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Predictors of Binge Eating in College Women

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The University of Southern Mississippi

PREDICTORS OF BINGE EATING IN COLLEGE WOMEN

by

Emily E. Prather

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
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ABSTRACT

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Binge eating has received increased attention in the psychological literature, as the health consequences are becoming increasingly well known. The prevalence of subclinical binge eating (i.e., binge eating that is not associated with a diagnosable eating disorder) is elevated among college women, some of whom will go on to develop more serious problems. Thus, improved understanding of subclinical binge eating in this population can help to inform prevention and intervention strategies.

In a sample of 472 college women this study evaluated the relationships among four theoretically relevant factors hypothesized to predict binge eating: trait anger, anger suppression, impulsivity, and emotion regulation. After confirming the factor structure of the UPPS Impulsivity Scale through confirmatory factor analysis, we found that the UPPS factors of urgency and lack of perseverance predicted binge eating. In addition, trait anger predicted binge eating above and beyond general negative affect. Anger suppression also predicted binge eating, and we found that both anger suppression and emotion regulation partially mediated the relationship between trait anger and binge eating. The implications of these findings for assisting college women with binge eating are addressed.

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DEDICATION

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INTRODUCTION

Binge eating refers to the consumption of objectively large amounts of food in a discrete period of time. It is a symptom of eating disorders (e.g., Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder), but it has also gained recognition as being problematic in its own right over the past 15 years (Fichter, Quadflieg, & Brandl, 1992; McManus & Waller, 1995). For example, binge eating is a contributing factor to obesity (Villarejo et al., 2012) and has been associated with depression (Skinner, Haines, Austin, & Field, 2012), low self-esteem (Goldschmidt, Wall, Loth, LeGrange, & Newark-Sztainer, 2012), and an increased risk of developing Anorexia Nervosa and Bulimia Nervosa (Thomas, Butryn, Stice, & Lowe, 2011).

Binge Eating Disorder (BED) was recently added to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*; American Psychiatric Association, 2013). The *DSM-5* defines a binge as eating, within a 2-hour period, "an amount of food which is definitely larger than what most people would eat in a similar period of time under similar circumstances," with a co-occurring sense of lack of control during the eating episode (p. 350). BED is a disorder involving recurrent episodes of binge eating with at least three symptoms of rapid eating, eating until uncomfortably full, eating large amounts of food when not physically hungry, eating alone due to embarrassment, or feeling disgusted, guilty, or depressed after eating; marked distress regarding binge eating; binge eating at least once per week for three months; and the absence of inappropriate compensatory behaviors (American Psychiatric Association, 2013). BED is estimated to occur in between 0.8% and 13% of the population (American Psychiatric

Association, 2013; Napolitano & Himes, 2011). BED can impair social role adjustment, quality of life, life satisfaction, and physical health. BED is associated with increased medical morbidity and mortality, increased body mass index (BMI), and increased health care service utilization (American Psychiatric Association, 2013).

Subclinical binge eating occurs when one engages in binge eating without one or more of the diagnostic criteria (i.e., the objective size of the binge, discrete period of time, frequency of bingeing, lack of control, or accompanying distress) being met (Cotrufo, Baretta, Monteleone, & Maj, 1998). Although binge eating, especially in its subclinical form, can occur in obese, overweight, and healthy weight individuals, it is often accompanied by weight gain, as 87% of binge eaters are obese (Villarejo et al., 2012). Thus, binge eating can compound the health problems of individuals who may already be in poor health due to obesity.

Binge eating is often comorbid with bipolar disorder, major depression, anxiety disorders, borderline personality disorder, avoidant personality disorder, obsessive-compulsive personality disorder, Attention-Deficit Hyperactivity Disorder (ADHD), and substance use disorders (American Psychiatric Disorder, 2013; Tanofsky-Kraff et al., 2013). Adults with BED report lower quality of life than obese adults without BED in the following domains: physical health, mobility, emotional well being, work, sex life, public distress, and self esteem (Tanofsky-Kraff et al., 2013).

Binge eating represents a subset of disordered eating which is associated with a wide range of physical and mental health correlates. Increasing the knowledge base about this form of disordered eating may help to inform treatment (e.g., targeted treatment may be more useful in alleviating symptoms and reducing the need for other

healthcare services associated with binge eating). Understanding the psychological predictors of binge eating is an important step in devising effective prevention and intervention strategies. This study seeks to evaluate the relationships among four theoretically relevant factors hypothesized to predict binge eating among college women: trait anger, anger suppression, impulsivity, and emotion regulation. Binge eating appears to be a particular problem among college women, with estimated prevalence rates of up to 19% (Lynch, Everingham, Dubitzky, Hartman, & Kasser, 2000). With a better understanding of the nature of these variables and their relation to binge eating in this population, we hope to make a contribution to the literature, informing prevention and treatment efforts.

Eating Disorders

Eating disorders are psychiatric conditions that involve excessive concern with weight and body image, the over or under consumption of food, and a variety of compensatory behaviors (American Psychiatric Association, 2013). Eating disorders fall into four subcategories in the *DSM-5*: Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, and Eating Disorder Not Otherwise Specified (NOS). Anorexia Nervosa (AN) involves an intense fear of gaining weight and the refusal to maintain a healthy body weight for one's age and height. Bulimia Nervosa (BN) involves recurrent episodes of binge eating (i.e., consuming excessive amounts of food accompanied by feelings that one's eating is out of control) and compensatory behaviors aimed at eliminating food or the associated weight gain (e.g., vomiting or excessive exercise). Eating Disorder NOS includes any maladaptive pattern of eating behavior that does not fit the stringent criteria of AN, BN, or BED (American Psychiatric Association, 2013).

Binge Eating Disorder (BED) was recently included as a diagnosis in the *DSM-5*, and far less is known about it than either AN or BN. BED is expected to be more common than either AN or BN, and most people with BED are obese due to the excess intake of calories (Napolitano & Himes, 2011). It is estimated that AN affects less than 1% of the general population and BN affects 1-3% (American Psychiatric Association, 2013). Estimates of the prevalence of BED in the general population range from 0.8% to 13% (American Psychiatric Association, 2013; Napolitano & Himes, 2011). All eating disorders have been found to be more common in women. AN affects 0.5% of women in the U.S., BN affects 1% of U.S. women, and BED affects between 1.8% and 6% of U.S. women (Espindola & Blay, 2006; Napolitano & Himes, 2011).

For the purpose of this study, it is important to distinguish between *eating disorders* (i.e., clinically diagnosed Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder) and subclinical *disordered eating*, a label used to describe any eating behavior that is considered problematic (e.g., fasting, restricting, bingeing, purging, over-exercise, laxative abuse) but which does not meet severity or longevity requirements for a clinical diagnosis (Timmerman, 2006). While BED may be more common than other eating disorders, it is still not expected to be common in a nonclinical sample; subclinical disordered eating is expected to have a higher prevalence rate (Timmerman, 2006). Therefore, this study focuses on problematic behaviors considered to be disordered eating, as this will allow us to examine a larger range of eating behaviors, include more participants in the study, and allow the results to be generalized to a larger segment of the population.

College age women are considered at increased risk for developing an eating disorder or disordered eating. It is estimated that 62% of undergraduate women exhibit subclinical levels of maladaptive eating attitudes or behaviors (Timmerman, 2006). Approximately 16-19% of college women and 6-7 % of college men report regularly binge eating (Heatherton, Nichols, Mahamedi, & Keel, 1995; Lynch, Everingham, Dubitzky, Hartman, & Kasser, 2000), and Napolitano and Himes (2011) found that 44% of college undergraduate women reported some binge eating symptoms. Thus, sampling college women should be relevant in terms of their increased risk for disordered eating and provide us with an adequate range on the measures of interest.

It has been theorized that disordered eating, and binge eating in particular, are maladaptive reactions to negative emotions (Napolitano & Himes, 2011). Binge eating seems to be an attempt to regulate or reduce awareness of uncomfortable negative emotions (Fairburn et al., 2008). Stice, Miller, Marti, and Nathan (2008) found that one third of women with binge eating problems eat in response to a negative emotion. This negative emotional response is most commonly triggered by anger, anxiety, or depression (Arnow, Kenardy, & Agras, 1995).

Theories of Binge Eating

There have been many theories proposed to explain the origins and motivations behind binge eating. This section provides a brief description of four of the most influential.

Dietary Restraint Theory

One of the first theories of binge eating emphasized the role of dietary restriction. It suggested that when one was dieting or restricting caloric intake, one would eventually

compensate with the opposite extreme of binge eating (Wardle & Beinart, 1981). This theory has both a biological and psychological component. It asserts that the human body will perceive dietary restriction as starvation and react by increased hunger and food cravings (Arnow, Kenardy, & Agras, 1992). It is also a well-known psychological phenomenon that when one "cannot" have something one becomes preoccupied with this forbidden object. When a dieter tells herself she cannot have high fat foods, these foods become more desirable and harder to resist (Mann & Ward, 2001). Support for dietary restriction theory has been mixed, with some finding evidence to support it (e.g., Arnow, Kenardy, & Agras, 1992; Wardle & Beinart, 1981) and others failing to do so (e.g., Blackburn, Johnson, Blampied, Popp, & Kallen, 2006; Kenardy, Arnow, & Agras, 1996; Macht, 2008).

Recently, there has been increased interest in identifying emotional mechanisms, which may act in concert with or be more important than dietary restriction, as predictors of binge eating. The inability to tolerate or regulate negative emotions has been found to predict multiple self-destructive coping behaviors, such as self-harm, substance abuse, and binge eating (Anestis, Selby, Fink, & Joiner, 2007; Brandon et al., 2003; Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Daughters, Lejuez, Kahler, Strong, & Brown, 2005). It has been proposed that binge eating may be used as a way to alleviate (Selby, Anestis, Bender & Joiner, 2009), escape (Heatherton & Baumeister, 1991), or trade off (Polivy & Herman, 1999) unpleasant or intolerable emotions.

Emotion Regulation Theories (also called Affect Regulation Theories)

There is mounting evidence that negative emotions and problems regulating these emotions precede binge eating (Gratz & Roemer, 2004; Whiteside et al., 2007). Emotion

regulation theorists hypothesize that binge eating serves as a maladaptive coping strategy aimed at regulating emotion (Evers, Stok, & de Ridder, 2010). Eating is an inherently pleasurable experience and delivers dopamine to the reward pathway in the brain in a similar way, but to a lesser extent, than illicit drugs (Davis at al., 2009; Evers et al., 2010; Johnson & Kenny, 2010). It is proposed that when one experiences negative affect that they cannot regulate they may implement an easily employed, though maladaptive, strategy like binge eating (Wiser & Telch, 1999). It is unclear whether eating regulates emotions through neurochemical changes in the brain, as a distraction from negative emotions, or as a way to shift focus from one negative emotion to another (Evers et al., 2010). Emotion regulation theory is often used as a general term, but can also be subdivided into more specific sub-theories. The three most prominent of these sub-theories are outlined below.

Emotional Cascade Theory

Emotional cascade theory proposes that when an individual with few emotion regulation strategies experiences an intense negative emotion, he or she ruminates over the unpleasantness of the emotion, the cause of the emotion, and what could have been done differently to prevent the negative emotion from occurring (Selby et al., 2009; Selby, Anestis, & Joiner, 2008). This rumination intensifies and prolongs the negative emotion being experienced, leading to more rumination and more intense emotion, hence the term *cascade*. Eventually the negative emotion becomes so intense that it overwhelms the individual and he or she must do something equally as intense to alleviate the emotional distress (Selby et al., 2008, 2009). These intense coping

behaviors are commonly self-destructive and include cutting, suicidal gestures, substance abuse, bingeing, and purging (Gordon, Holm-Denoma, Troop-Gordon, & Sand, 2012).

Emotional cascade theory does not indicate a specific mechanism by which these intense self-destructive behaviors alleviate the emotion; however, these behaviors do seem to serve an emotional regulation function (Gordon et al., 2012). Emotional cascade theory has been supported in bulimic (Sarin & Nolen-Hoeksema, 2010) and binge eating samples (Harrell & Jackson, 2008).

Escape Theory

Escape theory proposes that when one feels a negative emotion that is too intense or uncomfortable, one can avoid or escape from the experience of this emotion by narrowing one's cognitive focus onto something else. Binge eating, as well as other hedonic self-destructive behaviors, may serve this function (Macht, 2008). By narrowing one's focus to the act of eating and enjoying food, one can temporarily avoid the unpleasant emotions that were producing distress (Heatherton & Baumeister, 1991). Escape theory's applicability to binge eating has been supported by Macht and Muller (2007) and Spitzer and Rodin (1983). It has also been supported in nonclinical binge eating samples (Blackburn et al., 2006).

Trade Off Theory

Trade off theory proposes that individuals may engage in binge eating when experiencing negative emotions perceived as intolerable or unacceptable because the emotions related to the binge, while still negative, are viewed as a less threatening alternative (Polivy & Herman, 1999). For example, someone who has learned that expressing anger toward others is inappropriate will perceive feelings of anger at another

person as unacceptable and may binge as a way of trading off the unacceptable emotion of anger toward another for a more acceptable emotion (e.g., guilt, shame, or anger toward oneself) related to a binge. Thus, trade off theory proposes that the negative affect is not eliminated but redirected or transformed into a different negative emotion through binge eating (Polivy & Herman, 1999). This theory has been supported in binge eating samples (Kenardy et al., 1996; Stein et al., 2007).

These three theories of emotion regulation are not necessarily mutually exclusive and may even be acting in concert (Macht, 2008). We do not currently understand the exact mechanism of emotion regulation in binge eating, but it appears to play an important role.

Feminist Theories of Anger Suppression

There have also been feminist theories of binge eating which propose that the behavior not only serves to regulate emotion but serves specifically to suppress anger, which is a socially unacceptable emotion for women to express (Bekker & Spoor, 2008). Feminist theories have been supported by Norwood and colleagues (2011) and Zaitsoff, Geller, and Srikameswaran (2002), but not supported by Edman, Yates, Arguete, and Debord, (2005), who found that men and women reported the same levels of anger suppression and it affected their eating in similar ways. While the cause of the need to suppress anger is still being debated, the idea that suppressing an emotion could lead to binge eating is also supported by the theory of ego depletion, which will be considered next.

Ego Depletion Theory

The theory of ego depletion proposes that an individual's capacity to self regulate is limited (Baumeister, Heatherton, & Tice, 1994; Muraven, Tice, & Baumeister, 1998) and that this self-regulation energy (i.e., ego strength) can be exhausted (Baumeister, Bratlavsky, Muraven, & Tice, 1998; Baumeister & Muraven, 2000). Ego depletion is when one's self-regulatory energy is reduced due to a previous act of self-regulation, which used this energy (Baumeister, 2002a; Baumeister & Muraven, 2000). Acts of self-regulation (also called acts of volition or will power) are cognitive processes used to decide on and commit to a course of action, including conscious processing, choice making, behavior initiation, and overriding responses (Baumeister et al., 1998). One has a limited amount of ego strength, which can be depleted by each act of self-regulation, leaving less to use on subsequent behaviors (Baumeister, 2002b; Baumeister et al., 1994; Baumeister & Muraven, 2000; Muraven et al., 1998). While ego strength can be depleted in the short-term, it does replenish itself over time through rest and positive affect (Baumeister et al. 1998; Tice, Baumeister, Shmueli, & Muraven, 2007).

Baumeister et al. (1998) provided empirical support for the theory of ego depletion with a series of four experiments. In the first, participants were presented with radishes and chocolate cookies or no food. In the experimental groups, one group was told to eat radishes (and avoid the cookies) and one group was told to eat as much as they wanted of any of the food presented. The control group was not presented with any food. All participants were then asked to attempt to solve an unsolvable puzzle. Those who had eaten radishes, and presumably used some self-regulation energy to resist the cookies, gave up solving the puzzle significantly earlier than the other two condition

participants. In a second experiment, the self-regulatory condition involved suppressing emotion expression while watching a movie. After watching the movie, participants who had to suppress emotion solved significantly fewer solvable anagrams than the non-suppression participants and controls. In two other similar experiments, the authors found that the initial act of self-control increased passivity in a situation calling for another act of self-control and that making a choice to perform an attitude-relevant behavior also caused a decrement in puzzle persistence.

It is worth noting that participants in Baumeister and colleagues' (1998) study who resisted the urge to eat tempting food reacted more aggressively to an insult than participants who were allowed to eat all they wanted and that similar results were found for participants who suppressed emotion during a movie clip. The capacity to inhibit aggressive behavior seems to decrease when people have already exercised self-regulation in another domain (Stucke & Baumeister, 2006). After having to make a choice about an unrelated issue, participants ate more than participants who did not have to make a choice before eating (Kahan, Polivy, & Herman, 2003). Similarly, Vohs and Heatherton (2000) and Hofman, Rauch, and Gawronski (2007) showed that suppressing emotions made it more difficult for college undergraduates to restrain eating behavior. Emotion suppression has been shown to contribute to ego depletion. Ego depletion theory supports the idea that suppressing emotions, including anger, would then make it more difficult to resist the urge to binge eat. Evidence of limited self-regulatory resources and depletion of this resource has been found with eating, sexuality, sleep, tobacco, alcohol, leisure activities, media use, intelligent thought, choice making, and interpersonal behavior (Baumeister & Vohs, 2007; Hoffman, Vohs, & Baumeister, 2012).

Emotion regulation theories of binge eating posit that when a negative emotion is too intense or deemed unacceptable, binge eating may serve to distract from or alleviate that unpleasant emotion (Gratz & Roemer, 2004). Another way to deal with uncomfortable negative emotions is to suppress them. Ego depletion theory posits that when one has used most of one's ego strength to suppress an emotion, one will have less ego strength left to control eating behavior (Hofman, Rauch, & Gawronski, 2007; Vohs & Heatherton, 2000). It is possible that difficulties in emotion regulation cause one to binge eat in order to avoid negative emotions and that eating becomes increasingly disinhibited as one's ego strength becomes depleted from suppressing that emotion. One's response to negative emotions seems to be an important precursor to binge eating.

Binge Eating in Response to Negative Affect

Negative Affect and Bulimia Nervosa

Negative affect is an umbrella term used to encompass all negative emotional states (e.g., anxiety, anger, sadness, guilt, shame) (Watson & Clark, 1994). Negative affect has been found to predict Bulimia Nervosa in clinical samples (Berg et al., 2012; Engelberg, Steiger, Gauvin, & Wonderlich, 2007). It has also been shown to predict binge episodes in participants with Bulimia Nervosa (Engelberg et al., 2007).

Engelberg et al. (2007) used escape theory to explore the relationships among negative affect, dissociation, and binge eating. Escape theory describes a shift in awareness when people binge to allow themselves to escape from negative emotions. "Cognitive narrowing" is used to move attention from more abstract thought (which may be more distressing) to focus on the immediate environment (food). Thus, the "spacing out" often reported during binges may be a dissociative experience. The authors used

ecological momentary assessment (EMA) based on self-monitoring with handheld computers to study 45 women with bulimic symptoms recruited from ED outpatient services (33 completed the study: 24 met full criteria for BN purging type, 1 met full criteria for BN nonpurging type, and 8 met criteria for ED NOS). Participants' mean age was 23.7 years, and their mean BMI of 22.02 was within the normal range. On average, participants reported bingeing on 15.61 days per month and vomiting on 16.96 days per month. They were initially interviewed with the Eating Disorder Examination (EDE) and then given their handheld computer for electronic self-monitoring. They recorded all eating episodes and indicated if these were binges, heavy meals, average meals, light meals, or snacks. Negative affect was measured with Larsen and Diener's Daily Mood Form consisting of 5 negative affect adjectives (i.e., worried, frustrated, angry, unhappy, depressed). Dissociation was measured with 3 items from the Peritraumatic Dissociative Experience Scale.

Engelberg et al. (2007) found that the likelihood of bingeing increased over the course of the day, that negative affect experienced prior to an eating episode increased the likelihood that that episode would be categorized as a binge, and that the presence of dissociation prior to bingeing increased the likelihood of subsequent bingeing. Both negative affect and dissociation predicted bingeing, independent of time of day. These findings were consistent with both the escape model (i.e., negative affect predicts binge eating and decreases in awareness/dissociation predict binge eating).

Berg et al. (2012) examined 133 women who met criteria for Bulimia Nervosa (BN). Participants were interviewed with the SCID and given palm-top computers to complete the positive and negative affective states (PANAS) and eating disorder

checklist 6 times per day when randomly signaled, at the end of the day, and immediately following any bingeing or purging behavior. After a 2-week data collection period, within-day analyses using an abbreviated version of the PANAS (i.e., fear, sadness, guilt, and hostility) showed that all four factors of negative affect increased before a binge or binge/purge event and decreased afterwards. Berg at el.'s (2012) use of electronic assessment was a particular strength of this study; however, the manner in which they assessed negative affect using a subset of the original PANAS items may have decreased validity.

Negative Affect and Binge Eating

Negative affect has also been found to predict binge eating (Arnow et al., 1992 & 1995; Henderson & Huon, 2002; Masheb & Grilo, 2008a; Stein et al., 2007) and is the most often cited antecedent of binge eating (Wolfe, Baker, Smith, & Kelly-Weeder, 2009). The idea that general negative affect preceded binge eating is supported by the emotion regulation theories of binge eating. Negative affect may be a more important predictor than dietary restraint (Penas-Lledo, Loeb, Puerto, Hildebrandt, & Llerena, 2008). Negative affect and binge eating seem to be reciprocally related in that negative affect has been found to predict next day binge eating, and binge eating has been found to predict next-day negative affect (Barker, Williams, & Galambos, 2006). Binge eating may be a coping strategy used to deal with, or numb, negative affect, similar to alcohol use or self-harm behavior (Luce, Engler, & Crowther, 2007).

