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Binge Eating Disorder: Relationship to Physical and Emotional Factors

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Binge Eating Disorder: Relationship to Physical and Emotional Factors

(TITLE)

BY

Taylor M. McMillan

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Binge Eating Disorder: Relationship to Physical and Emotional Factors

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Abstract

Binge eating disorder (BED) is a new core diagnosis within the Diagnostic Statistical Manual Fifth Edition (DSM-5; APA, 2013). Because binge eating disorder is a new diagnosis, research within this area is both lacking and developing quickly. Social physique anxiety and emotion regulation have been linked previously to binge eating disorder. In contrast, there is little research on the potential link between physical activity and binge eating disorder; however, physical activity has been shown to have potential treatment benefits for binge eating. This study examined BED on a continuum and its links to physical activity, emotion regulation, and subtypes of social anxiety. There was not a significant correlation between binge eating behaviors and physical activity, but binge eating was correlated positively with body mass index (BMI). In addition, binge eating was associated with all three subtypes of anxiety (social physique, appearance, and exercise anxiety) along with emotion difficulties.

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Binge Eating Disorder: Relationship to Physical and Emotional Factors

Eating disorders have been linked to perfectionistic characteristics, difficulties in emotion regulation, social anxiety, and specific physical activity behaviors. Binge-eating disorder (BED), however, is a recent addition to the Diagnostic Statistical Manual Fifth Edition (DSM-5; American Psychological Association [APA], 2013), and many of the established relationships within disordered eating do not pertain to BED. Recent research has identified sedentary behavior among those with BED, but less is known about physical activity behaviors between obese and non-obese individuals with BED. Social anxiety has been linked to eating disorders, but limited research has identified whether social physique and appearance anxiety, subtypes of social anxiety, are associated with eating disorders. Likewise, emotion regulation difficulties have also shown to be related to BED. Thus, the present study examines physical activity habits (i.e., type, duration, and frequency of physical activity) and emotional factors (i.e., social anxiety, emotional eating, and emotion regulation) in conjunction with BED. This paper begins with a review of the relevant literature on binge eating and then presents findings from a study examining relationships among physical activity, social anxiety, emotional eating, and emotion regulation difficulties.

Literature Review

Binge Eating Disorder

BED is a relatively rare disorder among the general population (Smink, van Hoeken, & Hoek, 2012), and there are few population-based studies that provide accurate estimates (Udo & Grilo, 2018). Most recent population-based studies estimate lifetime prevalence rates of .85% for binge eating disorder when using the recent DSM-5 criteria

in a representative U.S. adult sample (Udo & Grilo, 2018). The current DSM-5 recently modified the disordered eating criteria for Anorexia Nervosa, Bulimia Nervosa, and Eating Disorder Not Otherwise specified (EDNOS) and now includes a diagnosis for binge-eating disorder. Some research suggests that by modifying the criteria and introducing the BED diagnosis, the DSM-5 does a better job at characterizing those who meet the threshold for disordered eating and reducing the prevalence of EDNOS (Mancuso et al., 2015). Using DSM-IV, individuals with binge-eating disorder typically were previously categorized in the EDNOS (Mancuso et al., 2015).

Binge eating disorder is characterized by recurrent episodes of binge eating (APA, 2013). A binge eating episode is eating an amount of food that is larger than what most people would eat in a similar situation within a discrete time period (typically within a two-hour period) and involves feeling a lack of control over eating behaviors during this episode (APA, 2013). Binge eating episodes also are associated with at least three of the following symptoms: eating more rapidly than normal, eating until feeling uncomfortable full, eating large amounts of food without experiencing hunger, eating alone because one is embarrassed about the amount of food one eats, feelings of disgust, depression, or guilt after the episode (APA, 2013). Binge eating disorder can vary in severity depending on the number of binge-eating episodes one experiences per week (APA, 2013).

Researchers have identified BED as more common than both anorexia nervosa (AN) and bulimia nervosa (BN) (Hudson, Hiripi, Pope, Kessler, 2007; Udo & Grilo, 2018). It is important to consider that many people experience disordered eating behaviors throughout their lifetime; likewise, many experiment with disordered eating behaviors while never developing a clinically significant eating disorder (Keel, 2005). In

a study examining 80,000 adolescents, 56% of 9th grade females and 57% of 12th grade female students engaged in one or more disordered eating behaviors, including taking diet pills, laxatives to lose or control one's weight (Croll, Neumark-Sztainer, Story, & Ireland, 2002).

Binge eating is particularly common among college students and peaks when they leave home, often after they had subthreshold binge eating behaviors (Sherry & Hall, 2009), and 16-25% of college-age women engage in binge eating behaviors with 10% participating in these behaviors one-time per week or more (Ferriter & Ray, 2011). Individuals with BED experience an increased risk for both physical and mental health problems (Hudson et al., 2007). Physical health risks can include fluctuation in glucose levels and weight gain, among others (Bulik & Reichbron-Kiennerud, 2003; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). Higher rates of anxiety, depression, substance abuse, and personality disturbances also often accompany BED (Bulik & Reichbron-Kiennerud, 2003; Wonderlich et al., 2009).

