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Stephanie M. LaMattina

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EXAMINING THE ROLE OF STRESS IN BINGE EATING DISORDER

By

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B.S., Northeastern University, 2002

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A THESIS

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Chapter One

INTRODUCTION

In the United States, as in many other countries around the world, the rates of eating disorders and maladaptive eating behaviors continue to rise (U.S. Department of Health and Human Service's Office on Women's Health, 2000). For example, dissatisfaction with body weight, a major risk factor for the development of eating disorders, represents a major concern for most American women, even those that do not meet diagnostic criteria for eating disorders (Cash & Henry, 1995; Grabe & Hyde, 2006; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Specifically, research has shown that 80% of women are unhappy or dissatisfied with their appearance (Screening for Mental Health, Inc., 2004). According to the U.S. Department of Health and Human Service's Office on Women's Health (2004), approximately 45% of women report that they are on a diet on any given day, in contrast to only 25% of men. In addition, research from the Renfrew Center Foundation (2003) found that improving health and well being were not women's primary reasons for going on a diet; instead it was to lose weight and become more attractive.

Unfortunately, concerns about weight and shape are no longer just issues associated with adults; younger and younger children are becoming more concerned about their weight and shape. For example, research has found that 42% of girls in the first to third grades report that they want to be thinner (Collins, 1991). According to the Renfrew Center Foundation (2003), 80% of 13-year-olds have attempted to lose weight and 15% of young women who are not diagnosed with an eating disorder, still display maladaptive eating behaviors and attitudes. Concerns about weight and shape have

received widespread attention because of their relationship with poor self-esteem, a desire to be thin, excessive dieting behaviors, and the development of eating disorders (Grabe & Hyde, 2006; Thompson & Stice, 2001; Tiggemann & McGill, 2004).

Interestingly, the desire to be thinner coincides with a dramatic increase in American obesity rates (Centers for Disease Control and Prevention National Center for Health Statistics, 2002; Mokdad, Serdula, Dietz, Bowman, Marks, & Koplan, 2000). Obesity represents a severe, costly condition that results in significant health risks (e.g., diabetes, cardiovascular disease; American Medical Association [AMA], 2003). In particular, the proportion of adults considered obese by a Body Mass Index [BMI] of 30 or greater has increased 61% in the last decade (AMA, 2003). Increased body mass can magnify sociocultural pressures to be thin, body dissatisfaction, dieting, and negative affect, thereby increasing an individual's risk for developing eating disturbances (Cattarin & Thompson, 1994). For example, research has found that body mass is positively correlated with body dissatisfaction (Thelen & Cormier, 1995), parental pressure to lose weight (Thelen & Cormier, 1995), and onset of binge eating (Vogeltanz-Holm et al., 2000). Researchers have also found a significant positive correlation between BMI and a desire to be thinner in fourth grade girls (Thelen & Cormier, 1995). However, it is difficult to determine the causal direction for the relationship between increased body mass and the development of an eating disorder.

Although most women report that they would like to look like thin actresses and models (e.g., Calista Flockhart, Kate Moss), few women will achieve this goal. According to the website of the Student Nutrition and Body Image Action Committee at UCLA, "if Barbie were life-size, she would stand 5'9" and weigh 110 lb. (only 76% of

what is considered a healthy weight for her height). Her measurements would be 39-18-33, and she would not menstruate due to inadequate levels of fat on her body.” Other research (Renfrew Center Foundation, 2003) indicates that the average model weighs 23% less than the average woman and this thin body type only naturally occurs in 5% of American females. For example, data from the Screening for Mental Health, Inc. (2004) indicated that the average American model is 5’11” and weighs 117 pounds, whereas the average American woman is 5’4” and weighs 140 pounds. Clearly these statistics represent unrealistic goals for the majority of women. As the rates of eating disorders and maladaptive eating behaviors continue to rise, so has the need to fully understand how these disorders develop and are maintained.

For many years, researchers have attempted to understand the relationship between stress (i.e., a situation that is difficult or exceeds an individual’s resources), coping (i.e., a process through which an individual handles a situation), and eating. One way to explore this relationship is to examine the relationships between stress, coping, and maladaptive forms of eating (e.g., binge eating). For example, research has consistently shown that individuals who engage in binge eating episodes perceive situations as more stressful (e.g., Hansel & Wittrock, 1997), engage in significantly higher rates of emotion-focused coping (i.e., emotion regulation; Bittinger & Smith, 2003), report greater urges to binge eat when stressed (e.g., Pendleton et al., 2001), and eat significantly more calories on stressful days (e.g., Crowther, Sanftner, Bonifazi, & Shepherd, 2001) when compared to controls (i.e., individuals who do not engage in binge eating episodes). Unfortunately, existing studies have mostly utilized samples that either consisted of individuals diagnosed with bulimia nervosa (BN), obesity, or individuals

who did not meet diagnostic criteria for eating disorders, but instead scored high on measures assessing binge eating. Therefore, there is a paucity of data which looks directly at the association between stress, coping, and Binge Eating Disorder (BED).

In addition, the majority of models that were developed to explain the relationship between stress, coping, and maladaptive eating were originally developed for other eating pathology (e.g., AN, BN, obesity) and then later applied to BED. For example, Cattanach and Rodin's (1988) integrative theory was originally developed for BN, thus limiting its ability to accurately portray individuals diagnosed with BED. Individuals diagnosed with BED engage in binge eating episodes, but do not engage in compensatory behaviors (e.g., vomiting, laxative use) observed in individuals diagnosed with BN. Research has also shown that individuals diagnosed with BED do not engage in extreme restrictive eating patterns often found in individuals diagnosed with AN or BN (Castonguay, Eldredge, & Agras, 1995).

In order to determine if these models and results are generalizable to individuals diagnosed with BED, researchers need to begin recruiting individuals utilizing structured interviews that can more accurately determine eating disorder status. Additional research, using individuals diagnosed with BED as study participants, will be necessary to determine if such theories are appropriate for explaining the development and maintenance of BED. It is unknown if the results of previous research will be applicable for individuals diagnosed with BED. In order to further the research on BED, it is important to begin moving beyond healthy populations and investigating the relations between stress and eating in clinically diagnosed BED samples.

The following literature review presents current BED research that includes diagnostic criteria, risk factors, and etiological models associated with eating disorders, stress and coping. While summarizing the relevant models, the following review examines whether these models are applicable to BED and discusses any research findings that have specifically used samples including individuals diagnosed with BED. The following sections also explore the various methodologies that have been used to assess stress in existing research (e.g., psychological and biological approaches), with a focus on the relationship between stress and cortisol.

Exploring the role of cortisol in BED may have utility in understanding the stress component found in the stress-eating relationship. Including such a biological assessment can also contribute to a better understanding of the relationship between self-reports of stress and more objective measures. The current study examined the role of stress and coping in BED. It was hypothesized that individuals diagnosed with BED would perceive situations as more stressful, exhibit significantly higher cortisol levels, and report a greater urge to binge eat when faced with a stressful task than individuals in the control group. This experimental study utilized a laboratory stress task with salivary cortisol assessment and self-report measures that assessed the ability to cope with stress in BED compared to controls.

Defining Binge Eating Disorder

Binge Eating Disorder (BED) is characterized by recurrent episodes of the consumption of large quantities of food accompanied with a sense of loss of control over eating (Diagnostic and Statistical Manual of Mental Disorders, Text Revision [DSM-IV-TR]; American Psychiatric Association [APA], 2000). Research has shown that

individuals typically prefer high fat, sweet, and salty foods during binge eating episodes (e.g., Allison & Timmerman, 2007). DSM-IV criteria also specify that individuals must experience at least three of the following impaired control behavioral indicators: (1) eating rapidly, (2) eating until uncomfortably full, (3) eating large amounts of food when not hungry, (4) eating alone due to embarrassment, and (5) feeling depressed, disgusted, or guilty after overeating. In addition, individuals must experience significant distress, and abstain from compensatory behaviors (e.g., self-induced vomiting, laxative use, excessive exercise) after bingeing. Although it has long been recognized as a symptom of bulimia nervosa (BN), currently BED represents a provisional diagnostic category that warrants further investigation.

Relationship between BED and Obesity

Clinical, community, and population-based studies have found that BED is significantly associated with being overweight and being obese (Bruce & Agras, 1992; Spitzer et al., 1992, 1993). However, BED can also occur in individuals who do not meet medical criteria for obesity (i.e., body mass index [BMI] ≥ 30). Over the past few decades, researchers have begun to examine the relationship between binge eating and obesity. Several studies have found that individuals who are obese and also binge eat, compared with individuals who are obese and do not binge eat, report significantly greater rates of depression and anxiety and are more likely to have a history of other psychiatric disturbances (e.g., personality disorders; Marcus, Wing, Ewing, Kern, Gooding, & McDermott, 1990; Marcus, Wing, & Hopkins, 1988; Marcus, Wing, & Lamparski, 1985). In addition, obese individuals with BED report lower levels of self-esteem and greater depressive symptomatology than obese individuals without BED

(Dingemans, Bruna, & van Furth, 2002). Individuals with BED are also more likely to report dietary disinhibition, excessive concerns with weight and shape, and difficulty in distinguishing hunger and satiety cues than obese individuals who do not binge eat (Marcus et al., 1990). Laboratory studies have also found that individuals with BED consume more calories at both binge meals and non-binge meals than weight-matched controls without BED (e.g., Goldfein, Walsh, La Chaussee, Kissileff, & Devlin, 1993; Yanovski, 1993; Yanovski, Leet, Yanovski, Flood, Gold, Kissileff, & Walsh, 1992). In addition, individuals with BED display more chaotic eating habits, exhibit higher levels of eating disturbances (i.e., eating in response to emotional distress), and suffer from significantly higher levels of eating disorder psychopathology (Dingemans et al., 2002; Goldfein et al., 1993; Marcus et al., 1990; Mussell, Mitchell, de Zwaan, Crosby, Seim, & Crow, 1996; Spitzer et al., 1993).

Given the above findings, binge eating represents an important and expanding research area. Although the majority of obese individuals may not meet DSM-IV criteria for BED (e.g., some obese individuals report that they can control food urges and only overeat because they enjoy food), a significant proportion report binge eating problems (e.g., Spitzer et al., 1992). Overall, the clinical significance of BED and its relationship to obesity represents an important interaction that can provide valuable information regarding the onset and maintenance of binge eating problems.

Epidemiology of BED

Prevalence

Although BED is not characterized as a distinct diagnostic entity in DSM-IV, a few epidemiological studies have provided information regarding prevalence,

comorbidity, and gender comparisons (e.g., Brody, Walsh, & Devlin, 1994; Bruce & Agras, 1992; Spitzer et al., 1992, 1993; Striegel-Moore & Franko, 2003).

Epidemiological methodology usually involves gathering information by either self-report instruments and/or interview methods. However, due to the ambiguous meaning of the term “binge eating” (i.e., objective vs. subjective binges), each method has yielded different results (Striegel-Moore & Franko, 2003). For example, an objective binge has been defined as a “true” binge meeting DSM-IV criteria that includes two common aspects: the individual consumes a large amount of food and also experiences a sense of loss of control (Fairburn & Cooper, 1993). Loss of control represents the essential feature that separates an objective binge from overeating. On the other hand, a subjective binge is defined as a loss of control without the consumption of a large amount of food (Fairburn & Cooper, 1993). In general, studies that rely solely on self-report methodology tend to identify more individuals that meet BED criteria than those using interview-based methods (Fairburn & Beglin, 1994). Specifically, an interviewer has an opportunity to clarify the meaning of a binge (e.g., Fairburn & Beglin, 1994).

Over the last 10 years, epidemiological surveys have documented an increase in BED rates. For example, Spitzer and colleagues (1992, 1993) conducted studies with non-patient community samples and found that approximately 2 - 4.6% of the samples met DSM-IV criteria for BED. Furthermore, the researchers found that female student samples in the United States and Canada had a BED prevalence rate twice that of bulimia (BN). According to their reports, BN occurs in 1.2% of the general population, whereas BED is thought to occur in at least 2.6% of the population. Other epidemiological studies have also found that BED is more prevalent among obese individuals (e.g., Striegel-

Moore & Franko, 2003). In addition, researchers found that 19 – 30% of individuals seeking weight loss treatment, met DSM-IV BED criteria (Brody, Walsh, & Devlin, 1994). Overall, initial epidemiological studies indicate that BED is much more common in the general population than other eating disorders.

Comorbidity

In several studies, researchers have found that the severity of binge eating is positively correlated with global psychological distress, depression, interpersonal problems, and low self-esteem (e.g., Telch & Agras, 1994). Individuals who meet BED criteria also have significantly higher lifetime rates of panic disorder, BN, and personality disorders compared with individuals who do not meet BED criteria (Yanovski, Nelson, Dubbert, & Spitzer, 1993). In addition, Wilfley and colleagues (2000) found that participants with BED were diagnosed with comorbid anxiety disorders (13%), substance abuse disorders (4%), borderline personality disorder (9%), avoidant personality disorder (12%), and obsessive-compulsive personality disorder (14%). Overall, both Axis I and Axis II disorders are frequently comorbid with BED.

Gender

Although significantly more women are diagnosed with anorexia nervosa (AN) and BN than men, men appear to represent a considerable portion of individuals with BED (e.g., Barry, Grilo, & Masheb, 2002). However, researchers estimate that women are 1.5 times more likely than men to be diagnosed with BED (Spitzer et al., 1992, 1993). A recent study found that men are less likely than women to report distress over binge eating, a symptom required for the diagnosis of BED (Lewinsohn, Seeley, Moerk, & Striegel-Moore, 2002). This finding suggests that even if men are as likely as women to

engage in recurrent binge eating, men may be less likely to meet full diagnostic criteria. In a study comparing men and women with BED (Tanofsky, Wilfley, Spurrell, Welch, & Brownell, 1997), researchers found that males appeared more likely to meet criteria for substance-abuse disorders than females, but both were equally likely to meet criteria for anxiety and mood disorders. Although the literature on gender issues in BED is limited, initial findings suggest that a greater proportion of men (and women) are diagnosed with BED than any other eating disorder.

Course

According to Spitzer and colleagues (1993), individuals with BED typically report that binge eating began in late adolescence or in their early 20s. In addition, the course of the disorder, at least for those who present for treatment, is usually chronic. For most of these individuals, prolonged periods without any struggle with binge eating are rare. Research has also found that overweight individuals who binge eat lose less weight than non-binge eaters when they are treated with a conventional diet (Dingemans et al., 2002; Marcus et al., 1988; Yanovski, 1993). In addition, the average age at which participants present for treatment is approximately 45 years of age, although these individuals report having experienced the onset of the syndrome two decades earlier (Mussell, Mitchell, Weller, Raymond, Crow, & Crosby, 1995).

Binge Eating Risk Factors

Researchers have identified several risk factors (discussed below) that are related to the development and maintenance of binge eating. However, the majority of this research has not included pure samples of individuals diagnosed with BED. Instead, the majority of the research has focused on an assortment of individuals with binge eating

patterns (e.g., individuals diagnosed with BN, BED, obesity, and otherwise healthy individuals who engage in binge eating) who may or may not meet diagnostic criteria for BED. Therefore, the risk factors discussed below represent the results of studies that included samples of general binge eating, unless otherwise noted.

Sociocultural pressure

Extensive research has acknowledged the relationship between cultural pressure to be thin and the prevalence of eating disorders (e.g., Johnson & Connors, 1987; Levine, Smolak, & Hayden, 1994; Polivy & Herman, 1993). Individuals in western cultures commonly relate physical attractiveness in women with thinness. In addition, women are more concerned with appearance than men that often make controlling their weight a priority (Striegel-Moore, 1993). Moreover, physical attractiveness typically accompanies perceptions of social competence, popularity, and preferential treatment by others (e.g., Feingold, 1992). Researchers have hypothesized that the media, peers, family members, and romantic partners likely contribute to Western society women experiencing a “pressure to be thin” (e.g., Levine et al., 1994; Striegel-Moore, 1993). It has also been hypothesized that the pressure to be thin represents a risk factor linked with eating pathology because it increases a woman’s body dissatisfaction (Striegel-Moore, 1993). Research tends to support the hypothesis that pressure to be thin may lead to binge eating by increasing an individual’s likelihood to diet (Stice, Presnell, & Spangler, 2002; Stice, Shaw, & Nemeroff, 1998; Striegel-Moore, 1993). In general, perceived pressure to be thin represents a risk factor that could eventually lead to, and even maintain binge eating.

Ideal-body internalization

Researchers have found that individuals who internalize societal values of thinness are more vulnerable to developing eating pathologies than individuals who do not (e.g., Stice et al., 2002; Striegel-Moore, 1993). Internalization of societal values of thinness occurs when a woman's thoughts, behaviors, and attitudes are influenced by the belief that society values thin women over larger sized women. For example, the media is replete with thin models and actresses being rewarded for their beauty coupled with constant advertisements for weight-loss strategies. This constant exposure may contribute to a woman's belief that losing weight to achieve thinness (e.g., like the models on television), represents a way for her to find a mate or be successful in relationships. Unfortunately, attitudes such as this may lead to the development of eating disorders. Specifically, adolescent females who endorsed high appearance overvaluation, body mass, and dieting behavior were at an increased risk for developing binge eating (Stice et al., 2002). On the other hand, adolescent females who endorsed low appearance overvaluation were not at an increased risk (Stice et al., 2002). Taken as a whole, thin-ideal internalization has been identified as another risk factor that could contribute to the development and maintenance of BED by forcing the individual to continue engaging in behaviors thought to achieve thinness (e.g., dieting).

Body dissatisfaction

According to Grabe and Hyde (2006), "...body dissatisfaction is a significant problem in Western societies and... girls and women are more dissatisfied with their body size and shape than their male counterparts" (p. 622). Body dissatisfaction has been found to be a risk factor related to the development and maintenance of eating disorders,

including obesity (Cash & Henry, 1995; Grabe & Hyde, 2006; Thompson et al., 1999; Thompson & Stice, 2001). Research has found that obese binge eaters report greater body dissatisfaction (e.g., distaste with their weight, shape, and general appearance) than obese non-binge eaters (Wilson, Nonas, & Rosenblum, 1993). Researchers have hypothesized that body dissatisfaction represents a risk factor for binge eating because it promotes dietary restraint and negative affect (e.g., Stice et al., 1998). For example, longitudinal research has found that body dissatisfaction predicted dietary restraint and onset of binge eating in a sample of adolescent females that were followed for 2 years (Stice et al., 2002). These initial studies support the hypothesis that body dissatisfaction does represent a risk factor for binge eating by allowing the individual to continue engaging in unhealthy behaviors (e.g., dietary restraint, negative affect) in order to achieve a more desired body size and shape.

Body mass

Researchers have hypothesized that increased body mass can magnify sociocultural pressures to be thin, body dissatisfaction, dieting, and negative affect, thereby increasing an individual's risk for developing eating problems (Cattarin & Thompson, 1994). In support of this hypothesis, researchers have found that body mass is positively correlated with body dissatisfaction, parental pressure to lose weight (e.g., Thelen & Cormier, 1995), and onset of binge eating (Vogeltanz-Holm et al., 2000). In particular, Thelen and Cormier (1995) found a significant, positive correlation between BMI and a desire to be thinner in fourth grade girls. However, longitudinal research has not been conducted to investigate a potential causal relationship between increased body mass and binge eating.

Dietary restraint

Sociocultural pressure, ideal-body internalization, body dissatisfaction, and increased body mass are all hypothesized to increase dieting in individuals that perceive dietary restraint as an effective method to control weight in order to achieve thinness (Stice, Nemeroff, & Shaw, 1996). Dietary restraint has been conceptualized as "...a self-initiated attempt to restrict food intake for the purpose of weight control" (p. 88; Lowe, 2002). Restraint refers to actual dieting behaviors (e.g., caloric restriction), and cognitive control (i.e., strict rules about which foods can be eaten). Researchers hypothesize that dietary restraint may represent a risk for binge eating because it increases the probability that an individual will overeat after periods of strict caloric deprivation (e.g., Howard & Porzelius, 1999; Lowe et al., 1996). Indeed, research has found that caloric deprivation can lead to increased binge eating in women (e.g., Agras & Telch, 1998). For example, obese women diagnosed with BED were asked to refrain from eating either for a period of 2 or 14 hours and then were allowed to eat as much food as they wanted at a buffet that contained binge and non-binge foods. The researchers discovered that individuals who were food deprived for 14 hours ate significantly more food than individuals who were only deprived for 2 hours. Overall, dietary restraint appears to represent a primary risk factor for binge eating behaviors because of its primary role in the restrict-binge cycle.

Negative affect

Negative affect (e.g., depression, anxiety) has been hypothesized as both a predisposing condition (i.e., individuals with greater negative affect are more likely to binge eat than individuals with less negative affect) and a proximal trigger (i.e., negative moods trigger binge eating episodes) that contributes to binge eating (Polivy & Herman,

1993). Greeno and colleagues (2000) had women diagnosed with BED and age-matched controls self-monitor (i.e., with handheld computers) affect and food intake for a period of one week. The researchers found that individuals diagnosed with BED reported more distress and affective experiences prior to binge eating episodes than controls (Greeno, Wing, & Shiffman, 2000). In addition, the results of a longitudinal study indicated that negative affect (i.e., elevated depressive symptoms, low self-esteem, and a tendency to eat when emotionally distressed) predicted the onset of binge eating in a sample of adolescent girls (Stice et al., 2002). Taken as a whole, research indicates that negative affect may represent a risk factor for binge eating, although few, if any, empirical studies exist which point to the specific mechanisms involved in the relationship between negative affect and binge eating.

The Role of Stress and Coping

As the above review indicates, there is a large body of research that proposes many factors that may lead to the onset and maintenance of an eating disorder (e.g., sociocultural pressure, body dissatisfaction, dietary restraint). Some of the questions that still remain unanswered are how these factors are linked, and what combination determines whether or not an individual will develop an eating disorder. Researchers have suggested that understanding the link between stress and coping and binge eating may comprehensively link the previous findings (Bennett & Cooper, 1999; Cattanach & Rodin, 1988; Greeno & Wing, 1994; Wolff, Crosby, Roberts, & Wittrock, 2000).

The experience of stress has long been associated with overeating (Bennett & Cooper, 1999; Conner, Fitter, & Fletcher, 1999; Greeno & Wing, 1994; Hansel & Wittrock, 1997; Robert-McComb, 2001). According to Lazarus and Folkman (1984),

stress is defined 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" (p. 19). The difficulty in operationally defining stress represents a major methodological concern for studying the relationship between stress and eating (Bennett & Cooper, 1999; Fryer, Waller, Kroese, 1997; Greeno & Wing, 1994; Jones, 2001; Lazarus & Folkman, 1984; Wolff et al., 2000). What constitutes a stressor and how stressful an event/situation is perceived can vary dramatically between individuals (Greeno & Wing, 1994; Jones, 2001; Oliver, Wardle, & Gibson, 2000; Rosch, 1995; Wolff et al., 2000). For example, giving a speech in front of a large audience may be perceived as an extremely stressful event for one individual, but may be perceived by another individual as an opportunity to demonstrate their knowledge.

Over the past hundred years, researchers have studied stress using different types of methodologies that have included examining the frequency of life events and the perception of stress via self-report as well as laboratory research (including both animals and humans). Such research is frequently used when attempting to determine a link between stress and eating (Greeno & Wing, 1994; Hagan, Chandler, Wauford, Rybak, & Oswald, 2003; Hagan, Wauford, Chandler, Jarrett, Rybak, & Blackburn, 2002; Oliver, Wardle, & Gibson, 2000). Laboratory research paradigms have typically involved subjecting research participants to a stressful event and then measuring the amount of food consumed. In animal research, stress is typically provided in the form of electrical shock or tail pinching (e.g., Greeno & Wing, 1994). For example, Hagan and colleagues (2003) compared eating behaviors in rats that were either in a high-stress environment (i.e., housed in a foot shock apparatus) or no stress environment. The researchers found

that rats in the high stress environment ate more than twice the amount of food than non-stressed rats.