Stein and colleagues (2007) examined 33 women who met criteria for BED. Their BMIs ranged from 27-48, indicating that all were overweight or obese. Data were collected via handheld computers on which participants were prompted to enter data at 6

scheduled intervals throughout the day for 7 days. Participants were asked to record data about current binge status, mood, hunger, binge-related situational variables and attributions, interpersonal conflict, anger, and food "rule breaking" (i.e. abstinence violation). They were also asked to choose up to three discreet emotions and rate how pleasant and how aroused they felt based on a circumplex model of emotion. Overall, data for 264 binge episodes were compiled. The remaining data points were classified as "precursor times" (the point in time immediately before a binge), "consequence times" (the point in time immediately after a binge), and "non-binge times." Large amounts of food (binge) were associated with higher levels of distress, loss of control, and intentionality of binges (not found for small to average amounts of food).

Stein and colleagues (2007) used a repeated-measures ANOVA to compare mean arousal, pleasantness, and guilt in precursor, consequence, and non-binge times. All three differed across the three times, as did positive and negative mood. Negative mood was greater in precursor times than non-binge times. Interestingly, precursor negative mood was also less than consequence times. When they examined attributions, negative mood was more likely to be attributed to weight and shape concerns and relationship issues at precursor times than at non-binge times. Participants reported that 47.7% of binges were caused by how they felt. An important limitation of this study was the authors' use of positive and negative affect measures without evidence of reliability and validity.

Masheb and Grilo (2008b) examined 75 help-seeking patients (81% female) with diagnosed BED and BMI greater than 27 (overweight or obese). Although this was a treatment study comparing CBT vs. a behavioral weight loss guided self-help program,

some analyses were completed across both groups to investigate other predictors of outcome. Pretreatment BED pathology, negative affect, and self-esteem all predicted post-treatment BED pathology. Negative affect (operationalized as scores on the Beck Depression Inventory) was the most salient predictor of treatment outcomes.

Henderson and Huon (2002) attempted to determine whether coping styles moderated or mediated the relationship between negative affect and binge eating severity in 105 overweight women recruited from commercial weight reduction programs. BMI had to be over 25 (cutoff for overweight), and participants' mean age was 45. Participants were given the Binge Eating Scale (BES); the 10-item negative mood scale of the Positive and Negative Affect Schedule (POMS); the planning, positive reinterpretation and growth, and behavioral disengagement subscales of the COPE. Negative affect predicted binge eating and accounted for 31% of the variance. To assess moderation, negative affect, disengagement (maladaptive avoidant coping), and their interaction term were regressed onto binge eating. The interaction term was significant, indicating moderation. Women low in negative affect reported less severe binge eating, especially if they used less disengagement, whereas women high in negative affect reported more severe binge eating, regardless of their use of disengagement. Coping style was found to be a moderator, but not a mediator, in the relationship between general negative affect and binge eating.

Arnow et al. (1995) found that negative affect predicted binge eating; however, they also found that different aspects of negative affect had differential predictive effects. They developed a measure, the Emotional Eating Scale (EES), to assess overeating in response to negative emotions. They found that the EES had 3 factors: anger/frustration,

anxiety, and depression. Arnow and colleagues (1995) emphasized the importance of examining multiple emotions, as overeating may vary in response to different emotions. They found that anger preceded a binge 42% of the time, while sadness preceded a binge only 16% of the time. Evidently, negative emotions may vary in their relationships with binge eating.

While the studies reviewed above all used clinical samples, negative affect has also been found to predict clinical and subclinical levels of binge eating among college women (Beebe, Holmbeck, Albright, & Noga, 1995; Napolitano & Himes, 2011; Tassava & Ruderman, 1999; Whiteside et al., 2007), a population at particular risk of disordered eating (Timmerman, 2006), and binge eating in particular (Lynch et al., 2000).

Napolitano and Himes (2011) found that negative affect was related to binge eating in a sample of 590 college women. Participants who met criteria for BED endorsed more negative affect (anger, worry, guilt) preceding a binge than those who endorsed binge eating but did not meet full criteria for BED. This sample had higher rates of binge eating and BED than had been found in prior research. The authors proposed two possible explanations for this. First, the higher rates of binge eating may have been due to an overestimation of "large portion size" (this is a frequent measurement error and is not defined for the participants). Second, these rates may be more accurate due to anonymous computer data collection.

Barker and Galambos (2009) found that negative affect predicted the current diagnostic symptoms of BED in 117 undergraduate women. Participants completed a daily checklist of health behaviors for 14 days. Two dichotomized variables were created with the binge eating items classifying participants as either with binge eating symptoms

(1 or more symptoms endorsed on any day) or without binge eating symptoms. Participants who reported at least one diagnostic binge eating symptom had higher than average stress levels and greater levels of negative affect than participants who did not report any binge eating. Participants who reported at least one of the behavioral binge eating symptoms had higher levels of stress, but not higher levels of negative affect than those who did not report behavioral binge eating symptoms. This finding suggests that there may have been some measurement difficulties in the form of item overlap across some of the measures used. When looking purely at binge eating behaviors (and none of the affect laden wording in the diagnostic criteria) negative affect did not predict binge eating. Barker and Galambos (2009) argued that the way binge eating is defined may confound its relationship with negative affect. However, it also may be that negative affect is interwoven into the experience of binge eating. Overeating with accompanying distress before or after, is an important diagnostic criterion for binge eating disorder. Overeating without any accompanying distress may not constitute a disorder at all.

Overall, general negative affect has been found to predict binge eating in clinical and non-clinical samples (Engelberg et al., 2007; Napolitano & Himes, 2011; Stein et al., 2007). Also, it has been shown that different types of negative emotion, particularly anger, may have more weight in predicting binge eating than others (Arnow et al., 1995). It is not yet clear how much of the variance in binge eating accounted for by negative affect is due to anger vs. other emotional states. This warrants additional study because a clear link between anger and binge eating may have implications for the prevention and treatment of binge eating.

Anger and Binge Eating

The Experience and Expression of Anger

Anger is one of the most basic emotions (Croy, Olgun, & Joraschky, 2011; Ghazinour & Richter, 2009). The experience of anger is characterized by a specific constellation of autonomic, bodily, facial, and behavioral reactions (Ghazinour & Richter, 2009; Wilkowski & Robinson, 2008), and it is generally a conscious experience that is aroused by perceived threat, injustice, or blocking of goal oriented behavior (Roseman, 1996). Anger is also characterized by distinct autonomic physiological responses. (Potegal & Stemmler, 2010).

Anger, aggression, and hostility are related but distinct constructs. However, they are often used interchangeably and confused with one another (Biaggio, Supplee, & Curtis, 1981; Spielberger & Reheiser, 2010). *Anger* is an emotional state, which consists of feelings ranging in intensity from mild irritation to intense rage. *Hostility* involves a complex set of attitudes motivating one to injure others or damage property. *Aggression* refers to behavior, often punitive or destructive, that is directed towards another person or object (Spielberger, 1999; Spielberger & Reheiser, 2010). Due to the interrelatedness of these feelings, attitudes, and behaviors they are sometimes combined and referred to as the AHA! Syndrome (anger, hostility, & aggression).

Spielberger's (1999) state-trait theory of anger has been tremendously influential in informing the study of anger. He defined state anger as a temporary emotional and physiological state involving the immediate subjective experience of angry feelings. That is, state anger refers to one's immediate moment-to-moment experience of angry feelings. Trait-anger is more akin to a stable personality trait that indicates one's likelihood of experiencing state anger (i.e., anger proneness). Individuals high in trait

anger experience state anger more frequently, more intensely, and for a longer duration than those low in trait anger (Deffenbacher et al., 1996). The concurrent and construct validity of these constructs has been supported in several studies (Deffenbacher, 1992; Spielberger, 1999; Spielberger & Reheiser, 2010).

As research into anger has progressed, it has become evident that how one controls and expresses anger plays a role in interpersonal functioning and health. The control and expression of anger has been found to affect blood pressure, heart disease, chronic pain, wound healing, cancer, stress coping, and drug use (Curtis, Kinder, Kalichman, & Spana, 1988; Johnson, Spielberger, Wordon, & Jacobs, 1987; Schlosser, 1990; Stoner, 1988; Spielberger, Krasner, & Solomon, 1988; Thomas et al., 2000).

Spielberger and colleagues (Spielberger et al., 1985; Spielberger et al., 1988; Spielberger, 1999; Spielberger & Reheiser, 2010) proposed four components of anger control and expression: anger-in, anger-out, anger control-out, and anger control-in. Anger-in is defined as the frequency with which anger is held in or suppressed. Anger-out is defined as the frequency with which anger is expressed as aggressive behavior aimed at people or objects in the environment. Anger control-out is the frequency with which an individual attempts to control the outward expression of anger. Anger control-in is the frequency with which an individual attempts to reduce the intensity of suppressed feelings of anger (Spielberger, 1999; Spielberger & Reheiser, 2010). These constructs have been supported and demonstrated clinical utility (Moses, 1992; Spielberger at al. 1985; Spielberger et al. 1998). Trait-anger is positively related to both anger suppression and the aggressive expression of anger and inversely related to anger control (Deffenbacher et al., 1996).

Anger and Health

Anger is often a healthy and adaptive emotion, leading one to express oneself or find solutions to a problem (Hosseini, Mokhberi, Mohammadpour, & Lashak, 2011; Sell, 2011). However, chronically high trait anger and repeated reliance on maladaptive forms of anger expression (i.e., anger-out or anger-in) may result in a number of adverse psychological, interpersonal and physiological consequences (Hosseini et al., 2011; Spielberger, 1999).

Trait anger has been shown to predict cardiovascular disease (Kent & Shapiro, 2009; Williams, 2010). High trait anger is more common in people with coronary heart disease (Iqbal, Ahmad, & Khan, 2003) and is positively correlated with carotid artherosclerosis (Bliel, McCaffery, Muldoon, Sutton-Tyrrell, & Manuck, 2004) and hypertension (Hosseini et al., 2011; Player, King, Mainous, & Geesey, 2007). Trait anger has also been linked to certain types of cancer (Thomas et al., 2000), chronic pain (Burns, Kubilus, & Bruehl, 2003; Fernandez, Clark, & Rudick-Davis, 1999), and stroke (Eaker, Sullivan, Kelly-Hayes, D'Agostino, & Benjamin, 2004; Williams, Nieto, Sanford, Couper, & Tyroler, 2002).

Individuals who exhibit higher levels of aggressive anger expression (i.e., anger-out) also seem to have an increased risk of death from cardiovascular events, hypertension, lower immune functioning, and higher levels of cholesterol than individuals who are less likely to express anger in this manner (Robins, Keng, Ekblad, & Brantley, 2012). Those who score high on the anger-out subscale of the State-Trait Anger Expression Inventory or State-Trait Anger Expression Inventory-2 tend to have elevated blood pressure and heart rate (Bongard & al'Absi, 2005), higher prevalence of

diabetes mellitus (Cohen, Panguluri, Na, & Whooley, 2010), higher incidence of coronary heart disease (Iqbal et al., 2003), heightened carotid atherosclerosis (Bliel et al., 2004), and a 12% increase in hypertension risk (Everson, Goldberg, Kaplan, Julkunen, & Salonen, 1998).

Anger suppression (i.e., anger-in) has also been associated with a variety of health problems. Anger-in is associated with heart problems, hypertension, headaches, depression, somatization, anxiety, and disordered eating (Hosseini et al., 2011; Koh, Kim, Kim, & Park, 2005). Higher levels of anger suppression have also been found to increase pain sensitivity in patients with both acute and chronic pain (Burns, Quartana, & Bruehl, 2007; Burns, Quartana, & Bruehl, 2011; Quartana, Bounds, Yoon, Goodin, & Burns, 2010). Cancer patients tend to report more immune dysfunction, cardiovascular symptoms, and negative coping appraisals when suppressing anger (Schlatter & Cameron, 2010). In addition, anger-in has been associated with increased risk of coronary heart disease (Iqbal et al., 2003; Low, Thurston, & Matthews, 2010) and hypertension (Everson et al., 1998; Gosh & Sharma, 1998; Hosseini et al., 2011).

Healthy anger control, which is distinct from both anger-out and anger-in, has been shown to improve health in patients with cancer and chronic pain (Burns et al. 2011; Schlatter & Cameron, 2010). Thus, dysfunctional anger expression is associated with a number of health problems while adaptive anger control appears to have some positive health-related effects.

Anger and Binge Eating

Negative affect, specifically anger and anxiety, has been shown to increase emotional eating (Pollard, Steptoe, Canaan, Davies, & Wardle, 1995). Approximately

one third of women with binge eating symptoms eat in response to negative emotions (Stice et al., 2001), most commonly anger, anxiety, and depression (Arnow at al., 1995). Thus, it should not be surprising that some studies have demonstrated a link between state anger and binge eating (e.g., Engel et al., 2007; Smyth et al., 2007). Connections between trait anger and binge eating appear to be more tentative, as few studies have examined the potential relationship in nonclinical samples. And while there is considerable evidence supporting relationships between anger expression styles and binge eating (e.g., Meyer at al., 2005; Milligan & Waller, 2000; Milligan, Waller, & Andrews, 2002), they are also primarily based on data from clinical samples.

State Anger and Binge Eating

State anger refers to the transient experience of angry feelings. Spielberger and Reheiser (2010) described it as "an emotional state that consists of feelings that vary in intensity from mild irritation or annoyance to intense fury or rage" (p. 406). State anger is commonly triggered by frustration, perceived disrespect or insult, threats to autonomy or independence, rule violations, and goal blockage. A predictive relationship between state anger and binge eating has been clearly established in studies using clinical samples of individuals diagnosed with Bulimia Nervosa (Engel et al., 2007; Smyth et al., 2007). Additionally, Milligan and Waller (2000) found that bulimic symptoms, including binge eating, were positively correlated with state anger in 83 college women.

Smyth et al. (2007) studied 131 women recruited from the community and a college campus who met criteria for Bulimia Nervosa. Participants completed daily entries on palmtop computers assessing mood, affect, stress, and bulimic behavior. State anger was assessed with the four-item anger/hostility subscale of the Profile of Mood

States. Participants entered data 6 times per day when their computer signaled them. They also recorded any time they experienced a bulimic event (binge or purge). Binge days and purge days were both lower in positive affect and higher in negative affect, hostility-anger, and stress than days without bulimic behavior. Prior to a binge, women reported increasing negative affect, anger-hostility, and stress, as well as decreasing positive affect. Following a binge, positive affect increased rapidly while negative affect decreased rapidly. Similarly stress and anger increased pre bulimic event and were reduced post event, but to a lesser extent than positive or negative affect. Overall, positive affect, negative affect, and anger-hostility were robust predictors of bingeing and purging.

Engel et al. (2007) examined anger level, instability and trajectory and trait impulsivity's effect on bulimic behaviors in 125 female participants who met *DSM-IV-TR* criteria for BN. Engel et al. (2007) used the same EMA assessment with palmtop computer data collection as that of Smyth et al., (2007). They found that antecedent state anger increased the likelihood of a binge. The authors suggested that increased levels of anger may precipitate binge eating because binge eating is an attempt to regulate this emotion.

Smyth et al. (2007) and Engel et al. (2007) provided strong evidence that increased levels of state anger precede binge eating episodes. However these are in samples that both binge and purge. The only study in the reviewed literature to find a link between state anger and nonclinical binge eating was Milligan and Waller's (2000). These three studies also indicated the importance of other variables such as emotional lability, impulsivity, and general positive and negative affect. They provide evidence that

binge eating may be acting to reduce negative affect and anger, which supports the emotion regulation models of binge eating.

Trait Anger and Binge Eating

The relationship between trait anger and binge eating is unclear. Only a few published studies have directly addressed the relationship, and most of the research to date has been conducted in clinical samples of patients diagnosed with Bulimia Nervosa. Little is known about the potential role of trait anger in predicting binge eating in nonclinical samples.

Fassino, Daga, Piero, Leombruni, and Rovera (2001) examined trait anger in a sample of 135 outpatients with one of 3 eating disorder diagnoses (Anorexia-Restricting type, Anorexia-Binge/Purge type, and Bulimia Nervosa). They also recruited a nonclinical control group of women matching the age, educational level, and socioeconomic levels of the three clinical groups. Participants completed the State-Trait Anger Expression Inventory (STAXI) along with other measures. Participants diagnosed with Bulimia had temperaments more inclined to trait anger and were more likely to express anger outwardly toward other people or objects than those in the other groups. These findings are consistent with previous research that bulimic patients tend to have low frustration tolerance, low impulse control, and greater levels of anger (Lacey, 1993).

Zeeck, Stelzer, Linster, Joos, and Hartmann (2011) compared 20 women with Binge Eating Disorder to 23 obese and 20 normal weight controls in regards to emotions, the desire to eat, and binge eating. Participants completed the Symptom-Check-List-27 (SCL-27), the Toronto Alexithymia Scale (TAS-20), the Differential Affect Scale (DAS), and the Emotional Eating Scale (EES). Overall, the BED group exhibited greater levels

of daily negative emotions in general than the obese or normal weight controls. Anger was a significant predictor of desire to eat and binge eating behavior in all three groups, but the relationships were strongest in the BED group. In fact, anger was the most frequently reported emotion preceding a binge. Zeeck et al. (2011) postulated that anger may be a particularly threatening emotion to individuals who binge eat and they may eat in an attempt to suppress or regulate this emotion in particular. Fassino, Leombruni, Piero, Abbate-Daga, and Rovera (2003) examined multiple facets of anger in 103 obese participants with and without BED. They found differences in anger expression, but not trait anger.

Penas-Lledo, de Dios Fernandez, and Waller (2004) examined bulimic pathology, anger, and impulsivity in a nonclinical sample of college men (n = 49) and women (n = 72). They used the STAXI to measure trait anger and anger expression as well as other measures of impulsivity and symptoms of disordered eating. They found a gender difference in the relationship between trait anger and binge eating. Among women, trait anger was positively correlated with binge eating. This relationship was not observed for men, among whom trait anger was associated with other internally directed impulsive behaviors (e.g., self-harm and substance abuse).

In one of the few studies to examine trait anger and binge eating in a nonclinical sample: Schneider, Appelhans, Whited, Oleski, and Pagoto (2010) investigated the effects of anxiety and anger mood induction on food intake in 61 lean and obese male and female participants. They used a memory generation technique to induce mood. Participants were prescreened for mood induction susceptibility and excluded if the exercise did not change their mood rating at least 4 points on a 10 point Likert scale.

Every participant went through 3 mood induction trials (neutral, anxious, and angry). Mood was assessed before and after the mood induction exercise to ensure that it successfully induced the desired mood, and hunger was assessed before and after the exercise. After each mood induction, participants were then left alone in a room for 20 minutes with 6 highly palatable foods and asked to sample and rate the palatability of these foods. Each participant was given 6 of 38 possible snack foods, based on earlier assessed preferences. The amount of calories consumed was calculated after the participant left the room, and participants were not aware that the study was assessing their food consumption.

The authors did not find support for their hypothesis that there would be a significant trait anger x BMI x mood induction interaction on caloric intake. They suggested that anger is related to approach motivation (i.e., seeking reward), anxiety is related to avoidance motivation (i.e., avoiding punishment), and that previous research has shown that avoidant coping strategies are associated with higher eating dysfunction (Kof & Sangani, 1997). Similarly, Milligan and Waller (2000) examined binge eating in college women. They found state anger and anger suppression to be predictive of binge eating, but not trait anger.

The research on trait anger has been mixed. Trait anger has been found to predict binge eating in bulimic patients (Fassino et al., 2001) and in full syndrome BED (Zeeck et al., 2011) and has been found to be positively correlated with binge eating in nonclinical female-only samples (Penas-Lledo et al., 2004). However trait anger has also failed to predict binge eating in obese BED samples (Fassino et al., 2003) and nonclinical samples (Milligan & Waller, 2000; Schneider et al. 2010). Of these studies, two used

nonclinical college samples and self-report data and are most similar to the current study. One study found a correlation between trait anger and binge eating (Penas-Lledo et al., 2004), and one failed to find a significant relationship between trait anger and binge eating (Milligan & Waller, 2000).

It is also interesting to note that in two of the three studies (Fassino et al., 2003; Milligan & Waller, 2000) in which a predictive relationship between trait anger and binge eating was not found, anger suppression was also measured and found to be a significant predictor. These findings suggest that trait anger may predict binge eating, except when anger suppression is included into the analyses. Perhaps the relationship between trait anger and binge eating is mediated by anger suppression. This would account for the mixed results and the well-established finding that anger suppression predicts binge eating in nonclinical samples (see below). However, this mediation model has yet to be examined in the literature.

Anger Suppression and Binge Eating

Anger suppression refers to a style of anger expression where the angry feelings are held in and not expressed (Boddeker & Stemmler, 2000; Spielberger, 1999). Research has demonstrated that anger suppression tends to be elevated in women with bingeing and purging behavior across ED diagnoses (Meyer, Leung, Barry, & de Fao, 2005; Milligan et al., 2002). A link between anger suppression and binge eating in nonclinical samples has also been established (Milligan & Waller, 2000).

Waller and colleagues (2003) examined the role of anger in women with eating disorders. They collected data from 140 women with a diagnosis of Anorexia Nervosa or Bulimia Nervosa and 50 control women recruited from a college campus. Waller et al.

(2003) found that women with eating disorders had higher levels of state anger and anger suppression than normal controls. Women with BN had the highest levels of both. They concluded that state anger and anger suppression must play an important role in the maintenance of eating disorders, specifically BN.

