

MOOD, FOOD, TRAITS, AND RESTRAINT:  
AN EXPERIMENTAL INVESTIGATION OF NEGATIVE AFFECT,  
BORDERLINE PERSONALITY, AND DISORDERED EATING

A Dissertation

by

SUMAN AMBWANI

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2008

Major Subject: Psychology

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## ABSTRACT

Mood, Food, Traits, and Restraint: An Experimental Investigation of  
Negative Affect, Borderline Personality, and Disordered Eating. (August 2008)

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Eating disorders and borderline personality disorder involve several overlapping features, such as impulsivity, negative affectivity, and dissociation. However, few studies have specifically assessed how eating pathology and borderline personality may be related. The present study sought to evaluate this relationship by focusing on one particular area of overlap, negative affectivity. A pilot study assessed the psychometric properties of a dietary restraint measure among undergraduate women ( $N = 149$ ). In the main study, undergraduate women ( $N = 307$ ) completed a baseline mood assessment, then viewed a 39-minute sad film either with or without concurrent food presentation. Participants then completed a second mood assessment, and those who received food completed a third mood assessment following a 10-minute post-reflection delay. Results suggest that women reporting more borderline features exhibited greater negative affect across three different time points (baseline, post-movie/food, and post-reflection period), and were more reactive to the sad film. Food presentation appeared to have a small tempering effect on sadness, such that individuals who received food reported relatively

less sadness after viewing the film when compared to those who did not receive food. However, actual quantity of food consumption was associated with improvements in mood only for women reporting higher levels of borderline features. Finally, high-scoring on dietary restraint measures consumed greater quantities of food than their low-scoring counterparts. In sum, these data suggest that women with borderline personality features may be at elevated risk for developing problems with binge-eating, as consuming larger quantities of food appeared to have a tempering effect on their negative mood and specific feelings of sadness. Further, results are consistent with earlier findings in that reported efforts to restrain dietary intake were associated with greater food consumption in response to negative affect, and this relationship may need to be addressed in treating individuals with problematic eating behaviors.

## ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Les Morey, for adopting me as his student mid-way through graduate school, and for being an incredibly supportive, patient, encouraging, and knowledgeable mentor – I could not have asked for more. I would also like to thank Dr. David Gleaves, who, despite being thousands of miles away, continues to show his dedication as a mentor and guides me in so many ways. Thank you to my committee members, Dr. Douglas Snyder and Dr. Danny Ballard, for their time, effort, and practical assistance throughout this process. I also thank my diligent research assistants, Christy Talbert and Samantha Barnes, without whom these data might never have been collected, as well as others who assisted us in the lab, including, Jessica Stoner, Elizabeth Koonce, Becky Thompson, and Kara Palmer. Thanks to Chris Hopwood, my lab mate, for his early weekend phone calls to brainstorm research ideas, and all of my other friends and colleagues for nudging me through the ups and downs of graduate school. I want to extend my gratitude to the College of Liberal Arts at Texas A&M University for providing monetary assistance for this project. And last, but most certainly not least, I thank my family. Thank you for understanding what this means to me and giving me the opportunity to study so far away from home. This is for you.

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## INTRODUCTION

Borderline Personality Disorder (BPD) and the Eating Disorders (EDs), including Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Eating Disorder Not Otherwise Specified (EDNOS), typically cause substantial impairment in functioning (BPD; Bradley & Westen, 2005; EDs; Newman et al., 1996) and are among the most disabling of psychiatric conditions. These disorders tend to follow difficult courses of treatment, often with poor outcome (BPD; Stevenson & Mearns, 1992; EDs; Fairburn et al., 2000; Keel et al., 1999). BPD may be one of the most frequently diagnosed Axis II conditions among individuals with eating disorders, and although variable across studies, rates of BPD and ED co-morbidity often range from 4.3% to 10% for AN, and 6.2% to 28% for BN (Godt, 2002; Sansone, Levitt, & Sansone, 2005). Given these high, albeit variable, estimates of co-morbidity, the present review explores possible links between BPD and EDs to understand *how* and *why* they might be related.

### *Borderline Personality*

Individuals with BPD, who are estimated to comprise about 1-2% of the community population (Torgerson et al., 2001) and 15-27% of inpatient and outpatient populations, respectively (Widiger & Rogers, 1989), experience substantial difficulty in multiple areas of functioning. Diagnostic criteria for BPD specify problems with affect regulation, cognition, impulsivity, and dysfunctional interpersonal relationships (APA,

1994). Individuals with BPD are amongst the highest at-risk for committing suicide (Linehan, Rizvi, Shaw-Welch, & Page, 2000) and have high rates of co-morbid psychiatric conditions (Skodol et al., 2002). Among its constellation of symptoms, BPD is considered by some to be essentially a disorder of emotion regulation, in particular due to the heightened emotional vulnerability and lack of regulation strategies seen in individuals with BPD (Linehan, 1993). Thus, individuals with BPD seem to have few resources to cope with external stressors, to which they respond with significant mood shifts. Moreover, affective intensity and problems with affect control seem to be significantly associated with BPD even after the effects of dysphoric mood have been controlled for (Yen, Zlotnick, & Costello, 2002). Nonetheless, negative affect in itself appears to be a critical component of BPD, as BPD individuals typically report dysphoric baseline moods (Trull, 2001), feelings of hopelessness and anger (Freeman, Stone, Martin, & Reinecke, 2005) and depression in response to life circumstances (Perry, Lavori, Pagano, Hoke, and O'Connell, 1992).

Although difficulty modulating or regulating affect is a central characteristic of BPD (e.g., Conklin, Bradley, & Westen, 2006; Linehan, 1993), few have assessed specific affect regulation processes among individuals with BPD. *Affective dysregulation* in BPD refers to the tendency for emotions to be illogical, escalate out of control, fluctuate rapidly, and be expressed in extreme form (Westen, 1998). For instance, Russell, Moskowitz, Zuroff, Sookman, and Paris (2007) recently reported that individuals with borderline personality disorder reported increased affective variability over a 20-day recording period relative to nonclinical controls. Individuals with BPD are

somewhat unique in their propensity to experience affective dysregulation in addition to negative affect, in comparison to individuals with mood disorders, such as Dysthymic Disorder, who are characterized primarily by negative affect, but not affective dysregulation (Conklin et al., 2006). A key problem experienced by individuals with BPD is difficulty in emotion processing, or identifying and organizing emotion within themselves and in others. For instance, one study reported that individuals with BPD were less accurate than non-clinical controls in identifying certain negative emotions, such as sadness, anger, and disgust, on a picture rating task, and also reported greater global intensity of emotion (Bland, Williams, Scharer & Manning, 2004). Thus, not only do individuals with borderline personality exhibit difficulty identifying emotions, but they also demonstrate a hyper-responsiveness to daily stressors and negative affect (e.g., Tolpin et al., 2004; Zeigler-Hill & Abraham, 2006). In sum, much of the research literature highlights the salience of negative affectivity and dysregulation among individuals with BPD, thereby suggesting that BPD may act as a proxy for hyperreactivity to distressing situations.

### *Eating Disorders*

Individuals with eating disorders, for whom prevalence estimates typically range from 3% to 10% among at-risk women (i.e., ages 15-29 years; Polivy & Herman, 2002), are prone to experience a host of significant medical and psychological consequences and correlates, such as gastro-intestinal complications, dangerously low body weight, dental carries, overall poor psychological functioning, clinical depression (Stice, Hayward, Cameron, Killen, & Taylor, 2000) and co-morbid Axis II diagnoses (33%;

Godt, 2002). In addition, individuals with eating disorders, relative to those with other psychiatric conditions, are amongst the highest in rates of hospitalizations (Newman et al., 1996) and suicide attempts and mortality (5%- 8%; Herzog et al., 2000).

The diagnostic criteria for AN specify maintaining low body weight (less than 85% of normal body weight), significant fear of fatness, disturbed evaluation of one's body weight/shape, and amenorrhea for at least 3 consecutive cycles (DSM-IV; APA, 1994). Moreover, AN clients may be distinguished in their tendency to refuse eating (AN-restricting subtype) or tendency to engage in bingeing and purging (AN-binge/purge subtype). To be diagnosed with BN, individuals must demonstrate recurrent episodes of binge-eating and compensatory behavior (such as exercising or purging) at least twice a week for three months, and maintain an overvaluation of their body weight/shape (APA, 1994). Despite apparent similarities between AN-binge/purge subtype and BN, individuals with AN must also exhibit lower-than-normal body weight and amenorrhea for diagnosis, and other differences between the two groups, such as higher levels of impulsivity among individuals with BN than AN (Polivy & Herman, 2002) have been noted in the literature.

Multiple factors are implicated in the etiology of eating disorders, including *sociocultural factors*, such as female gender (Striegel-Moore, Silberstein, & Rodin, 1986), peer influence (Vohs, Heatherton, & Herrin, 2001; Zalta & Keel, 2006), distorted media images, critical family environments (Haworth-Hoepfner, 2000) and childhood teasing (Cash, 1995; Vartanian, Giant, & Passino, 2001), and *psychological factors*, such as depression (Raffi et al., 2000), body dissatisfaction (Stice, 2001), thin-ideal

internalization (Stice, 2002), childhood sexual abuse (Everill & Waller, 1995), psychological stress (Ball & Lee, 2000), low self-esteem (Fairburn et al., 1997; Striegel-Moore, 1997), and impulsive characteristics (Lyke & Spinella, 2004). Finally, *physiological factors*, such as disruptions in the serotonergic system (Kruger & Kennedy, 2000; Steiger et al., 2005), are also considered significant in the etiology of EDs. However, the physiological basis of EDs has been difficult to examine because the biological anomalies seen in individuals with EDs are just as likely to represent results of their eating habits, as causes of them (Polivy & Herman, 2002).

#### *Borderline Personality and Eating Disorders*

Borderline personality and EDs appear to be related in multiple ways. For instance, EDs and BPD are both associated with tendencies towards impulsive behavior, such as suicidality and deliberate self-harm, difficulty managing emotion, the experiencing of dissociative states, and identity problems (Sansone & Levitt, 2005; Smith, Burkey, Nawn, & Reif, 1991).<sup>1</sup> A study linking BPD and EDs reported that emotionally dysregulated ED clients exhibited the poorest functioning, most co-morbid conditions (i.e., 32.4% BPD; 80.6% any Axis II diagnosis), and demonstrated the worst therapeutic outcome, when compared with ED individuals who were classified as emotionally constricted or perfectionistic (Thompson-Brenner & Westen, 2005). Moreover, researchers comparing individuals with BPD and EDs often comment on the apparent overlap between the disorders. For instance, Sansone and Levitt (2005) noted in their review of borderline personality and EDs, “Given that ED patients often appear to

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<sup>1</sup> Following Conklin, Bradley, and Westen (2006), the terms *affect* and *emotion* are used interchangeably.

have difficulty modulating moods and behavior, maintaining self-esteem, sustaining successful relationships, and constructing an identity, there appear to be fewer genuine differences with BPD in areas of functioning than indicated by the *DSM-IV*" (p.77). Overall, although the nature of the relationship between EDs and BPD remains unknown, it seems that affective instability is an area of considerable overlap between individuals with EDs and BPD: whereas for BPD, affective instability is a diagnostic criterion, individuals with eating disorders, particularly BN and Binge-Eating Disorder, often point to the role of negative affect in precipitating and maintaining their disordered eating. Despite the apparent associations among borderline personality characteristics, negative affect, and eating pathology, few researchers have examined all three within an experimental paradigm.

#### *Affect and Eating Behavior*

As individuals with BPD and those with EDs typically exhibit problems with affect regulation, a review of the association between affect and eating behavior may inform an understanding of the interrelationship between the two clinical disorders. Several studies have demonstrated the salience of negative affect, as well as inhibition of negative affect, in disordered eating behavior (e.g., Podar, Hannus, & Allik, 1999; Stice, 2002). Negative affect theory suggests that binge eating is more likely in the presence of emotional disturbance, and that individuals eat to provide comfort and to distract themselves from the negative stimuli (Heatherton & Baumeister, 1991; Stice & Agras, 1999). Several studies support this theory, as negative affect consistently predicts disordered eating. For instance, Kaye, Gwirtsman, George, Weiss, and Jimerson (1986)

found that BN clients reported greater depression and anxiety than non-clinical controls prior to engaging in binge-eating behavior. Similarly, Stice (2001) reported that negative affect, among other factors, was prospectively related to the growth of bulimic symptoms among adolescents. Additionally, in a meta-analysis, Stice (2002) reported medium effect sizes for the relationship between lab-induced negative affect and resultant binge-eating, and noted that the effects were significantly larger in studies where participants ate with concurrent presentation of the negative affect-inducing stimulus, rather than after it.