In order to measure differences between stressed and non-stressed groups in human laboratory research, participants are often asked to engage in a stressful task (e.g., serial counting, cold pressor task, watching unpleasant videos) and then offered food in a mock taste test. For example, Epel and colleagues (2000) subjected healthy, non-eating disordered women to stressful tasks (i.e., visuospatial puzzles, serial subtraction, and videotaped speech), then provided snacks for them to eat. The researchers collected salivary cortisol samples before, during, and after the stressful tasks. The authors discovered that women with high cortisol levels ate more food after the stressful tasks than women with low cortisol levels (Epel, Lapidus, McEwen, & Brownell, 2000). Although laboratory research has the benefit of providing the same stressor to all participants, they are limited in that most stress paradigms do not mimic real-life situations (Greeno & Wing, 1994). In addition, the mock taste tests have limited ecological validity given it is unlikely that an individual would engage in a full binge eating episode in an unfamiliar laboratory situation.

Researchers have examined the frequency of life events under the assumption that major life events (e.g., divorce, job loss, death of a loved one) play a role in the development of an eating disorder (Ball & Lee, 2000; Bennett & Cooper, 1999; Greeno & Wing, 1994; Lazarus & Folkman, 1984). This type of research typically sums the number of stressful life events that an individual experiences with the hypothesis that individuals with an increasingly large number of life events are more susceptible to the development of an eating disorder (Greeno & Wing, 1994; Lazarus & Folkman, 1984).

For example, one study examining factors associated with the onset of BN, found that 70% of participants reported a change in life circumstances (e.g., job change, relocation) and 20% reported a major loss (e.g., bereavement, estrangement, or separation from a close family member or friend) within 6 months prior to the onset of BN (Lacey, Coker, & Birtchnell, 1986). However, many researchers have pointed to a number of limitations with this type of research; including the fact that there is great variation in not only the characteristics of the event, but also in how individuals respond to major life events (Ball & Lee, 2000; Bennett & Cooper, 1999; Greeno & Wing, 1994; Lazarus & Folkman, 1984).

Given limitations with frequency of life events, researchers began to investigate how the perception of stressful situations contributes to the development and maintenance of an eating disorder (Ball & Lee, 2000; Greeno & Wing, 1994; Lazarus & Folkman, 1984). One purpose of perceived stress research is to examine how an individual feels about various stressful situations and determine if individuals who perceive situations as more stressful are more likely to report maladaptive eating behaviors (e.g., binge eating). For example, Striegel-Moore and colleagues (1989) examined the relationship between maladaptive eating behaviors and perceptions of stress in students during their first year of college. In this study, the researchers asked the incoming first year class to complete a battery of questionnaires assessing height, weight, body image, symptoms of maladaptive eating, perfectionism, ineffectiveness, work ethic, and perceived stress during their first week of classes. The students then completed the same questionnaires at the end of the school year. The researchers found that high levels of perceived stress were associated with an exacerbation of eating disorder

symptomatology. Although this line of research is not plagued by some of the same limitations as life events research, perceived stress research tends to focus on eating disordered symptomatology in normal or at-risk individuals. Few studies have recruited individuals with diagnosable eating disorders; therefore the results of these studies may not be generalizable to clinical samples (Ball & Lee, 2000).

Two basic approaches have been utilized to study the relationship between stress and eating: (1) a general effect model (e.g., animal research) and (2) an individual differences model (e.g., research looking at obese vs. normal weight individuals, or restrained vs. unrestrained eaters). According to the general effect model, the experience of stress itself changes the consumption of food, whereas the individual differences model posits that stress affects eating in special subgroups (e.g., women, eating disordered individuals, individuals who are obese; Greeno & Wing, 1994). The general effect model is typically used to demonstrate that stress-induced eating is the result of physiological changes. One limitation with this research is that other studies have shown that animals engage in other behaviors, besides eating, when stressed (e.g., digging, biting; Greeno & Wing, 1994); making it difficult to determine if eating results are just a product of the experimental design. On the other hand, the individual differences model “which has been tested only in humans, posits that individual differences in learning history, attitudes, or biology determine the effects of stress on eating” (p. 445; Greeno & Wing, 1994). This type of research explores the assumption that certain groups of individuals will handle stress by changing their eating patterns.

The ways that an individual copes is closely tied to stress, and has also been implicated in the development and maintenance of binge eating (Heatherton &

Baumeister, 1991; Henderson & Huon, 2002; Paxton & Diggins, 1997; Schwarze, Oliver, & Handal, 2003; Troop, Holbrey, & Treasure, 1998). Coping has been conceptualized 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" (p. 141; Lazarus & Folkman, 1984). Emotion-focused coping (e.g., minimization, positive comparisons), problem-focused coping (e.g., doing something to manage the situation), and avoidant-oriented coping (e.g., staying away from stressful situations) are three types of coping styles that have been studied in the eating disorders literature (e.g., Bennett & Cooper, 1999; Bittinger & Smith, 2003; Cattanaach & Rodin, 1988; Thompson & Cook, 2001; Troop, Holbrey, Trowler, & Treasure, 1994; Wolff et al., 2000).

According to Lazarus and Folkman (1984) "Emotion-focused forms of coping are more likely to occur when there has been an appraisal that nothing can be done to modify harmful, threatening, or challenging environmental conditions" (p. 150). On the other hand, "problem-focused forms of coping...are more probable when such conditions are appraised as amenable to change" (p.150; Lazarus and Folkman, 1984). Avoidant coping has been conceptualized as encompassing both behavioral and cognitive strategies (e.g., Thompson & Cook, 2001). One important aspect of coping is that no one strategy is inherently good or bad (Lazarus & Folkman, 1991). According to this transactional model of stress and coping (Lazarus & Folkman, 1991), "Definitions of coping must include efforts to manage stressful demands, regardless of outcome... The goodness (efficacy, appropriateness) of a strategy is determined only by its effects in a given encounter and its effects in the long term" (p. 201). In other words, there are some

situations in which emotion-focused strategies might be more helpful than problem-focused strategies (e.g., when dealing with an uncontrollable stressor such as a natural disaster). Based on this line of reasoning, effective coping may have more to do with an individual's ability to be flexible in their use of coping strategies depending on the situation and how it allows them to adapt over the long-term (Lazarus & Folkman, 1991).

Research investigating coping in individuals diagnosed with eating disorders typically hypothesizes the relationship in one of three ways. Researchers either hypothesize that individuals lack adaptive coping strategies (e.g., Etringer, Altmaier, & Bowers, 1989; Janzen, Kelly, & Saklofske, 1992) or that individuals have the actual skills but are ineffective in using them appropriately (e.g., Bittinger & Smith, 2003; Cattanach & Rodin, 1988; Troop et al., 1994). A third approach conceptualizes binge eating as a coping strategy in itself (e.g., Hawkins & Clement, 1984; Heatherton & Baumeister, 1991). For example, in an attempt to find group differences in terms of desire to binge eat and psychophysiological reactivity, Tuschen-Caffier and Vögele (1999) subjected individuals diagnosed with BN, restrained eaters, and healthy controls to achievement tasks (i.e., serial counting with unpredictable and distracting background noise played in headphones and Stroop task) and interpersonal stressors (i.e., guided imagery task and watching a video with scenes from *The Unbearable Lightness of Being*). The researchers hypothesized that binge eating represents a way for individuals diagnosed with BN to cope with stress. Results indicated that individuals diagnosed with BN were significantly more likely to report an increased desire to binge eat in response to interpersonal stressors, but there were no group differences with respect to achievement challenges (Tuschen-Caffier & Vögele, 1999). Similar to the results of several other studies (e.g.,

Cattanach et al., 1988; Gluck, Geliebter, Hung, & Yahav, 2003; Pells, 2005), there were no significant psychophysiological (i.e., blood pressure, heart rate, skin conductance, and respiration rate) differences between groups.

Few, if any, studies have been able to demonstrate that individuals diagnosed with eating disorders actually lack coping skills (Bennett & Cooper, 1999; Cattanach & Rodin, 1988). In general, research tends to indicate that individuals diagnosed with eating disorders have coping skills, but lack the ability to use them effectively (e.g., over reliance on one particular coping strategy, such as avoidance, even if it is not the most appropriate given a particular situation). The majority of studies have found that individuals diagnosed with eating disorders tend to report using more emotion-focused and avoidant-focused forms of coping in response to stress (e.g., Bittinger & Smith, 2003; Troop et al., 1994). For example, researchers looking at coping differences between individuals diagnosed with eating disorders (i.e., AN and BN) and controls interviewed participants with the Coping Strategies Interview (Bifulco & Brown, 1996) to examine how participants coped in adverse situations they encountered over the previous year (Troop et al., 1998). The researchers found that women diagnosed with AN and BN were significantly more likely to use cognitive avoidance and rumination than controls (Troop et al., 1998).

In a related study, researchers investigated coping strategies used by women diagnosed with AN and BN and controls by having individuals complete a questionnaire that assessed coping strategies used in a recent situation they considered stressful (Troop et al., 1994). Participants completed the revised Ways of Coping Checklist (Vitaliano, Russo, Carr, Maiuro, & Becker, 1985) according to how they dealt with a recent stressor

in their lives. The researchers discovered that women diagnosed with AN and BN relied significantly more on avoidance strategies than controls. In addition, women diagnosed with BN relied less on social support and used wishful thinking disproportionately more than controls.

Before describing the relevant models involving stress and coping, it is important to note that the majority of these models were developed to describe general eating attitudes and eating disorders other than BED (e.g., AN, BN, obesity). Of course, an obvious shortcoming of most models is that BED and other eating disturbances (e.g., AN, BN, obesity) are different in terms of clinical characteristics and course of the disorder (le Grange, Gorin, Catley, & Stone, 2001; Wolff et al., 2000). Another limitation is that most of the research has been narrow in perspective and focuses on a limited range of etiological factors i.e., usually just one), instead of investigating the relative contributions of numerous factors or how they interact (Fryer et al., 1997). Therefore, most of the models presented have never been subjected to empirical scrutiny in their entirety. For example, research has focused either on antecedents (e.g., sociocultural ideals, family characteristics, dieting) or consequences (e.g., binge eating, negative affect), but not both. Because most research tends to focus on the impact of just one factor at a time, the ability to obtain a complete picture of the factors that contribute to and maintain BED remains limited.

Stress-Coping Models

Restraint Model. The restraint model represents an extensively researched cognitive-behavioral model that emphasizes dietary restraint in binge eating. According to the restraint model, binge eating represents a consequence of prolonged restrictive

weight control efforts (i.e., dieting). The perception of stress is hypothesized to play a role by altering an individual's ability to exert control over their eating (Conner, Fitter, & Fletcher, 1999). This model also assumes that individuals who employ dichotomous thinking concerning food and dieting (e.g., labeling foods as "good" or "bad") form heightened attention to food cues (Polivy & Herman, 1993). Research has found that stress brought on by cognitions about violating an individual's diet may lead to a binge (Polivy & Herman, 1985). For example, Polivy (1976) conducted a laboratory study that found dieters who believed they had violated their diets consumed more food following the perceived violation than when they believed their diets remained intact. Although Polivy did not explicitly conceptualize stress in this study, it is logical to assume that believing the diet was violated could represent a stressful experience.

In another study (Yacono Freeman & Gil, 2004), researchers examined how dietary restraint and the use of various coping strategies when faced with stress would influence binge eating. In particular, the researchers hypothesized that women who engaged in high levels of dietary restraint and lacked problem-focused coping strategies would exhibit a strong stress-binge eating relationship (Yacono Freeman & Gil, 2004). Participants, including self-identified binge eaters, completed daily dairies for one month that measured binge food consumption, affect, daily stress, subjective stress level, and coping strategies. Daily stress was conceptualized as the most stressful event that occurred each day. Dietary restraint was measured using a subscale (i.e., Dutch Restrained Eating Scale) of the Dutch Eating Behavior Questionnaire (van Strien, Frijters, Bergers, & DeFares, 1986). The researchers discovered that the relationship between stress, coping, and binge eating varied with an individual's self-reported level of

dietary restraint. For example, women who used distraction and expended little cognitive effort to control their eating (i.e., low or average dietary restraint) were more likely to engage in binge eating episodes when levels of stress increased (Yacono Freeman & Gil, 2004). According to the authors, distraction and limited restraint led these individuals to binge eat when faced with stressful situations because these individuals already had lenient rules about eating. Thus, further distraction only leads to increased avoidance. However, the authors also found that individuals who reported high levels of dietary restraint engaged in binge eating episodes when faced with increasing levels of stress, regardless of coping strategies used.

In general, the restraint model tends to be supported by research; however, a shortcoming of this model is that it was originally proposed to explain BN, and later expanded to include BED. In their review of the literature, Castonguay and colleagues (1995) stated that individuals with BN have been shown to be more restricted in their eating patterns and more cognitively restrained than individuals with BED. For example, Marcus and colleagues (1992) found that individuals diagnosed with BED had significantly lower scores on the Restraint Subscale of the Eating Disorder Examination (Cooper & Fairburn, 1987) than individuals diagnosed with BN. Therefore, this model may not be the most appropriate to explain binge eating in individuals who are not diagnosed with BN.

Affect Regulation Models. Affect regulation models propose that binge eaters learn to regulate stress or negative emotions by using overeating to reduce aversive affective states (Hawkins & Clement, 1984; Johnson & Connors, 1987). According to these models, eating reduces perceived stress, which reinforces eating behaviors in

response to negative feelings (e.g., anxiety, depression; Hawkins & Clement, 1984). The “trade-off” hypothesis represents one of the affect-regulation explanations of binge eating (Kenardy, Arnow, & Agras, 1996). Similar to earlier affect regulation models, the “trade-off” hypothesis posits that binge eating is maintained because it reduces negative affect present before the binge. In addition, this hypothesis also attempts to account for the negative affect present following a binge. For example, studies have shown that different negative emotions (e.g., disgust, guilt, shame) increase during a binge episode, and depression increases following the binge (Kenardy et al., 1996). Specifically, Kenardy and colleagues (1996) found that obese individuals diagnosed with BED reported lower levels of tolerance to negative mood states and higher distress prior to binges than controls. These results were based on participant ratings taken from the Emotional Tolerance and Emotional Eating Scales (Arnow, Kenardy, & Agras, 1995). In addition to the above findings, individuals diagnosed with BED reported feelings of guilt following the binge, but admitted the guilt was more tolerable than the pre-binge emotions (Kenardy et al., 1996).

Other research has investigated the role that stress plays in binge eating. Individuals diagnosed with BN (using DSM-III criteria) and controls self-monitored food intake and stress levels several days before and after a midterm examination (Katzman (1989). Results indicated that individuals with BN did not report decreased stress after the binge eating episode, but instead reported reduced stress just prior to the binge. In light of the findings, the author proposed that the anticipation of binge eating might be the factor that reduces stress instead of the actual act of eating (Katzman, 1989).

However, one limitation concerning affect regulation models is that they fail to explain the mechanism(s) involved in reducing the stress or negative affect.

Escape Model. The escape from awareness model developed by Heatherton and Baumeister (1991) can be conceptualized as an elaboration of the restraint model. Similar to the restraint model, the escape model proposes that dietary restraint represents a precursor to binge eating (Heatherton & Baumeister, 1991). According to this model, binge eaters are motivated to escape from stress, aversive self-awareness, and negative affect by changing their thinking to a narrow, concrete style focusing on immediate environmental stimuli. This style of thinking is labeled cognitive narrowing. In this model, binge eaters tend to report high standards and expectations for themselves. When they fail to meet these high standards, they become overly concerned with how others perceive them which may lead to greater emotional distress.

According to the escape from awareness model (Heatherton & Baumeister, 1991) a binge occurs because an individual tries to escape from stress by replacing abstract goals (e.g., control of eating or weight loss) with concrete, external stimuli (e.g., food). Researchers have conceptualized these types of individuals as external eaters. External eating “is eating in response to food related stimuli, regardless of the internal state of hunger and satiety” (p. 296; van Strien et al., 1986). To examine external eating, Conner and colleagues (1999) investigated the relationship between the number of daily stressors (i.e., hassles that are a part of everyday life) and snacking. The researchers focused on the moderating effects of external eating, emotional eating, restrained eating, gender, and stress severity. Male and female university students, who were not assessed for eating disorders or specific eating disturbances, completed daily measures assessing number and

severity of daily hassles and number of snacks consumed. Results indicated a positive correlation between snacking and both the number and severity of daily hassles and that external eating was the only significant moderator in the stress-snacking relationship.

Support for the escape from awareness model has also been found in studies in which binge eaters tend to report high standards and high self-awareness regarding appearance (Bauer & Anderson, 1989), the experience of negative affect (e.g., Abraham & Beaumont, 1982), and dichotomous thinking (Bauer & Anderson, 1989; Polivy & Herman, 1985). Dichotomous thinking may represent an example of cognitive narrowing. According to the escape from awareness model, cognitive narrowing leads to the removal of inhibitions because an individual refuses to evaluate the situation and instead focuses attention on eating. Such disinhibited eating is associated with a focus on taste and texture (rather than caloric content or dietary plans) and is consistent with the behavior of binge eaters (Polivy, Heatherton, & Herman, 1988).

In addition, research has supported the hypothesis that binge eaters tend to engage in dichotomous thinking. One example of such thinking is irrational beliefs and research indicates that binge eaters report more irrational beliefs than non binge eaters (Bauer & Anderson, 1989). In addition, Johnson and Connors (1987) found that individuals diagnosed with BN endorsed a number of cognitive distortions including faulty attributions, personalization, magnification, dichotomous thinking, filtering, overgeneralization, and magical thinking. Individuals who diet have also reported dichotomous thinking regarding various foods (Heatherton & Baumeister, 1991). Specifically, individuals tend to view foods as either “good” or “bad.”

In summary, the escape model proposes that individuals who engage in binge eating can be characterized by (a) high standards and expectations for self, (b) aversive self-awareness/self-focus and low self-esteem, (c) negative affect, (d) cognitive narrowing (i.e., focusing on the immediate present as opposed to broadly meaningful thought), (e) removal of inhibitions, and (f) irrational beliefs. According to the escape model, individuals who binge eat tend to be external eaters (i.e., eating in response to emotions instead of hunger cues) who are unable to cope with stress, and use binge eating as a means to cope with the negative emotions.

The escape model offers many insights into the development and maintenance of binge eating; however, it also has limitations. First and foremost, the escape from awareness model was initially developed to explain binge eating episodes in chronic dieters, including individuals diagnosed with BN and subclinical binge eaters that chronically diet. It was not hypothesized to capture the behaviors of individuals diagnosed with BED (e.g., binge eating episodes that may occur despite lack of dieting or dietary restraint). This limits the model's ability to generalize to individuals diagnosed with BED since studies have shown that there are important differences between individuals diagnosed with BED and other binge eating groups (e.g., individuals with BED do not engage in chronic dietary restraint). Another limitation to the model is the ability to test cognitive narrowing. Although research has found that individuals who binge eat report negative self-awareness, it is unclear if they are engaging in cognitive narrowing while binge eating.

Interactive Model. Cattanach and Rodin (1988) developed an interactive model describing the role of stress in the etiology and maintenance of binge eating. The authors

view stress as a process similar to the transactional model proposed by Lazarus and Folkman (1984). According to Lazarus and Folkman (1984), an individual continuously evaluates situations to determine if they are benign or stressful. Situations are considered stressful when they are relevant to the individual and require more coping resources than the individual can devote to the situation. If the situation is considered stressful the individual evaluates his or her options and determines the appropriate way to cope. Typically, individuals will engage in either emotion-focused or problem-focused coping. Problem-focused coping tends to be used when the individual is able to rectify the situation, whereas emotion-focused coping tends to be used when the individual cannot fix the problem and instead needs to alter the way he or she perceives the situation.

Cattanach and Rodin (1988) extend Lazarus and Folkman's transactional model (1984) by focusing on stress and coping in a specific population, individuals that engage in binge eating episodes. According to the interactive model proposed by Cattanach and Rodin (1988), stressors interact with mediators of stress (e.g., appraisal, coping styles) to precipitate binge eating episodes. The authors discuss how everyone experiences stress to some extent; so it seems more likely that intervening variables determine how stressors are associated with eating disorders instead of the dated view that cumulative stressors lead to the development of eating disorders. In their model, the following variables act as potential mediators: appraisal, coping, level of control, social support, and various individual differences variables (e.g., depressive and anxious mood states, which can influence the way individuals perceive situations in their environment). Appraisal is cited as a mediator due to research indicating that individuals who engaged in binge eating episodes perceived situations as more stressful than non-eating disordered individuals.

Coping has been conceptualized as a mediator in the sense that individuals who engage in binge eating do not use coping skills in an appropriate manner. For example, several studies have found that women diagnosed with eating disorders over-rely on emotion-focused and avoidant-focused coping strategies (e.g., Bittinger & Smith, 2003; Troop et al., 1994; Troop et al., 1998). The issue of control also represents a mediator given individuals diagnosed with eating disorders may feel unable to control the environment, and therefore, engage in maladaptive eating behaviors (e.g., binge eat, vomit). Cattanach and Rodin (1988) also consider social support as a mediator given research that suggests that individuals with eating disorders may isolate themselves from others which may decrease adequate social support. Finally, individual differences variables are considered mediators of the relationship between stress and eating disorders given factors, such as depression and anxiety, can affect the way an individual responds to various situations.

In order to test their interactive model, Cattanach and Rodin (1988) conducted a study to establish whether the relationship between binge eating and stress is due to (1) stress directly increasing an individual's desire to eat, or (2) an individual's increased physiological reactivity causing them to be more reactive to stressors (i.e., experience stressors more intensely) thereby increasing the frequency of binge eating. Individuals classified as engaging in maladaptive eating (i.e., scoring at least a 3 on the Bulimia Subscale of the Eating Disorder Inventory; Garner, Olmstead, & Polivy, 1983) and controls were subjected to various stressful situations (i.e., Stroop, interpersonal conflict and social interaction vignettes, and speech delivery) while researchers measured affect (i.e., Profile of Mood States questionnaire; McNair, Lorr, & Droppleman, 1971) and

physiological reactivity (i.e., blood pressure and pulse). The researchers wanted to determine if the maladaptive eater group was more influenced to binge in response to their general level of affective stress (i.e., former hypothesis), or were more affected physiologically by the laboratory stressors (i.e., latter hypothesis).

Although the researchers found that there were no significant physiological differences between groups, the maladaptive eaters reported an increased urge to binge and higher levels of global stress in comparison to controls in response to the interpersonal conflict and social interaction vignettes (Cattanach et al., 1988). The results of this study support the premise that individuals who engage in binge eating do not experience higher levels of physiological reactivity, but instead perceive greater levels of stress in their lives compared to controls.

In another influential study, Hansel and Wittrock (1997) explored differences between appraisal and coping in a female undergraduate population. In one situation, individuals who scored high on a binge eating questionnaire were compared to controls on measures of perceived stress and coping in either a high stress (e.g., videotaped argument between roommates) or low stress (e.g., neutral conversation videotaped between roommates) situation. Participants were also given a second experimental task in which they were expected to either complete a simple (i.e., low-stress condition) or unsolvable (i.e., high-stress condition) anagram. The researchers found that binge eaters reported significantly more stress on a 100-point visual analog scale compared to controls, with binge eaters in the high-stress condition reporting the most stress. Binge eaters were also found to differ from controls in the number and type of coping strategies used. Specifically, individuals in the binge eating group reported using more positive and

negative coping strategies than controls. Unfortunately, the authors failed to explain how they defined positive and negative coping strategies. However, the authors did explicitly state that individuals in the binge eating group reported significantly more catastrophizing compared to controls, with more catastrophizing occurring after the video task, and binge eaters in the high-stress condition reporting the most catastrophizing overall.

Crowther and colleagues (2001) investigated the relationship between daily hassles and the frequency of binge eating in a sample of healthy-weight women. Consistent with the results of the Hansel & Wittrock's (1997) study, participants who engaged in binge eating episodes did not experience significantly more daily stressors, but instead, perceived those hassles to be significantly more stressful (Crowther et al., 2001). In addition, women in the binge eating group ate significantly more calories on days when they perceived the greatest stress. Although this study supports the relationship between stress and binge eating, the results must be generalized with caution given that the participants were not diagnosed with an eating disorder and self-report measures were utilized.