Fassino et al. (2003) examined mood, eating attitudes, and anger in obese women with and without binge eating disorder. They compared two clinical obese groups to a control group. The study consisted of 103 obese patients recruited from a university psychiatric clinic. Fifty-one of these obese patients met criteria for Binge Eating Disorder (BED group) and 52 did not (non-BED group). Ninety-three control group subjects were recruited from a nonclinical population, matching the clinical groups in age and socioeconomic status. They found differences in anger expression between groups. The BED group had higher levels of outward anger expression than controls and then the non-BED group. The tendency of the BED group to "impulsively" express anger outward was the "strongest discriminating element between the two groups of obese patients." Interestingly, Fassino et al. (2003) also found that the impulse to binge (as measured by the Bulimia scale of the EDI-2) correlated with state anger for the BED group and with anger suppression for the non-BED group. This finding suggests that clinical BED is more similar to Bulimia Nervosa, as impulse to binge in BN is also highly correlated with state anger (Fassino et al., 2003; Smyth et al., 2007). It also indicates that subclinical binge eating, which is likely present in obese individuals without a diagnosis of BED who experience a strong impulse to binge, correlates with anger suppression.

Meyer et al. (2005) examined gender differences in bulimic pathology (bingeing and purging) and anger in a college sample of 125 men and 125 women. Regression analyses found that while there was an overall effect of anger predicting bulimic pathology for both women and men, important gender differences emerged in the pattern of predictors. Anger suppression was the only significant predictor of bulimic symptoms in women; state anger was the only significant predictor in men. The authors concluded that there are clear gender differences in bulimic pathology and an interaction between anger subscales and bulimic pathology, even though there are not clear gender differences in anger levels. It seems that men engage in bingeing and purging in response to immediate, state anger to alleviate the negative emotion. Women may use bingeing and purging to reduce the likelihood of experiencing the emotion at all (suppressing the emotion before it can surface).

Using a nonclinical sample of college women, Milligan and Waller (2000) found that anger suppression was positively related to bulimic symptoms, including binge eating. Compared with women who did not report bingeing, those who did had higher levels of anger suppression. The authors posited that different bulimic behaviors may serve different functions and that binge eating may allow individuals to avoid experiencing anger altogether (suppression). While this study was fairly basic, it was able to show what has been implied in the literature for years: disordered eating seems to be a way to deal with, regulate, or avoid emotions (Heatherton & Baumeister, 1991; Macht, 2008). It also illustrated that different facets of anger are related to different facets of bulimic pathology, creating a much more complex picture.

Connolly, Rieger, and Caterson (2007) examined 140 first year college students. They used an all female sample due to previous research highlighting gender differences in bulimic pathology (Meyer et al., 2005). Participants completed the Binge Eating Scale (BES), Eating Disorders Examination-Questionnaire (EDE-Q), STAXI-2 Anger In subscale, Behavioral Anger Response Questionnaire (BARQ) and the Neuroticism scale from the NEO Personality Inventory- Revised (NEO PI-R). They found a positive correlation between STAXI-2 anger-in (anger suppression) and BES scores; however, this was not found with anger-in and the EDE-Q. This may illustrate that the BES is more sensitive in nonclinical samples. A similar pattern was found with BARQ subscales.

In sum, state anger predicts binge eating in clinical and nonclinical samples (Engel et al., 2007; Milligan & Waller, 2000; Smyth et al., 2007); trait anger predicts binge eating in clinical and nonclinical samples (Penas-Lledo et al., 2004; Zeeck et al., 2011), but not when anger suppression is included in prediction analyses (Milligan & Waller 2000); and anger suppression predicts binge eating in nonclinical samples (Fassino et al., 2003; Meyer et al., 2005). Previous literature has found that negative affect also predicts binge eating (Engelberg et al., 2007; Napolitano & Himes, 2011; Stein et al., 2007). It appears that while the various facets of anger and anger expression play an important role in nonclinical binge eating, these variables likely interact with one another and other variables in a complex way. Based on the literature reviewed above, it is proposed that while trait anger and anger suppression predict binge eating, the relationship between trait anger and binge eating may be mediated by anger suppression.

Emotion Regulation

Increasing attention is being paid to the role of emotion regulation in psychopathology and maladaptive behavior. Linehan's (1993) work has focused on emotion dysregulation as a central feature of Borderline Personality Disorder, and deliberate self-harm and violence towards others have both been linked to emotion dysregulation (Gratz, 2003; Jakupcak, Lisak, & Roemer, 2002). Despite the utility of the construct, there is a great deal of inconsistency in the literature regarding the definition and assessment of emotion regulation. The definition of emotion regulation that has been generally accepted involves four dimensions: awareness and understanding of emotions, acceptance of emotions, ability to control impulsive behavior and continue goal-directed behavior in the presence of negative emotions, and the ability to modulate emotional responses to be appropriate in the given situation (Cole, Michael, & Teti, 1994; Linehan, 1993; Thompson & Calkins, 1996; Melnick & Hinshaw, 2000; Gratz & Roemer, 2004).

However, after a thorough review of the literature, Gratz and Roemer (2004) proposed a comprehensive definition of emotion regulation, which they then confirmed via factor analysis. It has since been validated in multiple studies (Neumann, van Lier, Gratz, & Koot, 2010; Salsman & Linehan, 2012). In Gratz and Roemer's conceptualization (2004), the complex construct of emotion regulation was expanded from four factors to six: nonacceptance of emotional responses, difficulties in goal-directed behavior, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity.

Emotion regulation theories propose that binge eating is a maladaptive emotion regulation strategy (Evers et al., 2010). The threat or presence of a negative emotional experience in combination with a deficiency in adaptive emotion regulation skills leads to

binge eating, which promotes distraction from or a dampening of the distressing emotion (Wiser & Telch, 1999). Binge eating may function as a negative reinforcer, temporarily relieving the negative emotion state (Heatherton & Baumeister, 1991; Wiser & Telch, 1999). Negative emotions are the most cited reason for binge eating (Wiser & Telch, 1999). Greeno, Wing, and Shiffman (2000) found that at least 50% of binges were affect driven. Binge eating may act as a dysfunctional, emotion-focused coping mechanism, as binge eaters tend to lack other coping strategies (Wiser & Telch, 1999).

Emotion Regulation in Clinical Eating Disorder Samples

Emotion regulation models have received ample support in the clinical research. A relationship between binge eating and precipitating negative emotions is well established (Arnow et al., 1992; Clyne, Latner, Gleaves, & Blampied, 2010; Fairburn, Cooper, & Shafran, 2003). The literature also indicates that individuals with eating disorders have fewer coping strategies and tend to use more maladaptive and emotion-focused strategies than healthy controls (Bybee, Zigler, Berliner, & Mersica, 1996; Hawkins & Clement, 1984; Koo-Loeb, Pederson, & Girdler, 1998).

Sim and Zeman (2006) found that adolescent girls with higher levels of disordered eating reported higher levels of negative affect, difficulties with emotional awareness, and difficulty coping with negative emotions in a constructive way. Smyth et al. (2007) found that increased negative affect and anger/hostility reliably predicted bingeing and purging in women diagnosed with Bulimia Nervosa. They also found that positive affect increased and negative affect and anger/hostility decreased after bingeing and purging, providing further evidence that bingeing and purging may serve to regulate emotions. Munsch, Meyer, Quartier, and Wilhelm (2012) found that binge eating was

triggered by a breakdown in emotion regulation in women with BED. However, they did not find evidence of accumulation of negative affect and then reinforcement from mood improvement, as seen in bulimic samples with bingeing and purging.

Most explanatory models of BED have come from models of bulimia (Munsch et al., 2012). It is possible that the two disorders share the difficulties in emotion regulation but that bingeing alone does not provide the significant change in affect that bingeing and purging in combination seem to cause. Svaldi, Caffier, and Tuschen-Caffier's (2010) results indicated that emotion regulation difficulties were found in all eating disorder diagnoses (Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder), with no significant differences. They also found evidence of a path from negative emotions to binge eating.

Wiser and Telch (1999) proposed that one way to test the Emotion Regulation Model (also called the Affect Driven model) would be with Dialectical Behavior Therapy (DBT). DBT focuses on increasing emotion regulation skills and would theoretically decrease binge eating if this model were correct. Safer, Telch, and Agras (2001) used DBT adapted for BN to test this hypothesis. They found that DBT treatment decreased bingeing and purging behavior in a bulimic sample versus a wait list control group. Similarly, Clyne at al. (2010) examined 23 women with sub threshold and full syndrome BED. Based on the hypothesis that binge eating is a result of emotion dysregulation, they taught their participants emotion regulation skills. Binge abstinence rates of 78% at post-treatment and 87% at one year were comparable to other empirically supported treatments for Binge Eating Disorder. These results supported the perspective that emotion regulation is an important component of binge eating pathology.

In summary, bingeing and purging in participants with Bulimia Nervosa are often preceded by increased negative affect and anger and followed by a decrease in negative affect and anger (Smyth et al. 2007). The idea that bingeing (without purging) may also alleviate negative emotion and be negatively reinforcing was proposed by Heatherton and Baumeister (1991). Negative affect has been shown to predict binge eating (Stice, Presnell, & Spangler, 2002), but a reduction in negative affect post-binge has not been found in clinical samples (Munsch et al., 2012). However, while bingeing may not seem to alleviate negative affect as dramatically in BED as in BN, there is evidence that problems in emotion regulation contribute to binge eating (Wiser & Telch, 1999). It is just unclear what mechanism is reinforcing this behavior.

Emotion Regulation in Nonclinical Bulimic and Binge Eating Symptomology

Problems with tolerating and regulating negative emotions have been linked to bulimic and binge eating symptomology in nonclinical samples as well. Selby, Anestis, Bender, and Joiner (2009) and Selby, Ward, and Joiner (2010) found a direct link from emotion dysregulation to dysregulated eating behavior (i.e., bingeing and purging) in male and female college students. Anestis, Selby, Fink, and Joiner (2007) found that distress tolerance predicted bulimic symptoms, even when controlling for depression, anxiety, and impulsivity.

Meyer and colleagues (2010) examined attitudes towards emotion expression and eating disorder pathology in a nonclinical sample of 89 young women recruited from the community and a local college. They found that women with higher levels of eating disorder pathology (including bingeing, purging, restricting, and over-concern with shape and weight) were more likely to believe that displaying emotion was sign of weakness

and believe they should keep their emotions under tight control to avoid negative consequences than women with lower levels of eating pathology. Meyer and colleagues (2010) proposed that attitudes prohibiting emotional expression may contribute to eating pathology.

Emotion regulation problems have been found to precede binge eating in nonclinical populations (Buckholdt, Parra, & Jobe-Shields, 2010; Evers et al., 2010; Whiteside et al., 2007). However, the applicability of the emotion regulation theories of binge eating have been called into question due to some results indicating a lack of emotional relief post-binge (Haedt-Matt & Keel, 2011).

Buckholdt et al. (2010) examined the role of parental emotion magnification, emotion dysregulation, and disordered eating in 118 college students. They found that difficulties regulating emotions partially mediated the relationship between parental magnification of emotions and current binge eating. Parental magnification of emotion is beyond the scope of this paper; however, the authors' finding that emotion dysregulation predicted binge eating in a college sample is relevant. Whiteside at al. (2007) found that problems with emotion regulation were responsible for a significant amount of variance in binge eating in college undergraduates, over and above gender, food restriction, and over-evaluation of shape and weight. Specifically, problems with identifying and making sense of emotions and limited emotion regulation strategies were predictive of binge eating. These results support a model of sensitivity to emotional states and a deficit in ability to modulate negative emotions as predictors of binge eating.

Evers and colleagues (2010) experimentally induced sadness in college women across three studies. They found that individual differences in emotion regulation

strategies affected food intake. Women who used more emotion suppression consumed more food after mood induction than women who did not use this strategy as often. When the participants were told to suppress emotion purposefully, they ate more food than participants told to reappraise emotions. Lastly, Evers and colleagues (2010) found that participants told to suppress their emotions also ate more food than those told to spontaneously express their emotions.

Haedt-Matt and Keel (2011) performed a meta-analysis on 36 studies ($N = 968$) using Ecological Momentary Assessment (EMA) to examine the role of emotion regulation in binge eating. EMA involves the use of diaries or handheld computers used daily by participants to assess momentary ratings through repeated assessments over time. This model is particularly well suited for examining temporal antecedents and consequences of binge eating. Haedt-Matt and Keel (2011) found that negative affect did increase prior to binge eating; however, they did not find that negative affect was reduced after binge eating. They argued against an emotion regulation model of binge eating on this basis. However, it is also possible that their results indicate support for trade off theory, an emotion regulation theory which proposes that binge eating does not alleviate negative affect, but it trades one particular affect deemed "intolerable" for another negative affect which is deemed more manageable by the individual (Polivy & Herman, 1999).

In nonclinical samples, problems with emotion regulation have been linked to bulimic symptoms (Selby et al., 2009; Selby et al., 2010) and binge eating alone (Buckholdt et al., 2010; Evers et al., 2010; Whiteside et al. 2007). The literature supports a relationship between emotion regulation difficulty and binge eating. However, Haedt-

Matt and Keel (2011) call the emotion regulation theories often used to explain this relationship into question. There is no evidence that binge eating is serving to alleviate negative emotion. This could be due to emotion regulation theories not adequately explaining the phenomenon of binge eating; binge eating being used in an effort to reduce negative emotion, but is essentially a coping mechanism that does not work; or the negative affect may not be alleviated, but it may be attributed to binge eating as opposed to the original stressor, such as in trade off theory (Polivy & Herman, 1999). It is clear that emotion dysregulation precedes binge eating (Evers et al., 2010; Haedt-Matt & Keel, 2011). It is less clear why this relationship occurs.

Emotion Regulation as a Mediator

While the theoretical explanation for the relationship between emotion regulation and binge eating may be unclear, the relationship has been consistently reported (Selby et al., 2009; Whiteside et al., 2007). It has also been reported that certain negative emotions (e.g., anger, shame) and negative affect in general precede binge eating (Gupta, Rosenthal, Mancini, Cheavens, & Lynch, 2008; Svaldi et al., 2010). A few studies have started to examine the possible mediating effect emotion regulation may have on the relationship between negative emotions and binge eating.

Gupta at al. (2008) investigated eating disorder symptoms, shame, and emotion regulation in 154 undergraduate women. Shame predicted disordered eating above and beyond negative affect. Difficulty regulating emotion mediated the relationship between shame and disordered eating (i.e., low emotion regulation strengthened the relationship between shame and disordered eating). The authors suggested that learning emotion regulation skills may be a potent intervention for reducing disordered eating.

Svaldi and colleagues (2010) examined 27 women with BED and 25 healthy controls. All participants watched 3 sadness-inducing film clips with different instructions for each: watch the clip, watch the clip and suppress emotion, watch the clip and reappraise upcoming emotions. They found an interaction between experimental group (BED or control) and instruction (watch clip, suppress emotions, or reappraise emotions). For the BED group, just watching the clip or suppressing emotions led to an increase in desire to binge, while reappraising their emotions did not. The control group did not vary in desire to binge regardless of instructions. It appears that the emotion regulation strategy used, or not used, mediated the relationship between negative affect and the desire to binge in the BED group.

There is ample evidence that difficulties in emotion regulation contribute in some part to binge eating (Selby et al., 2009; Whiteside et al., 2007; Wiser & Telch, 1999). Also, as discussed previously, there is evidence that suppressing anger contributes to binge eating (Meyer et al., 2005; Milligan & Waller, 2000). Two studies reported that emotion regulation mediated the relationship between negative affect (shame and general negative affect) and bingeing (Gupta et al., 2008; Svaldi et al., 2010). While they did not examine anger suppression directly, they did examine emotion suppression in general. Emotion suppression is a common maladaptive emotion regulation strategy. Based on the role of negative affect (Napolitano & Himes, 2011) and trait anger (Fassino et al., 2003) in binge eating, it seems beneficial to examine the possibility that emotion regulation mediates the relationships between trait anger and binge eating.

Impulsivity

Impulsivity

Impulsivity is typically conceptualized as a personality trait associated with the lack of planning, rash action, and a lack of behavioral control (Whiteside & Lynam, 2001). Trait impulsivity is associated with several problematic behaviors, including substance abuse and disordered eating (Fischer, Settles, Collins, Gunn, & Smith, 2012; Nassar, Gluck, & Geliebter, 2004).

The manner in which impulsivity has been operationally defined and measured in the literature has been somewhat inconsistent. Impulsivity is generally recognized as being a multidimensional construct; however, 2, 3, and 4-factor models have been proposed and testing using different measures. The disagreement regarding the factor structure of impulsivity may largely be due to the abundance of impulsivity measures and the fact that each measure seems to point to a differing factor structure.

Patton, Stanford, and Barratt (1995) defined impulsivity using Barratt Impulsiveness Scale (BIS) a 3-factors model, including attention, motor, and non-planning components. Attention impulsivity was defined as lack of focus on current tasks and intrusive thoughts. Motor impulsivity involved acting without thinking. Non-planning was defined as a present orientation and lack of future focus. This 3-factor model was supported by Stanford et al. (2009) and appears to be one of the most common conceptualizations of impulsivity found in the research literature (Brownstone, et al., 2013; Carlson, Johnson, & Jacobs, 2010; Culbert & Klump, 2005; Galanti, Gluck, & Geliebter, 2007; Rosval et al., 2006).

However, the three factor structure has been disconfirmed more often than it has been confirmed. Multiple studies tested and failed to confirm the 3-factor model, using the BIS, Eyesneck Impulsiveness Scale, and the Dickman Impulsiveness Scale (e.g.,

Haden & Shiva, 2009; Ireland & Archer, 2008), instead supporting a 2-factor model or even the possibility that impulsiveness might be a undimensional construct. Moreover, even those studies supporting two-factor models have not agreed on the nature of the two factors. Some have found support for a 2-factor model including (1) the inability to wait for reward and (2) a rapid response style (Haden & Shiva, 2009; Swann, Bjork, Moeller, & Dougherty, 2009). Eysenck and Eysenck (1985) found support for a model including (1) impulsiveness and (2) venturesomness. Dickman (1990) supported a model including (1) dysfunctional and (2) functional impulsivity.

Miller, Joseph, and Tudway (2004) conducted a principal components analysis of multiple measures of impulsivity (i.e., the Eysenck Impulsiveness Scale, the Dickman Impulsiveness Scale, Barratt's Impulsiveness Scale, and BIS/BAS scales) and found support for a 3-factor structure: non-planning/dysfunctional, functional/venturesomness, and reward response/drive. The first two factors corresponded with Dickman's (1990) and Eysenck and Eysenck (1985) 2-factor models. However, the authors suggested that it was unclear whether these scales adequately assessed the third factor and that it may be premature to consider the reward response/drive as a component of impulsivity (Miller, Joseph, & Tudway, 2004).

Due to the lack of consensus regarding the factor structure of impulsivity, a newer measure, the UPPS (urgency, premeditation, perseverance, and sensation seeking) Impulsivity Scale has gained popularity. It is based on Whiteside and Lynam's (2001) 4-factor model of impulsivity consisting of: urgency, premeditation (lack of), perseverance (lack of), and sensation seeking. *Urgency* is the tendency to act rashly when experiencing negative affect and is likely the impetus of impulsive behavior aimed at

relieving emotional distress. The *premeditation* (low) component of impulsivity refers to the tendency to act without planning or regard for consequences of one's behavior. *Perseverance* (low) is the inability to sustain attention, especially when uninterested or fatigued. Lastly, *sensation seeking* refers to a preference for risky or exciting behaviors (Magid & Colder, 2007). This 4-factor structure has been well supported in the literature (Lynam & Miller, 2004; Whiteside & Lynam, 2001) and confirmed in a college student sample by Magid and Colder (2007). Moreover, Magid and Colder (2007) found that the four factors were differentially related to different behaviors (e.g. alcohol use). The factors most commonly associated with bingeing and purging in bulimic samples are urgency and lack of premeditation (Peterson & Fischer, 2012; Whiteside & Lynman, 2001). In college samples, urgency is the only factor that has been found to predict binge eating (Davis & Fischer, 2013; Fischer, Peterson, & McCarthy, 2013).

Researchers continue to measure impulsivity with different instruments and using different models of the construct. The UPPS is one of the newer measures of impulsiveness available and has been supported by the preponderance of studies that have included it. Although the UPPS was included in this study, its factor structure was confirmed as an initial step.

Eating Disorders and Impulsivity

A relationship between impulsivity and eating disorders is well documented; however, the nature of this relationship appears to be somewhat different depending on the specific eating disorder diagnosis or subtype. Some studies have shown that a key difference between AN and BN may involve level of impulsivity, with bulimic patients exhibiting high levels of impulsivity and anorexic patients exhibiting high levels of

impulse control (Brewerton et al., 1995; Fahy & Eisler, 1993; Podar, Hannus, & Allik, 1999). Additionally, binge eating and purging subtypes of Eating Disorders have been associated with impulsive and disinhibited personality features, while restricting subtypes are associated with more restrictive and controlled personality traits (Anderluch, Tchanturia, Rabe-Hesketh, & Treasure, 2003; Strober, Freeman, Lampert, & Diamond, 2007; Wagner et al., 2006). This makes sense given that part of the classification of a binge in *DSM-5* involves a lack of control (American Psychiatric Association, 2013. Individuals diagnosed with Bulimia also tend to show lack of impulse control in other areas: alcohol and drug abuse, self-harm, sexual behavior, and shoplifting (Rosval et al., 2006). Due to shared symptomology (e.g. binge eating) this lack of control may also be present in Binge Eating Disorder. However, there is a lack of research in this area.

Scherr, Ferraro, and Weatherly (2010) found that women at high risk for developing eating disorders had higher levels of impulsive behavior or urgency. Moreover, impulsivity is generally higher in eating disorder groups than normal groups, even though there is variability across diagnostic categories. Lyke and Spinella (2003) examined impulsivity and three factors of eating (cognitive restraint, disinhibition, and hunger) in a sample of 112 community adults. They found small positive correlations between eating disinhibition and impulsivity.