The research literature suggests that negative emotion may play an important role in triggering eating behavior, but that this relationship is likely influenced by several moderators. For instance, restrained eating, the tendency to consciously restrict food intake for weight loss or weight maintenance reasons (Herman & Polivy, 1980), is a central concept in the assessment of eating behavior. According to the restraint model of eating disorders, individuals high in dietary restraint eat to offset the effects of caloric deprivation, and because of disinhibition following a violation of their strict dietary restraint rules (Stice & Agras, 1999). Various factors have been reported to disinhibit the restrained eater's rigid over-control towards eating, such as general dysphoric mood (e.g., Chua, Touyz, & Hill, 2004), use of alcohol, and perceptions of having over-eaten, such as through consumption of a preload that is perceived to be high in calories (Herman & Polivy, 1975; McFarlane et al., 1999; Ruderman, 1986), as well as increased emotionality or general emotional arousal (Cools, Schotte, & McNally, 1992; Herman & Polivy, 1975), depressed affect (Strauss et al., 1994), and anxiety (McKenna, 1972).



The dual-pathway model of BN postulates that dietary restraint and negative affect are both significant contributors to disordered eating, which occur within the context of broader sociocultural factors promoting the development of eating disorders (Stice, 1994; Stice & Agras, 1999). Thus, dietary restraint and negative affect are considered to be the final mechanisms by which external pressures engender disordered eating behavior. There are some data to suggest that restrained eating is associated with negative affect (average effect size,  $r = .16$ ), eating pathology (average effect size,  $r = .15$ ), and maintenance of eating pathology (average effect size,  $r = .22$ ) (Stice, 2002).

In general, data suggest significant differences between restrained and unrestrained eaters in their food-based responses to negative affect. Individuals high in dietary restraint tend to overeat under conditions of anxiety and/or stress, whereas normal, unrestrained eaters tend to consume less food under similar conditions (Herman & Polivy, 1975; see McFarlane, Polivy, & McCabe, 1999, for a review of the literature). For instance, an experimental study by Frost and colleagues (1982) demonstrated that among non-clinical women exposed to a depression-eliciting stimulus, high-restricters consumed larger quantities of M&M candies than low-restricters. However, among those in the neutral affect condition, the pattern of results was reversed, such that high-restricters ate fewer M&Ms than low-restricters. Similarly, another experimental study reported that high-restricters exposed to a neutral film ate less than low-restricters, however, high-restricters ate more than low-restricters upon exposure to a horror film (negative affect) or comedy film (positive affect), although the effects for the negative-affect inducing stimulus were larger (Cools, Schotte, & McNally, 1992).

Consistent with earlier findings, a more recent study reported that high-restrainers ate more chocolate than low-restrainers after exposure to a sad film, compared to a neutral film, although the interaction of film by dietary restraint just failed to reach statistical significance (Chua, Touyz, & Hill, 2004). Other studies have demonstrated that dieters (i.e., restrainers) exposed to a sad-affect eliciting stimulus (e.g., failure at a task) eat significantly more than their dieting counterparts exposed to a non-depressing stimulus (e.g., success at a task), whereas nondieters exhibit the opposite pattern of results, but often without significant differences between the depressed and non-depressed conditions (Baucom & Aiken, 1981; Ruderman, 1985). In other words, typical eating patterns appear to be reversed when depressed affect is elicited, such that restrainers eat, whereas non-restrainers do not (Baucom & Aiken, 1981).

The combined significance of restrained eating and negative affect in predicting eating behavior has also been replicated in several studies (e.g., Herman, Polivy, Lank, & Heatherton, 1987; Schotte, Cools, & McNally, 1990; Strauss et al., 1994), indicating that individuals with high dietary restraint, when exposed to disinhibiting stimuli (e.g., food pre-load, induction of sad affect or anxiety), consume greater quantities of food than those low in dietary restraint and those not exposed to the disinhibitor (e.g., a neutral film clip). Overall, these data highlight the effects of negative affect in particular, and perhaps emotional arousal in general, as a disinhibiting stimulus for women characterized as high in dietary restraint.

One limitation of the research on dietary restraint is that extant measures of dietary restraint often fail to assess true dietary restraint as a behavioral outcome,

thereby leading some to conclude that such measures are invalid. For instance, in a series of four experiments conducted in laboratory and naturalistic eating environments, Stice, Fisher, and Lowe (2004) reported weak and typically nonsignificant correlations between scores on dietary restraint measures and objectively measured caloric intake. Similarly, Sysko, Walsh, Schebendach, and Wilson (2005) reported that scores on the Three-Factor Eating Questionnaire – Cognitive Restraint scale (*TFEQ-R*; Stunkard & Messick, 1985) and Dietary Intent Scale (*DIS*; Stice, 1998) were not significantly associated with observed consumption of yogurt shakes. A subsequent report noted that although the *DIS* correlated with consumption of a test meal shake ( $r = .30$ ), this relationship was non-significant ( $p = .07$ ; Sysko, Walsh, & Wilson, 2007). Results from a recent study in which 2-week caloric intake was estimated through doubly-labeled water, a biological measure of energy intake, and 3-month caloric intake was observed unobtrusively, suggested that the relationship between *TFEQ-R* and actual caloric intake was not significant (Stice, Cooper, Schoeller, Tappe, & Lowe, 2007). The researchers thus concluded that dietary restraint self-report measures are not valid measures of dietary restriction.

There have been a few reports of dietary restraint corresponding with objective binge eating in the expected direction. For instance, Lowe, Thomas, Safer, and Butryn (2007) reported a small inverse correlation ( $r = -.13$ ) between dietary restraint and objective binge-eating among individuals with bulimia nervosa, suggesting that high restrainers may have been able to temporarily inhibit their binge eating behavior. An earlier study by Laessle, Tuschl, Kotthaus, and Pirke (1989) also suggested that *TFEQ-R*

scores correlated with actual dietary restraint (i.e., daily caloric intake) in the expected direction,  $r = -.49$ . On the other end of the spectrum, prospective studies demonstrate that women with high levels of dietary restraint, as assessed by the aforementioned instruments, are at greater risk for future development of binge eating and bulimic symptoms (e.g., Stice, Killen, Hayward, & Taylor, 1998), suggesting that the construct assessed by these instruments may play an important role in the development of dysfunctional eating behavior.

Stice, Cooper, Schoeller, Tappe, and Lowe (2007) suggested that prior inconsistent findings with regard to the relationship between scores on dietary restraint measures and actual caloric intake may be in part due to confusion about relative versus absolute dietary restriction. Specifically, measures of dietary restraint may not assess absolute dietary restriction *per se*, but rather, assess relative dietary restriction. Others suggest that dietary restraint is best defined as successful and failed restriction, as restrained eating with occasional lapses in restraint is most characteristic of high-restrainers (Heatherton et al., 1988; Ogden, 1993). At present, the nature of dietary restraint as assessed by extant measures remains unclear, thus suggesting the need for further research comparing and evaluating the association of these measures with actual caloric intake.

An individual's hunger level prior to the experimental manipulation may be another moderator of food consumption in response to negative affect. For instance, Herman and colleagues' (1987) experiment demonstrated that whereas in the high-anxiety condition, dieters (i.e., restrainers) ate more food than non-dieters, in the low-

anxiety condition, dieters ate less than non-dieters. However, they noted, these effects were different for those who had and had not been presented with a preload milkshake prior to the anxiety manipulation: in the preload condition, dieters ate more than non-dieters in the low-anxiety condition, but there were no differences between groups in the high-anxiety condition. Thus, Herman and colleagues (1987) suggested that anxiety increased food consumption among dieters only when they were already hungry. These data suggest that prior food consumption may be an important factor to consider in assessing laboratory-based food consumption.

Studies assessing mood and food consumption suggest a tendency to eat food in response to emotion, however, there are few data with non-clinical samples that evaluate whether or not the food consumption affects participants' mood. In general, research suggests that the consumption of various foods is associated with the manufacture of serotonin and endogenous opiates (Wurtman, 1988, 1993), low levels of which are linked to the experience of negative affect. In one study examining mood and comfort food consumption, women reported that comfort food consumption decreased their negative affect, but also led to feelings of guilt (Dubé, LeBel, & Lu, 2005). Overall, participants (male and female) reported improvements in affect (positive and negative) after consuming comfort foods, particularly after consumption of high-calorie sweet foods (Dubé et al., 2005). Interpretation of study results, however, is limited by the self-report retrospective study design, in which participants were instructed to recall their mood states associated with comfort food consumption. In another study, chocolate consumption (and food consumption in general, although the effects were more

pronounced for chocolate) led to enhanced mood, but also immediate increased feelings of guilt (Macht & Dettmer, 2006). Notably, individuals who did and did not report feelings of guilt subsequent to chocolate consumption did not vary in self-reported dietary restraint, as assessed by the Dutch Eating Behavior Questionnaire (*DEBQ*; van Strien, Frijters, Bergers, & Defares, 1986). However, limitations of this particular study, such as the small sample size ( $N = 37$ ) and unsupervised nature of eating (i.e., individuals were mailed the food stimulus, questionnaire packets, and a timer) limit the interpretability of findings. Consistent with these findings, results from another study suggested that dieters and non-dieters did not differ in their mood ratings before and after consuming a chocolate bar, although the mood assessment was fairly non-specific (i.e., one item on a 10-point scale, such that 0 = bad mood, 9 = good mood; Jones & Rogers, 2003).

Although negative affect theory suggests that individuals with eating disorders engage in binge-eating to help them cope with negative affect, the data are mixed as to whether or not eating is an effective coping strategy. For instance, some studies suggest that BN clients experience a significant worsening of mood following binge-eating (e.g., Steiger et al., 2005), whereas others demonstrate an improvement in mood after bingeing (e.g., Stickney & Miltenberger, 1999). In one study, obese individuals who completed a weight management program reported significant decreases in negative affect (i.e., feelings of tension and tiredness), and a trend towards a decline in sadness, after eating; however, these participants may have been unique in having just completed a weight management program the day prior to data collection, thereby limiting the

generalizability of these findings (Tuomisto, Tuomisto, Hetherington, & Lappalainen, 1998). Other studies with eating disorder clients suggest variability within mood states, such that BN clients experience a decline in anxiety, but an increase in depression, following binge-eating (e.g., Kaye et al., 1986). As Gleaves and colleagues (1993) noted, negative affect also influences BN clients' perceptions of food consumption, rather than just their actual eating behavior. For instance, in a study assessing changes in perceived food intake after exposure to a negative affect-inducing stimulus, participants reported worsening of mood, as well as increases in self-perceived eating behavior, after exposure to the stimulus (Bekker et al., 2004). Overall, as Steiger and colleagues (2005) suggest, these variable findings may indicate differences in mood based on temporal proximity to the binge-eating; for instance, individuals may initially experience a brief respite from negative affect after binge-eating, but then experience dysphoric mood in the long-run. The paucity of experimental data in this area highlights the need to examine the immediate and delayed effects of food consumption on restrained and unrestrained eaters.