Unlike BED, individuals with BN participate in compensatory behaviors post binge eating episode (APA, 2013). Compensatory behaviors include using diuretics or laxatives, excessive exercise, or vomiting to combat excessive caloric intake during binge eating episodes and prevent weight gain (APA, 2013; Keel, 2005; Myers & Wilman, 2014). Although individuals with BN participate in compensatory behaviors, the majority of the calories obtained during a binge episodes are retained (Keel, 2005). In both BED and BN, caloric restriction can increase chances of experiencing a binge episode (Keel, 2005).

Physical Activity

Physical activity is linked to both better mental health and physical health outcomes. Not only does physical activity act as a buffer against health risks associated with overweight and obesity above and beyond the effects of body weight, individuals who engage in regular physical activity are more likely to have a better general quality of life, ability to function, and mood states (Penedo & Dahn, 2005). Research examining the effects of physical activity on mood is primarily focused around depression and anxiety: physical activity improves mood and reduces symptoms of depression and anxiety (Ross & Hayes, 1988; Stephens, 1988). Individuals experiencing disordered eating behaviors may receive benefits from exercise. Recent studies suggest physical activity may regulate negative affect (Davis & Kapetin, 2006).

The American College of Sports Medicine (ACSM; 2015) recommends that adults between the ages of 18 to 65 years participate in 150 minutes of moderate-intensity endurance exercise per week (ACSM, 2015). Moderate-intensity exercise includes any exercise where a noticeable increase in heart rate occurs, including brisk walking (Haskell, Lee, Pate, Powell, & Blair, 2015). One-hundred and fifty minutes of moderate-intensity exercise per week is equivalent to 30 to 60 minutes of exercise five days per week (ACSM, 2014); likewise, an individual could also participate in 20 to 60 minutes of vigorous-intensity exercise where one experiences a significant increase in heart rate and rapid breathing like jogging, three days per week and also meet physical activity recommendations (Haskell et. al., 2015). Resistance exercise requirements include training each major muscle group two to three days per week to maintain or gain muscle strength including weight training or stair climbing resulting in muscle fatigue (ACSM,

2015). Few studies have focused on details regarding the kinds of physical activities participated in or and duration; instead, most studies categorize participants in terms of total length of participation in physical activity (Haskell et. al., 2015).

Binge eating disorder is associated with individuals who are considered overweight or obese (APA, 2013; Myers & Wilman, 2014); binge eating becomes more prevalent as BMI increases (Telch, Agras, & Rossiter, 1988). However, the majority of obese individuals do not have BED (Schag, Schönleber, Teufel, Zipfel, & Giel, 2013). Lifetime rates of obesity within the BED population is 87% (Villarejo, et al., 2012); those who are obese and have BED experience more body image and shape disturbances compared to obese individuals who are obese but without BED (APA, 2013; Arhberg, Trojca, Nasrawi, & Vocks, 2011). Researchers suggest that individuals who are obese with BED also overeat outside of binge eating episodes and lack regular exercise habits (Keel, 2005); however, research is lacking in cases where individuals with BED meet physical activity requirements. Little is known about the difference between individuals with BED who are considered obese and those who are not. Research findings indicate individuals with BED who are obese participate in minimal, if any physical activity (Hrabosky, White, Masheb, & Grilo, 2007). Are non-obese individuals with BED meeting physical activity requirements reducing weight gain?

Individuals with BED may be more likely to seek treatment for weight loss rather than for psychological issues (Keel, 2005). In fact, 15 to 50% of individuals seeking treatment for their obesity meet criteria for BED (Johnson, Spitzer, & Williams, 2001; Myers & Wilman, 2014) and fewer than 8% of those with BED ever receive treatment for disordered eating compared to 40% of individuals with BN (Fairburn, Cooper, Doll,

Norman & O'Connor, 2000). Treatments for BED are still being examined, but researchers have identified that weight loss in individuals who are obese or overweight is just as important of a treatment goal as is controlling overeating during binges (Keel, 2005). Specifically, health problems, obesity, and comorbid psychiatric disorders (e.g. depression) are associated with BED (Myers & Wilman, 2014).

Unlike individuals with BED, individuals with BN participate in compensatory behaviors to combat binge episodes, which can include excessive exercise. Those who participate in excessive exercise as a compensatory strategy may be more likely to exceed the recommended physical activity requirements of 150 minutes per week. Excessive exercise is present in up to 55% of eating disorder individuals (Shroff et al., 2006) and is maintained by weight and shape concerns (Fairburn, Cooper, & Shaffran, 2003; Hechler, Beumont, Marks, & Touyz, 2005). An optimal amount of physical activity between two and seven hours per week, represents the point where then best mental health benefits are achieved (Kim et al., 2012). Very low physical activity (i.e., less than two hours per week) and high levels of physical activity (i.e., more than seven hours per week) are both associated with poorer mental health (Kim et al., 2012). Individuals with BN who are participating in excessive exercise may not be receiving the mental health benefits.