Another study also examined differences between stress, mood, and coping in a sample of binge eating and non-binge eating female undergraduates (Wolff et al., 2000). Participants were classified into binge eaters and controls based on their responses to the Questionnaire of Eating and Weight Patterns (Spitzer et al., 1992). Therefore, the binge eating group included women who may have met diagnostic criteria for BED, BN, or Eating Disorder Not Otherwise Specified. However, this could not be confirmed given that only self-report questionnaires were used to categorize groups. Participants

completed questionnaires assessing stress (i.e., Daily Stress Inventory which measures stress from daily activities; Brantley & Jones, 1989), coping (i.e., Daily Coping Questionnaire which assess coping strategies used to handle the most bothersome event of the day; Stone & Neale, 1984), mood (i.e., measured by twelve items chosen from the Profile of Mood States and Positive and Negative Affect Schedule; Lorr & McNair, 1971; Watson, Clark, & Tellegen, 1988), and eating behaviors (i.e., daily eating measure that categorizes food into various categories such as snack, small meal, overeating, large binge, etc.) for 21 days. While binge eaters reported consistent levels of stress over the monitoring period, they experienced more negative moods and perceived situations as more stressful on binge days compared to controls (Wolff et al., 2000).

The transactional view of stress was also incorporated into a model which examined levels of self-esteem with stress and eating. Fryer and colleagues (1997) proposed that high levels of stress associated with low self-esteem (i.e., mediator) are moderated by coping style (i.e., adaptive or maladaptive strategies). In this study, adolescent girls completed the Adolescent Life Experience Survey, Adolescent Ways of Coping Checklist, Setting Conditions for Anorexia Nervosa Scale (Slade & Dewey, 1986), and the Eating Attitudes Test (Garner, Olmstead, Bohr, & Garfinkel, 1982). Results indicated that an increase in the number and severity of stressors resulted in low self-esteem, which led to increased eating disturbances (e.g., vomit, diet, binge, avoid certain foods). However, the researchers found that self-esteem was not an ideal mediator (i.e., stress was also directly associated with disturbed eating without the influence of self-esteem). According to the authors, multiple factors (e.g., restraint and control) are

more likely to provide a better explanation of the relationship between stress, coping, and maladaptive eating behaviors (e.g., binge eating, vomiting, dietary restraint).

Although most of the research examining the relationship of stress and coping to binge eating has been conducted in the United States, one study was conducted with a sample of women from Australia (Ball, Lee, & Brown, 1999). In this study, participants completed the Eating Disorders Examination Questionnaire (Fairburn & Beglin), Norbeck Life Events Scale (Norbeck, 1984), and a question about perceived stress derived from the Canadian Bureau of Statistics survey. In terms of sample characteristics, binge eating was found in a high proportion of the sample whereas restrictive weight loss behaviors were relatively uncommon. The authors found that 47% of women reporting a high level of potentially stressful life events endorsed some form of maladaptive eating (e.g., binge eating, laxative use, vomiting) compared to only 21% of individuals reporting low levels of life events (Ball et al., 1999). In the analysis of women reporting feeling stress “all the time” and “never,” the researchers discovered that 47% of women in the high stress group (i.e., stressed “all the time”) endorsed symptoms of maladaptive eating compared to only 18% of the low/no stress group (i.e., stressed “never”). It remains to be seen if women from other cultures will report similar results.

Methodological limitations have plagued much of the previous research examining the effects of stress perception and coping. Researchers often fail to control for or even assess depression. This limitation is important given previous research that indicates individuals with depression report using avoidant coping strategies (Billings & Moos, 1984; Marx, Williams, & Claridge, 1992) and this type of coping strategy use is evident in eating disorder research. Another limitation concerns the way coping styles are

typically measured. Researchers typically either assess general coping styles (i.e., treating coping as a trait) or have participants retrospectively report coping strategies used in response to a previously stressful situation. These approaches have been criticized for lacking validity and generalizability as well as introducing recall bias.

A recent study addressed many of the methodological concerns noted in previous research on stress, coping, and eating. The effects of stress perception on coping behavior were examined in a female undergraduate population (Bittinger & Smith, 2003).

Researchers separated participants into two groups based on scores derived from the Eating Attitudes Test (EAT; Garner, et al., 1982). Women scoring ≥ 20 on the EAT were classified as the disordered eating group and women scoring less than 2 were classified as controls. Perceived stress was measured on a 100-point visual analog scale. Participants were asked to imagine themselves in a scene and then reported how they would cope with the current situation. Even when controlling for level of depression, Bittinger and Smith (2003) discovered that participants in the disordered eating group reported significantly higher rates of emotion-focused coping than controls. They also found that individuals in the disordered eating group perceived the scenes as significantly more stressful than the controls, with food/body related scenes being the most distressing.

Although this study addressed several important limitations of previous research, it still relied on participants that were not formally diagnosed with eating disorders. In order to determine if these results are generalizable to individuals diagnosed with eating disorders, specifically BED, researchers need to begin recruiting individuals on the basis of structured interviews that can more accurately and objectively determine eating disorder status.

Given that stress has been frequently cited as a factor in the development of binge eating episodes in individuals diagnosed with BED, a group of researchers decided to investigate whether or not stress would affect treatment outcomes in a sample of women diagnosed with BED (Pendleton et al., 2001). In this study, the level of perceived negative (e.g., death of loved one) versus positive (e.g., marriage) stress was examined during their time in treatment using the Recent Life Changes Questionnaire (Rahe, 1975). In addition to assessing the frequency of potentially stressful events, researchers asked participants to rate the subjective appraisal of the degree of stress associated with the event on a 7-point Likert scale. Participants also indicated whether or not they perceived the event as pleasant or unpleasant. The researchers discovered that negatively perceived stress significantly influenced treatment outcomes; outcomes were better when negative stress levels were low. In addition, individuals reporting high levels of negative stress engaged in binge eating episodes more than three times the rate of individuals reporting low stress levels. The researchers also found that positive stress had no relation to treatment outcome. Although the methodology used in this study cannot determine causality between stress and binge eating, it does provide support for the hypothesis that stress may play a central role in the maintenance of BED.

The above studies provide support for Cattinach and Rodin's (1988) interactive model. In particular, these studies provide evidence that stress and coping are closely linked to the development and maintenance of binge eating. In addition, the studies support the premise that mediators, such as appraisal, influence binge eating behaviors. Although this model was intended to explain binge eating in BN, it may prove useful to

examine this premise in BED given that it does not focus on dietary restraint and the compensatory behaviors (e.g., vomiting, laxative misuse) associated with BN.

The Relationship Between Stress and Cortisol

Stress has been studied using various methodologies including psychological approaches that assess an individual's subjective evaluation of their experiences and biological approaches that assess physiological changes in an individual's body (e.g., Cohen et al., 1997). Biological approaches are based on the premise that when an individual is faced with a stressor, hormonal changes occur in the body in order to help the individual respond to the stressor (Cohen et al., 1997). For example, if an individual is faced with a threat, such as a speeding car approaching him or her, there is an increase in sympathetic nervous system activity and catecholamines (neurotransmitters such as dopamine, epinephrine, and norepinephrine or noradrenaline) release, which motivate the individual to respond rapidly by moving out of the way (i.e., fight-or-flight response). During such a stressful experience, the hypothalamic-pituitary-adrenal axis (HPA axis) is activated. This activation causes the hypothalamus to release corticotropin releasing factor (CRF) into the hypothalamic hypophyseal portal system (e.g., McComb, 2001). The CRF then stimulates the pituitary to release adrenocorticotropin (ACTH), which then stimulates the adrenal cortex to release glucocorticoids (i.e., cortisol and corticosterone). Then cortisol (i.e., a steroid hormone) and catecholamines work together to break down energy stores in order to release glucose into the body to activate the fight-or-flight response.

Although there are many methods researchers can utilize to assess biological aspects of stress (e.g., blood pressure, heart rate, pulse, etc.), measuring cortisol has

proven to be a valid approach given that cortisol secretion represents a major component of the stress response (e.g., Gluck, Geliebter, & Lorence, 2004). Over the last decade, there have been numerous studies looking at the relationship between perceived stress (i.e., psychological approach) and cortisol (i.e., biological approach) with reference to many psychological disorders, including mood disorders (e.g., Ronsaville et al., 2006), substance abuse and dependence (e.g., Block, Farinpour, & Schlechte, 1991), anxiety disorders (e.g., Wessa, Rohleder, Kirschbaum, & Flor, 2006), and eating disorders (e.g., Burkhardt, Hemmeter, & Netter, 1992; Epel et al., 2001; Gluck, Geliebter, Hung, & Yahav, 2004; Gluck, Geliebter, & Lorence, 2004; Green, Elliman, & Kretsch, 2005; Monteleone et al., 2003).

Several studies investigating the relationship between stress and eating disorders have focused on cortisol measurement (e.g., Burkhardt et al., 1992; Epel et al., 2001; Gluck, Geliebter, & Hung et al., 2004; Gluck, Geliebter, & Lorence, 2004; Green et al., 2005; Monteleone et al., 2003). Cortisol is being studied in this population as research has shown that cortisol tends to stimulate appetite. For example, Tataranni and colleagues (1996) found that administering cortisol to healthy participants over multiple days led to an increase in food intake compared to controls that did not receive cortisol. In addition, cortisol has been shown to increase preference for high fat, sweet foods (e.g., Epel et al., 2001). This finding is particularly interesting given that research has also shown that individuals who engage in binge eating prefer similar foods during binge eating episodes (e.g., Allison & Timmerman, 2007). Given research indicating that this finding is independent of negative mood, it may be due to stress reducing properties of endogenous opioids. Research has shown that opioid antagonists (e.g., Naloxone) suppressed

preferences for fat, sweet foods in humans (Drewnowski, Krahn, Demitrack, Nairn, & Gosnell, 1995; Mercer & Holder, 1997). Interestingly, Grunberg and Straub (1992) found that the relationship between perceived stress and intake of high fat and sweet foods was associated in women, but not in men. Therefore, the relationship between perceived stress and cortisol is important given that several studies have found that cortisol, stress, and binge eating all increase a preference for high fat, sweet foods.

Several studies have investigated the relationship between food intake, stress, and cortisol levels. Burkhardt and colleagues (1992) investigated cortisol levels in women classified as restrained eaters (i.e., according to a self-report measure) and women diagnosed with BN. The researchers had half of the entire sample eat lunch, while the other half underwent a 9-hour fasting period. In addition, half of the participants underwent a mental stressor (i.e., 20-min test of difficult arithmetic), while the other half of the sample did nothing. Salivary cortisol samples were collected before and after each phase of the study. Results indicated that individuals diagnosed with BN had higher basal cortisol levels than individuals classified as restrained eaters. In addition, there were no significant differences between group cortisol levels with respect to the mental stressor and fasting period. According to the authors, these results indicate that binge eating episodes that occur in individuals diagnosed with BN are not the result of chaotic eating patterns (i.e., fast-binge-purge cycle), but instead are due to feelings of loss of control and an inability to correctly perceive and interpret the environment.

In another study utilizing cortisol methodology, researchers examined the relationship between cognitive functioning, dieting, and cortisol (Green et al., 2005). Participants were recruited to participate in either a supervised (i.e., commercially

available organized weight loss group) or unsupervised diet (i.e., any diet plan the participants wanted to try). The researchers hypothesized that working memory impairments would only be present in unsupervised dieting. Throughout the study, individuals provided salivary cortisol samples and completed a neuro-psychological battery (i.e., immediate verbal recall, motor speed, mental rotation, and the Tower of London Task) at baseline, and again at weeks one, four, and eight. Results indicated that unsupported dieting was associated with increased cortisol levels and impaired cognitive functioning in the first week of dieting. Interestingly, this result was not influenced by weight loss since both dieting groups lost similar amounts of weight over the course of their diets. However, after the first weeks of dieting there were no significant differences between groups in terms of cortisol levels and cognitive functioning. The authors concluded that the cognitive impairments were the result of increased cortisol levels in individuals that participated in the unsupervised dieting.

Although the above studies provide important information about cortisol and eating disorders in general, to date only three studies have looked specifically at the relationship between stress and BED (e.g., Monteleone et al., 2003; Gluck, Geliebter, Hung, et al., 2004; Gluck, Geliebter, & Lorence, 2004). The first study evaluated the production of neuroactive steroids (i.e., steroids that interact with neurotransmitters to alter nerve activity) in individuals diagnosed with BED. Previous research confirmed the presence of neuroactive steroids in other eating disordered populations (e.g., AN, BN; Monteleone et al., 2003). Diagnostic status was determined using the Structured Clinical Interview for DSM-IV (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1995), and blood cortisol samples were obtained from participants (i.e., individuals diagnosed with BED

who were obese or not obese, obese women, and healthy controls) after an overnight fast. The researchers discovered that both nonobese and obese women diagnosed with BED had significantly elevated plasma concentration levels of cortisol in the morning compared to the control groups (e.g., obese non-binge eating women and normal weight healthy controls). Although the authors only collected a single measure of cortisol in the morning, the results support the hypothesis that individuals diagnosed with BED display increased levels of cortisol similar to individuals diagnosed with AN and BN.

Another study examined the relationship between cortisol, hunger, and desire to binge eat. Women diagnosed with BED (based on a clinical interview) and women who did not engage in binge eating episodes (i.e., control group; Gluck, Geliebter, Hung, et al., 2004) participated in a cold pressor task while cortisol levels, hunger, and desire to binge eat were assessed. The researchers hypothesized that individuals diagnosed with BED would evidence increased cortisol levels, and report more hunger and desire to binge eat after the cold pressor test. Results indicated that individuals diagnosed with BED reported increased hunger, desire to binge eat, perceived pain, and perceived stress after the cold pressor test compared to controls. In addition, BED participants exhibited increased cortisol levels after the cold pressor test, although it failed to reach statistical significance ($p = .057$).

Gluck and colleagues continued data collection with this sample by following these same women over an intervention phase (i.e., cognitive-behavioral therapy or wait list control group) in order to determine if there is a relationship between cortisol and central fat before and after treatment (Gluck, Geliebter, & Lorence, 2004). The researchers discovered that there was no correlation between cortisol and central fat.

According to the authors, an overactive HPA axis due to stress raises cortisol, which may contribute to the development of binge eating episodes. However, a major limitation to this study was the small sample size with only eleven women in each group (i.e., BED group, non-BED group).

Although these studies provide insight into the stress response of individuals with eating disorders, only a few investigated individuals diagnosed with BED. In fact, two studies used the same sample, limiting their ability to generalize to the general population of individuals diagnosed with BED. Another limitation is that these studies were not designed to look at the stress and coping relationship in individuals diagnosed with BED. One study only determined whether or not cortisol levels in individuals diagnosed with BED were similar to other eating disorders (e.g., AN, BN), and the other study investigating women diagnosed with BED only assessed stress using one method (i.e., cold pressor test). Future research could benefit by studying the relationship between stress, coping, and BED by using emotionally relevant stressors such as interpersonal or food related stimuli.

Overview

Links have been found in research investigating relations between stress, coping, and eating disorders. However, many questions remain to be answered, such as whether or not these results will also hold true for individuals diagnosed with BED (Ball & Lee, 2000; Bennett & Cooper, 1999; Conner, Fitter, & Fletcher, 1999; Greeno & Wing, 1994; Hansel & Wittrock, 1997; Robert-McComb, 2001). Researchers have highlighted the importance of furthering the literature by moving beyond healthy populations and investigating the relations between stress and eating in clinically diagnosed eating

disorder populations (Ball & Lee, 2000; Fryer et al., 1997; Greeno & Wing, 1994; Wolff et al., 2000). Researchers have also highlighted the importance of determining a more sophisticated relationship between stress, coping, and binge eating by using a combination of self-report, physiological, and self-monitoring tasks (e.g., Ball & Lee, 2000; Bennett & Cooper, 1999; Cattanach & Rodin, 1988; Gluck, Geliebter, & Hung et al., 2004; Green et al., 2005; Greeno & Wing, 1994; Monteleone et al., 2003). For example, biological assessments, such as salivary cortisol, provide an opportunity us to recognize the relationship between objective measures (e.g., physiological measures such as salivary cortisol) and psychological aspects of perceived stress (e.g., individual's self-reported level of stress).

Exploring the relationship between stress, coping, and BED may help determine the extent to which stress and coping play a role in the development and maintenance of the disorder. This type of investigation will also help researchers understand how various risk factors mediate or moderate this relationship. Finally, research exploring the importance of stress and coping may help inform treatment for individuals diagnosed with BED. For example, if stress and coping are found to play a major role in the development and maintenance of the disorder, prevention and treatment efforts should focus on helping individuals decrease their stress and increase their use of effective coping strategies.

Statement of Purpose

Since BED has been added as a provisional diagnostic category that warrants further investigation, research in this area has greatly increased. One line of research that has been receiving increased attention focuses on the relations between stress, coping,

and binge eating. A shortcoming of the existing literature is that many of the stress-eating theories were originally developed for other eating disturbances (e.g., AN, BN, obesity) and then later applied to BED. For example, Cattanach and Rodin's (1988) integrative theory was originally developed for BN, which may limit its ability to accurately portray individuals diagnosed with BED. In addition, a majority of the models have focused on participants that do not meet diagnostic criteria for eating disorders. Another limitation is that most of the models have never been subjected to empirical scrutiny in their entirety. Due to the above limitations, additional research, using individuals diagnosed with BED as study participants, will be necessary to determine if such a theory is appropriate for explaining the development and maintenance of BED.

The purpose of this study was to test the applicability of aspects of the interactive model proposed by Cattanach and Rodin (1988) for BED. The interactive model was chosen over the other reviewed models because it does not focus on dieting, restraint, or purging behaviors. The model also specifically focuses on the interactive process between stress and coping. Exploring the role of cortisol may have utility in understanding the stress component of the interactive model for BED. As of yet, there are no models, including those described above, which specifically address the impact of cortisol. Including such a biological assessment contributes to a better understanding of the relationship between such objective measures and self-reports of stress. This research provides an opportunity to examine the role that stress and coping play in the maintenance of BED. Multiple assessment procedures (e.g., clinical interview, self-report, physiological assessment) were used to determine if stress precipitates urge to binge in individuals diagnosed with BED.

Hypotheses

1. Individuals diagnosed with BED would evidence greater eating disordered psychopathology (i.e., greater frequency of binge eating episodes, increased urges to binge eat, and significantly more distress about eating/weight/shape) compared to individuals in a control condition.
2. Individuals diagnosed with BED would evidence greater psychological distress (i.e., report experiencing more depressive and anxious symptoms) than individuals in the control group.
3. Individuals diagnosed with BED would experience significantly more stressful events (as assessed by the Life Experiences Survey described below) over the past six months than individuals in the control group.
4. Individuals diagnosed with BED would perceive events as more stressful (as assessed by self-report and in reaction to experimental tasks) than individuals in the control group. For example, individuals diagnosed with BED would rate experiences on the Perceived Stress Scale (described below) as more stressful than individuals in the control group. In addition, individuals in the BED group were expected to self-report significantly higher levels of stress following the experimental task than individuals in the control condition.
5. Individuals diagnosed with BED would exhibit significantly greater cortisol levels in reaction to the experimental task than individuals in the control group.
6. Individuals diagnosed with BED would display slower cortisol recovery rates after the experimental task than individuals in the control group.

7. Individuals diagnosed with BED would report significantly greater urges to binge eat after the experimental task than individuals in the control condition.
8. Individuals diagnosed with BED would report using significantly more food-related and emotion-focused coping responses (as assessed by self-report and in reaction to experimental tasks) than individuals in the control condition.

Chapter Two

METHOD

Participants

Forty-five Caucasian females who were 18 years of age or older were recruited for participation in this study (19 individuals met criteria for BED and 26 individuals served as non-eating disordered controls). College student volunteers were recruited from the Psychology Department Subject Pool and received four experimental credits for participation. Community volunteers were recruited by fliers posted in the community and in the local newspaper (i.e., Bangor Daily News). Community participants' names were entered into a drawing to receive a \$100 gift card. All participants read and signed an informed consent document and were debriefed at the end of the study. The study was approved by the University of Maine Institutional Review Board.

Study Criteria

Participants were screened prior to enrollment in the study. Participants were enrolled in the BED group if they met DSM-IV-TR research criteria for BED. Current BED criteria require that individuals engage in binge eating episodes "...on average, at least 2 days a week for 6 months" (p. 787; APA, 2000), in addition to the other criteria mentioned in the *Defining Binge Eating Disorder* section. Individuals diagnosed with AN or BN were excluded from the BED group even if they engaged in binge eating episodes. To qualify for the control group, participants did not meet criteria for any psychological disorder (including an eating disorder) or endorse subclinical symptoms consistent with an eating disorder (e.g., engaging in binge eating episodes on an intermittent basis). Individuals were excluded from either group if they were taking medications that contain

steroids (e.g., prednisone, dexamethasone) because these drugs can lead to false results when cortisol samples are analyzed. In addition, women were excluded from study participation if they were pregnant, perimenopausal, or menopausal given these conditions have been found to bias cortisol results. Menstrual cycle phase was recorded for each participant, and all women participated in the experimental task during the follicular phase (days 8-12) of their menstrual cycle. Individuals were run during the same phase of their menstrual cycle given that hormone levels across the cycle vary (e.g., compared to the follicular phase, cortisol rates are higher during the luteal phase; Kirschbaum et al., 1999). Data was collected during the follicular phase because research has shown that women in the follicular phase and oral contraceptive users do not differ in their salivary cortisol responses (Kirschbaum et al., 1999).

Recruitment

Female student participants in the subject pool were recruited from introductory and other psychology courses during the fall and spring semesters. Students completed an online screening survey for all experiments in the psychology department, including one for this study (Appendix A). Students received one experimental credit for completing the screening survey. Female community volunteers were recruited via fliers (Appendix B) posted in public businesses (e.g., laundromat, fitness center, etc.), medical offices, the local newspaper (e.g., Bangor Daily News), and around local universities (e.g., University of Maine, Hudson College). The advertisement stated that a psychology doctoral candidate at the University of Maine was conducting a research study on the relationship between stress and eating, and was looking for women between 18-28 years old who felt that they regularly binge ate. An electronic version of the flier was also

posted on the University of Maine internet conferences and forums. Community participants who responded to advertisements were contacted by telephone and briefly screened by the same measure (Appendix A) used for college volunteers. The principal investigator contacted participants who were eligible to determine their interest in participating in the study. All participants who meet study criteria were invited to participate in the study. Eighty-seven percent of participants were undergraduate or graduate students (15 BED, 24 controls); thirteen percent were recruited from the community (4 BED, 2 controls).

Experimenters

This study was primarily conducted by the principal investigator. An advanced graduate student in clinical psychology aided in administering diagnostic interviews and the study protocol. Interrater reliability for diagnosis was established by having the principal investigator and graduate student assistant, blind to group assignment (i.e., audiotapes did not have information that identified group assignment or diagnosis), review audiotaped recordings of the others' diagnostic interviews. Interrater reliability was 100%.

Measures

Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition (SCID- I/P)

The SCID- I/P was used to establish a diagnosis of BED, rule out other eating disorders, and assess for the presence of other comorbid disorders. The SCID-I/P is a semi-structured interview designed to assess current and lifetime Axis I psychiatric disorders (First, Spitzer, Gibbon, & Williams, 2002). During the interview, individuals

are asked questions regarding Axis I disorders such as depression (e.g., In the past month, has there been a period of time when you were feeling depressed or down most of the day nearly every day?), anxiety (e.g., In the past six months, have you felt particularly nervous or anxious?), and eating disorders (e.g., Have you ever felt that your eating was out of control?). Reliability and validity data for the SCID-I indicate good reliability kappa values (interrater reliability: 0.57-1.00; test-retest reliability: 0.35-0.78; Zanarini & Frankenburg, 2001; Zanarini, Skodol, Bender, Dolan, Sanislow, Schaefer, et al., 2000) and superior validity of the SCID-I over routine clinical interviews (Basco, Bostic, Davies, Rush, Witte, Hendrickse, et al., 2000; Shear, Greeno, Kang, Ludewig, Frank, Swartz, et al., 2000). For example, interrater reliability for the SCID-I based on 84 pairs of raters using videotaped interviews indicated kappa coefficients ranging from 0.57-1.00 (Zanarini et al., 2000). In particular, the kappa coefficient for eating disorders was 0.77.