#### *Personality, Affect, and Eating Behavior*

Patterns of restrained eating have also been implicated in the etiology of eating disorders (e.g., Striegel-Moore, Silberstein, & Rodin, 1986; Stice, 2002), and one prospective risk-factor study conducted in England reported that dieters are at 8 times higher risk than non-dieters for developing an eating disorder (Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990). However, when personality/individual difference factors are considered, such as self-esteem and borderline personality, the pattern of

results with regard to food consumption becomes more variable. For instance, body dissatisfaction and self-esteem problems have also been linked with dietary restraint and disinhibition of eating (Dewberry & Ussher, 1994; Paa & Larson, 1998; Ricciardelli et al., 1997). One study demonstrated that after restrained eaters were presented with a pre-load, only those with low self-esteem displayed patterns of disinhibited eating (Polivy et al., 1988). In another experimental study, Heatherton, Herman, and Polivy (1991) exposed participants to a negative affect-inducing stimulus (i.e., anxiety about having to give a speech) and reported that individuals with low self-esteem ate more when they were high versus low-restrainers, but that individuals with high self-esteem and high dietary restraint ate *less* than those with high self-esteem and low dietary restraint. Thus, level of self-esteem appeared to be a crucial factor in determining whether or not the high-restrainers ate in response to the negative affect-inducing stimulus. Previous reports suggest that individuals with BPD or sub-clinical borderline personality features exhibit low, fluctuating self-esteem (e.g., Tolpin et al., 2004; Zeigler-Hill & Abraham, 2006), thus, one might expect them to follow a similar pattern, with BPD high-restrainers consuming larger quantities of food than BPD low-restrainers when exposed to negative affective stimuli.

One study examined mood among BN clients (arguably “high restrainers”) with and without BPD, before and after binge-eating. Although both groups reported significant reductions in anxiety levels after bingeing and purging, this effect was magnified for the BPD group (Steinberg et al., 1990), who reported a greater decrease in anxiety from baseline levels than the non-BPD group. Further, the BPD group reported a



significant reduction in depressed mood after purging, whereas the non-BPD group reported somewhat higher levels of depressed mood after purging. The observation that both, BPD and non-BPD, groups reported decreased feelings of anxiety after purging, is consistent with the anxiety-reduction model of BN. Thus, whereas bingeing occurs in response to food deprivation and excessive restriction, purging serves to alleviate anxiety symptoms caused by the bingeing. Another study with BN clients and non-clinical controls failed to find significant changes in mood after engaging in eating behavior (Katzman, 1987), however, this study may have been limited by small sample sizes and an inability for the mood induction stimulus to substantially elicit negative affect.

In sum, the research literature suggests high rates of co-morbid BPD among individuals with EDs, and although psychological disorders do generally tend to co-occur, there seems to be a particularly unique relationship between EDs and BPD through several potentially overlapping mechanisms of action. In particular, poor affect regulation may be a fundamental link between the disorders, and one possible explanation is that individuals with comorbid BPD and EDs exhibit disordered eating *because* of their borderline personality characteristics; in essence, they misuse food to help them manage their deregulated affect. Dietary restraint appears to be another important variable to consider in eating behavior, as studies have demonstrated that negative affect tends to lead to food consumption among highly restrained eaters. One possible explanation for this is that poor affect regulation leads them to use food as a coping mechanism, or perhaps because the negative stimulus acts as a disinhibitor for their dietary restraint. The relationship between dietary restraint and impulsivity seems

to be another important link, as individuals with EDs report efforts (often unsuccessful) to restrain their eating, and individuals with BPD report problems with impulse control. In sum, these data highlight the need for further research to evaluate why borderline personality features and disordered eating tend to co-occur.

### *Study Objectives and Hypotheses*

The aim of the present study was to assess relationships among borderline personality features, dietary restraint, negative affect, and food consumption. Specifically, the study sought to induce negative affect to evaluate the extent to which individuals varying in borderline features and dietary restraint used food as a coping mechanism. The study also sought to understand the relationship between dietary restraint and borderline personality in mood changes subsequent to presentation of a negative affect inducing stimulus. Further, the study also assessed the impact of food consumption, dietary restraint, and borderline personality features on proximal and distal mood states.

To better understand relationships among actual dietary intake and measures of dietary restraint, three instruments were employed in the present study to assess dietary restraint, including the TFEQ-R, the DIS, and the commonly used Restraint Scale (RS; Herman & Mack, 1975). The RS in particular has been harshly criticized for failure to predict objectively measured dietary restraint, and for including items assessing food restriction and also overeating, suggesting that it selects restrained eaters with a high tendency towards overeating (Ouwens et al., 2003). However, high-scorers on the RS consistently consume larger quantities of food under conditions of negative affect (e.g.,

Cools, Schotte, & McNally, 1992; Heatherton et al., 1991), suggesting that the instrument does assess some meaningful construct, whether dietary restraint or propensity towards overeating, that is associated with food consumption. Previous studies suggest that the TFEQ-R may be somewhat less susceptible to the “disinhibition” effect, as high scorers on the TFEQ-R do not necessarily exhibit greater food consumption in response to negative affect (Lowe & Kleifeld, 1988; Wardle & Beales, 1987). However, to select individuals as high versus low restrainers in the present study, the DIS was selected as the screening instrument, as Stice, Fisher, and Lowe (2004) reported a modest inverse correlation between the DIS and unobtrusively observed eating among female fast food restaurant patrons ( $r = -.24$ ).

Three study hypotheses were developed, each involving significant main effects and interaction effects between key variables. First, it was hypothesized that *food consumption, borderline personality features, and dietary restraint would predict immediate levels of negative affect*. Consistent with negative affect theory, it was predicted that food consumption would lead to decreases in negative affect, and thus individuals presented with food would report smaller affective responses to a sad film than those not presented with food. As the literature suggests that individuals with borderline personality features experience more negative affect and difficulty regulating affect, it was predicted that individuals reporting more borderline personality features would exhibit higher levels of negative affect than those reporting fewer borderline features following presentation of a sad film. Further, it was hypothesized that individuals reporting high levels of dietary restraint would struggle to maintain their

rigid over-control over eating, and thus experience more negative affect than low-restrainers when presented with food. Moreover, the relationship between food consumption and subsequent mood was expected to vary as a function of borderline personality features, as those reporting more borderline personality features were expected to exhibit a greater propensity to modulate their affective response through food than those reporting fewer borderline features. Further, it was expected that dietary restraint, borderline personality features, and food consumption would interact in predicting immediate levels of negative affect following the sad film.

Second, it was hypothesized that *the delayed effects of food consumption on mood would vary for restrained and non-restrained eaters, and for individuals reporting higher and lower levels of borderline personality features*. For non-restrained eaters, it was hypothesized that food consumption would ameliorate relative negative affect, and that this response would be maintained over time. For restrained eaters, however, it was predicted that although they may initially experience a brief respite from negative affect, reflecting upon their food consumption would engender feelings of guilt and negative affect over time. Similarly, it was hypothesized that individuals reporting more borderline personality features would experience relative and temporary reductions in negative affect immediately after engaging in food consumption, however, their proneness towards negative affectivity would lead to subsequent increases in negative affect.

Third, it was hypothesized that *borderline personality features and dietary restraint would predict participants' food consumption*. Given the affective

dysregulation and impulsivity characteristic of individuals with borderline personality features, it was predicted that borderline features would be associated with greater food consumption. Moreover, following previous results in the literature and restraint theory, it was predicted that restrained eaters would consume more food than non-restrained eaters in response to the sad film clip. Finally, the interaction between borderline personality features and dietary restraint was presumed to be a significant predictor of food consumption, such that individuals with high dietary restraint and high borderline features were expected to consume the greatest quantity of food due to the multiplicative effects of impulse regulation problems, disinhibition, and negative affectivity.

## PILOT STUDY

### *Methods*

#### Participants

A pilot study was conducted to gather normative data for the Dietary Intent Scale (Stice, 1998). Participants were female college students ( $N = 149$ ) who completed the questionnaires on a voluntary basis. Participants were between the ages of 18 and 30 years ( $M = 19.07$ ;  $SD = 1.74$ ), had Body Mass Indices (BMIs;  $\text{kg}/\text{m}^2$ ) between 16.83 and 49.92 ( $M = 22.32$ ;  $SD = 4.22$ ), and were distributed as follows with regards to racial/ethnic background: 57.7% Caucasian/Euro-American, 6.7% Black/African-American, 5.4% Hispanic, 4% Asian-American, and 2.7% other; 23.5% did not identify their racial/ethnic background.

#### Measures

*Demographic Questionnaire.* Participants began by completing a brief demographic questionnaire that asked about age, height, weight, racial/ethnic background, and estimated family income.

*Dietary Intent Scale (DIS; Stice, 1998).* The DIS, a 9-item self-report measure, assesses dietary restraint and attempts to manage weight or prevent weight gain. Participants respond to items such as “I take small helpings in an effort to control my weight” and “I skip meals in an effort to control my weight.” Participants respond on a 5-point scale ranging from “Never” to “Always.”

### *Results*

The DIS exhibited adequate score reliability in this sample ( $\alpha = .91$ ). Participants obtained total scores on the DIS ranging from 9 to 45, with a mean of 21.46 (SD = 7.72), median of 21, and modal score of 20. The 75<sup>th</sup> percentile on the DIS was marked by a raw score of 27. Thus, it was determined that participants in the main study scoring 27 or above would be classified as “high restrainers,” whereas those scoring below 27 would be classified as “low restrainers.”<sup>2</sup>

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<sup>2</sup> Employing 25<sup>th</sup> and 75<sup>th</sup> percentiles as DIS cut-scores for high and low restrainers would likely serve to magnify any existing differences between groups. As it stands, considering someone a “low restrainer” on the basis of a DIS score below the 75<sup>th</sup> percentile is somewhat of a misnomer. However, due to sample size and recruitment considerations, participants were classified as high and low restrainers on the basis of the 75<sup>th</sup> percentile cut-score.

## MAIN STUDY

### *Methods*

#### Participants

Participants were female college students ( $N = 307$ ) who received course credit in exchange for their participation. Participants were between the ages of 17 and 23 years ( $M = 18.67$ ;  $SD = .93$ ), had BMIs between 14.35 and 46.00 ( $M = 22.86$ ;  $SD = 3.74$ ), and were distributed as follows with regards to racial/ethnic background: 67.1% Caucasian/Euro-American, 3.9% Black/African-American, 14.3% Hispanic, 2.9% Asian-American, and 2.3% other; 9.4% did not identify their racial/ethnic background.

#### Measures and Materials

*Demographic Information Sheet.* Participants completed a self-report questionnaire that asked about age, height, weight, education, socioeconomic status (i.e., estimated annual family income and parental education), and racial/ethnic background.

*Positive and Negative Affect Schedule – Expanded Form (PANAS-X; Watson & Clark, 1994).* The PANAS-X, a 60-item checklist, measures 11 specific positive and negative affect domains, including, fear, hostility, guilt, sadness, joviality, self-assurance, attentiveness, shyness, fatigue, serenity, and surprise, in addition to the general dimensions of positive and negative affect (i.e., PA and NA). The PANAS has previously been used to assess affective responses to viewing video clips (e.g., Sloan et al., 2004) and demonstrated sensitivity to the heightened mood vulnerability seen in individuals with borderline personality features (Tolpin et al., 2004).



*Personality Assessment Inventory – Borderline Features scale (PAI-BOR;* Morey, 1991). Participants completed the 24-item Borderline Features (BOR) of the PAI, a 344-item self-report clinical inventory. Four subscales assess the following aspects of borderline personality: affective instability (BOR-A), identity problems (BOR-I), negative relationships (BOR-N), and self-harm (BOR-S). Researchers comparing measures of borderline personality among college students have found the PAI-BOR to be the most reliable ( $\alpha = .84$ ; Trull, 1995). Sample items include, “My mood can shift quite suddenly” and “I worry a lot about other people leaving me” (false/slightly true/mainly true/very true). In the present study, the PAI-BOR demonstrated adequate score reliability ( $\alpha = .88$ ).

*Restraint Scale (RS; Herman & Mack, 1975).* The RS, a 10-item self-report measure, assesses chronic dieting, weight fluctuation, and attitudes towards eating and weight. As noted earlier, the RS has been criticized for identifying dieters with a propensity towards disinhibition, rather than assessing objective caloric intake. However, it has demonstrated factor stability in obese and nonobese samples (Gorman & Allison, 1995), and appears to be consistently associated with laboratory-based food consumption under conditions of experimentally-induced negative affect. Participants respond to items such as “how often are you dieting?” (never/rarely/sometimes/often/always) and “would a weight fluctuation of 5 lbs. affect the way you live your life?” (not at all/slightly/moderately/very much). In the present study, the RS demonstrated adequate score reliability ( $\alpha = .82$ ).