Social Anxiety

The association between social anxiety and eating disordered behaviors is well-established in the literature (e.g., Grilo, White, & Masheb, 2008; Hudson et al., 2007; Kaye, Bulik, Thornton, Barbarick, Masters, & Price Foundation Collaborative Group, 2004). Social anxiety, body image dissatisfaction and disturbance, along with maladaptive views about personal appearance are present in both clinical and nonclinical

samples of disordered eating (Cash & Labarge, 1996; Coles et al., 2006; Hinrichesen, Waller, & Van Gerko, 2004; Pinto & Phillips, 2005). Social anxiety is marked by an intense fear regarding social or performance situations where one may be negatively evaluated (Ostrovsky, Swencionis, Wylie-Rosett, & Isasi, 2013; Titchener & Wong, 2015) and has been correlated positively with BED and emotional eating (Ostrovsky et al. 2013). Within social anxiety is a subtype known as social physique anxiety (SPA). SPA is characterized by concerns about one's physique being negatively evaluated during social situations (Diehl, Johnson, Rogers, & Petrie, 1998; Hart, Flora, Palyo, Fresco, Holle, & Heimberg, 2008; Hart, Leary, & Rejeski, 1989). Although significant body image disturbances in relation to social anxiety have been linked with disordered eating, limited studies have examined the association between SPA and eating problems directly. Social physique anxiety is correlated with bulimic symptomology and related to other disordered eating symptoms (Diehl et al., 1998). Individuals who have high SPA are less likely to use physical activity or exercise as a means of losing weight or changing one's body shape, which can lead to higher concerns about body size and shape (Crawford & Eklund, 1994); however, SPA is linked positively to BMI (Diehl et al., 1998)

Social appearance anxiety (SAA) is another subtype of social anxiety but is characterized by fear of situations where one's overall appearance, including body shape, may be evaluated. SAA is positively associated with obesity (Titchener & Wong, 2015). In a study examining female undergraduates, those with higher BMI's were more likely to experience social evaluative anxiety and this association was mediated by body image dissatisfaction (Titchener & Wong, 2015).

Social exercise has been linked to high levels of social anxiety as well as avoidance in particular to individual (as opposed to team sports) as evaluation by others may be more acute when engaging in individual sports (Norton, Burns, Hope, & Bauer, 2000). Levinson and colleagues (2013) suggest that many public exercise settings including gymnasiums may trigger social anxiety. Comfort with exercising in social situations is likely to be linked to whether an individual may avoid such a situation (Levinson, Rodebaugh, Menatti, & Weeks, 2013). For example, the less comfortable one feels exercising in social situations, the more social anxiety one may experience, increasing the likelihood of avoidance. According to the self-efficacy theory (Bandura, 1977), people's perceptions of their own capabilities will ultimately affect how they will behave. Current literature suggests there may be a link between one's likelihood to participate in healthy behaviors like weight control or exercise, and self-efficacy (Leary, 1985). An established link between social anxiety and disordered eating has been found; however, there is limited research addressing social exercise anxiety, or social anxiety that occurs in during public exercise, and its link to binge eating disorder (Levinson et al., 2013). Levinson and colleagues (2013) developed a measure of social exercise anxiety examining social exercise self-efficacy, gym avoidance, and exercise important and suggest that future research address social exercise anxiety in relation to exercise difficulties, including individuals with eating disorders and who are obese.

Emotion Regulation

Emotion Regulation (ER) is the ability to monitor, evaluate, and modify one's emotional reaction to achieve goals in situations (Thompson, 1994). Emotion regulation includes variation in emotion arousal, awareness, understanding, and acceptance (Gratz

& Roemer, 2004. p. 41). Emotion regulation affects one's capability to act in a desirable fashion, without interference to emotional state (Gratz & Roemer, 2004). Individuals with eating disorders experience more intense emotions, have poorer acceptance of their emotions, have less awareness of emotions, and encounter more difficulty making sense of and identifying their emotions than those without disordered eating behaviors (Compare, Callus, & Grossi, 2012; Svaldi et al., 2012). Likewise, those within eating disorders groups report more severe ER problems and tend to use more maladaptive ER strategies and less adaptive strategies (Svaldi et al., 2012). Among individuals with binge eating disorder (BED), emotion regulation strategies are lacking and there is an increase in emotional vulnerability, verifying with the model of binge eating (Compare, Callus, & Grossi, 2012; Svaldi et a., 2010).