Questionnaire on Eating and Weight Patterns (QEWP)

The QEWP was used as an initial screening measure (see Appendix A). The QEWP represents a self-report instrument that corresponds with DSM-IV proposed criteria for eating disorders (e.g., AN, BN, BED; Spitzer et al., 1992). The full format version of the QEWP collects demographic information, weight/height, weight change patterns, and estimation of calories consumed during a binge episode (Spitzer et al., 1992). However, a shorter version has been designed that contains eight diagnostic items; information about the presence of binge eating (e.g., “During the past six months, did you often eat within any two-hour period of time what most people would regard as an unusually large amount of food?”), loss of control (e.g., “When you ate this way, did you often feel you couldn’t stop eating or control what or how much you were eating?”),

behavioral indicators regarding loss of control (e.g., eating more rapidly than usual, eating until uncomfortable full, eating alone, etc.), distress (e.g., “How upset were you by overeating...”), and frequency of binge episodes.

Previous studies have reported that using only the eight diagnostic items is sufficient to identify binge eaters (Nangle, Johnson, Carr-Nangle, & Engler, 1994; Stice, Agras, Telch, Halmi, Mitchell, & Wilson, 2001). Studies assessing QEWP psychometric properties found good concurrent and discriminant validity (Nangle et al., 1994). In addition, studies have shown that the QEWP can discriminate between nonclinical and clinical binge eaters. For the present study, participants were selected if they reported engaging in binge eating episodes (i.e., consuming large quantities of food accompanied with a sense of loss of control), experienced at least three of the impaired behavioral control indicators (e.g., eating rapidly, eating until uncomfortably full, eating large amounts of food when not hungry, eating alone due to embarrassment, and feeling depressed, disgusted, or guilty after overeating), experienced significant distress over eating behaviors, and abstained from compensatory behaviors (e.g., self-induced vomiting, laxative use, excessive exercise). This criterion was selected because it conforms to the DSM-IV criteria proposed for BED (APA, 2000).

Eating Disorder Examination- Questionnaire (EDE-Q)

The EDE-Q represents a 38-item self-report questionnaire that measures eating disorder psychopathology (Fairburn & Beglin, 1994; see Appendix C), and was used to confirm a diagnosis of BED. The EDE-Q was derived from the Eating Disorder Examination, 12th edition interview (EDE; Fairburn & Cooper, 1993) as a way to assess eating disorder symptomatology without having to administer a lengthy interview. In

fact, each item of the EDE-Q is directly taken from a corresponding item of the EDE interview (Mond, Hay, Rodgers, Owen, & Beumont, 2004). Studies assessing the relationship between the EDE-Q and EDE interview version have found that the two measures are highly convergent in terms of assessing important features of eating disorders (e.g., Fairburn & Beglin, 1994; Goldfein, Devlin, & Kamenetz, 2005; Grilo, Masheb, & Wilson, 2001; Sysko, Walsh, & Fairburn, 2005). In addition, studies have shown that the EDE-Q has excellent test-retest reliability and high internal consistency (Luce & Crowther, 1999; Mond et al., 2004).

Anthropometric Measurements

Body Mass Index (BMI) was used to ensure that the groups were comparable with regard to height and weight. The BMI ($\text{BMI} = \text{kg}/\text{m}^2$) is considered a good indicator of individuals' nutritional state because it divides weight by height (squared) in order to account for variations of weight due to height. During the initial assessment, each participant's weight was collected by a digital scale. Participants were instructed to remove their shoes and jewelry, and stand straight up on the scale with their shoulders back and head looking forward. Height was calculated by using a wall growth chart. Each participant was instructed to remove their shoes and stand up straight with their shoulders and feet back against the wall. Sagittal abdominal diameter was also collected and is a measure of body thickness between the lowest rib and the top of the iliac crest, and has been validated as an indirect measure of visceral fat (Zamboni, Turcato, Armellini, Zivelonghi, Santana, Bergamo-Andresis, & Bosello, 1998). Sagittal diameter was measured with a Lafayette anthropometer device by calculating the greatest distance from the abdomen to the back. In order to accurately collect the sagittal diameter of each

participant, individuals were instructed to lift their shirt up, and take a breath in and out while relaxing their muscles.

Profile of Mood States (POMS)

The POMS measures transitory mood states (i.e., nervous, irritated, bored, etc.; McNair, Lorr, & Droppleman, 1971; see Appendix D). Items are rated on a 5-point Likert scale ranging from 0 (“not at all”) to 4 (“extremely”). The POMS contains six subscales that can be used individually, in various combinations, or together as one complete measure. This study administered the Depression (15-items) and Anxiety (9-items) subscales prior to and following the experimental task in order to assess an individual’s mood state at various points in the experiment. Research has shown that the POMS has good reliability and validity, with coefficient alphas typically ranging .90 or higher (McNair et al., 1971). In addition, the POMS has been previously used in several studies investigating eating disorders. The POMS has been found to successfully identify various mood states associated with binge eating episodes (e.g., Arnow et al., 1995). Cronbach’s alpha for POMS depression and anxiety scales are presented in Table 1.

Table. 1 Cronbach’s alpha for POMS Depression and Anxiety Subscales

	Baseline	Stress Task	20 min	40 min	Relaxation task
Depression	.83	.88	.88	.94	.73
Anxiety	.87	.91	.85	.87	.62

Beck Depression Inventory- II (BDI-II)

The BDI-II is a 21-item self-report questionnaire that measures affective, cognitive, and physical symptoms of depression (Beck, Steer, & Brown, 1996; see Appendix E). The BDI-II was used to assess depressive symptomatology in participants given that the interactive model of stress and eating proposes that depression can serve as a mediator (Cattanach & Rodin, 1988). Items are rated on a 4-point severity scale ranging from 0 (symptom not endorsed) to 3 (symptom present at maximum severity). Beck and colleagues (1988; 1996) have demonstrated that the BDI and BDI-II have good convergent validity, internal consistency, and test-retest reliability. For example, Beck, Steer, and Garbin (1988) conducted a meta-analysis of studies assessing the psychometric properties of the BDI and found that the average internal consistency alpha coefficient was 0.86 for clinical populations and test-retest reliability is greater than 0.90. Beck and colleagues (1996) found that the BDI-II also demonstrated high internal consistency among college students ($\alpha = 0.93$) and clinical outpatients ($\alpha = 0.92$). When comparing psychometric properties between the BDI and BDI-II, researchers discovered that the BDI-II had stronger factorial validity than the earlier version (Dozois, Dobson, & Ahnberg, 1998). In the current study, Cronbach's alpha was .95.

State-Trait Anxiety Inventory (STAI)

The STAI consists of two 20-item self-report instruments that measures both state and trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1982; see Appendix F). The STAI was used to assess participants' levels of state and trait anxiety given that the interactive model of stress and eating proposes that anxiety can also serve as a mediator (Cattanach & Rodin, 1988). State anxiety has been conceptualized as the level

of anxiety an individual experiences at the time of the assessment (e.g., feeling anxious just before an exam), whereas trait anxiety refers to an individual's general level of anxiety across time and/or situations (e.g., feeling nervous or restless in most situations). On the state items, individuals are asked to report how they feel at that moment on a 5-point Likert scale ranging from 0 ("not at all") to 4 ("very much so"). On the trait items, individuals are asked to report how they generally feel on a 5-point Likert scale ranging from 0 ("almost never") to 4 ("almost always"). Research has shown that both scales have excellent internal consistency, with alpha coefficients ranging from 0.86-0.95, and good test-retest reliability (r_s 0.71 and 0.75; Spielberger et al., 1982). In the current study, Cronbach's alpha was .94 for both scales.

Brief COPE

The Brief COPE is a 28-item self-report instrument, comprised of 14 subscales (two items for each scale), designed to identify different ways in which individuals respond to stress (Carver, 1997). The Brief COPE was used in this study to measure various coping strategies used by participants. The Brief COPE is an abbreviated version of the full COPE, which contained 60-items (with some redundancy) making up 15 subscales (Carver, Scheier, & Weintraub, 1989). The 14 subscales of the Brief COPE represent different strategies (e.g., acceptance, denial, humor, religion) individuals typically use to cope in various situations. Four items measuring food-related coping were added for study purposes (e.g., "I've used food to make myself feel better"). Individuals indicate the degree to which they use each coping strategy on a 4-point Likert scale ranging from 0 ("I don't do this at all") to 3 ("I do this a lot").

Carver (1997) conducted a factor analysis of the Brief COPE and found that it is consistent with the full COPE. The Brief COPE has also been found to have acceptable internal reliability with all alpha coefficients exceeding 0.50 (most exceeding 0.60; Carver, 1997). The following study utilized the Brief COPE in three different ways. First, participants completed the Brief COPE in relation to how they coped with a recent stressful event (Cronbach's $\alpha = .88$ see Appendix G). Participants also completed the Brief COPE in relation to how they handled the experimental task (Cronbach's $\alpha = .78$; see Appendix H). Finally, participants completed the Brief COPE in reference to how they cope in general (Cronbach's $\alpha = .85$; see Appendix I).

Urge to Binge Rating

The Urge to Binge Rating is a one item 7-point Likert scale rating that measures a participants desire to binge where 0 ("not at all") reflects no desire to binge and 7 ("extremely") reflects an intense desire to binge (see Appendix J). Participants completed the Urge to Binge Rating prior to and following experimental tasks in order to assess an individual's desire to binge eat. Tuschen-Caffier & Vögele (1999) employed a similar scale in their research to measure an individual's urge to binge. Embedded in this measure was also a manipulation check to determine if participants felt stressful after the experimental task.

Perceived Stress Scale (PSS)

The PSS is a 14-item self-report measure that identifies and quantifies an individual's perception of stress (Cohen, Kamarck, & Mermelstein, 1983; see Appendix K). The PSS was used in the following study to assess how research participants perceived recent stressful events in their lives. Individuals indicate the extent to which

they have experienced various feelings over the last month on a 5-point Likert scale ranging from 0 (“never”) to 4 (“very often”). It is important to note that the PSS is a measure of the degree to which one appraises their life as stressful, instead of a measure of cumulative stressful events. The PSS has been found to have good validity and internal and test-retest reliability with alpha coefficients ranging from 0.84-0.86 (Cohen et al., 1983). In the current study, Cronbach’s alpha was .86.

Life Experiences Survey (LES)

The LES is a 57-item self-report measure that measures the number and severity of life experiences an individual has endured over the past year (Sarason, Johnson, & Siegel, 1978; see Appendix L). Some of the events listed on the LES include death of a close family member or friend, marriage, major change in sleep habits, new employment, and being fired from a previous job. If an individual indicated that an event occurred, they rated the impact of that event on a 7-point Likert scale ranging from -3 (“extremely negative”) to +3 (“extremely positive”). The LES yields three scores: a positive change score (i.e., sum of the positive impact ratings), a negative change score (i.e., sum of the negative impact ratings), and a total change score. Studies have shown that the LES has excellent reliability and validity (Sarason et al., 1978).

Experimental Tasks

Stress Induction Task

Participants were exposed to the Trier Social Stress Test (TSST; Kirschbaum, Pirke, Hellhammer, 1993). The TSST has been used extensively in research to induce moderate physiological and psychological stress (e.g., Epel et al., 2000; Gerra et al., 2000; Jones, Rollman, & Brooke, 1997; Young, Lopez, Murphy-Weinberg, Watson, &

Akil, 2000). According to Kirschbaum and colleagues (1993), the TSST "... was found to reliably induce 2- to 4- fold increase in salivary cortisol levels with similar peak concentrations in different populations studied" (p. 80). In the TSST, a participant is given 10 min to prepare for a 5 min speech about why they deserve a certain job. After the 10 min anticipation period, the participant is brought in front of a microphone in a room with three individuals they believe to be committee members of the company they are applying for; in actuality, the individuals are study confederates. Prior to starting the speech, the participant is told that they are being audio-taped and video-taped (although it is not true). In addition, they are told that the committee members are trained to monitor nonverbal behavior. If the individual finishes the speech in less than 5 min they are prompted to continue, and if they stop for a second time the committee members (i.e., study confederates) ask the participant previously prepared questions.

After the 5 min speech is finished, the participant is asked to serially subtract 13 from 1,022 as fast and accurately as possible for 5 min. If the individual makes a mathematical error while subtracting, the committee members require the participant to start over from the beginning (i.e., 1,022). After the serial counting is complete, the participant is debriefed about the experimental task and then rests for "30-70 min depending on the hormones measured in the particular study" (p. 77; Kirschbaum et al., 1993). The current study followed a similar TSST protocol with the following changes: no microphone was used and participants first were asked to subtract 7 from 996; if participants completed this task before 5 min, they were then asked to subtract 17 from 2043, if they could not do the first one, they were asked to subtract 3 beginning with 407.

Psychophysiological Recording

Salivary cortisol samples were collected using a device developed by Sarstedt, Inc. called a Salivette®. The Salivette® consists of a cotton swab, which participants place in their mouth and chew for 30-60 s to produce 0.5-1 ml of saliva. Research studies have found that saliva-based cortisol samples are as reliable as blood-based samples ($r > 0.90$; e.g., Kirschbaum & Hellhammer, 1989). In order to ensure valid and reliable assessment, individuals were not able to eat, drink (except water), or smoke cigarettes two hours prior to collecting a sample since studies have shown that these variables can influence salivary cortisol levels (Kirschbaum & Hellhammer, 1989).

Saliva-based cortisol methods were used because they have many advantages over blood and urine samples. First and foremost, salivary samples are less invasive given that it only requires individuals to place a cotton swab in their mouth. In addition, the samples can be transported in regular mail from the participant to the researcher without special precautions (e.g., dry ice). Kirschbaum and Hellhammer (1989) found that Salivette samples can be stored at room temperature for more than two weeks without affecting cortisol levels. However, laboratories recommend that all samples be stored at -20 degrees Celsius or lower since the samples can begin to mold at warmer temperatures and produce a noxious smell (although the mold does not affect cortisol levels). Therefore, all samples were stored in a -20 degree Celsius freezer until they were shipped (on dry ice) to the laboratory for analysis.

Another benefit to using salivary samples over other methods is that saliva samples do not require the expertise of medical personnel (e.g., phlebotomist) to collect the samples. According to Cohen and colleagues (1997), “Use of saliva-based cortisol

measures offers researchers the opportunity to assess this “stress hormone” without the reactivity, practical constraints, and ethical problems inherent in more invasive blood or urine sampling procedures” (p. 183).

Procedure

Individuals were invited to participate in the study if they met initial screening criteria (described above). During the first laboratory session (i.e., assessment day), participants read and signed an informed consent document (student consent: Appendix M; community consent: Appendix N) prior to beginning study procedures. After that, participants were interviewed using the SCID-I/P to confirm or rule out a diagnosis of BED. Participants who meet exclusionary criteria (i.e., report symptoms consistent with AN or BN, and specifically for the control group, symptoms consistent with BED or other Axis I diagnoses) as a result of the SCID-I/P, were debriefed and received 1 experimental credit for their participation. Participants who met criteria for either study group continued with study procedures. Based upon SCID-I/P results, participants were placed in either the BED group (i.e., individuals who meet DSM-IV-TR criteria for BED) or the control group (i.e., individuals who do not engage in binge eating episodes).

Next, anthropometric measurements (e.g., height, weight, sagittal abdominal diameter) were collected. Then participants completed questionnaires assessing: eating disorder symptomatology (i.e., EDE-Q), desire to binge eat (i.e., Urge to Binge Rating), current affective state (i.e., BDI-II, POMS, STAI), coping strategies used for a recent stressful event (i.e., Brief COPE), and current level of stress (i.e., LES, PSS) in a counterbalanced order. In addition, demographic information was collected (Appendix O) regarding age, ethnicity, general health, medication use (in addition to birth control use),

smoking status, exercise, menstrual cycle, caffeine and alcohol intake, and pregnancy status. After phase of menstrual cycle was determined, participants were scheduled for their next laboratory session on a day when they were in the follicular phase of their cycle.

Participants returned for the second laboratory session between 3:00 p.m. - 7:00 p.m., due to diurnal rhythms found in cortisol samples. This procedure has been used in several cortisol studies (e.g., Kirschbaum, Klauer, Filipp, & Hellhammer, 1995; Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999; Rohleder, Wolf, Piel, & Kirschbaum, 2003). At the start of the second laboratory session, participants were placed individually in a sound-attenuated room in order to minimize the influence of external stimuli during the baseline period. Prior to explaining experimental instructions, participants sat quietly for a 5 min baseline period. After the baseline period, participants completed measures assessing baseline mood state (i.e., POMS), desire to binge eat (i.e., Urge to Binge Rating), and a 7-point Likert scale indicating current perceived stress (i.e., perceived stress rating). In addition, a baseline salivary cortisol sample was collected. After the baseline assessment, individuals participated in the TSST. Specifically, participants were told that they have 10 min to prepare for a 5 min speech about a dream job. The participants were told that they have to give their speech in front of a committee with the belief that the committee members are trained at monitoring non-verbal behaviors. In addition, individuals were told that their speech would be videotaped, although recording did not actually take place.

After the speech preparation period, the committee came in and sat in front of the participant to give the speech. If the participant finished the speech in less than 5 min

they were prompted to continue, and if they stopped for a second time they were asked specific questions about their speech to elicit more information. Next, the participant was asked to serially subtract 7 from 996 as fast and accurately as possible for 5 min. If the individual made a mathematical error while subtracting, they were asked to start over from the beginning (i.e., 996). If the participant was able to serially subtract 7 from 996 before the 5 min period was over they were then asked to subtract 17 by 2,043 in an effort to keep the stressor going for the full 5 min. If, on the other hand, the participant was repeatedly struggling and unable to serially subtract 7 from 996 for even a times they were asked to subtract 3 from 407. This was done to ensure that the individual completed the serial subtraction for a full 5 min and did not prematurely give up on the task.

After completing the TSST, participants completed post-mood induction (i.e., POMS), desire to binge eat ratings (i.e., Urge to Binge Rating), and perceived stress ratings in order to measure changes after the experimental task. Participants also completed the Brief COPE with reference to how they coped with the stressful task. Immediately after the modified TSST was completed, a second salivary cortisol sample was collected in order to measure peak cortisol levels. According to C. Kirschbaum (personal communication, August 17, 2006), it takes salivary cortisol levels about 20-30 min after stress onset to reach peak levels and then 45-60 min after peak levels have been reached to return to baseline. Therefore, participants rested quietly for 60 min after the cessation of the TSST in order to measure changes in cortisol levels from baseline. The third and fourth salivary cortisol samples were collected 20 and 40 min post-stressor (i.e., 20 and 40 min after cessation of the TSST), respectively. Participants also completed post-mood induction (i.e., POMS), desire to binge eat ratings (i.e., Urge to Binge Rating),

and perceived stress ratings while the third and fourth salivary cortisol samples were collected.

Due to the fact that the stressor may elicit binge eating episodes in the BED group, all participants completed a 20 min guided imagery relaxation technique to ensure that they were not stressed prior to leaving the lab. The relaxation exercise was on an audiocassette that participants listened to while engaging in the relaxation exercises (i.e., progressive muscle relaxation, deep breathing, guided imagery). After the relaxation exercise, participants completed a fifth salivary cortisol sample, in addition to post-mood induction (i.e., POMS), desire to binge eat ratings (i.e., Urge to Binge Rating), and perceived stress ratings. After all procedures were finished, participants were debriefed about the purpose of the stress task, the entire experiment, compensated with experimental credit (student volunteers only), and thanked for their participation. Participants who were struggling with BED or other psychological problems were given treatment referral information (see Appendix P) if they were interested in receiving treatment for their difficulties.

Chapter Three

RESULTS

Data Analytic Strategy

All analyses were conducted using SPSS 12.0 statistical software. Independent variables consisted of Group as a between-subjects factor (i.e., BED, Control), and Cortisol Assessment Time, Urge to Binge Eat, and Stress Rating as within-subject factors (Baseline, Time 1: immediately after Trier Social Stress Test (TSST), Time 2: 20 min post-TSST, Time 3: 40 min post-TSST, Time 4: post- relaxation exercise). To address hypotheses, one-way ANOVA and repeated measures ANOVA were conducted. A significance level of .05 was specified for all procedures. Measures of effect size (eta squared; η^2) were also calculated. Effect magnitude has been classified as follows: $\eta^2 = 0.01$, small effect; $\eta^2 = 0.06$, medium effect; $\eta^2 = 0.14$, large effect (Cohen, 1988).

Cortisol samples were sent to Salimetrics laboratory for analyses. The lab used radioimmunoassays (RIA), a reliable measurement that has been well established for analyzing salivary cortisol (e.g., see Kirschbaum & Hellhammer, 1989, 1994). The lab ran each cortisol sample two times to ensure accuracy, and reported two measurement points and an average of the two. The average cortisol level was used in subsequent analyses.

Prior to analysis, dependent variables were examined to determine accuracy of data entry, missing values, and fit between their distributions and the assumptions of univariate analyses. Variables were examined separately for BED and Control conditions and there were no missing data points for the study.

Participant Characteristics

The means and standard deviations for variables describing study participants are presented in Table 2. Individuals diagnosed with BED were slightly older than individuals in the control group [$t(43) = 3.09, p = .004$]. The mean BMI (BMI = kg/m²) of the BED group was also significantly higher than the mean BMI of individuals in the control group [$t(43) = 2.04, p = .05$]. Interestingly, height [$t(43) = -.79, p = .43$] and weight [$t(43) = 1.68, p = .10$] were not significantly different between the two groups. In addition, average sagittal scores of both groups were not significantly different [$t(43) = 1.96, p = .06$]. Correlations for the groups can be found in Appendix S.

Table 2

Descriptive Statistics for Participants

	BED Group ($n = 19$)		Control Group ($n = 26$)	
	Mean	<i>SD</i>	Mean	<i>SD</i>
Age	20.79 _a	2.70	18.73 _b	1.78
Height	64.24 _a	3.01	64.81 _a	1.81
Weight	156.57 _a	42.79	139.87 _a	23.44
BMI	26.72 _a	7.01	23.54 _b	3.25
Sagittal	22.84 _a	5.29	20.40 _a	3.03

Note. Means in the same row having the same subscript are not significantly different at $p < .05$.

Stress Manipulation Check

To determine whether participants experienced stress after the TSST induction, perceived stress ratings immediately after the TSST induction were analyzed using

repeated-measures ANOVA. The findings (see Table 3) indicate that there was a statistically significant increase in perceived stress levels for all participants from baseline to the time immediately after the TSST induction was completed [$F(1,43) = 55.42, p = .0001, \eta^2 = .56$].

Table 3

Means and Standard Deviations for Perceived Stress Levels across Time

Time Point	Mean	SD
Baseline perceived stress level	2.53 _a	.21
Perceived stress after stress induction	3.93 _b	.19

Note. Means having the same subscript are not significantly different at $p < .05$.

Hypothesis 1: Eating Disorder Pathology

It was hypothesized that individuals diagnosed with BED would evidence greater psychopathology compared to individuals in the control condition. To test this hypothesis, two sets of one-way ANOVA procedures were conducted. In the first set, differences in eating behavior pathologies were compared across groups, without controlling for the effects of individual-level variables (results are presented in Table 4). In the second set, differences in eating behavior pathologies were compared across groups, controlling for the effects of individual-level variables (results are presented in Appendix R).

Number of Binge Eating Episodes in the Past Month. The number of binge eating episodes during the past month varied significantly across groups [$F(1, 43) = 19.01, p =$

.0001, $\eta^2 = .31$]. Individuals diagnosed with BED reported having a greater number of binge episodes in the past month than individuals in the control group.