*Dietary Intent Scale (DIS; Stice, 1998).* In the present study, the DIS demonstrated adequate score reliability ( $\alpha = .92$ ). The DIS correlated highly with other measures of dietary restraint (e.g.,  $r_s = .80$  and  $.91$  with RS and TFEQ-R, respectively), suggesting evidence of convergent validity (see Pilot Study for further information on the DIS).

*Three-Factor Eating Questionnaire - Cognitive Restraint subscale (TFEQ-R; Stunkard & Messick, 1985).* The TFEQ-R is a 21-item self-report measure from the longer TFEQ, which assesses disinhibition, susceptibility to hunger, and cognitive control of eating. Sample items include, “When I have eaten my quota of calories, I am usually good about not eating any more” (true/false) and “I often stop eating when I am not really full as a conscious means of limiting the amount that I eat” (true/false). The TFEQ-R has previously demonstrated adequate score reliability (e.g.,  $\alpha = .92$ , Stunkard & Messick) and test-retest reliability (Gorman & Allison, 1995); the TFEQ-R also demonstrated adequate score reliability in the present study ( $\alpha = .91$ ).

*Food Consumption Review Questionnaire (FCRQ).* The FCRQ, a 9-item questionnaire, was designed to assess participants’ self-perceived food intake and engender reflection upon their eating behavior in the laboratory. Sample items include “Approximately how many M&Ms do you think you ate during today’s experiment?” and “Do you try to avoid eating certain foods, such as chocolate and/or other sweets?” Participants were also asked, “How do you feel about having eaten chocolate in today’s experiment?”

*Food and Beverage Summary Sheet.* Participants reported food and beverages consumed in the two hours prior to the experiment, including, type of food or beverage, quantity, and time of consumption.

#### Design and Procedure

Participants were randomized via coin toss to control (no-food) or experimental (with-food) conditions, and sessions were run by research assistants blind to study hypotheses. Experiments were standardized to commence between 3 and 4 PM, and all sessions were conducted individually. Participants were informed that the study assessed relationships among mood, personality, and film viewing, and that they would be asked to view a 39-minute film and complete a packet of questionnaires. Individuals in the experimental condition were additionally informed that the study assessed the “relationship between mood and preferences for different colored foods,” and involved a “taste test.” Participants were requested to sample “at least a couple of each color” of the M&Ms, and to make a mental note of their preferences as they would be asked to report them subsequently. If participants challenged the notion of taste variability for M&Ms, experimenters informed them that although it is possible that all M&Ms taste the same, it is also possible that color perception may change how individuals interpret flavors, and consequently, the present study sought to assess whether this effect is true or spurious. Participants were also informed that they should “feel free to have as many as [they] would like,” as the M&Ms were discarded between participants for hygiene reasons and because there were abundant supplies of M&Ms in the lab. To address possible demand characteristics, emphasis was placed on the goal of “understanding individual

differences,” and participants were encouraged to respond to the mood measures with how they felt, rather than how someone else might feel under similar circumstances.

After providing informed consent, participants completed a basic demographic questionnaire and baseline mood assessment (PANAS), and were taken to an adjacent room to view the film clip. Those in the experimental condition were concurrently presented with the food stimulus. After viewing the film, participants completed a second mood assessment (PANAS). Those in the control condition then returned to the original laboratory, where they completed the remaining questionnaires, including the PAI-BOR, DIS, RS, and TFEQ-R. Those in the experimental condition remained in the film room for an additional 10 minutes while they completed the FCRQ. They then completed a third mood assessment (PANAS), and returned to the original laboratory to complete the remaining questionnaires. Participants were thoroughly debriefed at the end of the experiment, and those in the experimental condition were asked whether or not they had been aware that their M&M consumption was being measured. Participants were asked about whether or not they liked chocolate, and requested to refrain from discussing this study with others. The experimental procedure is depicted in Figure 1.

Following a 2 (with food/no food) by 2 (high BOR/low BOR) by 2 (high DIS/low DIS) design, participants were distributed across conditions as noted in Table 1. One person was excluded from analyses due to missing data on the DIS. An additional 13 individuals failed to answer one question on the PAI; as this missing item varied across participants, a mean substitution was employed to replace missing data in these instances. As several experimenters administered the study, ANOVAs were conducted to

assess whether there were differences in the dependent variables across experimenters. Results suggest that differences across experimenters in quantity of M&Ms consumed were not statistically significant,  $F(5,131) = .63, p = .68, \eta^2 = .02$ . Analyses comparing experimenters for changes in negative affect from baseline to time 2 ( $F[6, 274] = 1.04, p = .40, \eta^2 = .02$ ), and time 2 to time 3 ( $F[5, 129] = 1.77, p = .12, \eta^2 = .04$ ) were not statistically significant. Similarly, analyses comparing experimenters for changes in sadness from baseline to time 2 ( $F[6, 275] = .95, p = .46, \eta^2 = .02$ ), and time 2 to time 3 ( $F[5, 130] = 1.56, p = .17, \eta^2 = .03$ ), were also not statistically significant.

A subset of participants ( $n = 21$ ) indicated during debriefing that they had been aware their food consumption was being measured during the experiment. However, when individuals who reported being aware and unaware of the food measurement were compared in quantity of M&Ms consumed, the differences were not statistically significant,  $t(137) = -.26, p = .80, d = .07$ . Consequently, both groups of individuals were included in subsequent analyses. A few participants reported that they did not like chocolate ( $n = 13; 8.5\%$ ). When compared in terms of M&Ms eaten, individuals who reported not liking chocolate ate significantly fewer M&Ms ( $M = 23.54, SD = 18.22$ ) than those who reported liking chocolate ( $M = 43.01; SD = 30.76$ ),  $t(150) = 2.24, p = .03, d = .77$ . Consequently, individuals who reported not liking chocolate were excluded from subsequent analyses.

Participants reported food and beverages consumed in the two hours prior to the experiment. No instructions were provided for food consumption prior to the experiment to maintain the illusion of the cover story. A research assistant coded these responses

using the Calorie King website ([www.calorieking.com](http://www.calorieking.com)). Although participants were instructed to provide detailed information, some provided vague responses and thus their food and beverage consumption could not be coded. Participant responses ( $n = 282$ ) suggested high variability in caloric consumption, ranging from 0 to 2,436 calories consumed in the two hours prior to the experiment ( $M = 211.33$ ,  $SD = 335.56$ ). Among those in the experimental condition with codable data ( $n = 134$ ), results suggest that the association between pre-experiment caloric intake and quantity of M&Ms consumed was not significant ( $r = -.13$ ,  $p = .14$ ), thus, pre-experiment caloric intake was not accounted for in subsequent analyses.

As noted earlier, results from the pilot study indicated that a cut-score of 27 marked the 75<sup>th</sup> percentile for DIS scores amongst a female college student sample. Thus, participants in the present study scoring 27 or above were classified as “high restrainers,” whereas those scoring below 27 were classified as “low restrainers.” For borderline status, a cut-score of 28 was selected, which corresponds to 60 $t$  in the general population, and 55 $t$  in college student samples (Morey, 1991). Thus, participants scoring 28 and above were classified as “high borderline,” whereas those scoring 27 and below were classified as “low borderline.” Following these guidelines, participants in the present study were distributed as noted in Table 1.

### *Results*

Analyses of variance (ANOVAs) and a Mann-Whitney non-parametric test assessed differences across participant sub-groups on age, racial/ethnic background, BMI, borderline personality features, dietary restraint characteristics, and PANAS

negative affect (NA) and sadness scores prior to watching the film. Analyses comparing participant sub-groups across age, racial/ethnic background, BMI, baseline PANAS sadness scores, borderline personality features (PAI-BOR), and dietary restraint (DIS, TFEQ-R, and RS scores) were not statistically significant. However, individuals in the no-food control condition ( $M = 15.16$ ,  $SD = 5.26$ ) exhibited significantly higher baseline PANAS NA scores than those in the with-food experimental condition ( $M = 14.03$ ,  $SD = 3.83$ ;  $F [1, 291] = 4.37$ ,  $p = .04$ ;  $\eta^2 = .02$ ). After deletion of one outlier, differences in baseline PANAS NA scores for individuals in the no-food and with-food conditions were no longer significant,  $F (1, 290) = 3.50$ ,  $p = .06$ ;  $\eta^2 = .01$ . Moreover, although these differences exhibited small meaningful effect, subsequent analyses controlled for baseline NA by assessing residualized change scores (Cronbach, 1970) or entering baseline NA as a covariate, depending on the type of analysis. Further, as unequal cell sizes can influence patterns of interactions, participant scores were weighted such that individuals in the smallest groups (e.g., high BOR, high DIS, no food) counted for a full response, whereas others in larger groups counted for proportions of a full response (e.g., low DIS, low BOR, no food = 24/70). Weighting scores in such a manner did not affect the patterns of interactions, thus, the unweighted scores were used in the remaining analyses.

#### Hypothesis 1

A 2 (high BOR/low BOR) x 2 (high DIS/low DIS) x 2 (Food/No Food)

ANCOVA, with PANAS NA at time 2 as the dependent variable, and PANAS NA at time 1 as the covariate, assessed whether food consumption, borderline personality

features, and dietary restraint were associated with changes in mood from baseline to post-movie. An assumption of ANCOVA is that the covariate predicts the criterion variable, but does not interact with the predictor variables. PANAS NA at time 1 significantly predicted PANAS NA at time 2,  $F(22, 268) = 9.13, p < .01, \eta^2 = .43$ , but did not significantly interact with food consumption ( $F[1, 287] = 2.43, p = .12$ , partial  $\eta^2 = .008$ ), borderline personality features ( $F[1, 287] = .35, p = .56$ , partial  $\eta^2 = .001$ ), or dietary restraint ( $F[1, 286] = .88, p = .35$ , partial  $\eta^2 = .003$ ). Mean scores for PANAS NA are reported in Table 3. Results suggest a large effect for the covariate (NAt1),  $F(1, 280) = 68.35, p < .001, \eta^2 = .19$ . All 2-way and 3-way interaction terms (i.e., BOR\*FOOD, BOR\*DIS, DIS\*FOOD, BOR\*DIS\*FOOD) failed to reach statistical significance. However, BOR status exhibited a significant main effect,  $F(1, 281) = 5.3, p = .02$ , and an examination of group means suggested that those characterized as high-BOR exhibited significantly higher NA at time 2 than their low-BOR counterparts, although with small effect (partial  $\eta^2 = .02$ ). FOOD status exhibited a trend towards significance,  $F(1, 281) = 3.2, p = .08, \eta^2 = .01$ , such that individuals in the no-food condition exhibited somewhat higher NA at time 2 than their with-food counterparts. The main effect for DIS (or, correspondingly, the RS or TFEQ-R when substituted for the DIS in separate models) was not statistically significant.

Similar analyses were conducted to assess factors contributing to participant scores on the PANAS Sadness (PANAS-SD) scale as an alternate index of mood change (see Tables 3 and 4 for mean scores). Once again, PANAS-SD at time 1 significantly predicted PANAS-SD at time 2,  $F(15, 275) = 8.95, p < .01, \eta^2 = .33$ , but did not



significantly interact with food consumption ( $F [1, 287] < .01, p = .99, \text{partial } \eta^2 < .01$ ), borderline personality features ( $F [1, 287] = 3.09, p = .08, \text{partial } \eta^2 = .01$ ), or dietary restraint ( $F [1, 286] = 2.36, p = .13, \text{partial } \eta^2 = .008$ ). An ANCOVA entering PANAS-SD at time 2 as the dependent variable, PANAS-SD at time 1 as the covariate, and BOR status, DIS status, and FOOD status as independent variables, suggested, once again, a large effect of the covariate (PANAS-SD1),  $F (1, 281) = 89.04, p < .001, \eta^2 = .23$ . The interaction between FOOD status and BOR status suggested a trend towards significance,  $F (1, 282) = 3.33, p = .07, \eta^2 = .01$ . Specifically, in the with-food condition, low and high BOR-scorers reported similar levels of sadness at time 2 relative to scores at time 1 ( $M_s = 10.44, 10.31; SE_s = .41, .51; 95\% \text{ C.I.s} = 9.63-11.25, 9.31-11.31$ ). However, in the no-food condition, low BOR-scorers reported somewhat less sadness ( $M = 10.76; SE = .41; 95\% \text{ C.I.} = 9.96-11.55$ ) than high BOR-scorers ( $M = 12.30; SE = .48; 95\% \text{ C.I.} = 11.34-13.32$ ). As the above interaction was not significant, the model was evaluated for significance of main effects. Results suggest a small but significant main effect for FOOD-status,  $F (1, 282) = 6.50, p = .01, \eta^2 = .02$ . The main effect for DIS (or, correspondingly, the RS or TFEQ-R when substituted for the DIS in separate models) was not statistically significant. Additionally, the main effect for BOR was not significant.