Emotional eating can be defined as "the tendency to eat in response to a range of negative emotions such as anxiety, depression, anger, and loneliness, to cope with negative affect" (Arnow et al., 1995). Individuals who may experience difficulties in regulating negative affect may turn to emotional eating as a mechanism to respond to the negative emotions one is experiencing (Rotella et al., 2014). When assessing for emotional eating, it is important for measures to focus on the emotions or feelings some individuals experience that specifically trigger overeating behaviors (Rotella et al., 2014).

Within the disordered eating literature, researchers address emotional eating (EE) with the BN and BED populations. Emotional eating has been identified to be a potential trigger for binge eating episodes in persons with BN (Engelberg, Steiger, Gauvin, & Wonderlich, 2007) and BED (Masheb & Grilo, 2006; Ricca et al., 2009; Stein et al., 2007; Zeeck, Stelzer, Linster, Joos, & Hartmann, 2011). Likewise, EE is not only a

trigger for binge eating episodes in persons with BED, but also plays a large role in maintaining BED (Hilbert, Saelens, Stein, Mockus, Welch, & Matt, 2007). Tying into difficulties with emotion regulation, emotional eating tends to parallel binge eating episodes to attempt to reduce, eliminate, or distract from negative affect (Dingemans, Martijn van Furth, & Jansen, 2009; Stice, Bohon, Marti, & Fischer 2008); however, this maladaptive way of coping does not seem to be effective in actually reducing or eliminating negative affect (Hilbert & Tuschen-Caffier, 2007) suggesting another factor potentially maintaining binge eating behavior and reducing negative affect.

Among many theories of disordered eating, the *negative affect regulation model* suggests that participating in disordered eating behaviors is an attempt to regulate or escape from negative emotions (Heatherton & Baumeister, 1991; Stice et al., 2001). Emotionally-driven eating is a maladaptive behavior whereby individuals eat in response to their emotions or negative affect (Gianini et al. 2013). In fact, emotional eating in response to negative emotions predicts binge eating (Stice, Presnell, & Spangler, 2002). In addition, emotional eating is reportedly higher in obese individuals with BED (Pinaguy, Chabrol, Simon, Louvet, & Barbe, 2003). Binge eating episodes are commonly associated with negative affect (Polivy & Herman, 1993) and individuals participate in emotionally-driven eating and overeat in attempt to regulate their emotions and relieve negative affect (Goossens, Braet, Van Vlierberghe, & Mels, 2009; Masheb & Grilo, 2006; Ricca, Castellini, Lo Sauro, et al., 2009). This model suggests that after a binge-eating episode, negative affect should decrease, reinforcing binge behavior (Haedt-Matt & Keel, 2011; Munsch et al., 2012) and increases in positive mood may occur during the period after the binge-eating episode (Munsch et al., 2012). Binge eating episodes are

triggered by further breakdown in emotion regulation strategies and to alleviate the negative mood, individuals engage in binge-eating behaviors (Munsch et al., 2012); however, studies have found conflicting findings, with some studies reporting a significant increase in negative affect after binge episodes (Haedt-Matt & Keel, 2011). In other words, binge eating behavior do not result in an immediate decrease in negative mood; therefore, difficulties in affect regulation can lead to binge eating, but binge eating typically is not an effective mechanism for affect regulation (Hilbert & Tuschen-Caffier, 2007). Although there is disagreement about whether there is an increase or decrease in negative affect after a binge episode, negative affect and lack of emotion regulation strategies are most commonly associated with binge episodes. Likewise, negative mood seems to regulate pathological disordered eating behavior, such as binging in individuals with BED (Svaldi et al., 2012). In Gianini et al. (2013), negative affect accounted for 20% of the variance in emotional overeating and 17.7% of the variance in eating pathology.

Apart from the conflicting research about binge eating and its maintenance in negative affect, research suggests that individuals who participate in binge eating behavior hold expectations that the eating will help relieve the negative mood one is experiencing, even if one does not experience an actual decrease in negative affect (De Young, Zander, & Anderson, 2014); therefore, predicting higher frequencies of binge eating (De Young et al., 2014). The *expectancy theory* of binge eating is when an individual uses previous experiences to predict or shape beliefs about the effects of binge eating episodes in future situations (Haedt-Matt & Keel, 2011; De Young et al., 2014). For example, one may hold the belief or expect that binge eating will reduce negative

mood currently experienced, feeling rewarded or better about self. The expected consequences of one's binge eating behaviors are more important for maintaining their behavior compared to the actual consequences (Haedt-Matt & Keel, 2011). Individuals who binge but do not meet full criteria for BED often participate in binge eating episodes when experiencing high levels of both negative and positive affect (De Young et al., 2014). The expectancy theory may be used to explain the conflicting findings regarding the role of binge eating in maintaining negative affect. Some research suggests that there is a negative increase pre and post binge eating episodes due to the expectation, but the negative affect after the binge is greater, potentially because the expectation was not met and did not provide relief (Haedt-Matt & Keel, 2011; Hilbert & Tuschen-Caffier, 2007).