Distress about Eating, Weight, and Shape. Mean self-report of distress about eating, weight, and shape varied significantly across groups [$F(1, 43) = 32.67, p = .0001, \eta^2 = .43$]. Individuals diagnosed with BED reported being more distressed about eating, weight, and shape in comparison to individuals in the control group.

Self-judgments Based on Weight. Mean self-judgments based on weight varied significantly across groups [$F(1, 43) = 34.31, p = .0001, \eta^2 = .44$]. Individuals diagnosed with BED reported judging themselves based on their weight more often than individuals in the control group.

Self-judgments Based on Shape. Mean self-judgments based on shape varied significantly across groups [$F(1, 43) = 41.35, p = .0001, \eta^2 = .49$]. Individuals diagnosed with BED reported judging themselves based on their shape more often than individuals in the control group.

Dissatisfaction with Weight. Mean dissatisfaction with weight varied significantly across groups [$F(1, 43) = 34.12, p = .0001, \eta^2 = .44$]. Individuals diagnosed with BED reported being more dissatisfied with their weight in comparison to the individuals in the control group.

Dissatisfaction with Shape. Mean dissatisfaction with body shape varied significantly across groups [$F(1, 43) = 35.32, p = .0001, \eta^2 = .45$]. Individuals diagnosed with BED reported being more dissatisfied with their shape in comparison to the individuals in the control group.

Table 4

Means and Standard Deviations for Eating Disorder Pathology

	<u>BED Group</u>		<u>Control Group</u>	
	Mean	SD	Mean	SD
# binge episodes in past month	13.47 _a	8.51	2.81 _b	7.80
Distress about eating, weight, shape	3.21 _a	1.99	.62 _b	1.02
Self-judgment based on weight	4.21 _a	7.80	1.15 _b	1.57
Self-judgment based on shape	4.53 _a	1.58	1.31 _b	1.72
Dissatisfaction with weight	4.74 _a	1.33	1.92 _b	1.77
Dissatisfaction with shape	4.68 _a	1.29	1.96 _b	1.66

Note. Means in the same row having the same subscript are not significantly different at $p < .05$.

Given that the above results could be influenced by individual difference variables, the above analyses were repeated with age, BMI, sagittal measure, and Beck Depression Inventory (BDI) scores as covariates. All of the analyses remained significant after controlling for those variables. These results are reported in Appendix R. Therefore, the above findings support the hypothesis that individuals diagnosed with BED would evidence greater eating psychopathology compared to individuals in the control condition. These differences were still apparent even when individual difference variables (i.e., age, BMI, sagittal measure, BDI score) were included in the model.

Hypothesis 2: Psychological Distress

It was hypothesized that individuals diagnosed with BED would evidence greater psychological distress than individuals in the control condition. To test this hypothesis,

one-way ANOVA procedures were conducted. The results are presented in Table 5. The findings support the hypothesis that individuals diagnosed with BED would report greater psychological distress than individuals in the control condition.

Depression. There were significant differences between groups on BDI scores [$F(1, 43) = 28.88, p = .0001, \eta^2 = .40$]. Individuals diagnosed with BED reported being more depressed than individuals in the control group.

State Anxiety. Average state anxiety scores varied significantly across groups [$F(1, 43) = 7.06, p = .011, \eta^2 = .14$]. Individuals diagnosed with BED reported experiencing more current, state anxiety than individuals in the control group.

Trait Anxiety. There were significant differences between groups on trait anxiety scores [$F(1, 43) = 15.58, p = .0001, \eta^2 = .27$]. Individuals diagnosed with BED reported having more general, trait anxiety than individuals in the control group.

Table 5

Means and Standard Deviations for Psychological Distress

	<u>BED Group</u>		<u>Control Group</u>	
	Mean	SD	Mean	SD
BDI total score	20.05 _a	8.62	6.08 _b	8.62
State Anxiety	42.68 _a	10.92	33.92 _b	10.92
Trait Anxiety	48.32 _a	10.60	35.69 _b	10.60

Note. Means in the same row having the same subscript are not significantly different at $p < .05$.

Hypothesis 3: Stressful Life Events

It was hypothesized that individuals diagnosed with BED would experience significantly more stressful events in the previous time span of six months than individuals in the control group. To test this hypothesis, a one-way ANOVA was conducted. However, the mean number of stressful events in the last six months did not vary significantly across groups [$F(1, 43) = .41, p = .52, \eta^2 = .01$]. Accordingly, this hypothesis was not supported by the data (see Table 6).

Table 6

Means and Standard Deviations for Number of Stressful Events

Group	Mean	SD
Binge eating disorder	10.21 _a	4.45
Control	9.35 _a	4.46

Note. Means having the same subscript are not significantly different at $p < .05$.

Hypothesis 4: Stress Perception

It was hypothesized that individuals diagnosed with BED would perceive events as more stressful than individuals in the control group. To test this hypothesis, a one-way ANOVA on perceived stress scores and repeated-measures ANOVA on stress ratings across the experimental task were conducted.

Perceived Stress Scale Total Score. The general perception of stress (PSS) varied significantly across groups [$F(1, 43) = 14.001, p = .001, \eta^2 = .25$]. Individuals diagnosed with BED reported a greater perception of stress than individuals in the control group (see Table 7).

Table 7

Means and Standard Deviations for PSS Total Score

Group	Mean	SD
Binge eating disorder	29.37 _a	6.87
Control	21.62 _b	6.86

Note. Means having the same subscripts are not significantly different at $p < .05$.

Stress after the TSST Procedure. For the hypothesis regarding stress level after the TSST task, individuals in the BED group reported more stress than individuals in the control group, [$F(1, 43) = 5.02, p = .03, \eta^2 = .25$]. Individuals diagnosed with BED reported experiencing greater stress after the stress task than individuals in the control group (see Table 8).

Table 8

Means and Standard Deviations for Stress after the TSST Procedure

Group	Mean	SD
Binge eating disorder	4.37 _a	1.01
Control	3.50 _b	1.45

Note. Means having the same subscripts are not significantly different at $p < .05$.

Stress Ratings Across the Study. There was no significant effect for group [$F(1, 43, ns)$] nor was there a time x group interaction [$F(1, 43) = .60, ns$]. However, stress levels did change significantly across time for all participants [$F(1, 43) = 53.64, p =$

.0001, $\eta^2 = .56$]; see Figure 1. Using paired samples t tests, the mean baseline stress rating was higher than the stress rating post-relaxation and the stress ratings after the TSST task were greater than the 20 min and 40 minute ratings. In addition, the 20 minute rating was higher than the 40 minute rating and the post-relaxation rating. Also, the 40 minute stress rating was greater than the post-relaxation stress rating. Generally, stress levels initially increased after the stress task but then decreased over time. There was a significant quadratic trend [$F(1, 43) = 48.06, p = .0001, \eta^2 = .53$] and a significant cubic trend [$F(1, 43) = 41.15, p < .0001, \eta^2 = .49$].

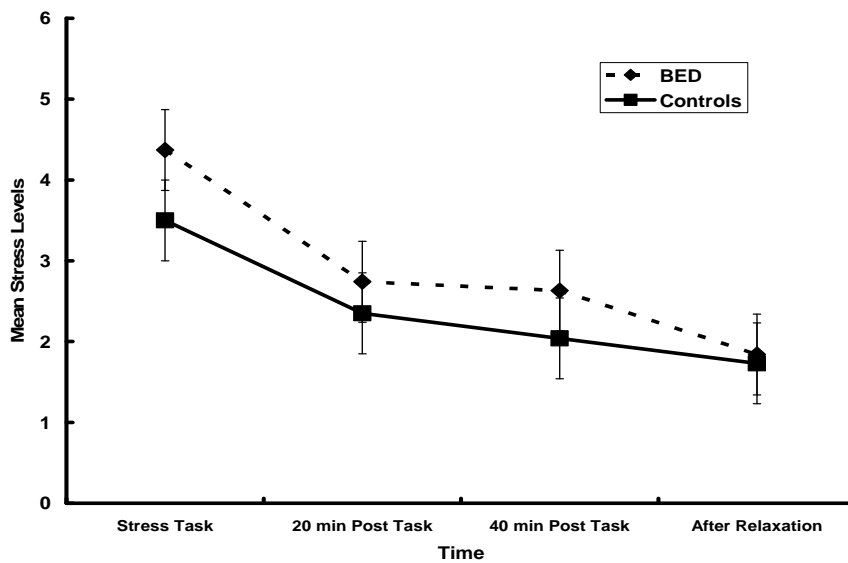


Figure 1. Stress levels across time for the BED and control groups.

Depressed Mood after TSST. Given the a priori hypothesis that individuals in the BED group would report more depressed mood after the TSST task, an ANOVA revealed significant differences between groups [$F(1, 43) = 10.76, p = .002, \eta^2 = .20$]. Individuals diagnosed with BED reported more depressed mood after the stress task than individuals in the control group (see Table 9).

Table 9

Means and Standard Deviations for Depression after the TSST Procedure

Group	Mean	SD
Binge eating disorder	5.26 _a	4.53
Control	.77 _b	4.54

Note. Means having the same subscripts are not significantly different at $p < .05$.

Depressed Mood Across the Study. Results indicated significant main effects for time [$F(4, 43) = 7.05, p < .0001, \eta^2 = .14$], a main effect for group [$F(4, 43) = 10.30, p < .003, \eta^2 = .19$], and a significant time x group interaction [$F(4, 43) = 4.01, p < .004, \eta^2 = .09$]. In a breakdown of the interaction, individuals in the BED group reported more depressed mood at each time point when compared to individuals in the control group. When looking at within group differences across time, individuals in the BED group reported more depressed mood at baseline than at post-relaxation, more depressed mood after the TSST task compared to post-relaxation, and more depressed mood at 20 min post TSST than at baseline. There were no differences across time in depressed mood for individuals in the control group. Results are presented in Figure 2.

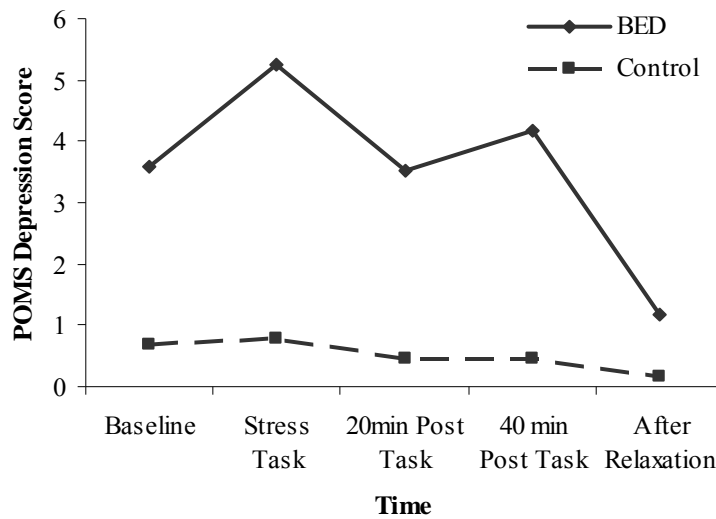


Figure 2. Depressed mood levels across time for the BED and control groups.

Anxious Mood after TSST Procedure. Given the a priori hypothesis that individuals in the BED group would report more anxious mood than controls after the TSST, a one-way ANOVA revealed significant differences across groups [$F(1, 43) = 13.90, p = .001, \eta^2 = .24$]. Individuals diagnosed with BED reported being more anxious after the stress task than individuals in the control group (see Table 10).

Table 10

Means and Standard Deviations for Anxiety after the TSST Procedure

Group	Mean	<u>SD</u>
Binge eating disorder	17.05 _a	6.92
Control	9.27 _b	6.92

Note. Means having the same subscript are not significantly different at $p < .05$.

Anxious Mood Across the Study. There was a significant main effect for time, [$F(4, 43) = 50.38, p < .0001, \eta^2 = .54$], a main effect for group [$F(1, 43) = 19.24, p < .0001, \eta^2 = .31$], and a significant interaction of group x time [$F(4, 43) = 3.57, p < .008, \eta^2 = .08$]. In a breakdown of the interaction, individuals diagnosed with BED reported more anxious mood than individuals in the control group at each time point. When looking at within group differences across time, individuals in the BED group reported more anxious mood after the TSST task than at baseline and at post relaxation, more anxious mood at 20 min post TSST compared to 40 min post TSST, more anxious mood at 40 min post TSST compared to post relaxation, and less anxious mood at baseline compared to post relaxation. Individuals in the control group reported increased anxious mood at 40 min post TSST, and post relaxation. These results are presented in Figure 3.

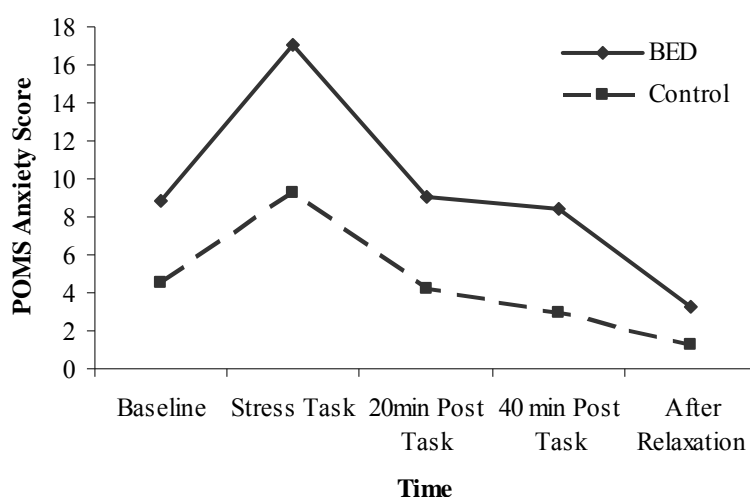


Figure 3. Anxiety levels across time for the BED and control groups.

The findings partially support the hypothesis that individuals diagnosed with BED perceive events as more stressful than individuals in the control group. First, individuals

diagnosed with BED perceived general events as more stressful than individuals in the control group. Second, individuals diagnosed with BED reported more stress, depression, and anxiety immediately after the TSST than individuals in the control condition. Third, anxiety and depression levels across time varied between the two groups. However, stress levels across time did not vary between the two groups. Accordingly, this hypothesis was only partially supported by the data.

Hypothesis 5: Cortisol Levels

It was hypothesized that individuals diagnosed with BED would exhibit significantly greater cortisol levels in reaction to the experimental task than individuals in the control group. To test this hypothesis, one-way ANOVA and repeated-measures ANOVA procedures were conducted.

Cortisol Levels after the TSST Procedure. There were no significant differences between groups on mean cortisol levels after the TSST task [$F(1, 43) = 1.57, p = .217, \eta^2 = .04$].

Table 11

Means and Standard Deviations for Cortisol Levels after the TSST Procedure

Group	Mean	SD
Binge eating disorder	.17 _a	.11
Control	.14 _a	.09

Note. Means having the same subscript are not significantly different at $p < .05$.

Hypothesis 6: Cortisol Recovery Rates

It was hypothesized that individuals diagnosed with BED would display slower cortisol recovery rates after the stress task than individuals in the control group. To test this hypothesis, a repeated measure ANOVA was conducted.

There was a main effect for time [$F(3, 43) = 15.28, p < .0001, \eta^2 = .26$], a nonsignificant main effect for group [$F(1, 43) = 1.36, ns$], and a nonsignificant group x time interaction [$F(3, 43) = .41, ns$]. Comparisons revealed that for all participants cortisol levels at the end of the stress task were higher than levels at post relaxation. Cortisol levels taken after the TSST were greater than those taken at 40 min TSST. Cortisol levels were also higher at 20 minute TSST compared to 40 minute and post relaxation times.

Using paired comparisons, individuals in the BED group had higher cortisol rates immediately after the TSST compared to baseline ($p < .045$), 40 min after the TSST ($p < .023$), and post relaxation ($p < .001$). There were no significant differences between cortisol levels immediately after the TSST compared to 20 min after the TSST.

Individuals in the BED group had greater cortisol levels 20 min after the TSST compared to 40 min after the TSST ($p < .002$) and post relaxation ($p < .002$) and 40 min after the TSST compared to post relaxation ($p < .01$). In addition, there were no significant differences between baseline cortisol levels and post relaxation.

Individuals in the control group had higher cortisol rates immediately after the TSST task compared to 40 min after the TSST ($p < .05$) and post relaxation ($p < .004$). Controls had higher cortisol levels 20 min after the TSST compared to post relaxation ($p < .004$) and 40 min after the TSST compared to post relaxation ($p < .02$). There were no

significant differences between cortisol levels at baseline and immediately after the TSST, between cortisol levels at baseline and 40 min after the TSST, between levels immediately after the TSST compared to 20 min after the TSST, nor between levels 20 min after the TSST and 40 min after the TSST. Results are presented in Figure 4.

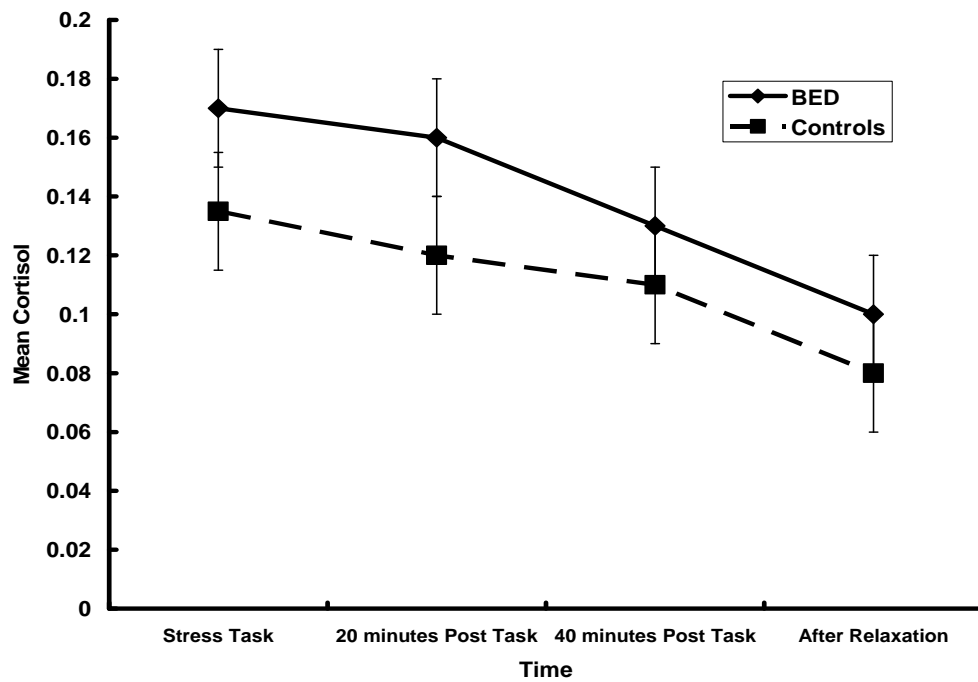


Figure 4. Cortisol levels across time for the BED and control groups.

Hypothesis 7: Urge to Binge

It was hypothesized that individuals diagnosed with BED would report significantly greater urges to binge eat after the stress task than individuals in the control condition. To test this hypothesis, one-way ANOVA and repeated-measures ANOVA procedures were conducted.

Urge to Binge after the TSST Procedure. The findings in Table 12 reveal that mean urge to binge after the TSST induction varied significantly across groups [$F(1, 43)$]

= 24.91, $p = .0001$, $\eta^2 = .37$]. Individuals diagnosed with BED reported a greater urge to binge after the induction than individuals in the control group.

Table 12

Means and Standard Deviations for Urge to Binge after the TSST Procedure

Group	Mean	SD
Binge eating disorder	2.95 _a	1.81
Control	1.12 _b	.43

Note. Means having the same subscript are not significantly different at $p < .05$.

Urge to Binge Across the Study. There was a significant main effect for time [$F(4, 43) = 4.93$, $p < .001$, $\eta^2 = .10$], a main effect for group [$F(1, 43) = 26.17$, $p < .013$, $\eta^2 = .38$], and a significant group x time interaction [$F(4, 43) = 3.27$, $p < .013$, $\eta^2 = .07$]. In a breakdown of the interaction, individuals in the BED group reported greater urges to binge after the stress task, after the 20 minute and 40 minute post stress task and at the post relaxation period. There were no significant differences between the groups at baseline on urge to binge. When looking at within group differences, there were no significant differences across time periods for individuals in the control group. For individuals in the BED group, the urge to binge was greater at 40 minute post TSST than at post relaxation. These results are presented in Figure 5.

Altogether, these findings support the alternative hypothesis that individuals diagnosed with BED would report significant greater urges to binge eat after the stress task than individuals in the control condition.

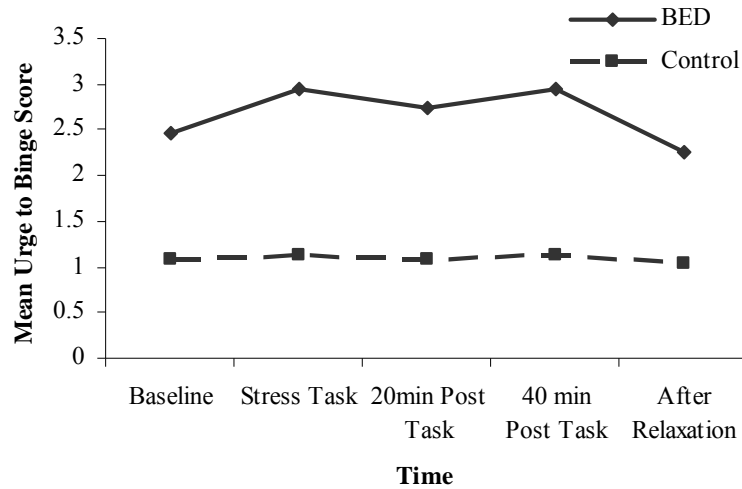


Figure 5. Urge to binge across time for the BED and control groups.

Hypothesis 8: Coping Strategies

It was hypothesized that individuals diagnosed with BED would report using significantly more food-related and emotion-focused coping strategies than individuals in the control condition. One-way ANOVAs were conducted to test this hypothesis.

Food Coping Skills. The average number of food coping strategies typically used varied significantly across groups [$F(1, 43) = 86.67, p = .0001, \eta^2 = .67$]. Individuals diagnosed with BED reported using food coping strategies more often than individuals in the control group (see Table 13).

Table 13

Means and Standard Deviations for Number of Food Coping Strategies Typically Used

Group	Mean	SD
Binge eating disorder	12.21 _a	3.61
Control	5.00 _b	1.39

Note. Means having the same subscript are not significantly different at $p < .05$.

Food Coping Skills Used During Stress Task. There were significant differences between groups in the mean number or reported use of food coping strategies that participants wanted to use during the stress task [$F(1, 43) = 12.63, p = .001, \eta^2 = .23$]. Individuals diagnosed with BED reported wanting to use food coping strategies more often than individuals in the control group (see Table 14).

Table 14

Means and Standard Deviations for Number of Food Coping Strategies Used during Stress Task

Group	Mean	SD
Binge eating disorder	7.00 _a	3.38
Control	4.54 _b	.91

Note. Means having the same subscript are not significantly different at $p < .05$.

Emotion-focused Coping Skills. There were no significant differences in the number of emotion-focused coping strategies typically used [$F(1, 43) = .77, p = .38, \eta^2 = .02$; see Table 15].

Table 15

Means and Standard Deviations for Number of Emotion-focused Coping Strategies Typically Used

Group	Mean	SD
Binge eating disorder	9.32 _a	2.26
Control	8.69 _a	2.41

Note. Means having the same subscript are not significantly different at $p < .05$.

Emotion-focused Coping Skills Used During Stress Task. There were no significant differences between groups regarding the mean number of emotion-focused coping strategies used during the stress task [$F(1, 43) = 2.41, p = .128, \eta^2 = .05$; see Table 16].

Table 16

Means and Standard Deviations for Number of Emotion-focused Coping Strategies Used during Stress Task

Group	Mean	SD
Binge eating disorder	7.37 _a	1.95
Control	6.23 _a	2.72

Note. Means having the same subscript are not significantly different at $p < .05$.