Multiple regression analyses evaluated whether quantity of food consumed and borderline personality features (BOR) predicted changes in mood from baseline to the second mood measurement. Individuals from both, experimental and control, groups were included in these analyses, and those in the control condition were recorded as

having consumed “zero” M&Ms. In this manner, individuals in the experimental condition who consumed little or no M&Ms were analyzed as analogous to those in the control condition, to presumably assess the impact of actual eating on mood. To assess changes in mood from time 1 to time 2, difference scores (i.e., time 2 minus time 1) were not used because the high correlations between mood at time 1 and time 2 (e.g.,  $r = .54$  for NA) suggested low reliability in using this method. Consequently, residualized change scores (Cronbach, 1970) were employed, and negative residuals indicated an improvement in mood (i.e., reduction in sadness, negative affect) at time 2 relative to what was expected based on the entire sample. In contrast, positive residuals indicated a worsening of mood (i.e., increases in sadness, negative affect) at time 2 relative to what was expected based on the total sample. After combining both experimental and control conditions, the distribution of quantity of M&Ms eaten was positively skewed (i.e., skewness statistic = 2.014), thus suggesting the need for transforming the data. A square root transformation was employed for the M&Ms data, and then the  $z$ -score was used for subsequent analyses. A multiple regression model predicting residualized change in NA from BOR, square-root transformed M&Ms eaten, and the interaction of BOR\*M&Ms eaten, was statistically significant,  $F(3, 287) = 6.93, p < .001, R^2 = .07$ , as were the main effects and the interaction effects (see Table 5). That is, the association between M&Ms eaten and change in NA was significant for the high BOR ( $r = -.22, p = .03$ ) but not low BOR ( $r = -.07, p = .33$ ) group (see Figure 2 for a visual representation of the

interaction). Similar results were obtained for a model predicting residualized change in sadness from the above,  $F(3, 288) = 5.86, p = .001, R^2 = .06$  (see Table 5 and Figure 3).<sup>3</sup>

## Hypothesis 2

A 2 (High BOR/low BOR) x 2 (High DIS/low DIS) x 3 (NA<sub>t1</sub>, NA<sub>t2</sub>, NA<sub>t3</sub>) repeated measures ANOVA assessed whether immediate and delayed changes in mood varied by borderline and dietary restraint characteristics. Results indicated significant differences in PANAS NA across the three time measurements,  $F(1, 134) = 14.62, p < .001$ , partial  $\eta^2 = .10$ . Tests of within subjects contrasts indicated a significant quadratic effect for time ( $F[1, 134] = 19.73, p < .001$ ), and examination of means suggested an increase in negative affect from baseline ( $M = 14.48; SE = .34; 95\% \text{ C.I.} = 13.81-15.15$ ) to time 2 ( $M = 15.40; SE = .38; 95\% \text{ C.I.} = 14.66-16.15$ ), and a decrease in negative affect from time 2 to time 3 ( $M = 13.50; SE = .31; 95\% \text{ C.I.} = 12.90-14.10$ ). Contrary to expectations, none of the interaction effects were statistically significant. Consequently, main effects were evaluated for statistical significance. The between-subjects effect for BOR status was statistically significant,  $F(1, 134) = 11.46, p = .001$ , partial  $\eta^2 = .08$ , and examination of group means suggested that low-BOR scorers reported lower levels of NA ( $M = 13.50; SE = .35; 95\% \text{ C.I.} = 12.85-14.22$ ) than their high-BOR scoring counterparts ( $M = 15.39; SE = .43; 95\% \text{ C.I.} = 14.55-16.24$ ). The main effect for DIS

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<sup>3</sup> Results employing untransformed M&Ms data were similar, although the interaction effect (M&Ms \* BOR) only demonstrated a trend towards significance ( $p = .075$ ) in predicting residualized change in PANAS Sadness scores.

status was not statistically significant, and analyses conducted with the TFEQ-R and RS as alternative measures of dietary restraint exhibited a similar pattern of findings.

A 2 (High BOR/low BOR) x 2 (High DIS/low DIS) x 3 (Sadness<sub>t1</sub>, Sadness<sub>t2</sub>, Sadness<sub>t3</sub>) repeated measures ANOVA revealed significant differences in PANAS Sadness across the three time measurements,  $F(2, 133) = 64.13, p < .001$ , partial  $\eta^2 = .49$ , and examination of group means suggested an increase in sadness from baseline ( $M = 7.48; SE = .27; 95\% \text{ C.I.} = 6.94-8.02$ ) to time 2 ( $M = 10.53; SE = .34; 95\% \text{ C.I.} = 9.85-11.21$ ), followed by a decrease in sadness from time 2 to time 3 ( $M = 7.81; SE = .27; 95\% \text{ C.I.} = 7.27-8.36$ ). Results also suggest a significant 3-way interaction (MOOD\*BOR\*DIS),  $F(2, 133) = 3.25, p = .04$ , partial  $\eta^2 = .05$ . These data suggest that although participants reported increases in sadness following the movie/food, and then decreases in sadness after a 10-minute delay, this pattern likely varied based on group membership (i.e., BOR and DIS statuses). An examination of means and confidence intervals (reported in Tables 3 and 4) suggests that individuals with high BOR and also high DIS scores reported the highest baseline sadness relative to the other groups, but then experienced relatively smaller increases in sadness following the movie/food compared to their peers. Tests of between-subjects effects suggested that the interaction between BOR\*DIS was not statistically significant. However, results suggest a significant main effect for BOR,  $F(1, 134) = 14.71, p < .001$ , partial  $\eta^2 = .10$ , and a trend towards significance for DIS,  $F(1, 134) = 3.18, p = .077$ , partial  $\eta^2 = .02$ . When alternative indices of dietary restraint were employed (i.e., the TFEQ-R and RS), the main effect for dietary restraint was not significant.

### Hypothesis 3

Multiple regression analyses assessed whether borderline personality features (BOR) and dietary restraint scores predicted quantity of M&Ms eaten among those in the experimental condition (who thus had M&Ms available). Three different models were constructed examining the three alternative measures of dietary restraint (see Table 6). The first model, entering BOR, DIS, and their interaction term (BOR\*DIS) as predictors of M&Ms eaten, was statistically significant,  $F(3, 135) = 3.81, p = .01, R^2 = .07$ . The test for the interaction effect (DIS\*BOR) was not statistically significant, and thus main effects were evaluated for significance. Results suggest that DIS significantly predicted quantity of M&Ms eaten,  $t(135) = 2.92, p < .01$ , with higher DIS scores associated with larger quantities of M&M consumption ( $\beta = .25$ ). The effect for BOR was not statistically significant. The second model, entering BOR, Restraint Scale total score (RS), and their interaction term (BOR\*RS) as predictors of M&Ms eaten, was not significant. However, the effect for RS was significant,  $t(126) = 2.20, p = .03$ , as higher RS scores were associated with larger quantities of M&M consumption ( $\beta = .20$ ). Finally, the third model, entering BOR, TFEQ-R total score, and their interaction term (BOR\*TFEQ-R) as predictors of M&Ms eaten, was also not significant. Once again, however, the effect for the dietary restraint measure, TFEQ-R, was significant,  $t(124) = 2.12, p = .036$ , as higher TFEQ-R scores were associated with greater quantities of M&M consumption ( $\beta = .19$ ).

## SUMMARY

The present study employed an experimental manipulation to evaluate relationships among food consumption, borderline personality features, dietary restraint, and changes in negative affect, among female college student. It was hypothesized that individuals who received food (M&M chocolate candies) would exhibit an attenuated response to a negative mood induction procedure relative to those without food, but that these results would vary across individual differences in borderline features, dietary restraint, and across time. Specifically, individuals with high levels of borderline characteristics and dietary restraint were expected to present with higher levels of negative affect than those with low levels of borderline characteristics and dietary restraint. It was also hypothesized that individuals would vary in their patterns of food consumption based on their dietary restraint and borderline characteristics, such that high restrainers and individuals with higher levels of borderline characteristics would consume greater quantities of food than their low-scoring counterparts.

Results suggest that viewing the selected film led to increases in negative affect (NA) across the entire sample of participants, thereby attesting to the efficacy of the mood induction procedure. Although it is also reasonable to suggest that these effects may be in part due to demand characteristics, as noted earlier, efforts were made to minimize the influence of demand characteristics. Results also suggest that the standardized questionnaires administered demonstrated adequate reliability (internal consistency) and correlated with each other in expected directions, suggesting evidence of convergent validity.

*Food, Mood, and Borderline Personality*

Results from the present study are consistent with earlier studies demonstrating that borderline personality features (BPF) are associated with a propensity towards negative affect: individuals with high levels of borderline characteristics exhibited higher levels of NA across the three time measurements than their low-borderline counterparts. Moreover, as is characteristic of borderline personality disorder, individuals with high levels of BPF exhibited a marked reactivity to the film, exhibiting higher levels of NA after the film than those with low levels of BPF, even after controlling for their relatively higher baseline levels of NA. Notably, this was not the case for the more specific emotion of sadness, as individuals with and without borderline features exhibited similar patterns of sadness in response to the film. One possibility for this is that the film was selected to elicit feelings of sadness, and thus, elicited increased feelings of sadness relative to baseline for the average participant, regardless of her borderline status.

Results from the present study are also consistent with earlier studies demonstrating a positive impact of food consumption on mood states (e.g., Dubé, LeBel, & Lu, 2005), as women who received food reported significantly less sadness following the movie (relative to their baseline sadness) than women who did not receive food. Thus, the presentation versus absence of food while viewing the film appeared to ameliorate relative feelings of sadness, but interestingly, the association of food presentation with changes in negative affect was not significant. It is possible that chocolate consumption had an influence on feelings of sadness because that was the

emotion specifically targeted by the mood induction procedure. Previous studies typically do not distinguish between feelings of sadness and negative affect, and improvements in mood following food consumption are often reported in a general sense. For instance, Macht and Mueller (2007) reported that non-clinical men and women who were shown a sad film clip reported “improved self-rated mood” (p. 669) after consuming chocolate versus drinking water. It is possible that greater attention to more specific mood states in the research literature may suggest possible effects of food consumption on sadness, but not necessarily other forms of negative affect.

Although not significant, results also suggest a trend towards significance for the interaction between food presentation and borderline status, such that among those who received food, women reporting higher and lower BPF fared comparably, but among those who did not receive food, higher levels of sadness were reported by women who also reported higher BPF. Thus, there was some suggestion that food was relatively more effective in ameliorating feelings of sadness among the women with more borderline features, making them more comparable in their responding to women reporting fewer borderline features.

Consistent with this latter observation, when individuals from both conditions were combined and analyses focused upon how much chocolate was actually consumed, results suggested a significant interaction between BPF and M&Ms eaten in predicting changes in NA and sadness from baseline to the second measurement. That is, actually consuming the chocolate had little impact on the emotional response of women reporting fewer borderline features. However, among those reporting more borderline features,



greater chocolate consumption appeared to ameliorate relative negative affect and feelings of sadness. Consequently, this suggests that quantity of food consumption had a tempering effect on NA and sadness, but only for the subset of women reporting higher levels of borderline features. This finding is noteworthy for several reasons. Specifically, although several studies reported improvements in mood subsequent to food consumption (e.g., Desmet & Schifferstein, 2008; Macht & Dettmer, 2006), they did not assess whether or not a particular subset exists for which food consumption serves as a protective factor, so to speak, against relative feelings of sadness or more general negative affect. Moreover, the commonly accepted affect-regulation model, or negative affect theory, suggests that binge eating comforts and distracts individuals from aversive emotions; however, this model does not specify certain individuals for whom this may be a more or less effective strategy. Results from the present study seem to suggest that consuming larger quantities of M&Ms ameliorates relative feelings of sadness but only for those with a propensity for emotional reactivity, as characterized by borderline features. Notably, this interaction effect only achieved significance when quantity of food consumption was examined, rather than food status (i.e., whether or not the individual was presented with the opportunity to eat), suggesting that food presentation was less salient than actual food consumption for changes in mood among women reporting more borderline features.