The expectancy theory of binge eating and its relationship to emotion regulation and negative affect is found in individuals with both BED and bulimia nervosa (BN). Persons with BN participate in compensatory behaviors after they participate in binge eating episodes to prevent weight gain. Recent studies examining differences between persons with BED and persons with BN suggest that both use binge eating to regulate their mood and experience an increase in negative affect when participating in binge eating; however, individuals with BED have binge eating episodes of shorter duration compared to those with BN (Hilbert & Tuschen-Caffier, 2007). Likewise, individuals with BED have less negative mood prior to the binge eating episode and have fewer negative thoughts associated with eating and food stress (Johnson, Schlundt, Barclay, & Engler, 1995; Greeno, Wing, & Shiffman, 2000; Le Grange, Gorin, Catley, Stone, 2001; Freeman & Gil 2004; Stein, Kenardy, Wiseman, Dounchis, Amow, & Wilfley, 2007).

Current Study and Hypotheses

The primary goal of this study is to examine specific physical activity habits and emotional factors (social anxiety and emotion regulation difficulties) in relation to BED symptom severity. Current literature examining physical activity habits is limited, along with literature associated with social physique, exercise, and appearance anxiety. In contrast, research on emotion regulation difficulties in relation to disordered eating is extensive; however, research focusing on BED specifically is limited.

Hypothesis I will examine physical activity (frequency, type, and duration) and BMI in relation to binge eating. In prior research, individuals with binge-eating behaviors are more likely to report sedentary behavior compared to those without current binge eating behaviors and compared to individuals who are obese without BED (Hrabosky et al., 2007). Specifically, Hypothesis Ia predicted that binge eating symptoms would be correlated positively with BMI and correlated negatively with physical activity.

It is important to consider that not all individuals who are obese have binge eating symptoms; likewise, not all individuals with binge eating symptoms are obese. To our current knowledge, potential differences in physical activity between obese and nonobese individuals with binge eating symptoms have not been addressed. Hypothesis1b addressed group differences between individuals who are "obese" and those who are "nonobese." The National Institute of Health (NIH) has cut-offs for obesity using BMI and these were used to do group comparisons between obese and nonobese individuals. Hypothesis Ib predicted significant group differences among "obese" and "nonobese" in regard to binge eating behaviors; specifically, it predicted significantly higher levels of binge eating, but lower levels of physical activity among obese individuals.

Hypothesis 2 examined binge eating behaviors in relation to social physique anxiety, social appearance anxiety, and exercise anxiety. The link between disordered eating and social anxiety has been established, but less information focuses on these specific subtypes of social anxiety. Thus, Hypothesis 2a predicted that binge eating symptoms would be correlated positively with social physique, appearance, and exercise anxiety.

Hypothesis 3 examined the link between binge eating behavior and emotions. Consistent with prior research, Hypothesis 3a predicted that binge eating symptoms would be correlated positively with emotional eating, which is consistent with the *negative affect regulation model* of binge eating (Heatherton & Baumeister, 1991; Stice et al., 2001). Hypothesis 3b predicted that binge eating symptoms would be related to each component of the emotional eating model (anger/frustration, anxiety, and depression). Hypothesis 3c further examined the link between binge eating and emotion; we predicted that binge eating behaviors would be associated positively with emotion regulation difficulties.

Finally, Hypothesis 4 was intended to be more exploratory in nature; it examined the predictors of binge eating behaviors using the main study variable. Based on the literature, we know that binge eating behaviors are related to a number of physical and emotional characteristics; in addition, the results of the previous hypotheses will help determine which variables to include as predictors.

Method

Participants

Participants were students from Eastern Illinois University, who were enrolled in introductory level psychology courses ($N = 97$). Students received course credit for their participation, which was conducted using Qualtrics. Missing data were addressed by calculating the mean of a participant's responses for other scale items was calculated and filled in for that response; however, if a participant was missing more than 20% of their data, they were deleted from analyses. Participants consisted of 30.9% ($N = 30$) were males and 68% ($N = 66$) were females. An a priori analysis was conducted and determined a sample size of at least 136 participants is needed to maintain a medium effect size, probability of .05, and a desired power of .90. Given the less than optimal power, Hypothesis 4 was simplified and intended to be more exploratory in nature.

Measures

Demographics & Physical Activity. This author created the demographics form, which included items pertaining to physical activity. Specifically, participants reported their sex, age, race, current meal plan, living situation, enrollment status, and exercise habits. Questions regarding exercise habits included exercise frequency, duration of exercise, location of exercise, the specific type of exercise participants partake in, and motivation to exercise.