Elevated impulsivity has also been reported in bulimic and BED samples (Raymond et al., 1999; Nassar et al., 2004), but substantially less research has been done with BED. Multiple studies have implicated impulsivity in the maintenance of bulimic symptoms (Anestis et al., 2007; Engel et al., 2005; Fahy & Eisler, 1993; Sullivan, Bulik, & Kendler, 1998). Engel et al. (2005) examined a mixed clinical, subclinical, and

healthy sample of 244 females. They found that participants with Bulimia Nervosa had higher scores on impulsivity than non-eating disordered participants (Engel et al., 2005). Wolfe et al. (1994) found that women with BN scored significantly higher on impulsivity scales than normal controls. Specifically, the urgency facet of impulsivity has been linked with binge eating symptoms (Fischer, Anderson, & Smith, 2004) and bulimic symptoms (Fischer, Smith, & Anderson, 2003).

Bulimia Nervosa Comorbidity: Impulsivity as Third Variable

Bulimia Nervosa and binge eating are highly comorbid with Attention Deficit-Hyperactivity Disorder (ADHD), risky sexual behavior, and substance use disorders (Cortese, Bernadina, & Mouren, 2007; Culbert & Klump, 2005; Fischer et al., 2012). All four disorders involve some level of impulsivity, and there is mounting evidence that impulsivity may be the underlying factor connecting these disorders (Culbert & Klump, 2005).

ADHD is a pervasive and developmentally inappropriate cluster of symptoms of inattention and/or impulsivity-hyperactivity (American Psychiatric Association, 2013; Cortese, Bernadina, & Mouren, 2007). It is important to note that ADHD, as disorder marked by impulsivity, has been shown to be related to binge eating (Cortese, Bernardina, & Mouren, 2007).

Neumark- Sztainer, Story, Resnick, Garwick, and Blum (1995) examined 2149 adolescents with chronic disorders and 1371 adolescents without chronic disorders. They found that participants with ADHD were more likely to binge eat than control participants. Similarly, Mattos et al. (2004) examined 86 adults with ADHD and found that 8.3% of them had BED. This is substantially greater than the 2.6% usually found in

the general population. Surman, Randall, and Biederman (2006) analyzed data from 600 participants with ADHD and 664 controls (adults and children) and found greater rates of BN in women with ADHD, but not in children or men. Davis, Levitan, Smith, Tweed, and Curtis (2006) analyzed data from 110 women (general population) and found that childhood ADHD symptoms predicted adulthood abnormal eating behaviors, including binge eating.

Davis et al. (2009) and Kaplan, Howlett, Yilmaz, and Levitan (2009) also found significant relationships between ADHD and binge eating in BED and BN. The symptoms of inattentiveness and impulsivity present in ADHD may play a role in the urges and impulsive behavior involved in binge eating. Kaplan et al. (2009) proposed that abnormalities in the dopamine transport system may be a shared genetic predisposition for both ADHD and binge eating. Davis et al. (2009) found that the D3 receptor abnormalities, which are thought to be largely responsible for hyperactive and impulsive symptoms of ADHD, are also present in obese individuals with binge eating.

Lastly, Sokol, Gray, Goldstein, and Kaye (1999) found that bulimic women have significantly more current and childhood symptoms of ADHD than normal controls. There is more evidence that binge eating occurs at a greater frequency in ADHD populations than there is that ADHD is more prevalent in binge eating populations. This area has less research. The limited research on this subject, however, does indicate the possibility of comorbidity among these disorders. This could be due to a causal relationship between the two or a third neurobiological or psychological variable that the two disorders share. This variable may be a propensity towards impulsivity (Cortese, Bernadina, & Mouren, 2007).

It has been suggested that the correlation often reported between bulimia nervosa and risky sexual behaviors may be explained by a common trait of increased impulsivity (Cooper, Wood, Orcutt, & Albino, 2003; Culbert & Klump, 2005; Irving, McCluskey-Fawcett, & Thissen, 1990; Katiala-Heino, Rissanen, Rimpelae, & Rantanen, 2003; Penas-Lledo, Vaz, Ramos, & Waller, 2002; Wiederman, 1996). In the first published study to investigate this possibility, Culbert and Klump (2005) examined the relationship between impulsivity, sexual behaviors, and disordered eating among 500 mostly White (83.2%) undergraduate women who had not pre-screened for eating disorders. Participants completed the Binge Eating (BE) and Compensatory Behavior (CB) subscales of the Minnesota Eating Behavior Survey (MEBS), the Barratt Impulsiveness Scale (BIS-11), and the four subscales of the Human Sexuality Questionnaire (HSQ): Heterosexual Experience, Homosexual Experience, Number of Heterosexual Partners, Number of Homosexual Partners. They found that impulsivity was positively correlated with BE, CB, heterosexual experience, and number of heterosexual partners. BE was not correlated with any of the sexual scales; however, CB was positively correlated with heterosexual experience, number of heterosexual partners, and number of homosexual partners. Partial correlations used to control for impulsivity were not significant, suggesting that the relationships between disordered eating and sexual behavior may be at least partially due to impulsivity. Culbert and Klump (2005) suggested that low levels of serotonin may lead to increased impulsivity, which in turn leads to bulimic behaviors and risky sexual behaviors.

Some have also suggested that the relationship between substance abuse and eating disorders may be explained by impulsivity, as an underlying shared correlate.

Eating disorders and substance use disorders are also often comorbid. Fischer et al. (2012) explained common hypotheses for this comorbidity. One hypothesis proposes that higher levels of impulsivity may be the link between the two disorders (Kane, Loxton, Staiger, & Dawe, 2004). The other proposes that emotion dysregulation is a precursor to both disorders (Engel et al., 2007). Negative urgency, or the tendency to act rashly in response to negative affect, is a form of impulsivity (usually one of four factors). When one is high in negative urgency, one's main emotion regulation tool is acting impulsively (e.g., binge eating, drinking, cutting) (Whiteside & Lynam, 2001). Negative urgency accounts for significant variance in eating disorders, including BN, (Anestis, Smith, Fink & Joiner, 2009; Fischer, Smith, & Cyders, 2008) and substance abuse (Verdejo-Garcia, Bechara, Recknor, & Perez-Garcia, 2007; Gunn & Smith, 2010).

Fischer et al. (2012) recruited 104 women from the community and eating disorder and substance use disorder (SUD) treatment centers. Participants were divided into four groups: substance abuse only (n = 31), eating disorder only (n = 40), both/comorbid (n = 19), or none/control (n = 14). They used the Structured Clinical Interview for DSM-IV Disorders (SCID) and Eating Disorder Evaluation (EDE) to classify groups; however, there were 5 women in the SUD only group with comorbid EDs that met criteria for ED NOS (it is unclear why they were not included in the comorbid group). Similarly, 14 women in the ED only group met criteria for substance abuse or dependence but were not included in the comorbid group because "substance misuse had occurred after the onset of the eating disorder symptoms." Fischer et al. (2012) did not provide an explanation as to why timing of disorder onset affected group

placement. The lack of stringent grouping criteria is a serious limitation of the study. However, the study illustrates the highly comorbid nature of SUDs and EDs.

Participants filled out the UPPS-R measure of impulsivity, the Alcohol Expectancy Questionnaire (AEQ), the Eating Expectancy Inventory (EEI), and the Thinness and Restricting Inventory (TREI). An analysis of variance (ANOVA) was used to compare groups on 4 subscales of impulsivity, eating and thinness expectancies, and alcohol expectancies. The three disordered groups scored higher on negative urgency (a subscale of UPPS-R) than the control group, but there were no significant differences between the ED, SUD, and comorbid groups. There were no differences between groups in lack of persistence or sensation seeking either. However, the three disordered groups had significantly lower levels of deliberation (or pre-planning) than the control group. There were no significant differences between the disordered groups. Fischer et al. (2012) concluded that certain factors of impulsivity, specifically negative urgency and lack of deliberation, are common traits among both substance use and eating disorders. They inferred that since impulsivity is a personality trait, that it likely precedes these disorders and may be a vulnerability that predisposes people to develop these disorders.

In summary, ADHD, risky sexual behavior, and substance use disorders are all correlated with Bulimia Nervosa. It has been suggested that these relationships may exist, at least in part, due to the underlying variable of impulsivity. The majority of research on impulsivity and eating disorders has been done with BN. Since BN includes both bingeing and purging behavior, it is possible that a similar relationship with binge eating alone and these other impulsivity driven behaviors exists. As will be presented in the next sections, BN and BED seem to follow similar patterns in their relationship with

impulsivity. Before additional exploration into the third variable status of impulsivity in the relationship between binge eating and ADHD, sexual behavior, and SUDs can be conducted, it needs to be confirmed that binge eating is predicted by impulsivity in the same way as bulimia nervosa.

Impulsivity in Clinical and Subthreshold Bulimia Nervosa

Multiple studies support a relationship between impulsivity and Bulimia Nervosa (Brownstone et al., 2013; Lock, Garrett, Beenhakker, & Reiss, 2011; Rosval et al., 2006). The most recent and noteworthy of these studies are outlined below.

Lock, Garrett, Beenhacker, and Reiss (2011) examined fMRIs of adolescent girls to examine biological evidence of differences in inhibitory control between disordered eating groups. Their sample included 13 girls exhibiting bingeing and purging behaviors, 14 girls exhibiting restricting behavior, and 13 healthy comparisons. Their results indicated preliminary evidence that eating disorder subtypes may be distinguished by "neural correlates of inhibitory control," which is consistent with subgroup differences in impulsivity. The binge-purge group showed more activation in the right dorsolateral prefrontal cortex, which is partly responsible for executive functioning (i.e., planning, delaying gratification, and controlling behavior). The authors suggested that this difference in brain activation is indicative of a deficit of compensatory action in the binge-purge group, which means that the binge-purge group has a natural deficit in inhibitory control such that their brains must "work harder" to refrain from impulsive behavior. They also noted greater activation of the hypothalamus in the binge-purge group during a concentration

task. Because the hypothalamus is largely responsible for emotional processing, Lock et al. (2011) proposed that members of this group may have experienced more stress during this task. Restrictors did not show any difference from controls neurologically. Due to the young age and relative health of this sample, the researchers interpreted their results as suggesting that these neurological differences were present before the disordered eating patterns developed, as opposed to being a product of the different disorders.

Fischer et al. (2003) examined two facets of impulsivity, lack of planning and urgency, in 291 undergraduate women, of whom 25% reported bingeing and/or purging behavior. They found that lack of planning was not associated with bulimic symptoms but that urgency (i.e., the predisposition to act immediately when experiencing negative emotions) was positively correlated with bulimic symptoms. Similar results were found in another study by Fischer and Smith (2008), which also showed that urgency predicted binge eating among college women.

Using a clinical sample, Rosval et al. (2006) examined 114 women with an eating disorder diagnosis. Seventy-nine women were diagnosed with BN, 17 were diagnosed with AN-BP, and 14 were diagnosed with AN-R. Fifty-nine women of comparable age with no ED diagnoses were recruited as normal controls. Participants completed the EDE structured interview, the Barratt Impulsivity Scale (BIS-11), the stimulus seeking subscale of the Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ), and a Go/No-Go task. The Go/No-Go task is a computerized measure of response

inhibition and disinhibition designed to assess behavioral impulsivity. Patients have to choose whether the screen presents "correct" or "incorrect" responses based on a pattern. Participants are rewarded and punished with small monetary amounts for choosing correctly. Errors in which the wrong button is pushed (as opposed to not picking and running out of time or picking the correct button) indicate a failure to inhibit impulsive responding. The measure has been correlated with other measures of impulsivity.

Rosval et al. (2006) found significant group differences on the three measures using a one-way ANOVA. All ED groups scored higher on the BIS attention scale than the control group. The bingeing groups (BN and AN-B) scored higher on the BIS motor impulsivity scale than the control and AN-R groups, indicating greater behavioral impulsivity. The BN group and normal group scored higher on BIS non-planning than both AN groups. The BN group scored higher on the total BIS score than AN-R and normal control. AN-B fell in the middle and was not significantly different from any of the other groups. The bingeing groups (BN and AN-B) scores higher on stimulus seeking than the control group. The bingeing groups also had greater response disinhibition than AN-R or control group. The bingeing groups (BN and AN-B) had higher levels of motor (or behavioral) impulsivity, stimulus seeking, and response disinhibition. Interestingly, they were not associated with cognitive forms of impulsivity such as risk-taking attitudes or recklessness. It seems that different ED diagnoses are related to different facets of impulsivity. Rosval et al. (2006) did screen their control group for all Axis I conditions. While this decreased confounds, it also

may have created a “super-normal” control group that could have inflated differences between the overly normal control group and the eating disorder groups.

Brownstone et al. (2013) examined the different clinical correlates of objective binge episodes (OBEs) and subjective binge episodes (SBEs) in women with bulimic pathology to determine if these are distinct and clinically meaningful constructs. OBEs are episodes in which an objectively large amount of food (e.g., greater than 2000 calories) is consumed in a 2-hour period or less and a sense of loss of control is reported. Previous studies have found that 12.2% of the general female population meets criteria for OBEs (Kinzl, Traweger, Trefalt, Mangweth, & Biebl, 1999) and 49% of college men and women have met criteria for OBEs at some point in their life (Katzman, Wolchik, & Braver, 1984). SBEs are episodes in which the participant reports the amount of food to be large, but the amount of food is not considered objectively large enough to constitute an official binge. SBEs are more common than OBEs (Luce, Crowther, & Pole, 2008).

Brownstone et al. (2013) analyzed a clinical sample of 204 women with full or sub-threshold Bulimia Nervosa. Participants completed the Eating Disorder Examination Questionnaire (EDE-Q); Spielberger Trait Anxiety Inventory (STAI); Inventory for Depressive Symptomology- Self-Report (IDS-SR); the Dimensional Assessment of Personality Problems-Basic Questionnaire (DAPP-BQ) subscales of cognitive distortion, social avoidance, affective lability, and insecure attachment; and the Barratt Impulsivity Scale (BIS-11) which has 3 subscales: motor, non-planning, and attention.

Brownstone et al. (2013) examined differences between the OBE and SBE groups using MANOVA and ANOVA. They also examined OBEs and SBEs as continuous variables and used frequency of both as independent variables in multiple regressions. When comparing OBE and SBE groups, no significant differences were found for eating disorder pathology or negative affect. Impulsivity, specifically attentional impulsivity was significantly greater in the SBE group. It is interesting that SBEs, and not OBEs, were related to impulsivity. It may be the personal attribution of an eating episode as a binge (whether distorted or accurate) is more important when considering the nature and treatment of EDs than the objective size of the binge. The items measuring attentional impulsivity related to task focus and intrusive or racing thoughts. Brownstone et al. (2013) speculated that the SBEs group's higher levels of attentional impulsivity might be related to intrusive, distracting, and upsetting thoughts about consuming too much food. It may be that the subjective binge leads to attentional impulsivity (in the form of intrusive thoughts) as apposed to impulsivity in general leading to binge eating. It is also possible that attentional impulsivity leads to SBEs. Brownstone et al. (2013) did not measure causal relationships, so the directionality of these findings remains speculative.

Impulsivity consistently emerges as a predictor of Bulimia Nervosa. More importantly, impulsivity appears to predict binge eating, regardless of specific ED diagnosis (BN, AN-BP, and BED).

Impulsivity and Binge Eating

Binge eating has been associated with impulsivity in nonclinical samples (Culbert & Klump, 2005; de Zwaan et al., 1994). As discussed above, the research on BED has taken place only over the last 15 years, and the research on subclinical binge eating has started in the last 7 years. Generally, researchers have taken results from the Bulimia literature and attempted to determine whether binge eating follows similar patterns. BN and BED are distinct clinical syndromes with differing diagnostic criteria; however, their shared symptom of binge eating does provide some overlap. Generally, the literature on binge eating has followed similar patterns to bulimia, with the exceptions of anger expression and certain components of impulsivity. The overarching trait of impulsivity seems to predict both bulimic symptoms and binge eating alone, but there is some evidence that different facets of impulsivity predict different symptoms (e.g., bingeing or purging).

In nonclinical samples, impulsivity has been found to predict binge eating. Horcajadas et al. (2006) found that obese patients with BED and subclinical binge eating had higher impulsivity levels than obese patients with no binge eating. Urgency, a facet of impulsivity, has also been strongly linked to binge eating in individuals with BED and sub threshold binge eating (Carrard, Crepin, Ceschi, Golay, & Van der Linden, 2012).

Galanti et al. (2007) divided 93 men and women (*M* age = 40) into three groups: binge eating disorder (BED; *n* = 22); subclinical binge eating (BE; *n* = 21), and non binge eating controls (non-BED; *n* = 36). To be included in the study, participants' BMI was required to be over 27. Participants completed the

Questionnaire on Eating and Weight Patterns (QEWP), the Barratt Impulsiveness Scale-11 (BIS-11), the Self-Rates Scale for Obsessive-Compulsive Disorder (SRS), and the Zung Depression Self-Rating Scale. After filling out measures, patients consumed a test meal of Boost (a nutritional supplement drink). They were told to drink until they felt extremely full and then rate the taste of the drink. Test meal intake (TMI) was measured by weighing the pitcher of Boost before and after the test meal. Findings indicated that BED and BE participants consumed significantly more in the test meal than did non-BED controls. They also had greater impulsivity levels than the controls, and impulsivity was the best predictor of BE and BED. It is also important to note that gender predicted test meal intake, was used as a covariate, and that there was little difference between the BE and BED groups. These findings illustrated three important points: impulsivity predicts binge eating, whether binge eating meets clinical criteria for BED does not seem to affect this relationship, and there are gender differences in predictors of binge eating.

There has been little research to date on the possible role of impulsivity in binge eating in college samples; however, this research has shown promising results. Studies of college women have supported a positive relationship between impulsivity and binge eating (Fink, Smith, Gordon, Holm-Denoma, & Joiner, 2009; Yeomans, Leitch, & Mobini, 2008).

Yeomans and colleagues (2008) recruited 147 women who were college students or staff and had them complete two subscales of the Three Factor Eating Questionnaire: restraint (TFEQ-R) and disinhibition (TFEQ-D). Restraint is

common in anorexia and disinhibition is found in binge eating syndromes. They categorized participants as high or low in both factors using a median split determined from a previous sample of 150 women from the same population. They then categorized participants into 4 groups: low on both scales (LRLD), low on TFEQ-R and high on TFEQ-D (LRHD), high on TFEQ-R and low on TFEQ-D (HRLD), and high on both scales (HRHD). Members of each group then completed three impulsivity measures: the Barratt Impulsiveness Scale (BIS-11) which assesses impulsivity with 3 subscales (i.e., motor, attention, and non-planning); the Dickman Impulsivity Inventory (DII) which conceptualizes impulsivity as having two factors (i.e., functional and dysfunctional); and a computerized delay-discounting procedure in which participants were presented with immediate or delayed rewards of different values. This task uses a complex algorithm to measure the rate at which the patient devalues the delayed rewards (which vary in monetary value and length of delay), even though it was almost always a higher monetary amount than the immediate reward (monetary value varied, but there was always no delay). The quicker the delayed reward is devalued, the more impulsive the participant.

Using a 2-way ANOVA (measure of impulsivity x group), Yeomans and colleagues (2008) found the BIS-11 total score was higher in women with high TFEQ-Disinhibition. This was not true for TFEQ-Restraint or an interaction between the two TFEQ subscales. Two BIS-11 subscales, motor and non-planning followed the same pattern. Attentional impulsivity did not differ between groups. Higher scores on the computer task (suggesting higher

impulsivity) were also found in women with high TFEQ-disinhibition. This was not true for TFEQ-restraint or an interaction between the TFEQ subscales. When BMI was entered as a covariate, none of the findings changed. These results were consistent with the authors' hypothesis that an impulsive personality type is related to disinhibited eating (e.g., overeating and binge eating) and fits previous literature, most of which used clinical samples. Thus, this study found that the same pattern previously observed in clinical samples is evident in nonclinical samples.

Overall, the literature supports the role of impulsivity as a predictor of BN and BE (Fischer et al., 2012; Galanti et al., 2007; Yeomans et al., 2008). Most research to date has utilized clinical samples of participants meeting diagnostic criteria for BN or AN-B. The role of impulsivity in non-clinical BE is less clear due to a paucity of research in this area; however, the BN literature has illustrated that binge eating is associated with different facets of impulsivity than compensatory behaviors, providing a promising starting point for investigations of impulsivity in non-clinical BE samples (Culbert & Klump, 2005). Also, the research that has recently been conducted on binge eating, especially in nonclinical samples, is supportive of impulsivity as a predictor. Additional research is needed to clarify which factors of impulsivity are most relevant to binge eating in nonclinical samples. The negative urgency (Fischer et al. 2012) and lack of planning/premeditation (Fischer et al., 2012; Yeomans et al., 2008) subscales of the UPPS have been found to predict binge eating.

Gender

This study used an all female sample. The decision to exclude men from the study *a priori* was made based on evidence of gender differences in the literature on anger and binge eating, the large gender difference in the prevalence of binge eating, and the preponderance of literature focusing on exclusively female samples.

The limited research including both men and women suggests that binge eating and bulimic symptoms are associated with different aspects of anger and impulsivity for men and women. While trait anger does not appear to differ by gender (Bolgar, Janelle, & Giacobbi, 2008; Wilkowski, Hartung, Crowe, & Chai, 2012), the relationship between various forms of anger and binge eating is unlikely to be the same for women and men. For example, bulimic attitudes have been linked to state anger in men and anger suppression in women (Meyer et al., 2005). This suggests that binge eating may serve somewhat different functions for women and men when it comes to anger. Similarly, there is some evidence that women high in trait anger are more likely to binge eat and fast less while men high in trait anger exhibit more substance use and self harm (Penas-Lledo et al., 2004). Again, the experience of anger appears to be related to different behaviors for women and men.