Overall, individuals diagnosed with BED reported using significantly more food-related but not more emotion-focused coping responses than individuals in the control condition.

Summary of Findings

A summary of findings is presented in Table 17. As can be gleaned from the table, five out of the eight hypotheses were either partially or fully supported by the data. Thus, individuals diagnosed with BED varied from individuals in the control condition in terms of eating disordered psychopathology, psychological distress, stress perceptions, urge to binge, and food-focused coping skills.

Three out of the eight hypotheses were not supported by the data. Individuals diagnosed with BED did not vary from individuals in the control condition in terms of the number of stressful life events experienced, cortisol levels, and cortisol rates of recovery.

Table 17

Summary of Findings

Hypothesis	Result
Eating disordered psychopathology (H1)	Fully supported
Psychological distress (H2)	Fully supported
Stressful life events (H3)	Not supported
Perception of events as stressful (H4)	Partially supported
Cortisol levels (H5)	Not supported
Rate in cortisol recovery (H6)	Not supported
Urge to binge (H7)	Fully supported
Coping (H8)	Partially supported

Post hoc Analyses

General Coping Strategies. Using the factor structure specified for the Brief Cope (Carver, 1997), there was one significant difference between groups. Using a one-way ANOVA, there were significant differences between groups on the denial and self-blame factor [$F(1, 43) = 11.58, p < .001, \eta^2 = .21$]. Individuals in the BED group ($M = 7.90, SD = .53$) reported using more denial and self-blame in general than individuals in the control group ($M = 5.54, SD = .45$).

Coping Strategies Used in Reaction to Stress Task. Again, using the factor structure specified for the Brief Cope (Carver, 1997), there were two significant differences between groups in terms of coping in reaction to the stress task. Using a one-way ANOVA, there was a significant difference between groups on the behavioral disengagement factor [$F(1, 43) = 4.08, p < .05, \eta^2 = .09$]. Individuals in the BED group ($M = 3.21, SD = 1.72$) reported using more behavioral disengagement during the stress task than individuals in the control group ($M = 2.42, SD = .86$). There was also a significant difference between groups on the self-blame factor [$F(1, 43) = 17.66, p < .0001, \eta^2 = .29$]. Individuals in the BED group ($M = 4.32, SD = 1.38$) reported engaging in more self-blame during the stress task than individuals in the control group ($M = 2.88, SD = .91$).

Chapter Four

DISCUSSION

The current study is one of the first to investigate the relationship between stress, coping, and binge eating in a clinical sample of individuals diagnosed with Binge Eating Disorder (BED). Previous research looking at this relationship has mostly utilized samples that either consisted of individuals diagnosed with bulimia nervosa (BN), obesity, or individuals that did not meet diagnostic criteria for eating disorders, but instead scored high on measures assessing binge eating. Therefore, there is little research that looks directly at the association between stress, coping, and BED.

Furthermore, the majority of models that were developed to explain the relationship between stress, coping, and maladaptive eating were originally developed for other eating disturbances (e.g., anorexia, BN, obesity) and then later applied to BED. For example, Cattanach and Rodin (1988) developed a model describing binge eating individuals with BN, which proposed that stressors interact with mediators of stress (e.g., appraisal, coping styles, mood state) to precipitate binge eating episodes. Researchers have found support for this model indicating that individuals who engage in binge eating perceive situations as more stressful (Hansel & Wittrock, 1997), engage in significantly higher rates of emotion-focused coping (Bittinger & Smith, 2003), report greater urges to binge eat when stressed (Pendleton et al., 2001), and eat significantly more calories on stressful days (Crowther, Sanftner, Bonifazi, & Shepherd, 2001) when compared to controls (i.e., individuals who do not engage in binge eating episodes). However, since this theory was originally developed to explain BN, it was thought to be limited in its ability to accurately characterize individuals diagnosed with BED as they do not engage

in compensatory behaviors (e.g., vomiting, laxative use) and extreme restrictive eating patterns commonly observed in individuals diagnosed with BN (e.g., Castonguay, Eldredge, & Agras, 1995).

Due to the gap in the literature (e.g., studying individuals with other eating disorders or healthy samples), the current study recruited individuals utilizing a structured interview. The use of a structured interview allows for more accuracy in determining eating disorder status, aids in testing aspects of a specific interactive theory (e.g., Cattanach & Rodin, 1988), and are more appropriate for explaining the development and maintenance of BED. It is possible that this model may prove useful in examining this hypothesis for BED given that it does not specifically focus on dietary restraint and the compensatory behaviors associated with BN. The present study also furthered the literature by exploring the role of cortisol (i.e., a stress hormone) in an effort to better understand the stress-eating relationship. Including this biological measure provided an opportunity to more clearly understand the relationship between physiological and perceptual measures of stress. The following is a discussion of the research findings, study limitations, clinical implications, and future directions.

Hypothesis 1: Eating Disorder Pathology

Research has shown that individuals with BED are more likely to report dietary disinhibition, excessive concerns with weight and shape, and difficulty in distinguishing hunger and satiety cues than obese individuals who do not binge eat (Marcus et al., 1990). Laboratory studies have also indicated that individuals with BED consume more calories at both binge meals and non-binge meals than weight-matched controls without BED (e.g., Goldfein et al., 1993; Yanovski, 1993; Yanovski et al., 1992).

The findings in the current study support the hypothesis and replicate earlier research that individuals diagnosed with BED evidence greater eating disorder pathology compared to individuals in the control condition. Individuals diagnosed with BED reported engaging in more binge eating episodes and were more distressed about their eating, weight, and body shape in contrast to individuals in the control group. Individuals in the BED group also made more self-judgments and expressed greater dissatisfaction about their weight and shape in comparison to controls. The results remained significant after controlling for individual differences in age, BMI, sagittal measure, and Beck Depression Inventory scores (see Appendix R). Consistent with previous research (e.g., Goldfein et al., 1993; Yanovski, 1993; Yanovski et al., 1992) these findings indicate that individuals with BED are over-concerned with their weight and appearance when compared to individuals of similar height and weight who do not engage in binge eating. In addition, these results suggest that binge eating but not obesity per se is associated with more eating disorder pathology.

Hypothesis 2: Psychological Distress

Research has shown that negative affect contributes to binge eating as a predisposing factor (i.e., greater reports of negative affect are significantly related to binge eating episodes prospectively) and a proximal trigger (i.e., negative moods trigger binge eating episodes; Polivy & Herman, 1993). In prospective research using BED samples and controls, individuals diagnosed with BED reported more distress and negative affective experiences prior to binge eating (e.g., Greeno et al., 2000), and increased negative affect has been found to predict the onset of a binge eating episode (Stice et al., 2002)

The current findings support the hypothesis that individuals diagnosed with BED would report greater psychological distress than controls. Individuals diagnosed with BED reported greater depressed mood, state anxiety, and trait anxiety than participants in the control condition. These findings are also consistent with Cattanach and Rodin's (1988) interactive model, which indicates that individual difference variables, such as depression and anxiety, are associated with binge eating. In addition, the current findings are consistent with aspects of the escape from awareness model of bingeing (e.g., Heatherton & Baumeister, 1991) which posits that individuals who binge are escaping from negative affect prior to binges. Consistent with previous research supporting the affect regulation model of bingeing (e.g., Greeno et al., 2000; Polivy & Herman, 1993; Stice et al., 2002), these findings add to a growing body of literature indicating that there is a strong relationship between binge eating episodes and negative emotions in individuals diagnosed with BED.

Hypothesis 3: Stressful Life Events

Researchers have examined the frequency of major life events under the assumption that major stressful life events (e.g., divorce, job loss, death of a loved one) play a role in the development of an eating disorder (e.g., Ball & Lee, 2000; Bennett & Cooper, 1999; Greeno & Wing, 1994). Previous research indicates that individuals diagnosed with bulimia (e.g., Lacey et al., 1986) and individuals with disordered eating patterns (e.g., Ball et al., 1999) report higher frequencies of stressful events compared to individuals who do not endorse maladaptive eating patterns. In addition, research with animals has also indicated that rats in a high stress environment eat more than twice the amount of food than non-stressed rats (e.g., Hagan et al., 2003).

In the current study, individuals diagnosed with BED did not report significantly more stressful life events in the previous time span of six months than controls. This nonsignificant finding could be due to differences in the way stressful life events were assessed in the current study compared to previous research (e.g., Ball et al., 1999; Lacey et al., 1986). For example, Lacey and colleagues (1986) asked patients and their psychiatrists whether or not a specific type of event (e.g., beginning or termination of major relationship, change in occupation or geographical location, or bereavement or separation) preceded the onset of a binge eating episode in bulimia. Ball and colleagues (1999) only looked at the occurrence of any major life event over the lifetime of a community sample of females that scored high on a measure of eating disorder pathology and did not examine the desirability or impact of the events. In addition, no previous research has assessed the occurrence of major life events using the Life Experiences Survey in BED. Thus, researchers have utilized different assessments to determine the relationship between stressful events and binge eating episodes. In addition, some studies have used questionnaires that involve a checklist of stressful life events for an individual to choose from while others have only assessed specific types of life events (e.g., Ball & Lee, 2000; Bennett & Cooper, 1999; Greeno & Wing, 1994; Lacey et al., 1986).

However, in the current study, a more specific measure was used to assess not only the number of major life events that occurred over the past six months, but also assessed the valence (e.g., positive or negative) and impact of the event; thereby focusing on negative events that had a large impact on a participant in her recent past. On the other hand, narrowing the focus to the occurrence of stressful events in the past six months could have contributed to the nonsignificant results in the current study. If the timeframe

had been extended to the previous year, perhaps significant results would have emerged. However, given that no previous research has utilized the LES in individuals diagnosed with BED, it is hard to compare to the current findings.

The interactive model suggests that inconsistent findings in terms of the number of stressful events reported between studies could be due to the fact that stressful events typically measured are not unique experiences for individuals that binge eat (Cattanach & Rodin, 1988). Therefore, some studies may fail to find significant differences in the number of stressful events reported between groups of individuals diagnosed with eating disorders and healthy controls because these are common stressors (e.g., poor relationship, illness of family member, etc.) experienced by most individuals. For this reason, Cattanach and Rodin (1988) point to intervening variables, such as appraisal and coping, to explain why individuals who binge eat react to common stressors by engaging in disordered eating behaviors (e.g., binge, purge).

Hypothesis 4: Stress Perception

In addition to examining the frequency of stressful life events, researchers have focused on how individuals perceive stressful situations (e.g., Ball & Lee, 2000; Greeno & Wing, 1994; Lazarus & Folkman, 1984) and if this perception is associated with or contributes to eating disorder pathology. Previous research indicates high levels of perceived stress are associated with an exacerbation of eating disorder symptomatology (Striegel-Moore et al., 1989) and binge eaters report greater stress in reaction to stressful tasks (e.g., Hansel & Wittrock, 1997). In addition, binge eaters perceive daily hassles to be more stressful than controls but do not report a greater frequency of daily stressors (Crowther et al., 2001). A more recent study examining a broad range of risk factors for

the development of BED and BN in a sample of 1,560 women found that high levels of perceived stress (as measured by the Perceived Stress Scale) was the primary pathway that led to the development of a binge-eating disorder (BED or BN) after the age of 14 (Striegel-Moore, Dohm, Kraemer, Schreiber, Taylor, & Daniels, 2007).

The current findings partially support the hypothesis that individuals diagnosed with BED would perceive events as more stressful than controls. In general, individuals diagnosed with BED, perceived events as more stressful in comparison to controls. Specifically, individuals diagnosed with BED reported more stress, depressed mood, and anxiety immediately after the TSST procedure than individuals in the control condition. These findings are consistent with previous research indicating that subjective psychological stress is an important contributing factor to BED (e.g., Ball & Lee, 2000; Crowther et al., 2001; Greeno & Wing, 1994; Hansel & Wittrock, 1997; Striegel-Moore et al., 1989; Striegel-Moore et al., 2007). These findings also lend support to the interactive model, which hypothesizes that individuals that binge eat may be deficient in accurately appraising a situation. In addition, in affect regulation models of bingeing, eating reduces perceived stress. Further research would be needed to test this hypothesis.

Although depressed and anxious mood varied across time, perceptions of stress levels across time did not vary between the two groups even though the trend was in the expected direction. The majority of studies examining the relationship between disordered eating and perceived stress have employed a cross-sectional design only measuring perceived stress at one time point (e.g., Hansel & Wittrock, 1997; Striegel-Moore et al., 2007). The current study is the first to measure perceived stress across time after a participant was subjected to a stressful task. It is plausible that individuals

diagnosed with BED perceive situations as significantly more stressful immediately after they occur, but their stress levels return to baseline similar to controls, whereas depressed and anxious mood levels take longer to decrease. However, future research is warranted to test this hypothesis.

Hypothesis 5: Cortisol Levels

Given that cortisol secretion represents a major component of the stress response, research has begun to focus on the relationship between cortisol levels and overeating (e.g., Epel et al., 2000; Gluck et al., 2004). Previous research suggests that women with high cortisol levels consume more calories after being subjected to a stressful task than women with low cortisol levels (e.g., Epel et al., 2000). Research has also found that obese women diagnosed with BED have significantly elevated cortisol plasma concentration levels in the morning compared to obese non-binge eating women and normal weight healthy controls (e.g., Gluck et al., 2004). In addition, women diagnosed with BED have been found to exhibit increased cortisol levels after a cold pressor test compared to controls (Gluck et al., 2004; $p = .057$).

In the current study, women diagnosed with BED did not exhibit significantly greater cortisol levels in reaction to the stress task than individuals in the control group, although the data were in the expected direction. The nonsignificant finding could be due to methodological differences between the current study and previous research. For example, Epel and colleagues (2000) used a healthy sample of females with an average age of 36 years (range 30-46 years old) and compared within subject cortisol levels from a stressful and restful day. In contrast, the current study conducted between subject comparisons of the cortisol results from a much younger sample of females aged 18-27

($M = 19.60$ years) diagnosed with BED and healthy controls. Similar to the results of Epel and colleagues, when data was collapsed for all participants in the current study, there was a significant difference from baseline to immediately post-stressor.

Gluck and colleagues (2004) also used different methodology from the present study. Their participants were admitted to the hospital after a 12 hour fast and each participant received a fixed meal administered intravenously. The researchers also used a different stressful task (i.e., cold pressor task) and assessed cortisol differently (i.e., plasma) than the current study [Trier Social Stress Task (TSST), salivary, respectively]. In addition, Gluck and colleagues did not hold menstrual cycle phase constant and recruited a much larger range of participants (i.e., 22-40 years old). Therefore, it is possible that the current nonsignificant results may be due to using strict criteria in an effort to minimize factors that would affect cortisol reactivity (e.g., menstrual cycle, age, gender, etc.) and utilizing a between subject comparison approach. More research is needed to determine if individuals with BED have a greater cortisol response to stressful lab tasks than controls.

Hypothesis 6: Cortisol Recovery Rates

Given that previous research has shown that women diagnosed with maladaptive eating patterns display increased cortisol rates (e.g., Gluck et al., 2004), the present study was interested in going beyond differences at individual times points to examine cortisol recovery rates. Therefore, this study is the first to examine differences in recovery rates across time between eating disordered and non-eating disordered groups (i.e., BED vs. healthy controls). However, the hypothesis that individuals diagnosed with BED would display slower cortisol recovery rates after the experimental task than individuals in the

control group was not supported with between groups analyses. Cortisol rates dropped across time, regardless of group type.

The between group results from the present study add to the existing literature indicating that salivary cortisol levels take about 20 min after stress onset to reach peak levels. For all participants, it took another 40 min after completing the TSST to return to baseline. As previously mentioned, the nonsignificant finding between groups could be due to the fact that the cortisol response after a stress task (i.e., increase after the stressor and then gradual decline back to baseline) may not be specific to individuals with eating disorders, but instead represents a natural physiological response that occurs in all individuals. Future research is warranted to determine the validity of the current studies findings.

Posthoc analyses, however, revealed that there were within group differences across time. Looking at successive changes across time within each group [i.e., baseline to immediately after the TSST (T1), T1 compared to 20 min post TSST (T2), T2 compared to 40 min post TSST (T3), and T3 compared to post relaxation (T4), individuals in the BED group had higher cortisol levels at T1 compared to baseline, T2 to T3, and T3 to T4. There were no significant differences between cortisol levels immediately after the TSST compared to 20 min after the task. Thus, individuals in the BED groups began experiencing higher levels of cortisol consistent with what is typically observed in the TSST literature (i.e., typically 20 min after the onset of a stressful task; Kirschbaum et al., 1993; Kirschbaum 2006). In contrast, there were no significant differences in cortisol level comparisons between baseline, immediately after the task, or 20 min after the TSST for individuals in the control group. Controls only began

experiencing significant decreases in cortisol levels from 40 min after the TSST compared to levels after the relaxation task. Although preliminary in nature, the above results offer intriguing hypotheses to be examined in the future regarding the timing of cortisol measurement for within and between group comparisons.

Hypothesis 7: Urge to Binge

Previous research has shown that individuals diagnosed with BED report increased urges to binge eat and higher levels of global stress without exhibiting significant physiological (e.g., blood pressure and pulse) changes when subjected to stressful events compared to controls (e.g., Cattanach et al., 1988). The current results support the hypothesis that individuals diagnosed with BED would report significant greater urges to binge eat after the stress task than individuals in the control condition. This finding suggests that even though individuals diagnosed with BED were not differentially reactive to the stress task in terms of a biological stress marker (i.e., cortisol), they are more likely to feel the urge to engage in binge eating after being exposed to a stressor compared to controls. This adds to the current literature suggesting that perceived stress leads to an increased desire to binge eat (e.g., Cattanach et al., 1988; Crowther et al., 2001; Gluck et al., 2004; Tuschen-Caffier & Vögele, 1999). These findings are consistent with the interactive model and affect regulation models of bingeing. Future research could expand on this finding by going beyond just assessing the urge to binge eat by actually measuring food consumption after a stress task in individuals diagnosed with BED and controls. Studies have looked at food consumption after a stressful task in healthy controls (e.g., Epel et al., 2000) demonstrating that individuals consume more calories of sweet foods after a stressful task, but to date, no

research has looking at the relationship comparing individuals diagnosed with BED and healthy controls.

Hypothesis 8: Coping Strategies

Several studies have found that women diagnosed with eating disorders report using more emotion-focused and avoidant-focused coping strategies compared to controls (e.g., Bittinger & Smith, 2003; Troop et al., 1994; Troop et al., 1998). After a stressful task (Hansel & Wittrock, 1997), individuals who engage in binge eating report using more catastrophizing coping than controls. In addition, individuals with disordered eating behaviors, as measured by an eating disorder questionnaire (i.e., Eating Attitudes Test), report that they use emotion-focused coping more often than controls (Bittinger & Smith, 2003). In the coping literature, rigid use of these types of coping strategies is considered to be maladaptive and may lead to the development or maintenance of psychopathology (e.g., Ball & Lee, 2000; Bennett & Cooper, 1999; Bittinger & Smith, 2003; Cattanach & Rodin, 1988; Thompson & Cook, 2001; Troop et al., 1994; Wolff et al., 2000).

The current findings partially support the hypothesis that individuals diagnosed with BED would report using significantly more food-related and emotion-focused coping responses than individuals in the control condition. Individuals diagnosed with BED reported using significantly more food-related but not more emotion-focused coping strategies than individuals in the control condition. The current study is the first to specifically compare the use of food-related coping strategies between individuals diagnosed with BED and healthy controls. Conceptually and diagnostically, it would be predicted that individuals diagnosed with BED would use food as a coping mechanism more often than controls given that DSM diagnostic criteria include maladaptive eating

strategies (e.g., binge eating) as a necessary component for diagnosis. The current finding furthers the literature by demonstrating that disordered eating behaviors may serve as a form of stress release in individuals diagnosed with BED who may lack more effective coping strategies to handle stressful situations (e.g., Hawkins & Clement, 1984; Heatherton & Baumeister, 1991; Tuschen-Caffier & Vögele, 1999). Food-related coping needs to be examined in future studies and could be coupled with research that also looks at actual food consumption after a stressful task.

Surprisingly, the current study failed to find significant differences between groups in terms of emotion-focused coping strategy use, given that previous research studies have found an increased use of emotion-focused coping strategies in eating disordered populations (e.g., Bittinger & Smith, 2003; Troop et al., 1994; Troop et al., 1998). Several types of coping styles (e.g., problem-focused, emotion-focused, avoidant, social support, religion, etc.) have been proposed and there is no single measure that assesses all possible types of coping. Therefore, it is possible that the current finding could be an artifact of the assessment instrument used (i.e., Brief Cope). Previous research has found that coping responses are significantly shaped by the instrument used to assess coping (Bittinger & Smith, 2003). In addition, the majority of studies that have assessed coping in eating disordered populations have either focused on individuals diagnosed with BN or anorexia, or individuals that score high on an eating disorder measure (Ball & Lee, 2000).

Posthoc analyses revealed that individuals in the BED group also reported using more denial, self-blame, and behavioral disengagement during the stress task than individuals in the control group. These results are consistent with research that indicates

that avoidant coping strategies tend to be prevalent in eating disorder populations (e.g., Troop et al., 1994; Troop et al., 1998) and with the interactive model of bingeing. The current findings also extend the literature by using the Brief Cope to assess coping strategies beyond the typical categories used in eating disorder literature (e.g., problem-focused, emotion-focused, and avoidance), and also by focusing on general coping strategies, coping strategies used in a recent situation, and coping strategies used in reaction to the stressful task used in this study.

Study Limitations

Given the large number of variables examined in the current study, one of the major limitations is the small sample size and multiple comparisons that increase the probability of making Type II errors. Only 19 individuals diagnosed with BED were recruited, despite recruiting that took place over 18 months. A major contributor to the small sample size relates to the strict diagnostic criteria for BED specified in the DSM. The DSM-IV-TR states that an individual can be diagnosed with BED if they engage in binge eating episodes that occur at least 2 days a week for six months. Approximately 37 potential participants for the present study met all diagnostic criteria for BED with the exception of the time requirement and were therefore excluded. For example, one participant engaged in binge eating episodes only once a week, and another participant engaged in binge eating episodes several times a week, but not for a continuous six month period.

The difficulties with the diagnostic criteria for BED and issues with recruitment appear to plague the current literature. For example, a recent study found that 50% of BED participants met all the DSM criteria except for the binge eating frequency

requirement (Friederich et al., 2006). Therefore, future studies should assess whether the time frame of 2 days a week for six months is a criterion necessary for diagnosis. Using less strict diagnostic criteria may possibly be more representative of individuals who are distressed by their binge eating. It may be more informative to have larger samples of individuals who binge eat (e.g., but do not meet diagnostic criteria for bulimia or BED) with possible subgroups of individuals who conform to specific aspects of the diagnostic criteria. Interestingly there was also one potential participant that did not qualify because she did not find the binge eating episodes stressful despite meeting all diagnostic criteria. This particular woman was thin and appeared proud of the amount of food she was able to consume; however, more data would need to be collected to substantiate including such individuals in BED research.

Exclusionary criteria utilized in the present study to minimize the impact of individual differences on cortisol rates may have also contributed to the small sample size. Menstrual cycle phase, gender, age, alcohol and tobacco use, exercise, and certain medications (e.g., prednisone, dexamethasone) have consistently been found to impact cortisol results (e.g., Kirschbaum et al., 1999; Kirschbaum & Hellhammer, 1989). Therefore, recruitment efforts were targeted toward only females within a limited age range that were in the same phase of their menstrual cycle. In addition, women were not allowed to exercise, drink alcohol or smoke cigarettes prior to having cortisol levels assessed. Placing multiple limitations on a sample of women between the ages of 18-27 led to the exclusion of about 65 potential participants. It is fairly common for women in this age range to drink alcohol, smoke cigarettes, and exercise on a regular basis. Some of the potential women were also excluded because they did not have regular menstrual

cycles, something that could have been related to exercise, their health in general, or to the use of particular birth control methods.