Disordered Eating. Participants answered questions assessing disordered eating behaviors using two scales. Participants completed the Eating Disorder Examination Questionnaire 6.0 (EDE-Q 6.0) to gain an overall accurate representation of eating attitudes and behaviors (Fairburn & Beglin, 1994; Fairburn & Beglin, 2008). The EDE-Q

6.0 is a 28-item self-report questionnaire of disordered eating behaviors using a six-point Likert scale and participants specify severity and frequency of various eating behaviors. The EDE-Q 6.0 consists of four subscales: Dietary Restraint (e.g., "Oh how many of the past 28 days have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?"), Weight Concern (e.g., "Over the past 28 days, how dissatisfied have you been with your weight?"), Shape Concern (e.g., Over the past 28 days, how dissatisfied have you been with your weight?"), and Eating Concern (e.g., "On what proportion of the times that you have eaten have you felt guilty because of its effect on your shape or weight?"). A total, global score of all four subscales can also be created. The EDE-Q shows adequate reliability with internal consistency values for the global score is .85 and a range of .60-.73 for the subscales (Gianini et al., 2013).

To address the presence and severity of binge eating behaviors, the Binge Eating Scale (BES) was used (Gormally, Black, Daston, & Rardin, 1982). The BES consists of 16 items (e.g., "Because I feel so helpless about controlling my eating I have become very desperate about trying to get in control"). In a sample of obese patients, the BES demonstrated high internal consistency (Gormally et al., 1982), while also showing good construct reliability and convergent validity in general female populations (Duarte, Pinto-Gouveia, & Ferreira, 2015).

Participants reported situations in which they experience the urge to eat based on negative affect using the Emotional Eating Scale (EES; Arnow et al., 1995). The EES is a 25-item scale high internal consistency among disordered eating women (r = .81; Arnow, et al., 1995) and non-eating disordered women (r = .93; Waller & Osman, 1996). Participants provide feelings (e.g., *Resentful, Rebellious, Lonely*) and then are instructed

to rate each feeling on the desired urge to eat. The EES contains three subscales: Anger/Frustration (e.g., "Furious"), Anxiety (e.g., "Uneasy"), and Depression (e.g., "Sad"). Participants will provide a rating using five-point scale ranging from *No Desire to Eat* to *An Overwhelming Urge to Eat* (Arnow et al., 1995).

Physical Measures. Participants self-reported measures of height and weight, which was used to calculate their body mass index (BMI), a continuous variable defined as weight in kilograms by the square of the participants' height in meters (Arnow, Kenardy, & Agras, 1995). According to NIH criteria (NIH, n.d.), body mass index scores that fall within <18.5 kg/m^2 are considered underweight; normal BMI scores are between 18.5 to 24.9 kg/m^2; overweight BMI scores fall within 25 to 29.9 kg/m^2; and individuals are considered obese with a BMI 30kg/m^2 or greater. Students were also given questions regarding their own perception of their weight and asked to select one item that represents their weight description; options included *Very underweight*, *Underweight*, *Average weight*, *Overweight*, *Very overweight* (Vohs et al., 1999).

Social Anxiety Subtypes. Social Physique Anxiety Scale (SPAS; Hart et al., 1989) assesses concerns regarding potential negative evaluations of one's physique in social situations. This 12-item scale focuses on characteristics of body physique including body fat, muscle tone, and body proportions (e.g., "It would make me uncomfortable to know others are evaluating my physique") (Hart et al., 2008). Participants provide a rating using a four-point Likert scale (*Not at all* to *Extremely*) (Hart et al., 2008). High internal consistency (α = .90) and reliability over an 8-week test-retest (r = .82) in a sample of university students has been demonstrated (Hart et al., 1989).

The Social Appearance Anxiety Scale (SAAS; Hart et al., 2008) is a 17-item measure assessing one's fear of social situations in which one's overall appearance (e.g., body shape) is being evaluated (e.g., "I get nervous talking to people because of the way I look"). Participants provided a rating using a five-point Likert scale (*Not at all* to *Extremely*) (Hart et al., 2008). Hart and colleagues (2008) demonstrated good internal consistency in an undergraduate sample (α = .94, .95, and .94). Likewise, Hart et al., 2008 established good convergent validity.

The Social Exercise and Anxiety Measure (SEAM; Levinson, Rodebaugh, Menatti, & Weeks, 2013) assessed anxiety associated with exercise in social situations. In particular, the SEAM contains 12 items divided into three subscales: Social Exercise Self-Efficacy (SES), Gym Avoidance (GA), and Exercise Importance (EI). The SES subscale contains 5 items (e.g., "I am confident that I could exercise with a group of people I do not know"). Respondents provide a rating using a 0 to 100 scale that is currently utilized in the field of self-efficacy research (*Cannot do at all* to *Highly certain can do*) (Bandura, 2006). The GA subscale includes 4 items (e.g., "I don't go to the gym because I feel like people are looking at me"). Participants provided their rating using a seven-point Likert rating scale (*Not like me at all* to *Completely like me*) (Levinson et al., 2013). The EI subscale includes 3 items (e.g., "How important to you is exercising as a social activity?"). Participants provided their rating using a seven-point Likert rating scale (*Not important to me* to *Very important to me*) (Levinson et al., 2013). Upon the creation of the scale, Levinson et al (2013) demonstrated incremental validity when comparing the SEAM with social anxiety. Likewise, the SEAM had excellent divergent

validity when examining its relationship with personality factors and convergent validity with SES and GA subscales (Levinson et al., 2013).