#### *Dietary Restraint and Immediate Mood*

It was expected that for those in the with-food experimental condition, dietary restraint would be associated with increases in negative affect at the second

measurement. Research suggests that dieters report more feelings of guilt associated with chocolate consumption than non-dieters (e.g., Fletcher, Pine, Woodbridge, & Nash, 2007; Macht & Mueller, 2007), and it was expected that requiring high dietary restrainers to consume chocolate would elicit elevated levels of negative affect relative to low dietary restrainers. Contrary to expectations, dietary restraint, whether assessed by the DIS, RS, or TFEQ-R, was not associated with changes in mood (NA or sadness) from baseline to the second measurement. One possibility is that perhaps even for individuals who seek to restrain their dietary intake, consuming up to 200 grams of M&Ms is not sufficient to elicit changes in mood. An earlier study reported that although chocolate consumption elicited feelings of guilt, these guilty feelings were not significantly associated with participants' scores on an index of dietary restraint (Macht & Dettmer, 2006). Similarly, another study reported that dieters and non-dieters did not differ in their mood ratings before and after consuming a chocolate bar (Jones & Rogers, 2003). Thus, earlier findings are consistent with results from the present study in that individuals did not vary in mood changes based on their dietary restraint scores. An alternate possibility is that although high restrainers who ate food may have indeed experienced some relative increases in negative affect or sadness, this effect was balanced against the high restrainers in the control condition who did not receive food and may not have experienced the same relative increases in negative affect. However, the interaction between food condition and restraint status was not significant, lending little support to this latter explanation.

The interaction between dietary restraint and borderline personality features was not significantly associated with changes in mood from baseline to the second measurement. It was expected that individuals who exhibited dietary restraint characteristics and also borderline personality features would fare poorest in this experimental paradigm, due to the affective hyperresponsivity characteristic of individuals with borderline personality interacting with the behavior of eating despite efforts to restrain dietary intake. Although borderline personality was associated with changes in mood from baseline to post-movie, this relationship was not significant for dietary restraint, and thus, it is possible that as noted above, violations of restraint intentions do not appear to be salient for understanding mood immediately subsequent to food consumption.

#### *Immediate Versus Delayed Mood Following the Experimental Intervention*

A series of analyses evaluated factors associated with changes in NA and sadness from the second (post-movie/food) to third (post-reflection) assessment. It was expected that women with more borderline features would not only report *immediate* increases in negative affect (i.e., from baseline to time 2), but also report *delayed* increases in negative affect (i.e., from time 2 to time 3) due to their general proneness towards negative affectivity. Conversely, although those with fewer borderline features were also expected to experience immediate increases in negative affect, they were expected to then experience delayed *decreases* in negative affect. Contrary to expectations, women reporting higher and lower levels of borderline features performed similarly in this regard, both reporting immediate increases, followed by delayed decreases in negative

affect following the reflection period. Thus, results suggest that although the mood induction procedure was sufficient to elicit increases in negative affect, it did not lead to further (i.e., delayed) increases in negative affect for women reporting more borderline features. This may be in part because the time lapse merely led to regression to baseline mood states for both groups of women. Alternately, theory suggests that women with borderline personality experience a propensity towards negative affect, but also affective instability (e.g., Tolpin et al., 2004; Zeigler-Hill & Abraham, 2006). It is likely that the same affective instability may have led to a decrease in negative affect following the delay. Thus, although the underlying principles governing experiences of delayed mood may have varied based on borderline status (i.e., affective instability for women with more borderline features, versus regression to baseline mood for women with fewer borderline features), the end result is the same: individuals reported increases in immediate negative affect, followed by decreases in delayed negative affect.

Immediate versus delayed mood was also expected to vary based on dietary restraint status, such that high restrainers were expected to report immediate increases in negative affect, followed by delayed increases in negative affect due to feelings of guilt and remorse subsequent to their unplanned eating behavior. In contrast, for low dietary restrainers, it was expected that immediate increases in negative affect would be followed by delayed *decreases* in negative affect due to the passage of time and potential mood enhancement effects from chocolate consumption. Contrary to expectations, both groups reported immediate increases followed by delayed decreases in negative affect, suggesting that individuals with high versus low dietary restraint did not differ in this

pattern, no matter which of the three dietary restraint measures were considered. One possibility for this finding is that the FCRQ, a measure designed to engender reflection upon eating behavior during the experiment, failed to elicit this effect. As noted earlier, it is also possible that the cognitive processing of eating behavior, even when the eating behavior involved eating chocolate, a high fat, high calorie food, was not sufficient to augment already elevated negative affect. An alternative is that the time lapse merely led to regression to baseline mood states. Indeed, viewing a 39-minute film is unlikely to have a lasting impact on mood, and much of the effect of the film on mood may have been diminished during the 10-minute period allocated for completion of the FCRQ. It is also possible that the FCRQ successfully elicited feelings of guilt and other negative affect among high restrainers, but that the 10-minute time frame was sufficient for them to rationalize or otherwise accept their eating behavior. For instance, Jones and Rogers (2003) reported that in interviewing dieters and non-dieters after they consumed a chocolate bar, 78% of the dieters (vs. 6% of non-dieters) reported that they had already planned behavioral measures, such as exercise or subsequent food restriction, to compensate for their unplanned eating behavior. Consequently, it is possible that the high-restrainers acted similarly, and that having planned their compensatory behavior, also experienced some respite from their negative affect at the third mood measurement.

The pattern of results for changes in feelings of sadness was somewhat different from that observed for more broad changes in negative affect. Specifically, a three-way interaction was observed for sadness, borderline personality, and dietary restraint statuses, such that among those who received food, women with higher levels of

borderline features and dietary restraint reported the highest levels of baseline sadness, followed by relatively fewer increases, and then relatively fewer decreases in sadness, compared to their counterparts. In essence, although the pattern exhibited by this subgroup was similar to individuals in other groups, the magnitude of changes was somewhat smaller. Thus, it seems that among those who received food, women reporting more borderline features exhibited less variability in their feelings of sadness than those who reported fewer borderline features, and that this effect was particularly salient for those who also reported higher dietary restraint characteristics. These data are consistent with the hypothesis that food consumption attenuated negative affect and sadness for women reporting more borderline features, such that although they exhibited more sadness at baseline than their counterparts, their mood did not worsen significantly after presentation of the sad film when they had food present.

#### *Predictors of Food Consumption*

As expected, reported efforts to restrain dietary intake, whether assessed by the RS, TFEQ-R, or DIS, significantly predicted quantity of M&Ms eaten. Individuals with high scores on these measures were also more likely to consume greater quantities of M&Ms. Although somewhat paradoxical, this effect is consistent with reports from the research literature, such that high scorers on the RS typically consume greater quantities of food than low-scorers after exposure to a negative affect or stress inducing stimulus (e.g., Cools, Schotte, & McNally, 1992; Heatherton et al., 1991; Herman & Mack, 1975; Herman & Polivy, 1984; Schotte, Cools, & McNally, 1990). Perhaps somewhat more surprising is the fact that all three measures of efforts to restrain dietary intake

performed similarly. Although previous studies have reported significant associations between the TFEQ-R and RS (e.g., for normal weight women,  $r = .74$ ; van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007; for college women,  $r = .73$ ; Stice, Fisher, & Lowe, 2004), the TFEQ-R typically does not select individuals who are prone to disinhibited eating, but arguably assesses more successful dieting behavior (Laessle, Tuschl, Kotthaus, & Pirke, 1989). Indeed, the TFEQ-R was constructed to specifically assess efforts to restrain diet, and a separate subscale was constructed to assess tendencies towards disinhibited eating (Stunkard & Messick, 1985). Further, the high correlation between the RS and DIS observed in the present study is consistent with an earlier report of the same (e.g.,  $r = .66$ ; Stice, Fisher, & Lowe, 2004), which suggests that the instruments may have performed similarly because they assessed a similar construct or constructs.

Several researchers have argued that extant measures of dietary restraint are invalid as they fail to assess true dietary restraint as a behavioral outcome (e.g., Stice, Cooper, Schoeller, Tappe, & Lowe, 2007; Stice, Fisher, & Lowe, 2004; Sysko, Walsh, Schebendach, & Wilson, 2005; Sysko, Walsh, & Wilson, 2007). Stice and his colleagues have argued that part of the problem may be due to confusion about relative versus absolute dietary restriction. In other words, individuals completing measures of dietary restraint may in fact be eating less than their usual or ideal dietary intake, and thus interpret their behavior as “restrictive,” but this restriction may not be sufficient to indicate absolute dietary restraint. Although the dietary restraint measures employed in the present study may not have assessed absolute and true dietary restraint, they did

appear to assess some meaningful behavioral outcome variable, such that higher scores on these measures were associated with greater food consumption after being exposed to a sad film. One possibility for this finding is that intents to restrain diet are motivated by historical failures at restraint, and thus, those scoring high on such measures have a higher propensity towards failure in restraining dietary intake.

Taken together, these data suggest that the construct or constructs assessed by the RS, TFEQ-R, and DIS, are meaningfully and positively associated with dietary intake when assessed through a particular experimental paradigm. The mechanism of action is somewhat less clear, however, it is plausible that participants in the present study were susceptible to the disinhibition effect or impairment of cognitive capacity as suggested by the research literature. Certainly, the present study employed multiple strategies, such as showing a sad film to function as a distractor, requesting participants to “eat least a couple of each color” of M&Ms as a variant of a pre-load, and running experiments individually in closed rooms to ensure privacy, all designed to elicit the disinhibitory effect for a sub-group of participants.

Contrary to expectations, borderline personality characteristics were not associated with quantity of food consumed. It was predicted that food consumption may act as a coping mechanism for individuals with BPF, in part due to their affective reactivity and impulsivity, and that they would thus consume a greater quantity of M&Ms. Results do not support this assertion, and are, in fact, consistent with results from a recent student in which the relationship between quantity of crackers consumed and impulsivity in what was ostensibly a taste test in a stressful situation was not



significant ( $r = .12$ ; van Strien & Ouwens, 2007). Although the measure of impulsivity was different from the one used in the present study, it purportedly assessed various features of impulsivity that are consistent with borderline personality features, such as substance abuse, recklessness, and destructiveness in interpersonal relationships. In sum, even though food consumption appeared to attenuate negative affect to a greater extent among women reporting more borderline personality features, present data do not support the assertion that borderline personality features independently predict quantity of food consumption. However, future research with additional measures of borderline personality and specific measures of impulsivity may further clarify the nature of these relationships.

#### *Limitations and Future Directions*

One limitation of the present study is that participants generally did not exhibit the full range of borderline personality features, suggesting that the construct may have been inadequately represented. It is likely that relatively few participants would have been in the diagnosable range of borderline personality, and greater range on this construct might have led to stronger results. Similarly, consuming even a relatively large quantity of M&Ms in the present study does not constitute true binge-eating, and it would be interesting to observe whether these results replicate for individuals engaging in true binge-eating episodes, such as those with Bulimia Nervosa or Binge-Eating Disorder. Along similar lines, cut-scores for high versus low borderline personality features and dietary restraint were selected for convenience and sample size considerations, and an alternate method, such as employing individuals at the 25<sup>th</sup>

percentile as “low scorers” and 75<sup>th</sup> percentile as “high scorers,” excluding those falling in between, may have also led to stronger results.

Another limitation is that participants’ tendency towards overeating was not assessed. There are some data to suggest that restrained eaters consume greater quantities of food following a pre-load only insofar as they also exhibit a tendency towards overeating, such as by assessed by the Three-Factor Eating Questionnaire Disinhibition scale (van Strien, Cleven, & Schippers, 2000; Westenhoefer, Broeckmann, Munch, & Pudel, 1994). Thus, it is possible that the association between dietary restraint and food consumption in the present study may have been artifactual, and the entire variance explained by this variable may be due to a propensity towards overeating. Inclusion of such a measure in the present study may have replicated this effect, and provided further information about mediators of the relationship between intents to restrain dietary intake and laboratory based food consumption.