It is also well documented that disordered eating, in general, and binge eating in particular, is more prevalent in women. BN affects 1% of U.S. women, and BED affects 2-6% of U.S. women (Espindola & Blay, 2006; Napolitano & Himes, 2011). In the college population, these numbers increase exponentially. Sixty-two percent of undergraduate women exhibit nonclinical levels of maladaptive eating attitude or behaviors, and 44% report some binge eating (Napolitano & Himes, 2011; Timmerman,

2006). Approximately 16-19% of college women compared with 6-7 % of college men report regularly binge eating (Heatherton et al., 1995; Lynch et al., 2000).

In addition to differences in prevalence, there is some evidence of gender differences in psychiatric comorbidity among individuals diagnosed with BED. Tanofsky, Wifley, Spurrell, Welch, and Brownell (1997) examined men and women with clinical BED to assess gender differences in eating-related pathology and psychiatric symptoms. They recruited 21 men and 21 women who met *DSM-IV* criteria for BED and matched them by age (range 30-59 years) and BMI (range 27.81 to 47.74). They found gender differences on the Emotional Eating Scale (EES) global score and subscales for anxiety, anger, and depression, with women reporting higher levels of all four. On the SCID, men had significantly more lifetime Axis I disorders and a greater number of lifetime substance abuse disorders than women. No differences on anxiety or depression were noted. The authors suggested that men may have more psychiatric symptomology than women due to additional stigma of having a traditionally female disorder (ED) or that they tend to delay help seeking until distress level is much higher. It is worth noting that more women acknowledged emotional eating and eating in response to a variety of negative emotions. Tanofsky et al. (1997) suggested that this might be an indication that women are more likely to recognize and admit that they eat in response to emotions and not necessarily evidence than men participate in emotional eating less but are either less aware of their emotional response or less likely to admit the behavior. It is also possible that women simply engage in more emotional eating than men. Regardless of the underlying reasons, this study provides evidence of significant gender differences in psychiatric comorbidity and emotional eating in individuals with BED.

Lastly, most of the literature on disordered eating, binge eating, and their relationships with the other variables of interest in this study (i.e., trait anger, anger suppression, impulsivity, and emotion regulation) have used female samples. The model tested was based on findings from female samples, and there is little evidence to suggest that it would be applicable to men. Based on the findings from the few studies that have included both women and men, it is likely that a different model would need to be developed for predicting nonclinical binge eating in men (Meyer et al., 2005; Penas-Lledo et al., 2004; Stoltenberg, Batien, & Birgenheir, 2008). Unfortunately, more research on the possible predictors of binge eating among men needs to be completed before it would be feasible to develop such a model.

The Present Study

Based on this review of the literature, it appears that trait anger, anger suppression, emotion regulation, and impulsivity are relevant to binge eating and likely to predict the behavior among college women. After confirming the factor structure of the UPPS Impulsivity Scale using confirmatory factor analysis, we examined these variables as predictors of binge eating in a sample of college women. We expected that impulsivity, and specifically the urgency and lack of planning/premeditation components of impulsivity, would predict binge eating; trait anger and anger suppression would predict binge eating; trait anger would predict binge eating over and above negative affect; the relationship between trait anger and binge eating would be mediated by anger suppression; and emotion regulation would mediate the relationships between trait anger and binge eating. Statistical hypotheses are presented below.

Hypotheses

Hypothesis 1: The UPPS Impulsivity Scale's four factor structure will be confirmed. There has been some disagreement in the literature regarding the factor structure of impulsivity. The UPPS has shown promise, but questions remain about its factor structure. The four factor structure previously reported in community and college samples (Magid & Colder, 2007; Lynam & Miller, 2004; Whiteside & Lynam, 2001) was tested to determine how best to use the UPPS in subsequent analyses.

Hypothesis 2: Impulsivity, specifically the urgency component of impulsivity, will predict binge eating. Impulsivity has been found to predict binge eating in nonclinical samples (Culbert & Klump, 2005; de Zwaan et al., 1994; Fink et al., 2009; Yeomans, Leitch, & Mobini, 2008). There has been some evidence that specific aspects of impulsivity (i.e., urgency and lack of planning) may be the most predictive of binge eating (Whiteside & Lynam, 2001). Urgency has been shown to predict bulimic symptomology in clinical samples (Fischer et al., 2013) and binge eating in college samples (Davis & Fischer, 2013; Fischer et al., 2013). Lack of planning has been found to predict binge eating in bulimic samples (Fischer et al. 2003) and clinical binge eating samples (Yeomans et al., 2008), but not in nonclinical samples (Fischer et al., 2013). Therefore, urgency was the only specific factor we expected to predict binge eating in this sample.

Hypothesis 3: Trait anger will predict binge eating. The research on trait anger and binge eating has yielded mixed results. Trait anger has been found to predict binge eating in clinical bulimic (Fassino et al., 2001) and BED samples (Zeeck et al., 2011). It has been positively correlated with binge eating in a nonclinical female sample (Penas-

Lledo et al., 2003). However, it was not found to be a predictor in other clinical (Fassino et al., 2003) and nonclinical samples (Milligan & Waller, 2003; Schneider et al., 2010).

Hypothesis 4: Anger suppression will predict binge eating. Anger suppression has been shown to predict binge eating (Connolly et al., 2007; Fassino et al. 2003; Meyer et al. 2005; Miligan & Waller, 2000). Ego depletion theory suggests that suppressing anger reduces one's ability to utilize self-control and leads to increased binge eating (Baumeister et al., 1994).

Hypothesis 5: Trait anger will predict binge eating, over and above negative affect. Negative affect has been shown to predict binge eating in nonclinical samples (Engelberg et al., 2007; Napolitano & Himes, 2011; Stein et al., 2007); however, some negative emotions, anger in particular, appear to be more predictive of binge eating than others (Arnow et al., 1995; Zeeck et al., 2011). Thus, we tested this hypothesis to provide a more stringent test of the utility of trait anger in predicting binge eating (i.e., if the relationship between trait anger and binge eating is meaningful, trait anger should account for additional variance in binge eating beyond that explained by negative affect).

Hypothesis 6: The relationship between trait anger and binge eating will be partially mediated by anger suppression. Trait anger has been shown to predict binge eating (Penas-Lledo et al., 2001); however, there is some evidence that the relationship between trait anger and binge eating may be attenuated when anger suppression is included (Fassino et al. 2003; Milligan & Waller, 2000). Although this is a possible indicator of mediation (Baron & Kenny, 1986; Judd & Kenny, 1981), mediation has not previously been tested.

Hypothesis 7: Emotion regulation will partially mediate the relationship between trait anger and binge eating. Problems with emotion regulation have been shown to predict binge eating (Greeno et al., 2000; Whiteside et al., 2007), and there is some evidence that emotion regulation mediates the relationship between shame and disordered eating (Gupta et al., 2008) and between sadness and the desire to binge (Svaldi et al., 2010). Consistent with emotion regulation theories (Evers et al., 2010; Macht, 2008; Wiser & Telch, 1999), we expected that emotion regulation would serve a similar function in mediating the relationship between trait anger and binge eating.

CHAPTER II

METHODS

Participants

Of all the statistical analyses, the two with the most stringent sample size requirements were the confirmatory factor analysis of the UPPS Impulsive Behavior Scale and the structural equation model to test the mediation hypotheses (Kline, 2005; MacCallum, Browne, & Sugawara, 1996; Myers, Ahn, & Jin, 2011). A previous study conducting a factor analysis with the UPPS maintained adequate power with a sample size of 267 participants (Magid & Colder, 2007). On this basis, we aimed to recruit a minimum of 300 undergraduate women between the ages of 18 and 26 (i.e., traditional college age) from the Department of Psychology's subject pool at the University of Southern Mississippi. We collected 892 cases of data. After deleting duplicates, cases with too many missing values, and invalid cases, we conducted analyses with 472 participants (see the Results section for more information about data screening procedures). This was well above the acceptable number of participants for adequate statistical power.

All participants were female. Participants ranged in age from 18 to 26 years old (M =19.0). Most participants were in their first (42.5%) or second (25.9%) year of college, followed by 15.2% in their third year, 12.3% in their fourth year, and 4.1% in their fifth year or more. Most participants identified themselves as White (58.7%) or Black (37.0%), followed by 2.1% Hispanic or Latino, 0.8% American Indian or Native Alaskan, 0.8% Other or Biracial, and 0.6% Asian.

Measures

Demographic Questionnaire

A brief demographic questionnaire developed for this study was used to collect data such as participants' age, race, education level, and eating disorder diagnosis and treatment history (see Appendix A).

UPPS Impulsive Behavior Scale

The UPPS acronym in the name of this 45-item scale developed by Whiteside and Lynam (2001) stands for the 4 dimensions of impulsivity it assesses: Urgency (12 items), (lack of) Premeditation (11 items), (lack of) Perseverance (10 items), and Sensation Seeking (12 items). Items are rated on a Likert scale from 0 ("not at all") to 4 ("very much"). Individuals high on impulsivity elevate urgency and sensation seeking and score lower on perseverance and premeditation. There is no total impulsivity score. The scale was developed using exploratory factor analysis of previously validated measures of impulsivity and related constructs. The four-factor model of impulsivity was supported in a separate confirmatory factor analysis (Magid & Colder, 2007; Whiteside & Lynam, 2003). Internal consistencies of subscales range from .81-.91 (Magid & Colder, 2007; Whiteside & Lynam, 2001), and evidence of construct validity has been provided in multiple studies. As expected, bulimic symptoms in clinical and nonclinical populations are positively correlated with urgency, lack of premeditation, and lack of perseverance (Mobbs, Ghisletta, & Van der Linden, 2008). Also the urgency, lack of premeditation, and sensations seeking subscales discriminated among groups with Borderline Personality Disorder, gambling addiction, alcohol abuse, Antisocial Personality Disorder, and controls (Whiteside et al., 2005).

Eating Attitudes Test-26

The Eating Attitudes Test-26 (EAT-26) is a 26-item scale developed by Garner and Garfinkel (1979) as a screening measure to aid in the assessment of patients with eating disorders (i.e., a total score of 20 or greater suggests disordered eating). Items assess eating disordered cognitions and behaviors and are scored on a 4-point Likert scale (0 = "never or sometimes," 1 = "often," 2 = "usually," and 3 = "always"). The EAT-26 also has 4 yes/no behavioral questions that can aid diagnosis (e.g. "In the past 6 months, have you ever made yourself sick (vomited) to control your weight or shape?") and assesses current weight, current height, highest weight, lowest weight, and ideal weight (Garner & Garfinkel, 1979). Since Kashubeck-West, Mintz, and Saunders (2001) showed that the EAT-26 could be used as a broader measure of subclinical disordered eating, the EAT-26 has become one of the most frequently used measures of disordered eating in nonclinical samples. It has been used in a several college samples with internal consistencies ranging from 0.79 to 0.94 (Forestell, Spaeth, & Kane, 2012; Kashubeck-West et al., 2001; Shouse & Nilsson, 2011). High scores on the EAT correlate with a later diagnosis of Anorexia Nervosa and subscales of the Eating Disorders Inventory-2 (Doninger, Enders, & Burnett, 2005). This instrument was included to assess the standing of participants on general eating pathology and specific eating disorder criteria for the purpose of describing the sample.

Binge Eating Scale

The Binge Eating Scale (BES; Gormally, Black, Datson, & Riardin, 1982) assesses the severity of binge eating over 16 items in which respondents select from a series of 3 or 4 differently weighted statements the one that best represents their attitudes

and behavior (e.g. “I don’t feel any guilt of self-hate after I overeat,” “After I overeat, occasionally I feel guilt or self-hate,” or “Almost all the time I experience strong guilt or self-hate after I overeat”). The BES provides one total score between 0 and 46. Scores at or above 27 suggest severe binge eating, those between 18 and 26 suggest moderate binge eating, and scores at or below 17 suggest mild to no binge eating (Celio, Wilfley, Crow, Mitchell, & Walsh, 2004; Gormally et al., 1982). The BES has been shown to correctly identify 82.8 to 93.5% of individuals with Binge Eating Disorder in clinical populations. However, it only correctly identifies non-binge eaters 49.4% of the time (Celio et al., 2004; Greeno, Marcus, and Wing, 1995). In college samples, internal consistencies range from 0.88 to 0.93 (Anton, Perri, & Riley, 2000; Mitchell & Mazzeo, 2004; Napolitano & Himes, 2011). The BES has good test retest reliability (r = .87) over a period of 28 days (Timmerman, 1999). BES scores served as the dependent variable (i.e., binge eating).

State-Trait Anger Expression Inventory-2

The State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger, 1999) is a 57-item self-report measure of the experience, expression, and control of anger. It assesses trait anger (T-Ang), state-anger (S-Ang), and four types of anger expression and control: anger expression-in (AX-I), anger expression-out (AX-O), anger control-in (AC-I), and anger control-out (AC-O). The 10-item T-ANG scale measures the tendency to experience anger. Items are rated from 1 (“almost never”) to 4 (“almost always”) as to how well they describe the respondent. Scores range between 10 and 40 with higher scores indicating greater levels of trait anger. The four expression/control scales are 8-items each, with higher scores indicating more endorsement of that expression/control

style (Deffenbacher, 1992; Spielberger, 1999). High scores on AX-O indicate the aggressive expression of anger towards other persons or objects. High scores on AX-I indicate holding in or suppressing angry feelings. High scores on AC-O indicate controlling angry feelings by preventing the expression of anger towards other persons or objects. High scores on AC-I indicate controlling suppressed angry feelings by calming down or cooling off (Spielberger, 1999). The 15-item S-Ang scale was not used in the proposed study. Internal consistencies via coefficient alpha range from .73 to .95 (Driscoll, Zinivskay, Evans, & Campbell, 2006; Spielberger, 1999), and evidence of construct validity has been provided via factor analysis and in the form of correlations with measures of similar and dissimilar constructs (Freeman, 2001; Martin & Dahlen, 2007; Spielberger, 1999).

Difficulty in Emotion Regulation Scale

The Difficulty in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was developed and normed on a college sample and is based on an integrative model of emotion regulation. It has 36 items, scored on a 5-point Likert scale from 1 (“almost never”) to 5 (“almost always”), producing a total score and 6 subscales. Higher scores indicate higher levels of emotion dysregulation. The subscales are Non-Acceptance of Emotion Response (5 items), Difficulties Engaging in Goal-Directed Behavior (5 items), Lack of Emotional Awareness (6 items), Impulse Control Difficulties (6 items), Limited Access to Emotion Regulation Strategies (8 items), and Lack of Emotional Clarity (5 items). Internal consistencies for the subscales range from .79 to .92 (Whiteside et al., 2007). Gratz and Roemer (2004) provided evidence of construct validity through correlations in expected directions with the Generalized Expectancy for Negative Mood

Regulation Scale (NMR). The DERS subscales had a differential pattern of correlation with similar subscales of the NMR. Additionally, the DERS has been shown to predict self-harm behavior and intimate partner aggression (Gratz & Roemer, 2004).

Positive and Negative Affect Schedule

The Positive and Negative Affect Schedule (PANAS) was created by Watson, Clark, and Tellegen (1988). It consists of 20 affective descriptors (e.g., interested, enthusiastic, distressed, guilty) which respondents rate on a Likert scale from 1 ("very slightly to not at all") to 5 ("extremely") based on the extent to which they feel this descriptor describes them over a particular time frame (usually specified as "right now" or "this week"). The PANAS has two scales: the Positive Affect (PA) Scale and the Negative Affect (NA) Scale. In nonclinical samples, mean PA scores have been reported from 31.3 (7.1) to 33.3 (7.2) and NA scores have been reported from 16.0 (5.9) to 17.4 (6.2) (Crawford & Henry, 2004; Watson et al., 1988). Factor analytic studies have generally supported the two-factor structure of the PANAS as the best fitting model (Crawford & Henry, 2004). The PANAS has demonstrated acceptable internal consistency (αs = .85 to .89) and construct validity through comparisons with measures like the Depression Anxiety and Stress Scale and the Hospital Anxiety and Depression Scale (Crawford & Henry, 2004). Participants were administered the entire questionnaire to reduce any priming which could occur from using the negative affect scale alone; however, only the negative affect scale was used in the analyses.

Procedure

This study was approved by the University of Southern Mississippi's Institutional Review Board (see Appendix B). Participants were recruited through the Department of Psychology's online research system, Sona Systems Ltd. Participants read a brief description of the study. Those who signed up to participate were then directed to an online consent form (see Appendix C). Participants who electronically signed the consent form were entered in the study and directed to complete the study questionnaires. The consent form and all study questionnaires were hosted at Psychsurveys.org, so all data were collected online. All questionnaires were presented in a random order for each participant, to minimize possible order effects.

Analyses

Data analysis was conducted in five sequential stages.

Stage 1: Data Clean Up. Raw data were downloaded from PsychSurveys.org and converted to an SPSS data file. The data file was examined for errors and missing data. Study variables were formed via SPSS syntax, and scale-level frequency distributions were examined to identify potential errors, skeweness, kurtosis, and outliers. Data were normally distributed with no outliers.

Stage 2: Preliminary Analyses. Means, standard deviations, internal consistencies, and interrelationships among variables were computed for all variables. A correlation matrix was created to examine inter-correlations between variables.

Stage 3: Confirmatory Factor Analysis for UPPS Impulsivity Scale. The factor structure of the UPPS Impulsive Behavior Scale was tested with confirmatory factor analysis (Hypothesis 1) using Mplus. All items were entered as manifest variables, and

the four factors (i.e., urgency, premeditation, planning, and sensation seeking) were entered as latent variables. Items 2, 6, 10, 14, 18, 24, 28, 32, 36, 41, 43, and 45 were expected to load onto the urgency factor. Items 1, 5, 13, 17, 23, 27, 31, 35, 39, 40 were expected to load onto the premeditation factor. Items 4, 8, 12, 16, 20, 22, 26, 30, 34, 38 were expected to load onto the perseverance factor. Items 3, 7, 11, 15, 19, 21, 25, 29, 33, 37, 42, 44 were expected to load onto the sensation seeking factor. The four factors were expected to be independent but correlated. Model fit was assessed using the Chi-square, RMSEA, CFI, and TLI indices.

Stage 4: Regression Analyses. Separate regressions were used to examine Hypotheses 2, 3, and 4. BMI was entered in the first step of all regressions, as it is a well-known correlate of binge eating (Villarejo et al., 2012). In the first regression BMI was entered on Step 1 and the 4 factors of impulsivity were entered on Step 2 and regressed on the Binge Eating Scale (BES). In the second regression BMI was entered on Step 1 and trait anger was entered on Step 2. In the third regression BMI was entered on Step 1 and anger suppression was entered on Step 2.

Hierarchical multiple regression was used to test Hypothesis 5. Respondent BMI was entered on Step 1. Negative affect (i.e., the NA score from the PANAS) was entered on Step 2, and the trait anger (T-Ang) score was entered on Step 3. These variables were regressed on BES scores. This order of variable entry allowed us to test whether trait anger accounts for additional variance in binge eating above and beyond negative affect. A fifth regression was conducted which combined all four individual regressions. BMI was entered on step 1; negative affect was entered on step 2; and trait anger, anger

suppression, and the 4 factors of impulsivity were entered on step 3. These variables were regressed on BES scores.

Stage 5: Tests of Mediation. The two mediation hypotheses were tested simultaneously using path analysis via Mplus (Muthén & Muthén, 1998-2012). Trait anger (T-Ang), anger suppression (AX-I), and binge eating (BES total scores) were entered as manifest variables. Emotion regulation was entered as a latent variable, with the six DERS subscales entered as manifest variables. A measurement model of the DERS items and subscales (CFA) was tested first, and then the path models (SEM) were tested. The strength of the path from T-ANG to BES was examined in relation to the mediation paths (e.g., T-ANG to emotion regulation to BES and T-ANG to AX-I to BES). We examined the difference between the total direct effect (path from BES to T-ANG without mediation paths) and the direct effect (path from BES to T-Ang) when the indirect (i.e., mediation) paths were added to the model. If the indirect paths were significant and the significance of the direct path decreased then we had evidence of partial mediation. If the indirect paths were significant and the direct path was no longer significant then we had evidence of full mediation.

CHAPTER III

RESULTS

The data file, as downloaded from Psychsurveys.org, contained 892 cases. Of these, 49 were duplicates, 271 were incomplete (i.e., more than five missing items), and 100 were invalid. A case was considered invalid if one or more of three validity items were endorsed in a manner which indicated that the participant was not following directions or not reading items carefully (e.g., If the participant endorsed "often" when the validity item stated "Please endorse "rarely" on this item"). The final number of usable cases was 472. Nineteen cases were missing one item, and these items were imputed using linear trend at point through SPSS.

Only 0.2% of the sample reported a current eating disorder, and 3.1% reported a past eating disorder. Oddly, more participants (5.7%) indicated a specific eating disorder diagnosis than reported a current or past diagnosis (3.3%). This may have been due to participant confusion or unclear wording on the questionnaire. 1.7% indicated a current or prior diagnosis of Anorexia Nervosa, 0.6% indicated a current or prior diagnosis of Bulimia Nervosa, 0.8% indicated a current or prior diagnosis of Eating Disorder Not Otherwise Specified, and 2.5% indicated "other" as their diagnosis. No participants indicated a diagnosis of Binge Eating Disorder, which is not surprising considering that *DSM-5* was published while data were being collected and this diagnosis was not previously available. Participants' BMIs ranged from 16 to 58 (M = 24.82, SD = 5.94). The majority of the participants (65.8%) were in the average weight range of BMI 18-25, 1.9% were in the underweight range of BMI below 18, 14.4% were in the overweight range of BMI 26-29, and 17.9% were in the obese range of BMI 30 and above. The

EAT-26 was given to participants as a screener for possible disordered eating, which is indicated by a score of 20 or above. 82.1% of participants scored below 20 on the EAT-26. 17.9% scored 20 or above, indicating the possibility of some eating related psychopathology.