Emotion Regulation. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire of multiple aspects of emotion regulation dysfunction. The DERS contains six subscales: Nonacceptance of Emotional Response (NONACCEPT e.g., "When I'm upset, I become embarrassed for feeling that way"), Difficulties Engaging in Goal-Directed (GOALS e.g., "When I'm upset, I have difficulty focusing on other things"), Impulse Control Difficulties (IMPULSE e.g., "When I'm upset, I have difficulty controlling my behaviors"), Lack of Emotional Awareness (AWARE e.g.," I am attentive to my feelings"), Limited Access to Emotional Regulation Strategies (STRATEGIES e.g., "When I'm upset, I believe that I will remain that way for a long time"), and Lack of Emotional Clarity (CLARITY e.g., " I have difficulty making sense out of my feelings"). Item scores indicate one total score or a SUM including scores from each subtest. Individual subtest scores were attained examining the five six components of emotion regulation difficulties. Items are rated on a five-point Likert scale ranging from 1 (*Almost never, 0-10%*) to 5 (*Almost always, 91-100%*). The DERS has high internal consistency for the total score ($\alpha = .93$) as well as subscale scores ($\alpha > .80$ for each subscale; Gratz & Roemer, 2004). Likewise, the DERS overall score has good test-retest reliability over a period of 4 to 8 weeks in a sample of college students ($r = .88$, $p < .01$; Gratz & Roemer, 2004).

Procedure

Participants completed a multi-page online questionnaire packet through Qualtrics (an online survey platform); the packet contained measures assessing emotion regulation,

fear of negative evaluation, physical activity, perfectionism, BMI, and disordered eating behavior. The questionnaires were randomly ordered within the Qualtrics survey to control for possible order effects.

Results

All measures, apart from the Social Physique Anxiety Scale (SPAS), demonstrated satisfactory internal consistency, with Cronbach alpha levels above .7. The alpha was .45 for the SPAS, so it was not used as a predictor for hypothesis 4.

NIH (NIH, n.d.) criteria for BMI were used to create groups of individuals who are "obese" and "nonobese." Those with a BMI falling between <18.5 kg/m^2 to 30 kg/m^2 were considered "nonobese"; whereas, individuals with scores between 30 kg/m^2 and ≥35 kg/m^2 were considered "obese." Further demographic information can be found in Table 1.

The Binge Eating Scale (BES) is used to measure binge eating severity dimensionally. Using a cut-off value of >27, indicating severe binge eating, the BES has correctly identified 93.5% of binge eaters and 49.4% of non-binge eaters (cut-off of ≤17) in a sample of obese individuals seeking treatment for binge eating behaviors (Celio, Wilfley, Crow, Mitchell, & Walsh, 2004).). Therefore, the current study used the prior cut-offs to characterize the sample in assessing for BED and scores ranging from 18 to 27 were considered to have less severe binge eating. The current sample had binge eating severity scores ranging from 0 to 35 with a mean of 10.16 (SD = 7.96). Of the sample, 82.5% were non-binge eaters, 12.4% had less severe binge eating, and 4.1% had severe binge eating. In summary, approximately 16.5% of the sample has BED.

The EDE-Q 6.0 assess binge eating using three questions, but it is not used for diagnostic purposes. Within the current sample, 29.2% reported never experiencing a binge eating episode over the past 28 days where they ate an unusually large amount of food given the circumstances. However, 20.7% experienced a binge eating episode 10 days or more over the past 28 days and 4.2% experienced a binge episode every day.

Hypothesis 1

Hypothesis 1 examined binge eating behaviors in relation to physical activity (frequency, type, and duration). Using z-score cut-off of 3.29, no outliers were identified in type, duration, or frequency of physical activity. Binge eating behaviors were not significantly correlated with physical activity frequency (days per week), $r(95) = .09$, $p = .37$ (two-tailed). Binge eating behaviors also were not related to type of physical activity: aerobic ($r(95) = .12$, $p = .25$) and strength training ($r(95) = .10$, $p = .36$). Similarly, binge eating behaviors were not correlated with duration of aerobic activity ($r(96) = .13$, $p = .21$) or duration of strength training activity ($r(96) = .10$, $p = .36$).

Binge eating behaviors were correlated positively with BMI, $r(94) = .22$, $p = .009$ (one-tailed). In contrast, BMI was not related to physical activity duration of either aerobic ($r(95) = .13$, $p = .21$) or strength training exercise ($r(94) = .10$, $p = .36$). See Tables 2 and 3 for all descriptive statistics regarding physical activity.