A related limitation of the current study is the ability to generalize to other populations given that the present sample only included women between the ages of 18-27 with the above mentioned limitations (e.g., age, gender, birth control and medication status, smoking status, alcohol intake, exercise frequency, etc.). Given that it took over 18 months to find 19 individuals diagnosed with BED, it is possible that this small sample of participants is not reflective of typical individuals diagnosed with BED. Therefore, the results should be generalized with caution as they may not be representative of most individuals diagnosed with BED.

Another limitation concerns the significant difference in BMI between individuals in the BED and control groups. Although there were no significant differences between groups in terms of weight, height, and sagittal diameter measurements, individuals in the BED group had greater BMI. Previous research (e.g., Marcus, 1993) has questioned whether differences in responses to stress, eating disorder pathology and mood disturbances are due to obesity or binge eating given that clinical, community, and population-based studies have found that BED is significantly associated with being overweight and being obese (Bruce & Agras, 1992; Spitzer et al., 1992, 1993). However, when BMI was utilized as a covariate, it did not change the results (see Appendix R).

A similar methodological limitation concerns the significant age difference found between groups. Although the finding was statistically significant, it may not be clinically meaningful given that the mean ages for the BED group and control group were 20.79 and 18.73 respectively. In addition, age did not change the results when included as a

covariate (see Appendix R). Similarly, there were significant differences in depression and anxiety scores between the groups; however, results did not change when depression and anxiety scores were used as covariates (see Appendix R) and such differences are expected when using a clinical sample.

Clinical Implications and Future Directions

Results from the present study support growing evidence which demonstrates that stress can negatively impact binge eating. However, given the paucity of research examining these variables in clinical samples of individuals diagnosed with BED, additional research is warranted. Therefore, future studies should continue to recruit clinical samples utilizing clinical interviews. Research is also needed to further explore the relationship between cortisol and binge eating in individuals diagnosed with BED. Interestingly, individuals diagnosed with BED perceived the stress task (and situations in general) as more stressful than individuals in the control group despite the fact that there were no significant differences between cortisol levels. Individuals diagnosed with BED had a different experience even though there were no differences in cortisol. Therefore, it is important for future studies to focus on the relationship between cortisol and perceived stress. Given that many studies, including the current study, have found a relationship between binge eating and negative emotions (e.g., anxiety, depression) future research should extend these findings by focusing on other negative emotions, such as shame as another possible avenue to better understand BED processes.

Although there were interesting results when looking at within group changes in cortisol, the current findings have to be viewed cautiously. Future research utilizing larger samples and an actual consumption of food component after the stress task may be

able to address several limitations of the current study. In addition, there are other biological markers of stress (e.g., DHEA, ACTH, etc) that may be more pertinent to BED and could be examined in addition to cortisol.

Although aspects of the interactive model of binge eating (Cattanach & Rodin, 1988) were supported in the current study (e.g., greater negative affect and perceived stress, increased desire to binge eat after stress, and the use of maladaptive coping styles by individuals diagnosed with BED), the methodology of the study did not permit a thorough test of the model. For example, level of control and social support were not assessed in the current study. Similarly, in a test of the interactive model (Cattanach et al., 1988), only urge to binge eat was assessed after individuals went through stressful tasks. It remains to be seen if the interactive model can account for actual binges in individuals with BED. In addition, certain aspects of the escape from awareness model (Heatherton & Baumeister, 1991) and affect regulation models of bingeing (e.g., Kenardy et al., 1996) were supported in the current study. Incomplete tests of the models and commonalities between them make it difficult to provide definitive support for any one model of BED. In addition, the models were all proposed for bingeing associated with BN, not BED. Further research is needed to specify which components of the models apply to BED.

Future research should also focus on perceived stress given that the current study found no significant difference in the quantity of stressful events reported by groups. Taking into account perceived stress is also important when administering treatments for individuals diagnosed with BED. Given the current results, it may be more effective to focus on helping an individual perceive situations differently as opposed to (or in

addition to) just reducing the number of stressors in their lives. Therefore, treatment such as Cognitive-Behavioral Therapy (CBT) and Acceptance and Commitment Therapy (ACT) may be particularly helpful with this population. If an individual diagnosed with BED perceives situations as more stressful, then targeting only a reduction in quantity of stressful events, without addressing the client's beliefs about the stressors will not likely result in significant improvements. Instead, engaging in the meaning attributed to the stressor through cognitive restructuring or cognitive defusion may be an important aspect of treatment.

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APPENDICES

APPENDIX A

Questionnaire on Eating Patterns

1. During the past **six** months, did you often eat within any two-hour period what most people would regard as an unusually large amount of food?

1 YES 2 NO

2. When you ate this way, did you often feel you couldn't stop eating or control what or how much you were eating?

1 YES 2 NO 3 NOT APPLICABLE

3. During the past **six** months, *on average*, how often did you have times when you ate this way- that is, large amounts of food with the feeling that your eating was out of control?

0 Never; I don't have times when I eat this way	3 Two or three days a week
1 Less than 1 day a week	4 Four or five days a week
2 One day a week	5 Nearly every day

4. Did you usually have any of the following experiences during these occasions?

a) Eating much more rapidly than usual	YES	NO
b) Eating until you felt uncomfortably full	YES	NO
c) Eating large amounts of food when you didn't feel hungry	YES	NO
d) Eating large amounts of food throughout the day with no planned mealtimes	YES	NO
e) Eating alone because you were embarrassed by how much you were eating	YES	NO
f) Feeling disgusted with yourself, depressed, or feeling very guilty after overeating	YES	NO

5. In general, during the past **six** months, how upset were you by overeating (eating more than you think is best for you)?

1 Not at all	4 Greatly
2 Slightly	5 Extremely
3 Moderately	

6. In general, during the past **six** months, how upset were you by the feeling that you couldn't stop eating or control what or how much you were eating?

1 Not at all 4 Greatly
2 Slightly 5 Extremely
3 Moderately

7. During the past **three** months, did you ever make yourself vomit in order to avoid gaining weight after binge eating?

1 YES 2 NO

IF YES: How often- on average- was that?

1 Less than once a week 4 Four or five times a week
2 Once a week 5 More than five times a week
3 Two or three times a week

8. During the past **three** months, did you ever take more than twice the recommended dose of laxatives in order to avoid gaining weight after binge eating?

1 YES 2 NO

IF YES: How often- on average- was that?

1 Less than once a week 4 Four or five times a week
2 Once a week 5 More than five times a week
3 Two or three times a week

9. Have you ever been diagnosed, treated for, or felt you were struggling with, an eating disorder?

1 YES 2 NO

IF YES: please describe

10. Height: _____ Weight: _____

11. Females only: Do you take any types of birth control (e.g., pill, patch, injections, implants, IUDs)? 1 YES 2 NO If so, which type? _____

12. Females only: Are you currently menopausal or have you completed menopause?
1 YES 2 NO

APPENDIX B

Community Flier

VOLUNTEERS NEEDED!!

Looking for female volunteers between 18-28 years old to participate in a study about stress and overeating being conducted by a PhD candidate at the UMaine. If you experience any of the following symptoms, you may qualify:

Do you experience frequent episodes of OVEREATING?

Do you....

- Often eat a LARGE AMOUNT of food in a relatively short period of time?
- Feel like your eating at these times is OUT OF CONTROL?

During these times of OVEREATING, have you...

- Eaten more rapidly than normal?
- Eaten large amounts of food even though you weren't really hungry?
- Eaten until you were uncomfortably full?
- Eaten alone because you were embarrassed?
- Felt guilty or disgusted after eating because of how much you ate?

If you often experience overeating episodes like those described above, AND you DO NOT engage in self-induced vomiting, excessive exercise, fasting, or other extreme ways of getting rid of the food you ate, you may qualify to participate. All information will be kept confidential.

Participants have a 1 in 10 chance to win \$100

Every individual that struggles with binge eating also has a chance to receive free treatment (if interested)!

For more information, Please contact Stephanie at Stephanie.Lamattina@umit.maine.edu

APPENDIX C

EATING QUESTIONNAIRE

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all of the questions. Thank you.

Questions 1 to 12: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

		No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	E v e r y d a y
1	Have you been deliberately <u>trying</u> to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2	Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3	Have you <u>tried</u> to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4	Have you <u>tried</u> to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5	Have you had a definite desire to have an <u>empty</u> stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6
6	Have you had a definite desire to have a <u>totally flat</u> stomach?	0	1	2	3	4	5	6
7	Has thinking about <u>food, eating, or calories</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
8	Has thinking about <u>shape or weight</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
9	Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10	Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6

1	Have you felt fat?	0	1	2	3	4	5	6
1	Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

Questions 13-18: Please fill in the appropriate number in the space to the right. Remember that the questions only refer to the past four weeks (28 days).

Over the past four weeks (28 days)...

13	Over the past 28 days, how many <u>times</u> have you eaten what other people would regard as an <u>unusually large amount of food</u> (given the circumstances)?	...
14On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?	...
15	Over the past 28 days, on how many <u>DAYS</u> have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food <u>and</u> have had a sense of loss of control at the time)?	...
16	Over the past 28 days, how many <u>times</u> have you made yourself sick (vomit) as a means of controlling your shape or weight?	...
17	Over the past 28 days, how many <u>times</u> have you taken laxatives as a means of controlling your shape or weight?	...
18	Over the past 28 days, how many <u>times</u> have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape, or amount of fat, or to burn off calories?	...

Questions 19 to 21: Please circle the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

19	Over the past 28 days, on how many days have you eaten in secret (i.e., furtively)? ...Do not count episodes of binge eating?	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
		0	1	2	3	4	5	6
20	On what proportion of the times that you have eaten have you felt guilty (felt that you've some wrong) because of its effect on your shape or weight? ...Do not count episodes of binge eating?	None of the times	A few of the times	Less than half	Half of the times	More than half	Most of the time	Every time
		0	1	2	3	4	5	6
21	Over the past 28 days, how concerned have you been about other people seeing you eat? ...Do not count episodes of binge eating?	Not at all		Slightly		Moderately		Markedly
		0	1	2	3	4	5	6

Questions 22 to 28: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days).

On how many of the past 28 days...		Not at all		Slightly		Moderately		Markedly
22	Has your <u>weight</u> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
23	Has your <u>shape</u> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
24	How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?	0	1	2	3	4	5	6
25	How dissatisfied have you been with your <u>weight</u> ?	0	1	2	3	4	5	6
26	How dissatisfied have you been with your <u>shape</u> ?	0	1	2	3	4	5	6
27	How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?	0	1	2	3	4	5	6
28	How uncomfortable have you felt about <u>others</u> seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?	0	1	2	3	4	5	6

What is your weight at present? (Please give your best estimate).

.....

What is your height? (Please give your best estimate).

.....

If female: Over the past three-to-four months have you missed any menstrual periods?

.....

If so, how many?
Have you been taking the
"pill"?

.....

.....

THANK YOU

APPENDIX D

POMS Scale

Directions: Below is a list of words that describe feelings that people have. Please read each one carefully. Then select the number that best describes HOW YOU FEEL RIGHT NOW. Place that number on the small line to the left of each word. Do not skip any items, and print your numbers clearly.

0 = Not at all
 1 = A little
 2 = Moderately
 3 = Quite a bit
 4 = Extremely

- | | |
|--------------------------------|-----------------------|
| _____ 1. Tense | _____ 13. Restless |
| _____ 2. Unhappy | _____ 14. Discouraged |
| _____ 3. Sorry for things done | _____ 15. Nervous |
| _____ 4. Shaky | _____ 16. Lonely |
| _____ 5. Sad | _____ 17. Miserable |
| _____ 6. On edge | _____ 18. Anxious |
| _____ 7. Blue | _____ 19. Gloomy |
| _____ 8. Panicky | _____ 20. Desperate |
| _____ 9. Hopeless | _____ 21. Helpless |
| _____ 10. Relaxed | _____ 22. Worthless |
| _____ 11. Unworthy | _____ 23. Terrified |
| _____ 12. Uneasy | _____ 24. Guilty |

APPENDIX E

BDI-II

Date: _____
 Marital Status: _____ Age: _____ Sex: _____ Race: _____
 Occupation: _____ Education: _____

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

2. Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

3. Past Failure

- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

4. Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings

- 0 I don't feel particularly guilty.
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6. Punishment Feelings

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7. Self-Dislike

- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

8. Self-Criticalness

- 0 I don't criticize or blame myself more than usual.
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all of my faults.
- 3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes

- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10. Crying

- 0 I don't cry anymore than I used to.
- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

11. Agitation

- 0 I am no more restless or would up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

- 0 I have not lost interest in other people or activities.
- 1 I am less interested in other people or things than before.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

13. Indecisiveness

- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have much greater difficulty in making decisions than I used to.
- 3 I have trouble making any decisions.

14. Worthlessness

- 0 I do not feel I am worthless.
- 1 I don't consider myself as worthwhile and useful as I used to.
- 2 I feel more worthless as compared to other people.
- 3 I feel utterly worthless.

15. Loss of Energy

- 0 I have as much energy as ever.
- 1 I have less energy than I used to have.
- 2 I don't have enough energy to do very much.
- 3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern

- 0 I have not experienced any change in my sleeping pattern.
- 1a I sleep somewhat more than usual.
- 1b I sleep somewhat less than usual.
- 2a I sleep a lot more than usual.
- 2b I sleep a lot less than usual
- 3a I sleep most of the day.
- 3b I wake up 1-2 hours early and can't get back to sleep.

17. Irritability

- 0 I am no more irritable than usual.
- 1 I am more irritable than usual.
- 2 I am much more irritable than usual.
- 3 I am irritable all the time.

18. Changes in Appetite

- 0 I have not experienced any change in my appetite.
- 1a My appetite is somewhat less than usual.
- 1b My appetite is somewhat greater than usual.
- 2a My appetite is much less than before.
- 2b My appetite is much greater than usual.
- 3a I have no appetite at all.
- 3b I crave food all the time.

19. Concentration Difficulty

- 0 I can concentrate as well as ever.
- 1 I can't concentrate as well as usual.
- 2 It's hard to keep my mind on anything for very long.
- 3 I find I can't concentrate on anything.

20. Tiredness or Fatigue

- 0 I am no more tired or fatigued than usual.
- 1 I get more tired or fatigued more easily than usual.
- 2 I am too tired or fatigued to do a lot of the things I used to do.
- 3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex

- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I am much less interested in sex now.
- 3 I have lost interest in sex completely.

APPENDIX F

STAI - (State)

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then using the scale below, place the number that indicates how you feel right now, that is, at this moment, in the blank before the number. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1	2	3	4
Not at all	Somewhat	Moderately so	Very much so

- _____ 1. I feel calm
- _____ 2. I feel secure
- _____ 3. I am tense
- _____ 4. I feel strained
- _____ 5. I feel at ease
- _____ 6. I feel upset
- _____ 7. I am presently worrying over possible misfortunes
- _____ 8. I feel satisfied
- _____ 9. I feel frightened
- _____ 10. I feel comfortable
- _____ 11. I feel self-confident
- _____ 12. I feel nervous
- _____ 13. I am jittery
- _____ 14. I feel indecisive
- _____ 15. I am relaxed
- _____ 16. I feel content
- _____ 17. I am worried
- _____ 18. I feel confused
- _____ 19. I feel steady
- _____ 20. I feel pleasant

STAI - (Trait)

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then using the scale below, place the number that indicates how you generally feel in the blank before the number. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

1
Almost never

2
Sometimes

3
Often

4
Almost Always

- _____ 21. I feel pleasant
- _____ 22. I feel nervous and restless
- _____ 23. I feel satisfied with myself
- _____ 24. I wish I could be as happy as others seem to be
- _____ 25. I feel like a failure
- _____ 26. I feel rested
- _____ 27. I am "calm, cool, and collected"
- _____ 28. I feel that difficulties are piling up so that I cannot overcome them
- _____ 29. I worry too much over something that really doesn't matter
- _____ 30. I am happy
- _____ 31. I have disturbing thoughts
- _____ 32. I lack self-confidence
- _____ 33. I feel secure
- _____ 34. I make decisions easily
- _____ 35. I feel inadequate
- _____ 36. I am content
- _____ 37. Some unimportant thought runs through my mind and bothers me
- _____ 38. I take disappointments so keenly that I can't put them out of my mind
- _____ 39. I am a steady person
- _____ 40. I get in a state of tension or turmoil as I think over my recent concerns and interests

APPENDIX G

Brief COPE: Recent Stressor

INSTRUCTIONS: Please describe a recent stressful event in the lines below. Then, read each statement below and use the rating scale to indicate the extent to which you used or did not use each strategy to cope with the recent stressor.

Describe recent stressor:

Please rate the extent that you used each of the following strategies when coping with the above mentioned stressor:

- 1 = I didn't do this at all**
2 = I did this a little bit
3 = I did this a medium amount
4 = I did this a lot

1. ____ I turned to work or other activities to take my mind off the stressful event.
2. ____ I concentrated my efforts on doing something about the situation I was in.
3. ____ I used food to help me cope.
4. ____ I said to myself "this isn't real."
5. ____ I used alcohol or other drugs to make myself feel better.
6. ____ I got emotional support from others.
7. ____ I gave up trying to deal with it.
8. ____ I overate when I felt stressed.
9. ____ I took action to try to make the situation better.
10. ____ I refused to believe that it happened.
11. ____ I said things to let my unpleasant feelings escape.
12. ____ I got help and advice from other people.

13. ____ I used alcohol or other drugs to help me get through it.
14. ____ I tried to see it in a different light, to make it seem more positive.
15. ____ I criticized myself.
16. ____ I tried to come up with a strategy about what to do.
17. ____ I used food to make myself feel better.
18. ____ I got comfort and understanding from someone.
19. ____ I gave up the attempt to cope.
20. ____ I looked for something good in what is happening.
21. ____ I tried making jokes about it.
22. ____ I did something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
23. ____ I accepted the reality of the fact that it happened.
24. ____ I expressed my negative feelings.
25. ____ I tried to find comfort in my religion or spiritual beliefs.
26. ____ I tried to get advice or help from other people about what to do.
27. ____ I learned to live with it.
28. ____ I thought hard about what steps to take.
29. ____ I engaged in binge eating episodes.
30. ____ I blamed myself for things that happened.
31. ____ I prayed or meditated.
32. ____ I made fun of the situation.

APPENDIX H

Brief COPE: Experimental Stressor

INSTRUCTIONS: Please read each statement below and use the rating scale to indicate the extent to which you used or plan to use each strategy to cope with the experimental stressor you just encountered.

1 = I didn't do this at all
2 = I did this a little bit
3 = I did this a medium amount
4 = I did this a lot

1. ___ I turned to work or other activities to take my mind off the stressful event.
2. ___ I concentrated my efforts on doing something about the situation I was in.
3. ___ I used food to help me cope.
4. ___ I said to myself "this isn't real."
5. ___ I used alcohol or other drugs to make myself feel better.
6. ___ I got emotional support from others.
7. ___ I gave up trying to deal with it.
8. ___ I overate when I felt stressed.
9. ___ I took action to try to make the situation better.
10. ___ I refused to believe that it happened.
11. ___ I said things to let my unpleasant feelings escape.
12. ___ I got help and advice from other people.
13. ___ I used alcohol or other drugs to help me get through it.
14. ___ I tried to see it in a different light, to make it seem more positive.
15. ___ I criticized myself.
16. ___ I tried to come up with a strategy about what to do.
17. ___ I used food to make myself feel better.
18. ___ I got comfort and understanding from someone.
19. ___ I gave up the attempt to cope.
20. ___ I looked for something good in what is happening.
21. ___ I tried making jokes about it.

- 22. ____ I did something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
- 23. ____ I accepted the reality of the fact that it happened.
- 24. ____ I expressed my negative feelings.
- 25. ____ I tried to find comfort in my religion or spiritual beliefs.
- 26. ____ I tried to get advice or help from other people about what to do.
- 27. ____ I learned to live with it.
- 28. ____ I thought hard about what steps to take.
- 29. ____ I engaged in binge eating episodes.
- 30. ____ I blamed myself for things that happened.
- 31. ____ I prayed or meditated.
- 32. ____ I made fun of the situation.

APPENDIX I

General Brief COPE

INSTRUCTIONS: Please read each statement below and use the rating scale to indicate the extent to which you use or do not use each strategy to cope with stressors.

1 = I haven't been doing this at all

2 = I've been doing this a little bit

3 = I've been doing this a medium amount

4 = I've been doing this a lot

1. ____ I've been turning to work or other activities to take my mind off things.
2. ____ I've been concentrating my efforts on doing something about the situation I'm in.
3. ____ I've used food to help me cope.
4. ____ I've been saying to myself "this isn't real."
5. ____ I've been using alcohol or other drugs to make myself feel better.
6. ____ I've been getting emotional support from others.
7. ____ I've been giving up trying to deal with it.
8. ____ I've overeaten during times when I've felt stressed.
9. ____ I've been taking action to try to make the situation better.
10. ____ I've been refusing to believe that it has happened.
11. ____ I've been saying things to let my unpleasant feelings escape.
12. ____ I've been getting help and advice from other people.
13. ____ I've been using alcohol or other drugs to help me get through it.
14. ____ I've been trying to see it in a different light, to make it seem more positive.
15. ____ I've been criticizing myself.
16. ____ I've been trying to come up with a strategy about what to do.
17. ____ I've used food to make myself feel better.
18. ____ I've been getting comfort and understanding from someone.
19. ____ I've been giving up the attempt to cope.
20. ____ I've been looking for something good in what is happening.
21. ____ I've been making jokes about it.

- 22. ____ I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
- 23. ____ I've been accepting the reality of the fact that it has happened.
- 24. ____ I've been expressing my negative feelings.
- 25. ____ I've been trying to find comfort in my religion or spiritual beliefs.
- 26. ____ I've been trying to get advice or help from other people about what to do.
- 27. ____ I've been learning to live with it.
- 28. ____ I've been thinking hard about what steps to take.
- 29. ____ I've engaged in binge eating episodes when I feel stressed.
- 30. ____ I've been blaming myself for things that happened.
- 31. ____ I've been praying or meditating.
- 32. ____ I've been making fun of the situation.

APPENDIX J**Urge to Binge Rating Scale**

Directions: Please use the following scale to indicate the degree to which you presently feel a desire to overeat (or “binge eat”). Circle any number between 1 and 7.

1	2	3	4	5	6	7
no desire to binge eat						extreme desire to binge eat

Stress Rating Scale

Directions: Please use the following scale to indicate the degree to which you presently feel stressed. Circle any number between 1 and 7.

1	2	3	4	5	6	7
no stress at all						extremely stressed

APPENDIX K

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. *For each question, choose from the following alternatives:*

0-----1-----2-----3-----4
 Never Almost Never Sometimes Fairly Often Very Often

- ____ 1. In the very last month, how often have you been upset because of something that happened unexpectedly?
- ____ 2. In the last month, how often have you felt that you were unable to control the important things in your life?
- ____ 3. In the last month, how often have you felt nervous and "stressed"?
- ____ 4. In the last month, how often have you dealt successfully with irritating life hassles?
- ____ 5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
- ____ 6. In the last month, how often have you felt confident about your ability to handle your personal problems?
- ____ 7. In the last moth, how often have you felt that things were going your way?
- ____ 8. In the last month, how often have you found that you could not cope with all the things that you had to do?
- ____ 9. In the last month, how often have you been able to control irritations in your life?
- ____ 10. In the last month, how often have you felt that you were on top of things?
- ____ 11. In the last month, how often have you been angered because of things that happened that were outside of your control?

- _____ 12. In the last month, how often have you found yourself thinking about things that you have to accomplish?
- _____ 13. In the last month, how often have you been able to control the way you spend your time?
- _____ 14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

APPENDIX L

Life Experiences Survey

Listed below are a number of events which sometimes bring about change in the lives of those who experience them and which necessitate social readjustment. For **events that have happened to you in the past year**, please indicate the extent to which you viewed the event as having either a positive or negative impact on your life (by **putting a number from -3 to +3 in the blank space**). That is, indicate the type and extent of impact that the event had. A rating of -3 would indicate an extremely negative impact. A rating of 0 suggests no impact either positive or negative. A rating of +3 would indicate an extremely positive impact. Then put a checkmark (✓) to indicate when in the past year the event occurred (either 0 to 6 months or 7 months to 1 year ago).