Another limitation of the present study lies in that as with experimental studies in general, results can have limited ecological validity and may be susceptible to demand characteristics. Although efforts were made to mimic home environments in the location of the experiment and to minimize demand characteristics, the data from the present study are unlikely to be free from these confounds. Additionally, in an effort to disguise the true nature of the study, participants were not instructed to abstain from eating for any length of time prior to the experiment. Rather, the time of the experiment was standardized, and participants were asked to self-report their food and beverage consumption for 2 hours prior to the experiment. However, as noted in the research

literature, individuals frequently underreport their caloric intake, a practice that is particularly common among individuals with high dietary restraint scores (Bandini, Schoeller, Dyr, & Dietz, 1990; Lichtman et al., 1992). Consequently, although efforts were made to account for prior caloric intake, these efforts may have been unduly influenced by error. Another limitation is that participants in the control condition did not complete a third mood measurement, and thus, individuals in the with-food and no-food conditions could not be compared in their delayed mood. Finally, as with other studies with female, predominantly Caucasian, college student samples, the generalizability of these findings is limited to similar populations.

Despite these limitations, there are a number of strengths to the present study. First, the study design involved special efforts to control for influential external variables, such as whether or not participants liked chocolate, time of day, and estimated caloric intake prior to the experiment. Additionally, several features were designed to minimize demand characteristics, such as running experiments individually in closed rooms, emphasizing that individuals typically experience different emotions in response to the film, and use of a cover story. Experimenters were trained and monitored closely to minimize error, and were also blind to study hypotheses. Second, this study uniquely assessed relationships among dietary restraint, mood changes, borderline personality features, and food consumption within a controlled experimental design. Prior studies typically involved retrospective self-reports, which are subject to recall or reporting bias, or, conducted experiments without implementing the aforementioned controls. Moreover, this study examined mood changes across three time points, rather than

following the convention of assessing mood simply pre- and post-intervention. Third, the present study employed multiple measures of dietary restraint to evaluate whether the construct assessed by these instruments is meaningfully associated with objective dietary intake. Fourth, this study experimentally demonstrated the affective dysregulation characteristic of individuals with borderline personality features; indeed, BPF was the most robust predictor of negative affect changes across time. And finally, this study provides some evidence to suggest that consuming greater versus lesser quantities of food (in this case, chocolate) is associated with a tempering of negative affect or sadness after viewing a sad film, but that this is true only for those who also exhibit more borderline personality characteristics.

In addition to improving upon the limitations highlighted above, the present study offers several new directions for future research. In their review of the literature, Parker, Parker, and Brotchie (2007) suggested that chocolate consumption may offer enjoyment, but when consumed specifically in response to a dysphoric state (i.e., “emotional eating”) it is less likely to alleviate the negative mood than to prolong it. Results from the present study suggest that borderline personality features may moderate this relationship, such that chocolate consumption may differentially affect mood states for individuals reporting higher and lower levels of borderline personality. The present study did not assess tendencies towards emotional eating, however, further experimental research should continue to assess relationships among individual characteristics, such as tendencies towards “emotional eating,” observed eating behavior, and temporal and distal mood states. Future research in independent laboratories may be necessary to

replicate these findings, particularly the key finding that consumption of more M&Ms only ameliorates relative negative affect for individuals with borderline personality features. Studies employing multiple methods, such as self-report, observational, and perhaps psychophysiological methods, to assess these constructs are clearly indicated. Further, as emphasized by Stice and his colleagues, it is necessary to examine the latent construct assessed by indices of dietary restraint. As noted earlier, these measures do appear to be meaningfully related to behavioral outcomes, and a better understanding of the underlying construct is necessary to inform models of etiology and treatment of eating dysfunction. Finally, the present study focused exclusively on eliciting negative affect. There are some data to suggest, however, that intensity of emotion, rather than valence per se, may be more closely associated with eating behavior (e.g., Patel & Schlundt, 2001). Consequently, future researchers may opt to investigate relationships among food consumption, personality characteristics, and varied emotional states.

### *Conclusion*

The present study involved an experimental manipulation to assess relationships among negative affect, food consumption, borderline personality features and intents to restrain diet. Results suggest that women reporting more borderline features exhibited greater negative affect across three different time points (baseline, post-movie/food, and post-reflection period), and were more reactive to the sad film. However, these same women also experienced a greater attenuation of negative affect subsequent to their chocolate consumption. Thus, quantity of food consumption was associated with improvements in mood, but only for those women reporting higher levels of borderline

features. These data suggest that women with borderline features may be somewhat at risk for developing problems with binge-eating, as consuming larger quantities of food appeared to have a tempering effect on their negative mood and specific feelings of sadness. If so, these results may explain, in part, the co-morbidity and symptom overlap seen among individuals with borderline personality disorder and eating disorders.

Results from the present study have important implications for the treatment of individuals with maladaptive eating habits and borderline personality features. Specifically, results suggest that psychoeducation regarding the relationship between tendencies towards dietary restraint and subsequent food consumption (particularly in the face of negative affect, distraction, or disinhibitory effects induced by “all-or-nothing” thinking patterns and a food pre-load) may be important to address in treating individuals with eating-related problems. It is likely that a combination of these effects led to greater food consumption among the high-restrainers in the present study, however, further experimental research is required to disentangle specific effects from these variables. Further, as noted earlier, individuals with more borderline personality features may be somewhat at-risk for the development of eating-related problems, given their apparent propensity to experience attenuated feelings of sadness and negative affect following consumption of relatively larger quantities of food. Thus, treatment approaches for women exhibiting such characteristics should continue to provide psychoeducation regarding coping/distraction techniques, but also be particularly vigilant for the development of problematic eating behaviors. Overall, the present study demonstrates the complexity of the relationships among mood, borderline personality

features, attempts to restrain dietary intake, food consumption, and responses to a sad film, and suggests several areas for further research to replicate and further clarify present findings.

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## APPENDIX A

Table 1  
*Distribution of Participants across Conditions*

Group	DIS status	BOR status	Condition*	n	Percentage
1	Low	Low	Control	70	22.80
2	Low	Low	Experimental	66	21.50
3	High	Low	Control	25	8.10
4	High	Low	Experimental	29	9.40
5	Low	High	Control	34	11.10
6	Low	High	Experimental	33	10.70
7	High	High	Control	24	7.80
8	High	High	Experimental	25	8.10

*Note: The above table characterizes the entire sample of participants. After excluding individuals who answered “no” to the question, “do you like chocolate,” sample sizes for the experimental conditions changed to as follows: Group 2 = 63 (23.9%); Group 4 = 27 (9.2%), Group 6 = 27 (9.2%), and Group 8 = 22 (7.5%).*

Table 2  
*Correlations among Key Variables*

	BOR	M&Ms (g)	DIS	TFEQ- R	RS	NA <sub>t1</sub>	NA <sub>t2</sub>	NA <sub>t3</sub>	SD <sub>t1</sub>	SD <sub>t2</sub>	SD <sub>t3</sub>
BOR	—	-.067	.182**	.057	.218**	.359**	.338**	.263**	.392**	.310**	.367**
M&Ms (g)		—	.238**	.186*	.175*	.110	-.137	-.040	-.002	-.137	-.161
DIS			—	.905**	.797**	.103	.093	.050	.140*	.112	.101
TFEQ-R				—	.733**	.019	.040	.015	.076	.079	.090
RS					—	.128*	.114	.101	.183**	.166**	.066
NA <sub>t1</sub>						—	.537**	.498**	.638**	.366**	.437**
NA <sub>t2</sub>							—	.620**	.448**	.627**	.566**
NA <sub>t3</sub>								—	.538**	.566**	.705**
SD <sub>t1</sub>									—	.544**	.680**
SD <sub>t2</sub>										—	.705**
SD <sub>t3</sub>											—

*Note: BOR refers to PAI-BOR total score; M&Ms (g) refers to quantity of M&Ms consumed, RS refers to the total score on the Restraint Scale; DIS refers to the total score on the Dietary Intent Scale; TFEQ-R refers to the total score on the Three-Factor Eating Questionnaire – Cognitive Restraint Scale; NA t1, t2, and t3 and SD t1, t2, and t3 refer to PANAS-Negative Affect and Sadness scores at Time 1 (baseline), Time 2 (post-movie/food), and Time 3 (post-reflection period), respectively. \* $p < .05$ , \*\*  $p < .01$  (2-tailed).*



Table 3  
*Means and Standard Deviations of PANAS Scores across Participant Sub-Groups*

	<u>PANAS-NA</u>		
	Time 1	Time 2	Time 3
Low DIS, Low BOR, NF	13.74 (3.53)	14.91 (4.11)	—
Low DIS, Low BOR, WF	13.11 (2.78)	14.08 (3.46)	12.22 (2.31)
High DIS, Low BOR, NF	14.64 (4.38)	15.50 (3.93)	—
High DIS, Low BOR, WF	13.33 (3.57)	15.00 (4.49)	13.30 (3.76)
Low DIS, High BOR, NF	17.38 (7.25)	18.62 (6.88)	—
Low DIS, High BOR, WF	14.88 (4.48)	16.26 (5.15)	13.93 (4.16)
High DIS, High BOR, NF	16.79 (5.84)	19.13 (7.76)	—
High DIS, High BOR, WF	16.45 (4.76)	16.27 (3.81)	14.55 (3.84)
	<u>PANAS-SD</u>		
	Time 1	Time 2	Time 3
Low DIS, Low BOR, NF	6.33 (2.48)	10.16 (3.60)	—
Low DIS, Low BOR, WF	6.12 (1.96)	9.21 (3.44)	6.41 (2.33)
High DIS, Low BOR, NF	7.26 (3.74)	10.84 (4.96)	—
High DIS, Low BOR, WF	6.35 (1.85)	10.67 (3.44)	7.26 (2.10)
Low DIS, High BOR, NF	8.85 (5.00)	13.76 (4.84)	—
Low DIS, High BOR, WF	7.67 (3.52)	10.85 (3.92)	8.63 (3.98)
High DIS, High BOR, NF	9.17 (4.01)	12.92 (4.32)	—
High DIS, High BOR, WF	9.77 (4.94)	11.59 (4.49)	9.00 (3.90)

*Note: NF refers to “no food,” whereas WF refers to “with food.” High and low DIS and BOR represent individuals characterized as such by their total scores on the DIS and PAI-BOR scales, respectively. PANAS-NA and PANAS-SD represent scores on the PANAS Negative Affect and Sadness scales, respectively. The three different time points represent mood assessments at baseline (time 1), post-movie/food (time 2), post-reflection period (time 3).*

Table 4  
*Three-Way Interaction for PANAS-Sadness, DIS, and BOR scores*

			<u>PANAS-Sadness Score</u>		
BOR	DIS	TIME	Mean	Std. Error	95% Confidence Interval
Low	Low	1	6.13	.37	5.39 – 6.86
		2	9.21	.47	8.28 – 10.13
		3	6.41	.37	5.67 – 7.15
	High	1	6.34	.58	5.21 – 7.49
		2	10.46	.73	9.03 – 11.90
		3	7.19	.58	6.04 – 8.34
High	Low	1	7.67	.57	6.55 – 8.79
		2	10.86	.71	9.44 – 12.26
		3	8.63	.57	7.50 – 9.76
	High	1	9.77	.63	8.53 – 11.01
		2	11.59	.79	10.03 – 13.15
		3	9.00	.63	7.75 – 10.25

*Note: These individuals were in the experimental condition. DIS refers to the Dietary Intent Scale, BOR refers to the PAI-Borderline Features Scale, and TIME refers to whether the dependent variable, Sadness, was assessed at time 1 (baseline), time 2 (post-movie/food), or time 3 (post-reflection period).*

Table 5  
*Prediction of Mood Changes (Time 1 to Time 2) from Borderline Personality Features and M&Ms Eaten (Combining Experimental and Control Conditions)*

