutes writing.
(Time = 30 min)

Visit 3: You will be weighed and spend 20 minutes writing.
(Time = 30 min)

Visit 4: You will be weighed, spend 20 minutes writing and fill out questionnaires.
(Time = 45 min)

Visit 5: You will be weighed and fill out questionnaires.
(Time = 20-30 min)

Visit 6: You will be weighed and fill out questionnaires.
(Time = 20-30 min)

RISKS

It is possible that filling out questionnaires and writing sessions may be time consuming and potentially bothersome, but there are no other anticipated risks for participating in this study.

NEW FINDINGS STATEMENT

You will be informed if any significant new findings develop during the course of the study that may affect your willingness to participate in this study.

BENEFITS

There are several potential benefits for you and society at large. You may find the writing sessions to be a helpful and valuable experience. Your participation in this study may also advance our understanding and development of weight loss programs. Furthermore, you may derive personal satisfaction and growth from the knowledge that you participated in a study that may have public health implications and may contribute to existing scientific knowledge.

ALTERNATIVES

Participation in this study is completely voluntary. Deciding not to participate will have no effect on the care or services you receive at University of Kansas Medical Center.

COSTS

There are no costs to you for participating in this study.

PAYMENT TO SUBJECTS

There is no compensation for participation in this study.

INSTITUTIONAL DISCLAIMER STATEMENT

Although the University of Kansas Medical Center does not provide free medical treatment or other forms of compensation to persons injured as a result of participating in research, such compensation may be provided under the terms of the Kansas Tort Claims Act. If you believe you have been injured as a result of participating in research, you should contact the Office of Legal Counsel, Mail Stop #2013, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160.

CONFIDENTIALITY AND PRIVACY AUTHORIZATION

Efforts will be made to keep your personal information confidential. Researchers cannot guarantee absolute confidentiality. If the results of this study are published or presented in public, information that identifies you will be removed.

The privacy of your health information is protected by a federal law known as the Health Insurance Portability and Accountability Act (HIPAA). By signing this consent form, you are giving permission (“authorization”) for KUMC to use and share your health information for the purposes of this research study. If you decide not to sign the form, you cannot be in the study.

To do this research, we need to collect health information that identifies you. We will collect information from activities described in the Procedures section of this form.

Your study-related health information will be used at KU Medical Center by Dr. Paula Rhode, members of her research team, the KUMC Research Institute, the KUMC Human Subjects Committee and other committees and offices that review and monitor research studies. Study records might be reviewed by government officials who oversee research, if a regulatory review takes place.

All study information that is sent outside KU Medical Center will have your name and other identifying characteristics removed, so that your identity will not be known. Because identifiers will be removed, your health information will not be re-disclosed by outside persons or groups and will not lose its federal privacy protection.

Your permission to use and disclose your health information remains in effect until the study is complete and the results are analyzed. After that time, information that personally identifies you will be removed from the study records.

QUESTIONS

You have read the information in this form. Dr. Rhode or her associates have answered your question(s) to your satisfaction. You know if you have any more questions after signing this you may contact Dr. Rhode or one of her associates at (913) 588-3030. If you have any questions about your rights as a research subject, you may call (913) 588-1240 or write the Human Subjects Committee, Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160.

SUBJECT RIGHTS AND WITHDRAWAL FROM THE STUDY

You understand that your participation in this study is voluntary and that the choice not to participate or to quit at any time can be made without penalty or loss of benefits. You understand that not participating or quitting will have no effect upon the medical care or treatment you receive now or in the future at the University of Kansas Medical Center. The entire study may be discontinued for any reason without your consent by the investigator conducting the study.

You have a right to change your mind about allowing the research team to have access to your health information. If you want to cancel permission to use your health information, you should send a written request to Dr. Paula C. Rhode. Her mailing address is Paula C. Rhode, Ph.D., University of Kansas Medical Center, Department of Preventive Medicine, MS 1008, 3901 Rainbow Boulevard, Kansas City, KS 66160. If you cancel permission to use your health information, you will be withdrawn from the study. The research team will stop collecting any additional information about you. The research team may use and share information that was gathered before they received your cancellation.

CONSENT

Dr. Rhode or her associates have given you information about this research study. They have explained what will be done and how long it will take. They explained any inconvenience, discomfort or risks that may be experienced during this study.

I freely and voluntarily consent to participate in this research study. I have read and understand the information in this form and have had an opportunity to ask questions and have them answered. I will be given a signed copy of the consent form to keep for my records.

Type/Print Participant's Name

Signature of Participant

Time

Date

Type/Print Name of Person Obtaining Consent

Signature of Person Obtaining Consent

Date

Type/Print Name of Principal Investigator

Signature of Principal Investigator

Date