-3	-2	-1	0	+1	+2	+3
Extremely negative	Moderately negative	Somewhat negative	no impact	slightly positive	moderately positive	extremely positive

Impact Event

1. ____ Marriage
2. ____ Detention in jail or
Comparable institution
3. ____ Death of Spouse
4. ____ Major change in
sleeping habits (much
more or much less
sleep)
5. ____ Death of close family
a. mother
b. father
c. brother
d. sister
e. grandmother
f. grandfather
g. other (specify)
6. ____ Major change in eating
Habits (much more or
less food intake)
7. ____ Foreclosure on
Mortgage or loan
8. ____ Death of close friend
9. ____ Outstanding personal
achievement
10. ____ Minor law violations
(traffic tickets,
disturbing the peace,
etc.)

Impact

Event

13. ____ Changed work
situation (different work
responsibility, major change
in working conditions,
working hours, etc)
14. ____ New Job
15. ____ Serious illness or injury
of close family member:
a. father
b. mother
c. sister
d. brother
e. grandfather
f. grandmother
g. spouse
h. other (specify)
16. ____ Sexual difficulties
17. ____ Trouble with employer
(in danger of losing job,
being suspended, demoted, etc.)
18. ____ Trouble with in-laws
19. ____ Major change in
financial status (a lot better
or a lot worse off)
20. ____ Major change in closeness
of family members
(increased or decreased)
21. ____ Gaining a new family member

-3	-2	-1	0	+1	+2	+3
Extremely	Moderately	Somewhat	no	slightly	moderately	extremely
negative	negative	negative	impact	positive	positive	positive

Impact Event**Impact****Event**

- | | |
|---|---|
| 11. ____ Male: Wife/girlfriend's pregnancy
12. ____ Female: Pregnancy
23. ____ Marital separation from mate (due to conflict)
24. ____ Major change in church activities (increased or decreased attendance)
25. ____ Marital reconciliation with mate
26. ____ Major change in number of arguments with spouse (a lot more or a lot less arguments)
27. ____ Married male: Change in wife's work outside the home (beginning work, ceasing work, change to a new job, etc.)
28. ____ Married female: Change in husband's work, (loss of job, beginning a new job, retirement, etc.)
29. ____ Major change in usual type and/or amount of recreation
30. ____ Borrowing more than \$10,000 (buying car, TV, getting school loan, etc)
31. ____ Borrowing less than \$10,000 (buying car, TV, getting school loan, etc)
32. ____ Being fired from a job
33. ____ Male: Wife/girlfriend having an abortion
34. ____ Female: having an abortion
35. ____ Major personal illness or injury
36. ____ Major change in social activities, e.g. parties, movies, visiting (increased or decreased)
37. ____ Major change in living conditions of family (building new home, remodeling deterioration of home, neighborhood, etc.) | 22. ____ Change in residence
38. ____ Divorce
39. ____ Serious injury or illness (you or to a close friend)
40. ____ Retirement from work
41. ____ Son or daughter leaving home
42. ____ Ending of formal schooling
43. ____ Separation from spouse (due to work, travel, etc.)
44. ____ Engagement
45. ____ Breaking up with boyfriend or girlfriend
46. ____ Leaving home for the first time
47. ____ Reconciliation with boyfriend/girlfriend
48. ____ Beginning a new school experience at a higher academic level (college, graduate school, professional school, etc)
49. ____ Changing to a new school at same academic level (undergraduate, graduate, etc.)
50. ____ Academic probation
51. ____ Being dismissed from dormitory or other residence
52. ____ Failing an important exam
53. ____ Changing a major
54. ____ Failing a course
55. ____ Dropping a course
56. ____ Joining fraternity/sorority
57. ____ Financial problems concerning school (in danger of not having sufficient money to continue)
Other recent experiences which have had an impact:
58. ____ _____
59. ____ _____
60. ____ _____ |
|---|---|

APPENDIX M
Stress Processes in Eating Behavior Study
Student Consent Form

You are being asked to be in this study because you are a female 18 years of age or older and responded to recruitment efforts for a project about “Stress Processes in Eating Behavior.” This project is being conducted by Stephanie M. LaMattina, a doctoral student in the Department of Psychology at the University of Maine. Dr. Sandy Sigmon, a professor in the Psychology Department, is supervising this project. The purpose of the research is to learn more about how individuals respond to a challenging task and a tendency to overeat in reaction to a challenging task. Your participation in this study will further the understanding of the psychological processes involved in certain eating behaviors (e.g., binge eating).

What will you be asked to do?

There are two sessions involved in this study.

Part 1. At the first session, you will be administered a diagnostic interview to determine if you qualify for the study. The interviews will take approximately 30-45 min to complete. Interview questions will ask about whether you are feeling:

- Depressed (e.g., In the past month, has there been a period of time when you were feeling depressed or down most of the day nearly every day?)
- Anxious (e.g., In the past six months, have you felt particularly nervous or anxious?)
- Eating disorder symptoms (e.g., Have you ever felt that your eating was out of control?).

After the interview, you will be asked to complete some questionnaires describing your:

- Mood (e.g., do you feel sad, I am tense)
- Eating behaviors (e.g., Have you been deliberately trying to limit the amount of food that you eat to influence your shape or weight)
- Current life experiences (e.g., Marriage, Changed work situation)
- Stress (e.g., In the last month, how often have you felt nervous and “stressed”?)
- How you cope with stressors (e.g., do you turn to other activities to get your mind off it).
- Urge to binge eat (e.g., indicate the degree to which you feel a desire to binge eat).
- Background information (e.g., medication use, health problems, sleep habits)

The questionnaires will take approximately 30-45 minutes to complete. After completing questionnaires, information about your height, weight, and sagittal abdominal diameter (i.e., distance between the subject's back and the front of the subject's stomach) will be collected. This entire session should take approximately 2 hours.

Part 2. The second session will take place approximately 1-2 weeks after the first appointment. This session will need to take place in the afternoon (i.e., between 3-7 PM)

since cortisol changes in the body are minimal during this time. During the second session, you will be asked to complete two challenging tasks. One task will ask you to do some arithmetic without paper and pencil, and the second task will ask you to give a speech. You will be videotaped while completing these tasks. The videotapes will be destroyed as soon as the study is complete. Together, the two tasks will take approximately 20 minutes to complete. Throughout the tasks four salivary cortisol samples will be collected using a device called a Salivette®. The Salivette® consists of a cotton swab, which you will place in your mouth and chew for 30-60 seconds to produce 0.5-1 ml of saliva. This procedure is not painful or harmful in any way. After the challenging tasks, participants will remain in the lab for 60 minutes to produce additional cortisol samples.

During this session, you will also be asked questions about your:

- Mood (e.g., do you feel sad)
- Urge to eat (e.g., do you want to overeat)
- Stress (e.g., do you feel stressed)

After the 60 minute period, you will be taught how to engage in a relaxation technique (e.g., muscle relaxation) for 20 minutes. After the relaxation exercise, you will provide one final cortisol sample. In total, five cortisol samples will be collected during this session. This entire session should take approximately 2 hours to complete.

Risks

You may experience distress associated with the interview, questionnaires, and completing the challenging tasks. However, if you experience any distress associated with the interview, completing questionnaires, or the challenging tasks, you do not need to answer any questions that make you feel uncomfortable. You may withdraw from the study at any time. In addition, you may ask for counseling referrals, or speak to a licensed psychologist (Dr. Sandra Sigmon, 207-581-2049).

Benefits

Your responses will aid the researchers in understanding the relationship between a person's response to stress and the tendency to overeat in reaction to stress. Learning more about how stress can influence eating patterns can lead to more effective treatments for individuals diagnosed with eating disorders. You will receive 4 hours of research credit for your research experience in your psychology class.

Confidentiality

Your responses will remain confidential and will be stored in the faculty sponsor's locked laboratory. The videotape containing your performance on the tasks will also be stored in the faculty sponsor's locked laboratory. A code number will be used to protect your identity. If the study is published or presented, only information based upon the entire group of participants will be used. The key linking your name to the data and your videotape will be destroyed at the completion of data collection for this study. The original data with no identifying information will be stored indefinitely in the faculty

sponsor's locked laboratory. After you have completed the study, the experimenter will go over the study details with you.

Contact Information

Stephanie LaMattina (stephanie.lamattina@umit.maine.edu; 581-2031) and Dr. Sandra Sigmon may also be contacted at any time during the study at this address: 376 Little Hall, Orono, ME 04469, sandra.sigmon@umit.maine.edu, 581-2049. If you have any questions about your rights as a research participant, please contact Gayle Anderson, Assistant to the University of Maine's Protection of Human Subjects Review Board: (207) 581-1498, 415 Corbett Hall, Orono, ME 04469.

Your signature below indicates that you have read and understand the information stated above. You will receive a copy of this form.

Participant's Signature: _____ **Date:** _____

Print name here: _____

Please indicate if you would like to be contacted in the future in order to receive information about the free treatment study or another project related to eating behavior? ____ Yes ____ No

Phone: _____ **Ok to leave message?** ____ Yes ____ No

Email address: _____

If you would like a summary of the results of this study, please indicated your address below: _____

APPENDIX N
Stress Processes in Eating Behavior Study
Community Consent Form

You are being asked to be in this study because you are a female 18 years of age or older and responded to recruitment efforts for a project about “Stress Processes in Eating Behavior.” This project is being conducted by Stephanie M. LaMattina, a doctoral student in the Department of Psychology at the University of Maine. Dr. Sandy Sigmon, a professor in the Psychology Department, is supervising this project. The purpose of the research is to learn more about how individuals respond to a challenging task and a tendency to overeat in reaction to a challenging task. Your participation in this study will further the understanding of the psychological processes involved in certain eating behaviors (e.g., binge eating).

What will you be asked to do?

There are two sessions involved in this study.

Part 1. At the first session, you will be administered a diagnostic interview to determine if you qualify for the study. The interviews will take approximately 30-45 minutes to complete. Interview questions will ask about whether you are feeling:

- Depressed (e.g., In the past month, has there been a period of time when you were feeling depressed or down most of the day nearly every day?)
- Anxious (e.g., In the past six months, have you felt particularly nervous or anxious?)
- Eating disorder symptoms (e.g., Have you ever felt that your eating was out of control?).

After the interview, you will be asked to complete some questionnaires describing your:

- Mood (e.g., do you feel sad, I am tense)
- Eating behaviors (e.g., Have you been deliberately trying to limit the amount of food that you eat to influence your shape or weight)
- Current life experiences (e.g., Marriage, Changed work situation)
- Stress (e.g., In the last month, how often have you felt nervous and “stressed”?)
- How you cope with stressors (e.g., do you turn to other activities to get your mind off it).
- Urge to binge eat (e.g., indicate the degree to which you feel a desire to binge eat).
- Background information (e.g., medication use, health problems, sleep habits)

The questionnaires will take approximately 30-45 minutes to complete. After completing questionnaires, information about your height, weight, and sagittal abdominal diameter (i.e., distance between the subject's back and the front of the subject's stomach) will be collected. This entire session should take approximately 2 hours.

Part 2. The second session will take place approximately 1-2 weeks after the first appointment. This session will need to take place in the afternoon (i.e., between 3-7 PM)

since cortisol changes in the body are minimal during this time. During the second session, you will be asked to complete two challenging tasks. One task will ask you to do some arithmetic without paper and pencil, and the second task will ask you to give a speech. You will be videotaped while completing these tasks. The videotapes will be destroyed as soon as the study is complete. Together, the two tasks will take approximately 20 minutes to complete. Throughout the tasks four salivary cortisol samples will be collected using a device called a Salivette®. The Salivette® consists of a cotton swab, which you will place in your mouth and chew for 30-60 seconds to produce 0.5-1 ml of saliva. This procedure is not painful or harmful in any way. After the challenging tasks, participants will remain in the lab for 60 minutes to produce additional cortisol samples.

During this session, you will also be asked questions about your:

- Mood (e.g., do you feel sad)
- Urge to eat (e.g., do you want to overeat)
- Stress (e.g., do you feel stressed)

After the 60 minute period, you will be taught how to engage in a relaxation technique (e.g., muscle relaxation) for 20 minutes. After the relaxation exercise, you will provide one final cortisol sample. In total, five cortisol samples will be collected during this session. This entire session should take approximately 2 hours to complete.

Risks

You may experience distress associated with the interview, questionnaires, and completing the challenging tasks. However, if you experience any distress associated with the interview, completing questionnaires, or the challenging tasks, you do not need to answer any questions that make you feel uncomfortable. You may withdraw from the study at any time. In addition, you may ask for counseling referrals, or speak to a licensed psychologist (Dr. Sandra Sigmon, 207-581-2049).

Benefits

Your responses will aid the researchers in understanding the relationship between a person's response to stress and the tendency to overeat in reaction to stress. Learning more about how stress can influence eating patterns can lead to more effective treatments for individuals diagnosed with eating disorders. In addition, your name will be entered into a drawing to win a \$100 Visa or American Express gift card. The type of gift card will depend on availability. You will have a 1 in 10 chance to win. If you would like, you can participate in a free treatment research project being conducted by Dr. Sigmon.

Confidentiality

Your responses will remain confidential and will be stored in the faculty sponsor's locked laboratory. The videotape containing your performance on the tasks will also be stored in the faculty sponsor's locked laboratory. A code number will be used to protect your identity. If the study is published or presented, only information based upon the entire group of participants will be used. The key linking your name to the data and your

videotape will be destroyed at the completion of data collection for this study. The original data with no identifying information will be stored indefinitely in the faculty sponsor's locked laboratory. After you have completed the study, the experimenter will go over the study details with you.

Contact Information

Stephanie LaMattina (stephanie.lamattina@umit.maine.edu; 581-2031) and Dr. Sandra Sigmon may also be contacted at any time during the study at this address: 376 Little Hall, Orono, ME 04469, sandra.sigmon@umit.maine.edu, 581-2049. If you have any questions about your rights as a research participant, please contact Gayle Anderson, Assistant to the University of Maine's Protection of Human Subjects Review Board: (207) 581-1498, 415 Corbett Hall, Orono, ME 04469.

Your signature below indicates that you have read and understand the information stated above. You will receive a copy of this form.

Participant's Signature: _____ **Date:** _____

Print name here: _____

Please indicate if you would like to be contacted in the future in order to receive information about the free treatment study or another project related to eating behavior? ____ Yes ____ No

Phone: _____ **Ok to leave message?** ____ Yes ____ No

Email address: _____

If you would like a summary of the results of this study, please indicated your address below: _____

APPENDIX O
Demographics Page

Date: _____ Current Time: _____ Ethnicity: _____
Age: _____ Height: _____ Weight: _____

Do you take medications (e.g., prescription, over-the-counter, vitamins)? YES NO

If so, please list all medications: _____

Do you use birth control (e.g., pills, IUD, injections, patch)? YES NO

If so, please list the type and name of birth control: _____

Do you have any health problems (e.g., asthma, diabetes, hypertension)? YES NO

If so, please list all health problems: _____

Are you currently pregnant? YES NO

If so, how many weeks/months have you been pregnant for? _____

Do you have regular monthly periods (25-32 days)? YES NO

If so, when did your last menstrual period begin (record date)? _____

Do you use smoke cigarettes? YES NO

If so, when was the last time you had a cigarette today?: _____

How many cigarettes do you smoke each day (e.g., 5 a day, pack a day)? _____

How long have you been smoking cigarettes on a regular basis (e.g., 5 years)? _____

Do you exercise on a regular basis? YES NO

If so, did you exercise today? YES NO

If so, what time did you complete your workout today? _____

Do you drink caffeine products (e.g., soda, tea, coffee, energy drinks) on a regular basis?

YES NO

If so, how many caffeinated products do you drink each day? _____

When was the last time you have a caffeinated drink today? _____

Do you drink alcohol (e.g., beer, liquor) on a regular basis? YES NO

If so, how many alcoholic drinks do you drink each week? _____

Did you drink alcohol today? _____

If so, when was the last time you had an alcoholic beverage today? _____

APPENDIX P

Referral Info

If you feel that you would like to talk with someone about your feelings or any concerns that you may have, we have included some names and numbers of centers/counselors in the area. Cutler Health Center is free, the Psychological Services Center operates on a sliding fee scale which is based on your income, and the two psychologists listed charge by the hour. The choices below are provided as options and do not reflect an endorsement by the University of Maine.

University of Maine Psychological Services Center	581-2034
University of Maine Cutler Health Center	581-1392
Dr. Lucy Quimby	945-3675

If you have any further questions about the study, you may contact Stephanie LaMattina (207-581-2031); email: stephanie.lamattina@umit.maine.edu), or Dr. Sandra Sigmon (207-581-2049; email: Sandra.sigmon@umit.maine.edu).

Thank you again for your participation!

APPENDIX Q
Comorbid Diagnoses in BED Group

<u>Disorder</u>	<u>Frequency of Participants</u>
Current mood disorder	5
Past mood disorder	9
Anxiety disorder	9
Substance abuse disorder	1

APPENDIX R

Eating Disorder Pathologies (with Covariates)

Number of Binge Eating Episodes in the Past Month. The findings in Table 18 reveal that the number of binge eating episodes during the past month varied significantly across groups ($F(1,39) = 6.42, p = .015, \eta^2 = .14$), even after controlling for the effects of age, BMI, sagittal measure, and Beck's Depression Inventory (BDI) total score. Individuals diagnosed with BED ($M = 12.38; SD = 10.29$) reported having a greater number of binge episodes in the past month than individuals in the control group ($M = 3.61; SD = 9.82$).

Table 18

ANOVA Results for Number of Binge Eating Episodes

Source	<i>Df</i>	<i>F</i>	<i>p</i>	η^2
Overall model	5	3.71	.008	.32
Age	1	.02	.893	.00
BMI	1	.03	.867	.00
Sagittal	1	.00	.997	.00
Total BDI score	1	.68	.416	.02
Group	1	6.42	.015	.14
Error	39			

Distress About Eating, Weight, and Shape. As can be gleaned from the findings in Table 19, mean distress about eating, weight, and shape varied significantly across groups ($F(1,39) = 5.46, p = .025, \eta^2 = .12$), even after controlling for the effects of age, BMI, sagittal measure, and BDI total score. Individuals diagnosed with BED ($M = 2.50$;

$SD = 1.62$) reported being more distressed in comparison to the individuals in the control group ($M = 1.17$; $SD = 1.55$).

Table 19

ANOVA Results for Distress about Eating, Weight, and Shape

Source	<i>Df</i>	<i>F</i>	<i>p</i>	η^2
Overall model	5	11.62	.000	.60
Age	1	.10	.758	.00
BMI	1	.01	.914	.00
Sagittal	1	.40	.530	.01
Total BDI score	1	12.25	.001	.24
Group	1	5.46	.025	.12
Error	39			

Self-judgments Based on Weight. The findings in Table 20 indicate that mean self-judgments based on weight varied significantly across groups ($F(1,39) = 6.87$, $p = .012$, $\eta^2 = .15$), even after controlling for the effects of age, BMI, sagittal measure, and BDI total score. Individuals diagnosed with BED ($M = 3.35$; $SD = 1.77$) reported judging themselves based on their weight more often than individuals in the control group ($M = 1.79$; $SD = 1.69$).

Table 20

ANOVA Results for Self-Judgments Based on Weight

Source	<i>Df</i>	<i>F</i>	<i>P</i>	η^2
Overall model	5	14.32	.000	.65
Age	1	.00	.990	.00
BMI	1	2.18	.148	.05
Sagittal	1	.03	.868	.00
Total BDI score	1	8.27	.007	.18
Group	1	6.87	.012	.15
Error	39			

Self-judgments Based on Shape. The findings in Table 21 reveal that mean self-judgments based on shape varied significantly across groups ($F(1,39) = 8.82, p = .005, \eta^2 = .18$), even after controlling for the effects of age, BMI, sagittal measure, and BDI total score. Individuals diagnosed with BED ($M = 3.67; SD = 1.73$) reported judging themselves based on their shape more often than individuals in the control group ($M = 1.94; SD = 1.66$).

Table 21

ANOVA Results for Self-Judgments Based on Shape

Source	<i>Df</i>	<i>F</i>	<i>p</i>	η^2
Overall model	5	15.21	.000	.66
Age	1	.09	.766	.00
BMI	1	.55	.462	.01
Sagittal	1	.11	.742	.00
Total BDI score	1	11.29	.002	.22
Group	1	8.82	.005	.18
Error	39			

Dissatisfaction with Weight. As can be gleaned from the findings in Table 22, mean dissatisfaction with weight varied significantly across groups ($F(1,39) = 5.42, p = .025, \eta^2 = .12$), even after controlling for the effects of age, BMI, sagittal measure, and BDI total score. Individuals diagnosed with BED ($M = 3.82; SD = 1.56$) reported being more dissatisfied with their weight in comparison to the individuals in the control group ($M = 2.60; SD = 1.49$).

Table 22

ANOVA Results for Dissatisfaction with Weight

Source	<i>Df</i>	<i>F</i>	<i>p</i>	η^2
Overall model	5	16.41	.000	.68
Age	1	.00	.993	.00
BMI	1	.00	.997	.00
Sagittal	1	2.10	.155	.05
Total BDI score	1	13.80	.001	.26
Group	1	5.42	.025	.12
Error	39			

Dissatisfaction with Shape. The findings in Table 23 indicate that mean dissatisfaction with body shape varied significantly across groups ($F(1,39) = 6.90, p = .012, \eta^2 = .15$), even after controlling for the effects of age, BMI, sagittal measure, and BDI total score. Individuals diagnosed with BED ($M = 3.88; SD = 1.50$) reported being more dissatisfied with their shape in comparison to the individuals in the control group ($M = 2.55; SD = 1.43$).

Table 23

ANOVA Results for Dissatisfaction with Shape

Source	<i>Df</i>	<i>F</i>	<i>P</i>	η^2
Overall model	5	16.29	.000	.68
Age	1	.35	.560	.01
BMI	1	1.50	.229	.04
Sagittal	1	6.06	.018	.14
Total BDI score	1	15.56	.000	.29
Group	1	6.90	.012	.15
Error	39			

APPENDIX S

BED Correlation Table

Table 24

Correlations for BED and Control Groups

Measure	1	2	3	4	5
<hr/>					
BED Group (<i>n</i> = 19)					
1. Cortisol level post stressor	-	-.13	.08	.11	.11
2. Age		-	.70**	.63**	.48*
3. BMI			-	.93**	.48*
4. Sagittal				-	.59**
5. Perceived stress level post stressor					-
<hr/>					
Control Group (<i>n</i> = 26)					
1. Cortisol level post stressor	-	-.16	.08	.14	.29
2. Age		-	-.21	-.26	.09
3. BMI			-	.87**	.02
4. Sagittal				-	.23
5. Perceived stress level post stressor					-

Note. **p* = .05. ** *p* = .001

BIOGRAPHY OF THE AUTHOR

Stephanie M. LaMattina was born in Malden, Massachusetts on July 28, 1979. She was raised in Malden, MA and in 1997 she graduated from Matignon High School located in Cambridge, MA. She earned her Bachelors of Science degree from Northeastern University in 2002, where she graduated cum laude with honors in Psychology. She completed her graduate training at the University of Maine, earning a Master's degree in 2005, and fulfilling all requirements for the Doctoral degree in 2008. During her time at the University of Maine, Stephanie was awarded numerous honors including the University of Maine Provost Fellowship. She has also received Commendations for extraordinary accomplishments in clinical and research work, and in 2005 she was inducted into the honor society of Phi Kappa Phi. Stephanie completed her predoctoral internship at Syracuse VA Medical Center, and recently secured a postdoctoral fellowship in Behavioral Medicine at Cambridge Health Alliance/Harvard Medical School in Cambridge, MA. She has five scholarly publications and seventeen presentations at professional meetings. Stephanie is a member of the APA general association and Division 38 Health Psychology, the Advancement of Behavioral and Cognitive Therapies, and the Society of Behavioral Medicine. Stephanie is a candidate for the Doctor of Philosophy degree in Psychology from the University of Maine in December, 2008.