Means, standard deviations and internal consistencies were computed for all variables and compared to their previously reported means, standard deviations, and internal consistencies (see Table 1). Interrelationships among variables were computed for all variables. A correlation matrix was created to examine inter-correlations between variables (see Table 2).

Table 1

Means, Standard Deviations, and Internal Consistencies

Current Study				Previous Research		
Variable	*M*	*SD*	*α*	*M*	*SD*	*α*
STAXI-2						
T-ANG	18.18	6.06	0.89	19.23	5.8	0.87
AX-I	18.34	4.64	0.77	17.65	4.41	0.75
PANAS NA	21.29	7.68	0.87	16.0-17.4	5.9-6.2	0.85-0.89
UPPS						
PRE	18.62	5.45	0.88	NA	NA	0.81-0.91
URG	26.49	7.3	0.88	NA	NA	0.81-0.91
SS	31.8	7.56	0.86	NA	NA	0.81-0.91
PER	17.71	4.84	0.8	NA	NA	0.81-0.91

Table 1 (continued).

Current Study				Previous Research		
Variable	*M*	*SD*	α	*M*	*SD*	α
DERS						
NON	12.24	5.825	0.93	11.65	4.72	0.85
GOA	13.56	5.13	0.89	14.41	4.95	0.89
IMP	11.59	4.53	0.83	10.82	4.41	0.86
AWA	14.26	5.18	0.84	14.34	4.6	0.80
STR	16.22	6.89	0.9	16.16	6.19	0.88
CLA	11	3.95	0.8	10.61	3.8	0.84
TOT	78.86	23.92	0.94	77.99	20.72	
BES	11.19	8.20	0.92	22.3	6	0.88-0.93

Note. Previous research data from: Doninger, Enders, and Burnett (2005), Gratz and Roemer (2004), Martin and Dahlen (2007), Timmerman (1999). STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; AX-I = Anger Suppression Subscale of STAXI-2; PANAS-NA= Positive and Negative Affect Scale-Negative Affect Subscale; UPPS = UPPS Impulsive Behavior Scale; UPPS_PRE= Premeditation subscale; UPPS_URG = Urgency subscale; UPPS_SS= Sensation Seeking Subscale; UPPS_PER = Perseverance Subscale; DERS= Difficulty in Emotion Regulation Scale; DERS_NON = Nonacceptance of Emotional Response Subscale; DERS_GOA = Difficulties in Engaging in Goal-Directed Behavior Subscale; DERS_IMP = Impulse Control Difficulties Subscale; DERS_AWA = Lack of Emotional Awareness Subscale; DERS_STR = Limited Access to Control Strategies Subscale; DERS_CLA= Lack of Emotional Clarity Subscale; DERS_TOT = Difficulties in Emotion Regulation Scale Total Score; BES= Binge Eating Scale.

Table 2

Correlation Matrix

	BMI	A-ANG	AX-I	BES	PANAS_NA
T-ANG	.09				
AX-I	.06	.47**			
BES	.18**	.34**	.36**		
PANAS-NA	.05	.43**	.45**	.43**	
UPPS_PRE	-.11	.17**	-.01	.18**	.15**
UPPS_URG	.02	.55**	.33**	.47**	.48**
UPPS_SS	-.10*	.11*	-.00	.10*	.02
UPPS_PER	-.06	.19**	.15**	.28**	.32**
DERS_NON	.04	.33**	.45**	.39**	.54**
DERS_GOA	-.01	.38**	.34**	.33**	.47**
DERS_IMP	.09*	.57**	.37**	.35**	.51**
DERS_AWA	-.06	.06	.16**	.23**	.22**
DERS_STR	.07	.45**	.50**	.46**	.59**
DERS_CLA	-.02	.30**	.42**	.40**	.47**
DERS_TOT	.03	.45**	.50**	.48**	.63**

Table 2 (continued).

	UPPS_ PRE	UPPS_ URG	UPPS_ SS	UPPS_ PER	DERS_NON
UPPS_URG	.36**				
UPPS_SS	.20**	.14**			
UPPS_PER	.63**	.42**	-.01		
DERS_NON	.17**	.45**	.04	.29**	
DERS_GOA	.15**	.50**	.04	.37**	.53**
DERS_IMP	.27**	.64**	.06	.37**	.54**
DERS_AWA	.31**	.30**	.00	.30**	.22**
DERS_STR	.21**	.60**	.05	.39**	.73**
DERS_CLA	.31**	.49**	.11*	.38**	.51**
DERS_TOT	.31**	.65**	.06	.46**	.80**

	DERS_ GOA	DERS_ IMP	DERS_ AWA	DERS_ STR	DERS_CLA
DERS_IMP	.57**				
DERS_AWA	.12**	.22**			
DERS_STR	.66**	.76**	.26**		
DERS_CLA	.43**	.48**	.59**	.58**	
DERS_TOT	.74**	.79**	.51**	.90**	.77**

* p < .05, ** p < .01

Note. BMI= Body Mass Index STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; AX-I = Anger Suppression Subscale of STAXI-2; PANAS-NA= Positive and Negative Affect Scale- Negative Affect Subscale; UPPS = UPPS Impulsive Behavior Scale; UPPS_PRE= Premeditation subscale; UPPS_URG = Urgency subscale; UPPS_SS= Sensation Seeking Subscale; UPPS_PER = Perseverance Subscale; DERS= Difficulty in Emotion Regulation Scale; DERS_NON = Nonacceptance of Emotional Response Subscale; DERS_GOA = Difficulties in Engaging in Goal-Directed Behavior Subscale;

DERS_IMP = Impulse Control Difficulties Subscale; DERS_AWA = Lack of Emotional Awareness Subscale; DERS_STR = Limited Access to Control Strategies Subscale; DERS_CLA= Lack of Emotional Clarity Subscale; DERS_TOT = Difficulties in Emotion Regulation Scale Total Score; BES= Binge Eating Scale.

The factor structure of the UPPS Impulsive Behavior Scale was tested with confirmatory factor analysis (Hypothesis 1) using Mplus. All items were entered as manifest variables, and the four factors (i.e., urgency, premeditation, planning, and sensation seeking) were entered as latent variables. Items 2, 6, 10, 14, 18, 24, 28, 32, 36, 41, 43, and 45 loaded as expected onto the urgency factor. Items 1, 5, 13, 17, 23, 27, 31, 35, 39, 40 loaded as expected onto the premeditation factor. Items 4, 8, 12, 16, 20, 22, 26, 30, 34, 38 loaded as expected onto the perseverance factor. Items 3, 7, 11, 15, 19, 21, 25, 29, 33, 37, 42, 44 loaded as expected onto the sensation seeking factor. The initial model had acceptable fit. Standardized residuals and modification indices generated by Mplus indicated multiple possible paths and correlations that could improve fit. Correlations between items in the same subscale were considered theoretically valid. Adding correlations between items 4 and 3, 5 and 4, 18 and 14, 25 and 3, 25 and 3, 25 and 19, 27 and 26, 31 and 1, 33 and 19, 35 and 17, 42 and 15, 42 and 19 improved the model's overall fit. A path between the urgency factor and item 38 (which initially loaded on perseverance) was suggested in the modification indices. Models removing item 38 (Model 2), with paths from item 38 to both urgency and premeditation (Model 4), and with a path from item 38 to urgency and removing the path from item 38 to premeditation (Model 5) were tested. These models either did not improve fit or were found to be unsupported theoretically.

Model 1 ran the original factor structure without any correlations between items. Model 3 ran the original factor structure and added inter-item correlations. While the UPPS factor structure did not change, adding inter-correlations to the model improved overall fit. It was concluded that Model 3 was the best fitting model.

Separate hierarchical multiple regressions were used to examine Hypotheses 2, 3, and 4. BMI was entered in the first step of all regressions, as it is an established correlate of binge eating (Villarejo et al., 2012). To test Hypothesis 2 (i.e., impulsivity, specifically the urgency component of impulsivity, will predict binge eating), BMI was entered on Step 1 and the four factors of impulsivity were entered on Step 2. These variables were regressed on the Binge Eating BES. Results indicated that urgency and perseverance were both significant predictors of BES, while premeditation and sensation seeking were not (see Table 3).

Table 3

Standardized Beta Coefficients and Change in R-Squares for Hierarchical Regression of Body Mass Index and Impulsivity on Binge Eating

	Beta	ΔR^2
Step 1		.03**
BMI	.18**	
Step 2		.23**
BMI	.18**	
UPPS_PRE	-.07	
UPPS_URG	.41**	
UPPS_SS	.07	
UPPS_PER	.16**	

* p < .05, ** p < .01

Note. BMI= Body Mass Index; UPPS = UPPS Impulsive Behavior Scale; UPPS_PRE = Premeditation subscale; UPPS_URG = Urgency subscale; UPPS_SS= Sensation Seeking Subscale; UPPS_PER = Perseverance Subscale.

To test Hypothesis 3 (i.e., trait anger will predict binge eating), BMI (Step 1) and trait anger (Step 2) were regressed on the BES. Both BMI and T-ANG predicted BES scores (see Table 4).

Table 4

Standardized Beta Coefficients and Change in R-Squares for Hierarchical Regression of Body Mass Index and Trait Anger on Binge Eating

	Beta	ΔR^2
Step 1		.03**
BMI	.18**	
Step 2		.11**
BMI	.15**	
T-ANG	.33**	

* p < .05, ** p < .01

Note. BMI= Body Mass Index; STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2.

To test Hypothesis 4 (i.e., anger suppression will predict binge eating), BMI (Step 1) and the AX-I subscale of the STAXI-2 (Step 2) were regressed on the BES. Both predicted BES scores (see Table 5).

Table 5

Standardized Beta Coefficients and Change in R-Squares for Hierarchical Regression of Body Mass Index and Anger Suppression on Binge Eating

	Beta	ΔR^2
Step1		.03**
BMI	.18**	
Step 2		.12**
BMI	.16**	
AX-I	.35**	

* p < .05, ** p < .01

Note. BMI= Body Mass Index; STAXI-2 = State Trait Anger Expression Inventory-2; AX-I = Anger Suppression Subscale of STAXI-2.

To test Hypothesis 5 (i.e., trait anger will predict binge eating, over and above negative affect), BMI, the NA scale from the PANAS, and the T-ANG subscale of the STAXI-2 were regressed on BES scores. Respondent BMI was entered on Step 1, PANAS-NA was entered on Step 2, and T-ANG was entered on Step 3. This order of variable entry allowed us to test whether trait anger accounted for additional variance in binge eating above and beyond negative affect and BMI. BMI, PANAS-NA, and T-ANG predicted BES scores. Also, the change in R^2 on Step 3 indicated that the addition of T-ANG explained additional variance even after accounting for the contributions of BMI and PANAS-NA (see Table 6).

Table 6

Standardized Beta Coefficients and Change in R-Squares for Hierarchical Regression of Body Mass Index, Negative Affect, and Trait Anger on Binge Eating

	Beta	ΔR^2
Step 1		.03**
BMI	.18**	
Step 2		.18**
BMI	.16**	
PANAS-NA	.42**	
Step 3		.03**
BMI	.15**	
PANAS-NA	.34**	
T-ANG	.18**	

* p < .05, ** p < .01

Note. BMI = Body Mass Index; STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; PANAS-NA = Positive and Negative Affect Scale-Negative Affect Subscale.

The two mediation hypotheses were tested simultaneously using path analysis via Mplus. We followed the bootstrapping method outlined by Preacher and Hayes (2008). T-ANG, AX-I, DERS, and BES were entered as manifest variables. Measurement models of the DERS items and subscales (CFA) were tested first, and then the path model (SEM) was tested. All items loaded on the expected factors in the DERS item measurement model. Model fit was acceptable (Chi square = 2246.42, RMSEA = 0.055, CFI = 0.857, TLI = 0.848). Four alternative models were run, none of which had a better overall fit. As expected, the final DERS item measurement model had items 11, 12, 21, 23, 25, and 29 load on the Nonacceptance factor; items 13, 20, 26, and 33 on the Goals

factor; items 3, 14, 19, 24, 27, and 32 load on the Impulse Control factor; items 2, 6, 8, 10, 17, and 34 load on the Awareness factor; and items15, 16, 22, 28, 30, 31, 35, and 36 load on the Strategies factor; items 4, 5, 7, and 9 load on the Clarity factor. To increase overall model fit, 11 inter-item correlations were added to the measurement model. A second measurement model to assess model fit for the DERS subscales to a final total score was also conducted. Fit was acceptable (see Figure 1).

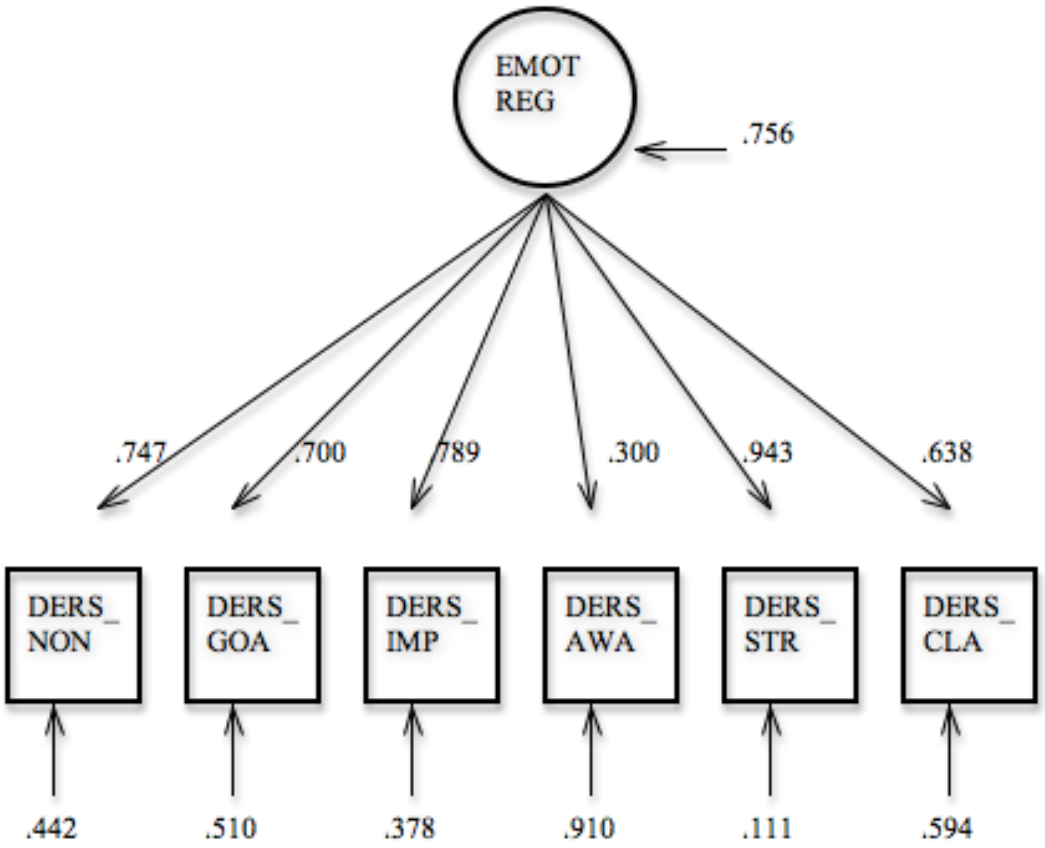

Figure 1. Measurement Model: DERS Subscale Measurement Model with Standard Path Estimates. Note. BMI = Body Mass Index; STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; AX-I = Anger Suppression Subscale of STAXI-2; DERS = Difficulty in Emotion Regulation Scale; DERS_NON = Nonacceptance of Emotional Response Subscale; DERS_GOA = Difficulties in Engaging in Goal-Directed Behavior Subscale; DERS_IMP = Impulse Control Difficulties Subscale; DERS_AWA = Lack of Emotional Awareness Subscale; DERS_STR = Limited Access to Control Strategies Subscale; DERS_CLA = Lack of

Emotional Clarity Subscale; EMOTREG = Latent Variable combining all DERS Subscales (e.g. DERS_TOT); BINGE = Latent Variable for Binge Eating Scale; BES = Binge Eating Scale.

Next, the mediation model was tested without the measurement models (see Table 7). The model did not work with DERS_TOT as an unobserved variable with the measurement model because BES was unintentionally becoming an indicator variable of DERS_TOT. Consequently, DER_TOT was used as an observed variable to solve this problem. Overall model fit was adequate (Chi-square = 66.60, RMSEA = 0.37, CFI = 0.85, TLI = 0.08). All paths were significant (p-value less than 0.025). Total direct effect from BES-tot to T-ANG (no mediation effects) was 0.345, 95% CI 0.258-0.432. Total indirect effect of both mediators was 0.223, 95% CI 0.159-0.287. Specific indirect effect for BES-tot to AX-I to T-ANG was 0.055, 95% CI 0.006-0.104. Specific indirect effect for BES-tot to DERS_TOT to T-ANG was 0.168, 95% CI 0.118-0.218. Direct effect from BES-tot to T-ANG (with mediation effects) was 0.122, 95% CI 0.021 to 0.224. This reduction from 0.345 to 0.122 when mediation paths are added to the model is evidence for partial mediation. AX-I mediated 15.94% of the relationships between BES-tot and T-ANG and DERS_TOT mediated 48.70% of the relationship. Together both mediators mediated 64.64% of the relationship between BES and T-ANG (see Figure 2).

Table 7

Path Estimates For Structural Equation Model: Mediation Paths from T-ANG to DERS_TOT to BES and T-ANG to AX-I to BES

Path	Standard Estimate	P-Value
DERS_TOT ON T-ANG	.45**	< 0.01
BES ON DERS_TOT	.37**	< 0.01
BES ON T-ANG	.12*	0.019
BES ON AX-I	.18*	0.024
AX-I ON T-ANG	.47**	< 0.01

* p < .05, ** p < .01

Note. STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; AX-I = Anger Suppression Subscale of STAXI-2; DERS_TOT = Difficulties in Emotion Regulation Scale Total Score; BES = Binge Eating Scale.

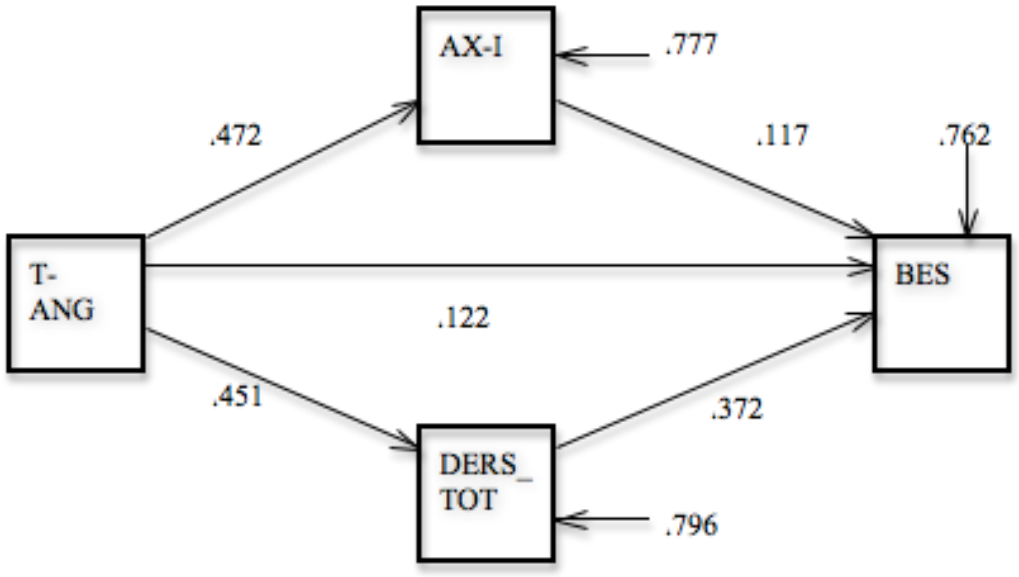

Figure 2. Model and Path Estimates For Structural Equation Model: Mediation Paths from T-ANG to DERS_TOT to BES and T-ANG to AX-I to BES. Note. STAXI-2 = State Trait Anger Expression Inventory-2; T-ANG = Trait Anger Subscale of STAXI-2; AX-I = Anger Suppression Subscale of STAXI-2; DERS_TOT = Difficulties in Emotion Regulation Scale Total Score; BES= Binge Eating Scale.

Lastly, post-hoc analyses were conducted to examine if the addition of an UPPS total score or certain UPPS factors would improve the fit of the mediation model. When an UPPS total factor was added to the structural equation model, the fit was significantly worsened. Since the UPPS urgency factor was the only significant UPPS factor in the regression analyses, this factor was added to the structural equation model. Fit was better than UPPS total, but still significantly worse than the original model. Table 8 compares model fit between final mediation model, mediation model with UPPS total, and mediation model with UPPS urgency factor.

Table 8

Model Fit Comparisons for Final Mediation Model, Mediation Model with UPPS_TOT Path, and Mediation Model with UPPS_URG Path

	Ideal Fit	Final Mediation	w/UPPS_TOT	w/UPPS_URG
Chi-Square	Lower indicates better fit	66.60	525.67	240.92
RMSEA	<.05	.37	.24	.41
CFI	>.90	.85	.58	.61
TLI	>.90	.08	.35	.15

Note. UPPS_TOT = UPPS Impulsivity Scale, Total Score; UPPS_URG = UPPS Impulsivity Scale, Urgency Sub-Scale; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index.