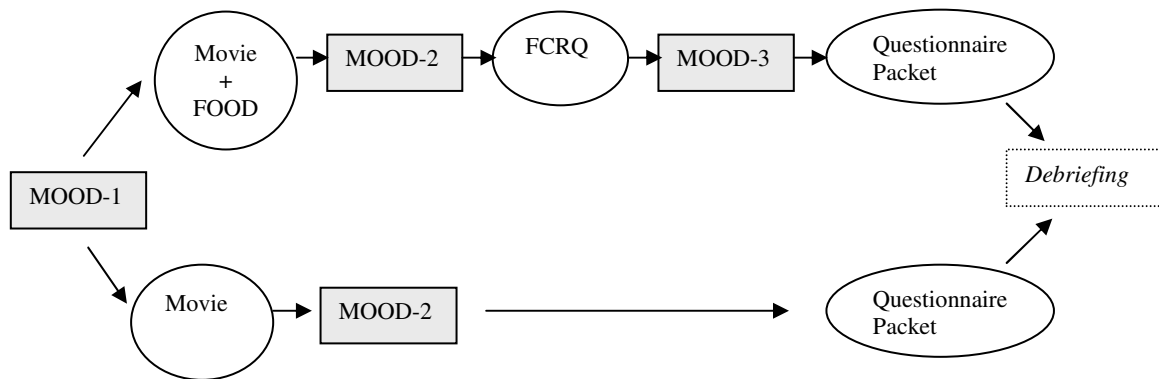
Variable	b (s.e.)	$\beta$	<i>t</i>	p
<u>Model 1: Residualized Change NA</u>				
BOR	.02 (.01)	.17	3.02	.003
Sq rt M&Ms Eaten	-.04 (.02)	-.15	-2.56	.011
BOR * Sq rt M&Ms Eaten	-.14 (.06)	-.14	-2.42	.016
<u>Model 2: Residualized Change SD</u>				
BOR	.01 (.01)	.17	2.04	.042
Sq rt M&Ms Eaten	-.05 (.02)	-.18	-3.10	.002
BOR * Sq rt M&Ms Eaten	-.12 (.06)	-.12	-2.11	.036

*Note: Residualized change NA and Residualized change SD refer to standardized residuals for changes from time 1 to time 2 for PANAS-NA and Sadness scores, respectively. BOR refers to total scores on the PAI-BOR scale, Sq rt M&Ms Eaten refers to the square root transformation of M&Ms Eaten (in grams), and BOR\*M&Ms Eaten refers to the interaction (taken as a z-score) between the above.*

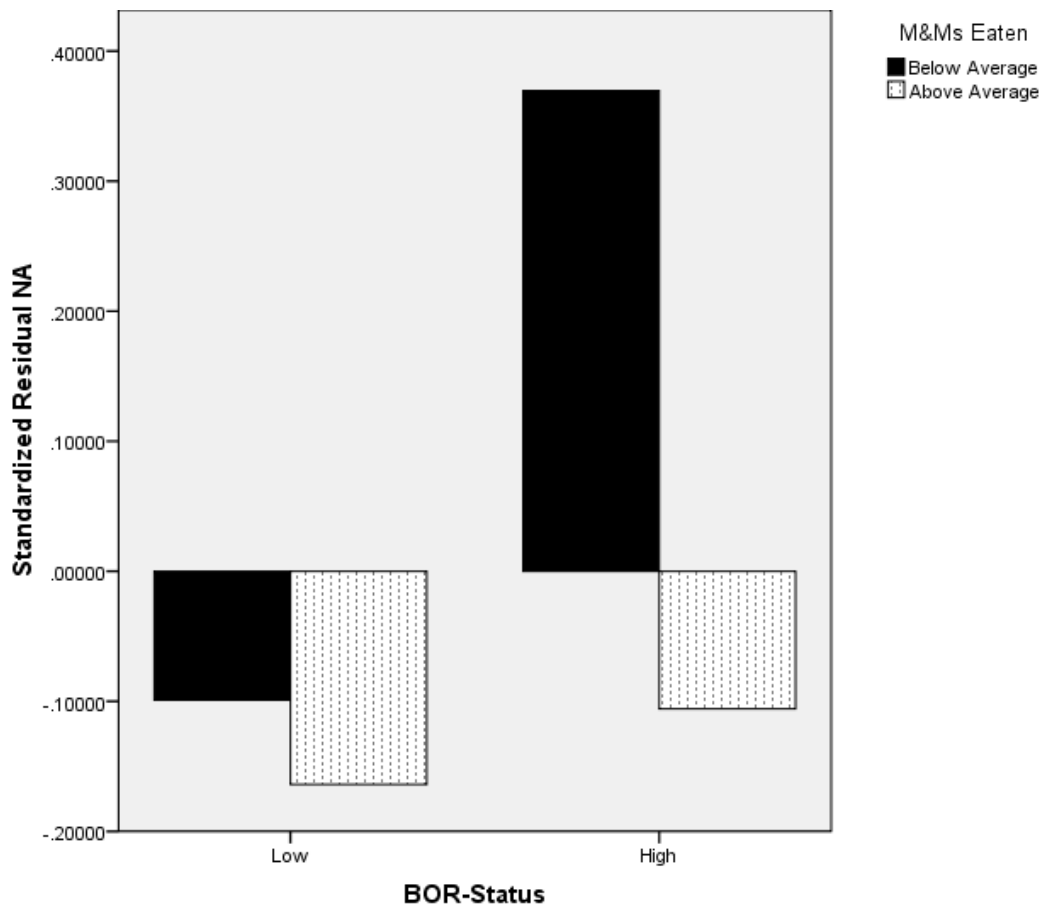
Table 6  
*Prediction of M&Ms Eaten from Borderline Features and Dietary Restraint Characteristics*

Variable	b (s.e.)	$\beta$	<i>t</i>	p
<u>Model 1</u>				
DIS	0.94 (0.32)	.25	2.92	.004
BOR	-0.35 (0.23)	-.13	-1.53	.129
BOR * DIS	2.42 (2.22)	.09	1.09	.278
<u>Model 2</u>				
RS	1.05 (0.48)	.20	2.20	.030
BOR	-0.29 (0.24)	-.11	-1.17	.243
BOR * RS	0.05 (2.49)	.01	.02	.983
<u>Model 3</u>				
TFEQ-R	0.87 (0.41)	.19	2.12	.036
BOR	-0.19 (0.21)	-.08	-.91	.366
BOR * TFEQ-R	1.59 (2.27)	.06	.70	.485

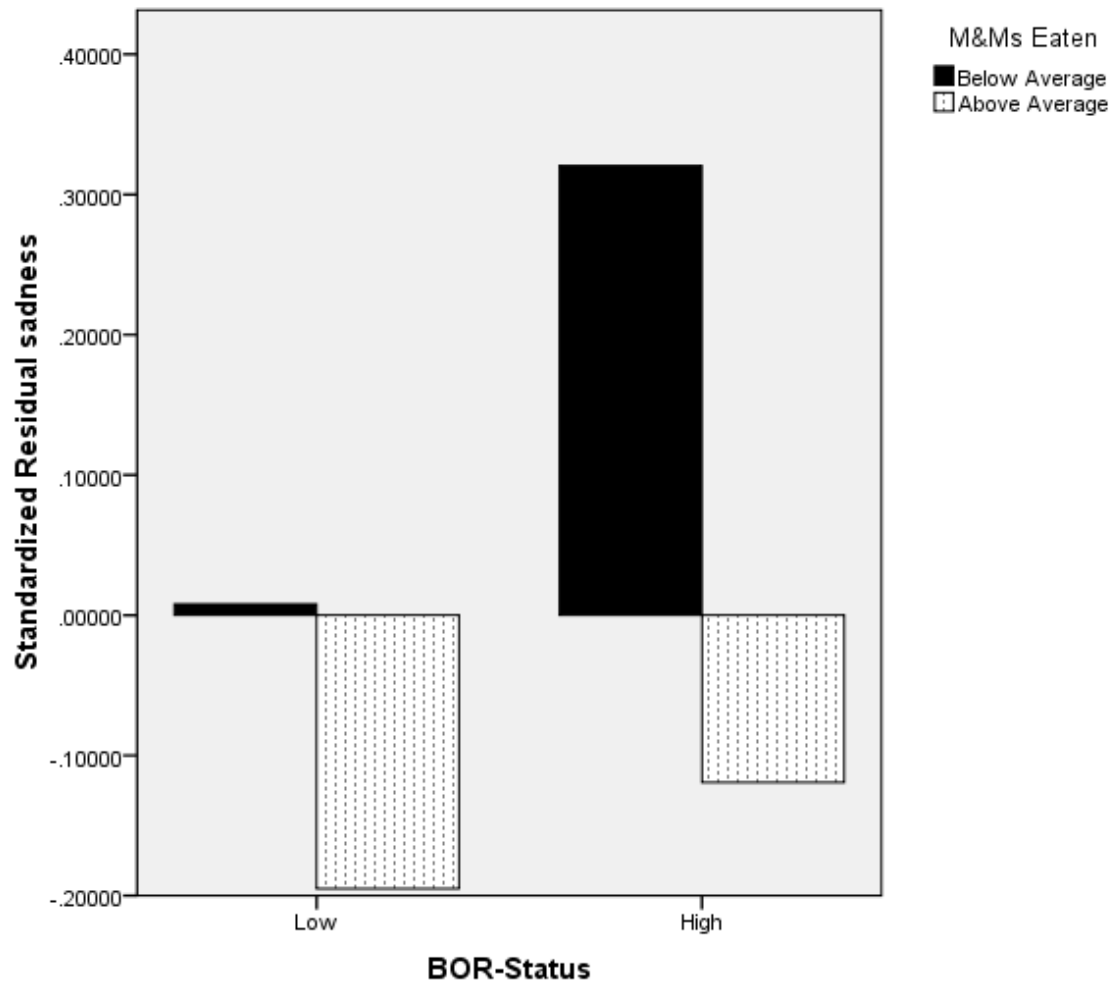
*Note: BOR refers to total scores on the PAI-BOR scale; DIS refers to total scores on the Dietary Intent Scale; RS refers to total scores on the Restraint Scale; TFEQ-R refers to total scores on the Three Factor Eating Questionnaire Restraint Scale. Z-scores were used to calculate each of the above interactions. Only participants from the experimental condition were included in these analyses.*



*Figure 1.* Visual Representation of the Experimental Procedure.



*Figure 2.* Residualized Changes in PANAS Negative Affect by BOR-status and M&Ms Eaten. Increases on the standardized residual NA correspond with a worsening of mood (i.e., increases in negative affect) and negative residuals are associated with an improvement in mood (i.e., decreases in negative affect). BOR-status represents the categorization of individuals as low and high scorers on the PAI-BOR scale.



*Figure 3.* Residualized Changes in PANAS Sadness by BOR-status and M&Ms Eaten.

Increases on the standardized residual Sadness correspond with a worsening of mood (i.e., increases in sadness) and negative residuals are associated with an improvement in mood (i.e., decreases in sadness). BOR-status represents the categorization of individuals as low and high scorers on the PAI-BOR scale.

## APPENDIX B

*Food Consumption Review Questionnaire (FCRQ)*

1. Approximately how many M&Ms do you think you ate during today's experiment?

\_\_\_\_\_ Number of M&M pieces    **OR**    \_\_\_\_\_ M&Ms by weight (specify unit)

2. Which M&M color did you prefer *today*? \_\_\_\_\_.

3. Did you prefer the [above listed color] of M&Ms in terms of... (circle one for each category)

i. Flavor?	Yes	No
ii. Texture?	Yes	No
iii. Overall preference?	Yes	No

4. How often do you typically eat chocolate or other forms of candy?

5. When you do eat chocolate and/or other candy, how much do you typically eat in one sitting? (Please specify units)

6. Do you try to avoid eating certain foods, such as chocolate and/or other sweets?

\_\_\_\_\_ Yes

\_\_\_\_\_ No

Please explain why or why not:

7. Do you think eating chocolate and/or sweet foods might be related to your mood?

Why or why not?

8. Had you planned to eat chocolate today? \_\_\_\_\_ YES          \_\_\_\_\_ NO

9. How do you feel about having eaten chocolate in today's experiment? Please describe your feelings and thoughts in at least 4-5 sentences.



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