CHAPTER IV

DISCUSSION

This study evaluated the relationships among four theoretically relevant factors hypothesized to predict binge eating among college women: trait anger, anger suppression, impulsivity, and emotion regulation. After confirming the previously reported four factor structure of the UPPS Impulsivity Scale through confirmatory factor analysis, we found that two of the UPPS factors (i.e., urgency and lack of perseverance) predicted binge eating. Moreover, anger suppression predicted binge eating, and trait anger predicted binge eating even after taking general negative affect into account. We also found that both anger suppression and emotion regulation partially mediated the relationship between trait anger and binge eating. The following discussion will summarize these key findings, explore their implications for future research and treatment, and discuss the limitations of this study.

Assessing Impulsivity

The current study confirmed the four factor structure of the UPPS Impulsivity Scale reported by Whiteside and Lynam (2001). According to Whiteside and Lynam, the UPPS assesses impulsivity across four factors: urgency, premeditation (lack of), perseverance (lack of), and sensation seeking. Urgency is the tendency to act rashly when experiencing negative affect and is likely the impetus of impulsive behavior aimed at relieving emotional distress. Lack of premeditation to the tendency to act without planning or regard for consequences of one's behavior. Lack of perseverance is the inability to sustain attention, especially when uninterested or fatigued. Sensation seeking refers to a preference for risky or exciting behaviors (Magid & Colder, 2007).

There has been considerable disagreement in the literature about the nature of the impulsivity construct. Some studies have found support for two factor models of impulsivity (e.g., Dickman, 1990; Eysenck & Eysenck, 1985; Haden & Shiva, 2009; Ireland & Archer, 2008; Swann et al., 2002); others have found support for three factor models (e.g., Brownstone, et al., 2013; Carlson et al., 2010; Culbert & Klump, 2005; Galanti et al., 2007; Patton et al., 1993; Rosval et al., 2006; Stanford et al., 2009). The use of different measures of impulsivity has contributed to some of the confusion, as it is not always easy to tell whether the number of factors obtained is due to the measure itself or reflects something about the underlying construct. Given the divergent findings across different measures and even across studies using some of the same measures, we opted to use the UPPS Impulsivity Scale, a somewhat newer measure than many of the more established alternatives. Although the four factor structure of the UPPS had previously been supported (Lynam & Miller, 2004; Magid & Colder, 2007; Whiteside & Lynam, 2001), the relative newness of the measure led us to test its factor structure here before proceeding.

Consistent with previous studies using the UPPS (e.g., Lynam & Miller, 2004; Magid & Colder, 2007; Whiteside & Lynam, 2001), our results confirmed the overall factor structure of the UPPS Impulsivity Scale. However, it is important to note that the best fitting model included some inter-item correlations that were not part of Whiteside and Lynam's (2001) original model. This is considered a minor change and did not affect the items loading onto the four UPPS factors, but it is important to note that adding inter-item correlations between certain items in each factor may improve overall model fit in future studies using structural equation modeling with the UPPS Impulsivity Scale.

Evidence supporting the four factor structure of the UPPS in a sample of college women has a few implications worth noting. First, it is one more study supporting the overall structure of the measure. Second, as evidence of this model builds, it supports the theoretical basis for the UPPS that impulsivity consists of four components: lack of premeditation, urgency, lack of perseverance, and urgency. Third, it demonstrates the appropriateness of this measure for research with college students. Lastly, it indicates that it was appropriate to examine binge eating in relation to any or all of the UPPS factors even though we were particularly interested in the urgency factor.

Impulsivity and Binge Eating

We expected that impulsivity, specifically the urgency component of impulsivity as assessed by the UPPS Impulsivity Scale, would predict binge eating. This prediction was supported, as urgency predicted binge eating. In addition, the lack of perseverance factor assessed by the UPPS predicted binge eating.

Previous research has supported the role of impulsivity as a predictor of Bulimia Nervosa and binge eating (Fischer et al., 2012; Galanti et al., 2007; Yeomans et al., 2008); however, most of these studies have been conducted with clinical participants diagnosed with Bulimia Nervosa or Anorexia Nervosa- Binge/Purge Type. The role of impulsivity in non-clinical binge eating is less clear due to a lack of literature in this area (Culbert & Klump, 2005). The research that has recently been conducted on binge eating, especially in nonclinical samples, is supportive of impulsivity as a predictor (Culbert & Klump, 2005; de Zwaan et al., 1994; Fink et al., 2009; Yeomans et al., 2008).

As soon as one begins to examine specific components of impulsivity and their relation to binge eating, the picture becomes less clear due to a dearth of studies using

multidimensional measures of impulsivity in this context. There is some evidence that specific factors of impulsivity (i.e., urgency and lack of planning/premeditation) may be more predictive of binge eating than others (Whiteside & Lynam, 2001). Urgency has been shown to predict bulimic symptomology in clinical samples (Fischer et al., 2013), and lack of planning has been found to predict binge eating in bulimic samples (Fischer et al. 2003) and clinical binge eating samples (Yeomans et al., 2008) but not in nonclinical samples (Fischer et al., 2013). In studies using college student samples, urgency is the only factor that has been found to consistently predict binge eating (Davis & Fischer, 2013; Fischer et al., 2013). Therefore, urgency was the only factor we expected to predict binge eating. This tendency to act rashly when experiencing negative affect seems to be a hallmark for binge eating behavior, and supports the theory that binge eating serves an emotion regulation function (Evers et al., 2010; Gratz & Roemer, 2004).

Evidence suggests that negative emotions and problems regulating these emotions precede binge eating (Gratz & Roemer, 2004; Whiteside et al., 2007). Researchers have hypothesized that binge eating serves as a coping strategy aimed at regulating emotion (Evers et al., 2010). Eating delivers dopamine to the reward pathway in the brain in a similar way, but to a lesser extent, than illicit drugs (Davis et al., 2009; Evers et al., 2010; Johnson & Kenny, 2010). Emotion regulation theories propose that when one experiences negative affect that they cannot regulate they may implement a maladaptive strategy like binge eating (Wiser & Telch, 1999). It is unclear whether eating regulates emotions through neurochemical changes in the brain, as a distraction from negative

emotions, or as a way to shift focus from one negative emotion to another (Evers et al., 2010).

Interestingly, lack of perseverance also predicted impulsivity in the current study. There has been little research to support this in the past. Three studies found lack of premeditation (e.g., planning) predicted binge eating in clinical binge eating samples (Whiteside & Lynam, 2001; Yeomans et al., 2008) and a bulimic sample (Fischer et al. 2003), but no other studies have found that lack of perseverance is a significant predictor. The only other evidence that lack of perseverance (e.g., difficulty with sustained attention) may play a role in binge eating is the high comorbidity between binge eating and ADHD in clinical binge eating samples (Davis et al., 2006; Kaplan et al. 2009; Mattos et al., 2004; Neumark-Sztainer et al., 1995) and bulimic samples (Sokol et al. 1999; Surman et al., 2006). It is unclear whether lack of perseverance as a predictor of binge eating is specific to nonclinical samples or if it may be a significant factor in clinical binge eating as well. Additional research is needed to determine if this finding is specific to this sample or if it can be replicated in other studies. It is possible that non-clinical binge eating has less to do with an inability to plan and more to do with an inability to sustain attention.

We hypothesized that those who have a lack of perseverance (e.g. difficulty maintaining attention and who become easily bored) may be more prone to binge eating for two reasons. First, they may overeat out of boredom, and have a tendency to eat a variety of foods in one sitting, due to lack of perseverance. Second, they may have more difficulty sustaining attention while focusing on dieting or healthy eating, which predisposes them to bingeing.

Our findings confirm that urgency is a significant predictor in non-clinical binge eating. Further, our findings suggest that lack of perseverance may play a role in binge eating. The role of urgency adds to the evidence supporting an emotion regulation model of binge eating (Evers et al., 2010; Gratz & Roemer, 2004; Whiteside et al., 2007). The lack of perseverance possibly adds more questions to the literature than answers. Additional research is needed to determine if this finding is consistent across samples. It also poses a new research question: Is lack of premeditation a better predictor of clinical binge eating, while lack of perseverance is a better predictor of non-clinical binge eating? If this is the case, further questions as to how this will inform prevention and treatment will also be need to be explored.

Trait Anger and Anger Suppression in Binge Eating

Trait anger predicted binge eating while taking BMI and general negative affect into account. Trait anger demonstrated evidence of incremental validity over and above general negative affect in the prediction of binge eating. Anger suppression was also found to predict binge eating. We found that anger suppression partially mediated the relationship between trait anger and binge eating. Anger suppression accounted for 15.94% of the relationship between trait anger and binge eating, indicating that anger suppression accounts for some, but not all of this relationship.

Previous studies have found that negative affect predicts binge eating in nonclinical samples (Engelberg et al., 2007; Napolitano & Himes, 2011; Stein et al., 2007) and that some negative emotions, particularly anger, seem to be more predictive of binge eating than others (Arnow et al., 1995; Zeeck et al., 2011). By testing trait anger after entering general negative affect, we were able to examine the utility of trait anger in

predicting binge eating above and beyond general negative affect. The finding that trait anger predicted binge eating over and above general negative affect is noteworthy because it suggests that there is something about anger in particular, beyond general negative emotionality, which is related to binge eating. And while anger suppression may be an important part of this, it does not account for the majority of the relationship between trait anger and binge eating. Thus, there appears to be something about one's propensity to experience angry feelings that is an important part of understanding binge eating.

These findings have interesting implications for emotion regulation theories of binge eating. Emotion regulation theories propose that binge eating serves as a way to cope with or avoid any negative emotion. However, the finding that anger may be a more salient predictor than general negative affect indicates that some negative emotions may be less tolerable than others and contribute to binge eating in different degrees. Further research is needed to parse out the effect of discrete negative emotional states on binge eating; however, our results seem to suggest that anger will be one of the most prominent predictors. This finding also has implications for the prevention and treatment of binge eating in that it is possible that identifying college women who are at risk for binge eating or exhibiting problems with binge eating and assisting them in learning to regulate and cope with their anger may help to reduce the need to use food as a coping tool for this particular emotion.

The research on trait anger and binge eating has been mixed. Previous research has found that trait anger predicts binge eating in clinical bulimic (Fassino et al., 2001) and BED samples (Zeeck et al., 2011), and that trait anger is positively correlated with

binge eating in a nonclinical female sample (Penas-Lledo et al., 2004). However, trait anger has also failed to predict binge eating in some clinical (Fassino et al., 2003) and nonclinical samples (Milligan & Waller, 2003; Schneider et al., 2010). These mixed results are interesting given the current study's findings. Perhaps trait anger is significant in studies that do not examine other factors such as anger suppression, and nonsignificant when studied with these other factors.

In the current study, anger suppression was a significant predictor of binge eating. Evidence that both trait anger and anger suppression were significant predictors of binge eating on their own allowed us to move to the next stage of analyses, which examined potential mediators of trait anger and binge eating.

Previous research has found trait anger predicts binge eating (Penas-Lledo et al., 2002), but there is also evidence that the relationship between trait anger and binge eating may be attenuated when anger suppression is included (Fassino et al., 2003; Milligan & Wller, 2000). This is a possible indicator of mediation (Baron & Kenny, 1986; Judd & Kenny, 1981), but mediation had yet to be tested overtly.

The findings of the current study take this research to the next step by testing a model in which anger suppression and emotion regulation were predicted to partially mediate the relationship between trait anger and binge eating. We found support for this model in that both anger suppression and emotion regulation partially mediated this relationship. This finding helps to explain why the addition of anger suppression sometimes diminishes the strength of the relationship between trait anger and binge eating. However, this mediation effect does not account for the entire relationship and we cannot lose sight of the predictive importance of trait anger by itself. Thus, our

findings are consistent with previous studies reporting relationships between trait anger and binge eating (Penas-Lledo et al., 2004; Zeeck et al., 2011) and with studies that have indicated that the relationship between trait anger and binge eating may be attenuated when anger suppression is included (Fassino et al., 2003; Milligan & Wller, 2000). The relationship between anger suppression and binge eating found in the present study and previous research (e.g., Connolly et al., 2007; Fassino et al. 2003; Meyer et al. 2005; Miligan & Waller, 2000) is consistent with Ego Depletion Theory, which suggests that suppressing any emotion reduces one's ability to utilize self-control and leads to increased binge eating (Baumeister et al., 1994). The idea that binge eating is used to suppress anger (a negative emotion) is also consistent with Emotion Regulation Theories of Binge Eating (Davis et al., 2009; Evers et al., 2010; Gratz & Roemer, 2004; Johnson & Kenny, 2010; Whiteside et al., 2007).

Overall, it appears that trait anger and anger suppression are both important predictors of binge eating. Anger suppression's partial mediation of the relationship between trait anger and binge eating may help to explain some of the divergent findings in previous research (i.e., why some studies have been unable to find a significant relationship between trait anger and binge eating while others have). This is likely due to variance being used up by other variables such as anger suppression. On the other hand, the current study suggests that trait anger remains a significant predictor even when taking partial mediation into account. Of course, the partial mediation effect does highlight the role of anger suppression, and it seems prudent to attend to both trait anger and anger suppression when creating treatments for binge eating. For example, trait anger could be addressed through the use of procedures designed to lower anger arousal

(e.g., relaxation training) while excessive anger suppression might be addressed through coping skills training. It is also important to note that anger suppression was not the only variable partially mediating the relationship between trait anger and binge eating; emotion regulation was an even more powerful mediator of this relationship.

Emotion Regulation and Binge Eating

Emotion regulation, assessed with the Difficulties in Emotion Regulation Scale, was also found to partially mediate the relationship between trait anger and binge eating. The pathway from trait anger to emotion regulation to binge eating mediated 48.70% of the direct pathway. While emotion regulation does not explain all of the relationship between trait anger and binge eating, it does explain almost half of that relationship. In combination with anger suppression, both mediators accounted for 64.64% of the direct effect from trait anger to binge eating. Taken together, this indicates that the regulation of emotions, anger in particular, plays an important role in binge eating.

Problems with emotion regulation in general, sadness and shame in particular, have been shown to predict binge eating (Greeno et al., 2000; Gupta et al., 2008; Svaldi et al., 2010; Whiteside et al., 2007). Our findings that emotion regulation and anger suppression not only predict binge eating, but partially mediate the relationship between trait anger and binge eating are consistent with emotion regulation theories of binge eating (Evers et al., 2010; Macht, 2008; Wiser & Telch, 1999). The general propensity to experience angry feelings (i.e., trait anger) was positively associated with binge eating, suggesting that college women in our sample who were more anger prone were more likely to binge eat. The finding that emotion regulation partially mediated this relationship suggests that the relationship between trait anger and binge eating may be

attenuated by effective emotion regulation and exacerbated by inadequate emotion regulation. By considering the full model, including both anger suppression and emotion regulation, a clearer picture emerges in which college women with a heightened propensity to experience anger are more likely to binge eat, particularly when they lack adequate emotion regulation and routinely seek to suppress their angry feelings. Thus, the current study points to the important role that emotions, particularly anger, and the way one regulates those emotions play in binge eating.

All three variables, trait anger, anger suppression, and emotion regulation seem to play an important role in the prediction of binge eating. Those with high trait anger and a tendency to suppress anger and/or difficulties regulating emotion are at increased risk of developing binge eating. Aldao, Nolen-Hoeksema, and Schweizer (2010) identified six types of emotion regulation strategies: acceptance, avoidance, problem solving, reappraisal, rumination, and suppression. If we look at emotion suppression as an emotion regulation strategy it may be that those with high trait anger and a tendency to over-rely on emotion suppression have particular difficulty with binge eating. This could indicate a need to teach those at risk for binge eating other emotion regulation strategies for dealing with anger, other than suppression.

Implications for the Treatment of Binge Eating

The current study may help to inform the treatment and prevention of binge eating among college women in many ways. Due to the primarily sub-clinical level of binge eating in this sample these findings seem particularly relevant to work with those who may be at risk for binge eating but have not yet progressed to clinical severity. The study's findings are likely most relevant to efforts aimed at prevention.

First, the finding that impulsivity in general - and urgency and lack of perseverance in particular - predicted binge eating may help to inform the initial assessment of binge eating and inform subsequent treatment planning. By incorporating a brief measure of impulsivity in the assessment of binge eating, clinicians can learn about the nature of a client's binge eating and the degree to which it might make sense to attend to potential problems with impulsivity in treatment. If the tendency to act rashly in the face of negative emotions and the inability to sustain attention predict binge eating, it is possible that assisting clients with the acquisition of strategies for dealing with these symptoms will help to decrease symptoms of - or risk for - binge eating.

Second, trait anger, general negative affect, and anger suppression appear to be useful in understanding binge eating. Since these variables appear to be risk factors for binge eating, assessing them may yield valuable information that could be used to identify clients at risk for binge eating but who have not yet engaged in the behavior. It is possible that helping clients make changes in these areas (e.g., learning to reduce anger arousal, gain adaptive coping and emotion regulation skills) could help prevent the onset of binge eating behaviors. With regard to treatment planning for clients who are currently binge eating, including measures to assess these variables could help clinicians identify clients who could benefit from education or treatment in areas such as anger management or emotion regulation. Adding these components to treatment or prevention programs could theoretically improve client outcomes. The next step would be to design a treatment program including strategies for dealing with anger and negative affect and assessing its efficacy when compared to more traditional treatments for binge eating.

Third, the finding that anger suppression and emotion regulation accounted for more than half of the relationship between trait anger and binge eating suggests that while strategies for assisting clients in reducing anger arousal may be beneficial, such efforts will likely be enhanced by attending to improving emotion regulation strategies and alternatives to anger suppression. The fact that anger suppression (a potential maladaptive emotion regulation strategy) and emotion regulation were partial mediators for the relationship between trait anger and binge eating is further evidence for the emotion regulation theories of binge eating. This indicates that prevention and treatment programs aimed at helping clients generate alternative emotion regulation strategies will likely be helpful in reducing binge eating symptoms. There also seems to be a significant benefit to focusing on anger and other ways of regulating this emotion other than suppression, which seems particularly problematic for people who binge eat.

Limitations

This study aimed to clarify the nature of the relationships among binge eating, trait anger, anger suppression, emotion regulation, and impulsivity. While we were successful in confirming multiple hypotheses and furthering our understanding of binge eating in a sample of college women, this study had a number of limitations worth noting. First, this study is limited by the fact that the sample consisted of female college students recruited from a single southeastern U.S. university. The decision to sample college women was deliberate and informed by the prevalence of binge eating in this population; however, it is important to acknowledge that the results may not apply to male students. Moreover, drawing the sample from a single university raises the question of regional differences and restricts the generalizability of the findings. This study should be

replicated at other universities in different geographical regions before it can be determined whether the present findings may generalize beyond the present sample.

Second, this study was conducted with self-report, retrospective data. The results of self-report data must always be interpreted with caution, due to the incomplete picture they can often paint. We used three validity questions to ensure people were paying attention and reading questions when responding, which eliminated a considerable amount of invalid data and strengthened our confidence in the validity of our data. Still, supplementing self-report data with other approaches (e.g., other report, observational data, food diaries) would have helped to guard against some of the biases inherent in self-report data (e.g., positive impression, limitations of human memory). Confirming this study's results while implementing real-time food and emotion logs or experimental emotion induction could add a great deal to this body of literature.

Third, this study specifically focused on anger and related variables. While we found that trait anger predicted binge eating over and above general negative affect we did not compare this directly to other specific emotional states such as sadness, anxiety, and shame. Replication of these findings while including other discrete emotional states would likely add credence to these findings or generate new and interesting research questions.

Fourth, the study's participants were predominantly Caucasian and African American. Other races were not well represented in the sample. This study's results may not generalize to other races and will need to be replicated with samples including a greater number of Asian and Hispanic participants.

Areas for Future Research

The first and most obvious area for additional research involves replication studies at different universities in different regions to determine the extent to which our findings generalize to other college women. Next, based on the unexpected finding that the lack of perseverance component of impulsivity predicted binge eating, future research designed to further evaluate this possibility seems warranted. If this can be confirmed in other studies, it would suggest that the relationship between impulsivity and binge eating might be broader than previously thought. Possible research questions might include: Will lack of perseverance predict binge eating in other college samples? Does lack of perseverance predict binge eating in non-clinical samples? If the lack of perseverance continues to be associated with binge eating, is this due to eating due to boredom or lack of sustained attention on healthy eating?

Understanding the particular aspects of impulsivity which predispose women to binge eating will better allow us to tailor prevention programs. A prevention program aimed at helping women cope with urgency will likely help participants find alternative coping mechanisms when trying to avoid emotional distress or improve ability to tolerate emotional distress without acting rashly. Whereas a prevention program aimed at helping women cope with lack of perseverance will likely focus on improving sustained attention, and strategies for avoiding binge eating when fatigued or uninterested.

As binge eating gains more attention in the literature, the pieces can start to be put together to form a more comprehensive model of this behavior. This study examined several variables that have been indicated in the Bulimia Nervosa and Binge Eating literature. Future research is needed to continue to put the pieces of the model together.

This study provides one part of a comprehensive model of binge eating among college women, but is by no means exhaustive. For example, additional research is needed to determine whether other emotions besides anger are mediated by emotion regulation. Another study using structural equation modeling with specific negative trait emotions (e.g. trait anger, trait sadness, trait anxiety), emotion suppression, and emotion regulation would allow us to examine how much each emotion and suppression of that particular emotion plays into binge eating.

It is also unclear how many of these findings are specific to non-clinical college women. Replication studies in other samples, including samples of men, persons outside the traditional college age range, and clinical samples would allow us to tease out the common and non-common factors of binge eating across populations. Lastly, as this model of binge eating is created and implications for treatment are generated it will become important to apply these concepts to treatment and run pilot studies to examine if addressing these additional components (e.g., trait anger, anger suppression, urgency, lack of perseverance, emotion regulation) is beneficial in practice.

The present study extended the literature on subclinical binge eating among college women by outlining relevant predictors and relationships between those predictors. This study illustrated that urgency, lack of perseverance, general negative affect, trait anger, anger suppression, and emotion regulation are all significant predictors of subclinical binge eating. We also found that trait anger predicts binge eating over and above general negative affect and that both anger suppression and emotion regulation mediate the relationship between trait anger and binge eating. The present study adds additional complexity and nuance to our understanding of how these predictors relate to

binge eating and one another; enhancing our ability to better prevent and treat binge eating in college women.

APPENDIX A

MEASURES

Demographic Questionnaire

1. Gender: M F

2. Age: _____

3. Year in school: Freshman Sophomore Junior Senior

4. Racial/Ethnic Background:

___ American Indian/Alaskan Native
__ Asian
__ Black or African American
___ Hispanic or Latino (of any race)
___ Native Hawaiian/Other Pacific Islander
___ White
___ Other _____ (please specify)

5. Are you currently diagnosed with or being treated for an Eating Disorder?
YES NO

6. Have you ever been diagnosed with or treated for an Eating Disorder?
YES NO

7. If yes to #5 or 6, please indicate the disorder(s) you were diagnosed with or treated for:
_____ Anorexia Nervosa
_____Bulimia Nervosa
_____Eating Disorder NOS (not otherwise specified)
_____Binge Eating Disorder
_____Other: _____

State-Trait Anger Expression Inventory-2 (STAXI-2)

Trait Anger Scale (T-Ang)

	Almost Never	Sometimes	Almost Always	Often
1. I am quick tempered.	1	2	3	4
2. I am a hotheaded person.	1	2	3	4
3. I have a fiery temper.	1	2	3	4
4. I get angry when I'm slowed down by other's mistakes	1	2	3	4
5. I feel annoyed when I am not given recognition for doing good work.	1	2	3	4
6. I fly off the handle.	1	2	3	4
7. When I get mad, I say nasty things.	1	2	3	4
8. When I get frustrated, I feel like hitting someone.	1	2	3	4
9. I feel infuriated when I do a good job and get a poor evaluation.	1	2	3	4
10. It makes me furious when I am criticized in front of others.	1	2	3	4

Anger Expression and Control Scales (AX, AC)

Directions: A number of statements are listed below which people use to describe their reactions when they feel angry. Read each statement and then blacken the appropriate circle to indicate how often you generally react or behave in the manner described when you are angry. There are no right or wrong answers. Do not spend too much time on any one statement.

	Almost Never	Sometimes	Almost Always	Often
1. I control my temper.	1	2	3	4
2. I express my anger.	1	2	3	4
3. I take a deep breath and relax.	1	2	3	4
4. I keep things in.	1	2	3	4
5. I am patient with others.	1	2	3	4
6. If someone annoys me, I'm apt to tell him or her how I feel.	1	2	3	4
7. I try to calm myself as soon as possible.	1	2	3	4
8. I pout or sulk.	1	2	3	4
9. I control my urge to express my angry feelings.	1	2	3	4
10. I lose my temper.	1	2	3	4
11. I try to simmer down.	1	2	3	4
12. I withdraw from people.	1	2	3	4
13. I keep my cool.	1	2	3	4
14. I make sarcastic remarks to others.	1	2	3	4
15. I try to soothe my angry feelings.	1	2	3	4
16. I boil inside, but I don't show it.	1	2	3	4
17. I control my behavior.	1	2	3	4
18. I do things like slam doors.	1	2	3	4

19. I endeavor to become calm again.	1	2	3	4
20. I tend to harbor grudges that I don't tell anyone about.	1	2	3	4
21. I can stop myself from losing my temper.	1	2	3	4
22. I argue with others	1	2	3	4
23. I reduce my anger as soon as possible	1	2	3	4
24. I am secretly quite critical of others.	1	2	3	4
25. I try to be tolerant and understanding.	1	2	3	4
26. I strike out at whatever infuriates me.	1	2	3	4
27. I do something relaxing to calm down.	1	2	3	4
28. I am angrier than I am willing to admit.	1	2	3	4
29. I control my angry feelings.	1	2	3	4
30. I say nasty things.	1	2	3	4
31. I try to relax.	1	2	3	4
32. I'm irritated a great deal more than people are aware of.	1	2	3	4

Difficulties in Emotion Regulation Scale (DERS)

	Almost	Some	About	Most of	Almost

	Never	times	half the time	the time	Always
1. I am clear about my feelings.	1	2	3	4	5
2. I pay attention to how I feel.	1	2	3	4	5
3. I experience my emotions as overwhelming.	1	2	3	4	5
4. I have no idea how I am feeling.	1	2	3	4	5
5. I have difficulty making sense out of my feelings.	1	2	3	4	5
6. I am attentive to my feelings.	1	2	3	4	5
7. I know exactly how I am feeling.	1	2	3	4	5
8. I care about what I am feeling.	1	2	3	4	5
9. I am confused about how I feel.	1	2	3	4	5
10. When I'm upset, I acknowledge my emotions.	1	2	3	4	5
11. When I'm upset, I become angry with myself for feeling that way.	1	2	3	4	5
12. 12. When I'm upset, I become embarrassed for feeling that way.	1	2	3	4	5
13. When I'm upset, I have difficulty getting work done.	1	2	3	4	5
14. When I'm upset, I become out of control.	1	2	3	4	5
15. When I'm upset,	1	2	3	4	5

I believe that I will remain that way for a long time.					
16. When I'm upset, I believe that I'll end up feeling very depressed.	1	2	3	4	5
17. When I'm upset, I believe that my feelings are valid and important.	1	2	3	4	5
18. When I'm upset, I have difficulty focusing on other things.	1	2	3	4	5
19. When I'm upset, I feel out of control.	1	2	3	4	5
20. 20. I can still get things done.	1	2	3	4	5
21. When I'm upset, I feel ashamed with myself for feeling that way.	1	2	3	4	5
22. When I'm upset, I know that I can find a way to eventually feel better.	1	2	3	4	5
23. When I'm upset, I feel like I am weak.	1	2	3	4	5
24. When I'm upset, I feel like I can remain in control of my behaviors.	1	2	3	4	5
25. When I'm upset, I feel guilty for feeling that way.	1	2	3	4	5
26. When I'm upset, I have difficulty concentrating.	1	2	3	4	5
27. When I'm upset, I have difficulty controlling my	1	2	3	4	5

behaviors.					
28. When I'm upset, I believe there is nothing I can do to make myself feel better.	1	2	3	4	5
29. When I'm upset, I become irritated with myself for feeling that way.	1	2	3	4	5
30. When I'm upset, I start to feel very bad about myself.	1	2	3	4	5
31. When I'm upset, I believe that wallowing in it is all I can do.	1	2	3	4	5
32. When I'm upset, I lose control over my behaviors.	1	2	3	4	5
33. When I'm upset, I have difficulty thinking about anything else.	1	2	3	4	5
34. When I'm upset, I take time to figure out what I'm really feeling.	1	2	3	4	5
35. When I'm upset, it takes me a long time to feel better.	1	2	3	4	5
36. When I'm upset, my emotions feel overwhelming.	1	2	3	4	5

Binge Eating Scale (BES)

Instructions. Below are groups of numbered statements. Read all of the statements in each group and choose the one that best describes the way you feel about the problems you have controlling your eating behavior.

#1
a. I don't feel self-conscious about my weight or body size when I'm with others.
b. I feel concerned about how I look to others, but it normally does not make me feel disappointed with myself.
c. I do get self-conscious about my appearance and weight which makes me feel disappointed in myself.
d. I feel very self-conscious about my weight and frequently, I feel intense shame and disgust for myself. I try to avoid social contacts because of my self-consciousness.

#2
a. I don't have any difficulty eating slowly in the proper manner.
b. Although I seem to "gobble down" foods, I don't end up feeling stuffed because of eating too much.
c. At times, I tend to eat quickly and then, I feel uncomfortably full afterwards.
d. I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I've eaten too much.

#3
a. I feel capable to control my eating urges when I want to.
b. I feel like I have failed to control my eating more than the average person.
c. I feel utterly helpless when it comes to feeling in control of my eating urges.
d. Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control.

#4
a. I don't have the habit of eating when I'm bored.
b. I sometimes eat when I'm bored, but often I'm able to "get busy" and get my mind off food.
c. I have a regular habit of eating when I'm bored, but occasionally, I can use some other activity to get my mind off eating.
d. I have a strong habit of eating when I'm bored. Nothing seems to help me break the habit.

#5
a. I'm usually physically hungry when I eat something.
b. Occasionally, I eat something on impulse even though I really am not hungry.
c. I have the regular habit of eating foods that I might not really enjoy, to satisfy a hungry feeling even though physically, I don't need the food.
d. Even though I'm not physically hungry, 1 get a hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth. Sometimes,

when I eat the food to satisfy my mouth hunger, I then spit the food out so I won't gain weight.

#6
a. I don't feel any guilt or self-hate after I overeat.
b. After I overeat, occasionally I feel guilt or self-hate.
c. Almost all the time I experience strong guilt or self-hate after I overeat.

#7
a. I don't lose total control of my eating when dieting even after periods when I overeat.
b. Sometimes when I eat a "forbidden food" on a diet, I feel like I "blew it" and eat even more.
c. Frequently, I have the habit of saying to myself, "I've blown it now, why not go all the way" when I overeat on a diet. When that happens I eat even more.
d. I have a regular habit of starting strict diets for myself, but I break the diets by going on an eating binge. My life seems to be either a "feast" or "famine."

#8
a. I rarely eat so much food that I feel uncomfortably stuffed afterwards.
b. Usually about once a month, I eat such a quantity of food, I end up feeling very stuffed.
c. I have regular periods during the month when I eat large amounts of food, either at mealtime or at snacks.
d. I eat so much food that I regularly feel quite uncomfortable after eating and sometimes a bit nauseous.

#9
a. My level of calorie intake does not go up very high or go down very low on a regular basis.
b. Sometimes after I overeat, I will try to reduce my caloric intake to almost nothing to compensate for the excess calories I've eaten.
c. I have a regular habit of overeating during the night. It seems that my routine is not to be hungry in the morning but overeat in the evening.
d. In my adult years, I have had week-long periods where I practically starve myself. This follows periods when I overeat. It seems I live a life of either "feast or famine."

#10
a. I usually am able to stop eating when I want to. I know when "enough is enough."
b. Every so often, I experience a compulsion to eat which I can't seem to control.
c. Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
d. I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

#11
a. I don't have any problem stopping eating when I feel full.

b. I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
c. I have a problem stopping eating once I start and usually I feel uncomfortable stuffed after I eat a meal.
d. Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

#I2
a. I seem to eat just as much when I'm with others (family, social gatherings) as when I'm by myself.
b. Sometimes, when I'm with other persons, I don't eat as much as I want to eat because I'm self-conscious about my eating.
c. Frequently, I eat only a small amount of food when others are present, because I'm very embarrassed about my eating.
d. I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a "closet eater."

#I3
a. I eat three meals a day with only an occasional between meal snack.
b. I eat 3 meals a day, but I also normally snack between meals.
c. When I am snacking heavily, I get in the habit of skipping regular meals.
d. There are regular periods when I seem to be continually eating, with no planned meals.

#14
a. I don't think much about trying to control unwanted eating urges.
b. At least some of the time, I feel my thoughts are pre-occupied with trying to control my eating urges.
c. I feel that frequently I spend much time thinking about how much I ate or about trying not to eat anymore.
d. It seems to me that most of my waking hours are pre-occupied by thoughts about eating or not eating. I feel like I'm constantly struggling not to eat.

#15
a. I don't think about food a great deal.
b. I have strong cravings for food but they last only for brief periods of time.
c. I have days when I can't seem to think about anything else but food.
d. Most of my days seem to be pre-occupied with thoughts about food. I feel like I live to eat.

#16
a. I usually know whether or not I'm physically hungry. I take the right portion of food to satisfy me.
b. Occasionally, I feel uncertain about knowing whether or not I'm physically hungry. At these times it's hard to know how much food I should take to satisfy me.
c. Even though I might know how many calories I should eat, I don't have any idea what is a "normal" amount of food for me.

Eating Attitudes Test (EAT-26)

Age: _____
Current Weight: _____ Highest weight (excluding pregnancy): _____
Sex: _____
Height: _____ Lowest Adult Weight: _____ Ideal Weight: _____

Please choose one response by marking a check to the right for each of the following statements:

	Always	Usually	Often	Sometimes	Rarely	Never
1. Am terrified about being overweight.	3	2	1	0	0	0
2. Avoid eating when I am hungry.	3	2	1	0	0	0
3. Find myself preoccupied with food.	3	2	1	0	0	0
4. Have gone on eating binges where I feel that I may not be able to stop.	3	2	1	0	0	0
5. Cut my food into small pieces.	3	2	1	0	0	0
6. Aware of the calorie content of foods that I eat.	3	2	1	0	0	0
7. Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)	3	2	1	0	0	0
8. Feel that others would prefer if I ate more.	3	2	1	0	0	0
9. Vomit after I have eaten.	3	2	1	0	0	0
10. Feel extremely guilty after eating.	3	2	1	0	0	0
11. Am preoccupied	3	2	1	0	0	0

with a desire to be thinner.						
12. Think about burning up calories when I exercise.	3	2	1	0	0	0
13. Other people think that I am too thin.	3	2	1	0	0	0
14. Am preoccupied with the thought of having fat on my body.	3	2	1	0	0	0
15. Take longer than others to eat my meals.	3	2	1	0	0	0
16. Avoid foods with sugar in them.	3	2	1	0	0	0
17. Eat diet foods.	3	2	1	0	0	0
18. Feel that food controls my life.	3	2	1	0	0	0
19. Display self-control around food.	3	2	1	0	0	0
20. Feel that others pressure me to eat.	3	2	1	0	0	0
21. Give too much time and thought to food.	3	2	1	0	0	0
22. Feel uncomfortable after eating sweets.	3	2	1	0	0	0
23. Engage in dieting behavior.	3	2	1	0	0	0
24. Like my stomach to be empty.	3	2	1	0	0	0
25. Have the impulse to vomit after meals.	3	2	1	0	0	0
26. Enjoy trying new rich foods. _	3	2	1	0	0	0

Behavioral Questions:

In the past 6 months have you:

A. Gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances) If you answered yes, how often during the worst week:	Yes	No
B. Ever made yourself sick (vomited) to control your weight or shape? If you answered yes, how often during the worst week:	Yes	No
C. Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape? If you answered yes, how often during the worst week?	Yes	No
D. Ever been treated for an eating disorder? When: _____	Yes	No

The Positive and Negative Affect Schedule (PANAS) (Washington et al. 1988)

This scale consists of a number of words that describe differential feelings and emotions. Read each item and then list the number from the scale below next each word. Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past weeks (circle the instructions you followed when taking this measure)

	Very Slightly or Not at All	A Little	Moderately	Quite A Bit	Extremely
1. Interested	1	2	3	4	5

2. Distressed	1	2	3	4	5
3. Excited	1	2	3	4	5
4. Upset	1	2	3	4	5
5. Strong	1	2	3	4	5
6. Guilty	1	2	3	4	5
7. Scared	1	2	3	4	5
8. Hostile	1	2	3	4	5
9. Enthusiastic	1	2	3	4	5
10. Proud	1	2	3	4	5
11. Irritable	1	2	3	4	5
12. Alert	1	2	3	4	5
13. Ashamed	1	2	3	4	5
14. Inspired	1	2	3	4	5
15. Nervous	1	2	3	4	5
16. Determined	1	2	3	4	5
17. Attentive	1	2	3	4	5
18. Jittery	1	2	3	4	5
19. Active	1	2	3	4	5
20. Afraid	1	2	3	4	5

UPPS Impulsivity Scale

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you Agree Strongly circle 1, if you Agree Somewhat circle 2, if you Disagree somewhat circle 3, and if you Disagree Strongly circle 4. Be sure to indicate your agreement or disagreement for every statement below. Also, there are a few more questions on the next page

	Agree Strongly	Agree Somewhat	Disagree Somewhat	Disagree Strongly
1. I have a reserved and cautious attitude toward life.	1	2	3	4
2. I have trouble controlling my impulses.	1	2	3	4

3. I generally seek new and exciting experiences and sensations.	1	2	3	4
4. I generally like to see things through to the end.	1	2	3	4
5. My thinking is usually careful and purposeful.	1	2	3	4
6. I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
7. I'll try anything once.	1	2	3	4
8. I tend to give up easily.	1	2	3	4
9. I am not one of those people who blurt out things without thinking.	1	2	3	4
10. I often get involved in things I later wish I could get out of.	1	2	3	4
11. I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
12. Unfinished tasks really bother me.	1	2	3	4
13. I like to stop and think things over before I do them.	1	2	3	4
14. When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
15. I would enjoy water skiing.	1	2	3	4
16. Once I get going on something I hate to stop.	1	2	3	4
17. I don't like to start a project until I know exactly how to proceed.	1	2	3	4
18. Sometimes when I feel bad, I can’t seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
19. I quite enjoy taking risks.	1	2	3	4
20. I concentrate easily.	1	2	3	4
21. I would enjoy parachute jumping.	1	2	3	4
22. I finish what I start.				
23. I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
24. When I am upset I often act without thinking.	1	2	3	4

25. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
26. I am able to pace myself so as to get things done on time.	1	2	3	4
27. I usually make up my mind through careful reasoning.	1	2	3	4
28. When I feel rejected, I will often say things that I later regret.	1	2	3	4
29. I would like to learn to fly an airplane.	1	2	3	4
30. I am a person who always gets the job done.	1	2	3	4
31. I am a cautious person.	1	2	3	4
32. It is hard for me to resist acting on my feelings.	1	2	3	4
33. I sometimes like doing things that are a bit frightening.	1	2	3	4
34. I almost always finish projects that I start.	1	2	3	4
35. Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
36. I often make matters worse because I act without thinking when I am upset.	1	2	3	4
37. I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
38. Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4
39. I usually think carefully before doing anything.	1	2	3	4
40. Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4
41. In the heat of an argument, I will often say things that I later regret.	1	2	3	4
42. I would like to go scuba diving.	1	2	3	4
43. I always keep my feelings under control.	1	2	3	4
44. I would enjoy fast driving.	1	2	3	4

45. Sometimes I do impulsive things that I later regret.	1	2	3	4

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6820 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **13080601**
PROJECT TITLE: **Eating and Emotional Correlates in College Women**
PROJECT TYPE: **Dissertation**
RESEARCHER(S): **Emily Prather**
COLLEGE/DIVISION: **College of Education and Psychology**
DEPARTMENT: **Psychology**
FUNDING AGENCY/SPONSOR: **N/A**
IRB COMMITTEE ACTION: **Expedited Review Approval**
PERIOD OF APPROVAL: **09/18/2013 to 09/17/2014**

Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX C

CONSENT FORM

UNIVERSITY OF SOUTHERN MISSISSIPPI
AUTHORIZATION TO PARTICIPATE IN RESEARCH PROJECT

Consent is hereby given to participate in the study entitled: *Eating and Emotional Correlates in College Women*

Purpose: This study is being conducted to investigate the relationship between mood, personality, and eating behavior in college women.

1. Description of Study: Participants will be asked to complete questionnaires about attitudes about their moods, personality, and eating behavior. This study should take approximately 60 minutes and will be worth one research credit.

2. Benefits: Although participants will receive no direct benefit from participation in this study, the information provided will enable researchers to better understand the role of emotions and personality on eating attitudes and behavior in women.

3. Risks: There are no foreseeable risks to participating in this study. If you feel that completing these questionnaires have resulted in emotional distress, please stop and notify the lead researcher (Emily Prather at Emily.Prather@eagles.usm.edu). If you should decide at a later date that you would like to discuss your concerns, please contact Emily Prather at Emily.Prather@eagles.usm.edu. Alternatively, you may contact one of several local agencies, such as:

   Student Counseling Services
   200 Kennard Washington Hall
   Phone: (601) 266-4829

   Community Counseling and Assessment Clinic
   Owings-McQuagge Hall, Room 202
   Phone: (601) 266-4601

   Pine Belt Mental Healthcare Resources
   Phone: (601) 544-4641

4. Confidentiality: These questionnaires are intended to be anonymous, and your name is requested on this page only for the purpose of assigning research credit. The information you provide will be kept strictly confidential, and your name will not be associated with your responses in any way. If significant new information relating to this study becomes known which may relate to your willingness to continue to take part in this study, you will be given this information.

5. Subject's Assurance: Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted), the researchers will take every precaution consistent with the best scientific

practice. Participation in this project is completely voluntary, and you may withdraw from this study at any time without penalty or prejudice. Questions concerning this research should be directed to Emily Prather, M.A. (Emily.Prather@eagles.usm.edu). This project and this consent form have been reviewed by the Human Subjects Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-001.

6. Consent to Participate: I consent to participate in this study, and in agreeing to do so, I understand that:
    a. I must be at least 18 years of age and identify as a woman,
    b. I am being asked to complete a set of questionnaires, which will take up to 1 hour and for which I will receive 1 research credit, and
    c. All information I provide will be used for research purposes and will be kept confidential.

I understand that my participation in this research is voluntary. If I decide to participate in the study, I may withdraw my consent and stop participating at any time without penalty or loss of benefits to which I am otherwise entitled.

I have read and understand the information stated, am at least 18 years of age, and I willingly sign this consent form. A copy can be printed by clicking on "file" at the top left and choosing "print" from the menu.

_____
(Subject name printed)

_____ _____
(Subject signature) Date

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