Using NIH cut-offs for BMI, participants were categorized into two groups: "persons who are obese" and "persons who are nonobese." A group comparison (t-test for independent means) examined binge eating behaviors in "obese" and "nonobese" groups. Results reveal no significant difference between "obese" ($M = 12.33$, $SD = 8.20$) and

"nonobese" groups (M = 9.44, SD = 7.74), $t(93) = -1.61$, $p = .11$ (two-tailed) (See Figure 1).

A group comparison (t-test for independent means) examined physical activity for "obese" and "nonobese" groups; the "nonobese" (M = 3.79, SD = 2.32) and "obese" groups (M = 3.59, SD = 2.17) did not differ in physical activity frequency, $t(92) = .39$, $p = .70$ (two-tailed) (See Figure 2). Individuals with BED who are "obese" did not differ significantly in the number of days per week where they participated in aerobic activity compared "nonobese" individuals with BED, $t(14) = -1.38$, $p = .19$ (two-tailed). Similarly, individuals who are "obese" and with BED did not differ significantly in the duration of aerobic activity per session compared to individuals who are "nonobese" with BED, $t(14) = -.46$, $p = .65$ (two-tailed). Notably, "obese" individuals with BED reported significantly less days per week participating in strength training activities compared to those who are "nonobese" with BED, $t(13) = -4.11$, $p = .001$ (one-tailed). In addition, "obese" and "nonobese" individuals with BED who participated in strength training activity did not differ in the duration of activity per session, $t(14) = -1.71$, $p = .11$ (two-tailed).

Hypothesis 2

Hypothesis 2 examined the relationship between binge eating symptoms and social physique, appearance, and exercise anxiety. Binge eating was correlated positively with social physique anxiety, $r(95) = .35$, $p < .001$. However, due to the relatively poor internal consistency of the SPAS, this result should be interpreted with caution. In addition, binge eating was correlated positively with social appearance anxiety, $r(95) =$

.55, $p < .001$. In contrast to our prediction, binge eating was correlated negatively with social exercise anxiety, $r(91) = -.35$, $p = .001$.

Hypothesis 3

Hypothesis 3 explored the link between binge eating behaviors and emotional factors. Binge eating behaviors were correlated positively with emotional eating, $r(95) = .43$, $p < .001$. Likewise, binge eating correlated positively with all three components of the negative affect model of emotional eating: anger/frustration ($r(95) = .39$, $p < .001$); anxiety ($r(95) = .38$, $p = .001$); and depression ($r(95) = .50$, $p < .001$). Differences in emotional eating in "obese" and "nonobese" individuals was examined via a t-test for independent means; there was not a significant difference between groups for emotional eating, $t(93) = 1.14$, $p = .26$ (two-tailed). In addition to emotional eating, the relationship between binge eating and difficulties in emotion regulation was examined. Binge eating behaviors was correlated positively with emotion regulation difficulties, $r(95) = .52$, $p < .001$.

Hypothesis 4

Finally, a hierarchical multiple regression analysis was conducted to examine the predictors of binge eating behaviors. Specifically, the predictors consisted of the demographic variables, BMI, social exercise anxiety, social appearance anxiety, emotion regulation, and emotional eating. See Table 4 for results. In the first step, demographic variables were entered: including age, sex, and race/ethnicity. The first step was not significant, $R^2 = .01$, $F(3, 87) = .27$ $p = .84$, and yielded no significant predictors (all p values >.05). In the second step, BMI was added, which was not a significant predictor, $R^2 = .05$, $F(4, 86) = 1.12$, $p = .35$. In the third step, the social anxiety measures were

added, which included social appearance anxiety and social exercise anxiety. Due to the poor internal consistency of items within the social physique anxiety scale, it was excluded from the current analyses. Social anxiety measures added predictive value to the model, $R^2 = .36$, $F(6, 84) = 7.83$, $p = < .001$. Among the predictors, social appearance anxiety accounted for 29% of the variance in binge eating, ($\beta = .54$; $p < .001$). In the last step of the model, emotion regulation and emotional eating was added to provide unique value to the prediction of binge eating. The emotion variables added unique predictive value to the model, $R^2 = .50$, $F(8, 82) = 10.35$, $p = < .001$. Notably, emotional eating accounted for 7% of the variance ($\beta = .27$; $p = .003$). Difficulties in emotion regulation accounted for unique variance in binge eating, accounting for 5% of the variance ($\beta = .22$; $p = .04$). In other words, emotional eating and difficulties regulating emotions accounted for unique variance in binge eating even after accounting for the shared variance in demographics, BMI, and social anxiety.

Discussion

The current study provided information to further understanding BED. Given the relatively new nature of BED, more research is needed to help characterize and conceptualize the disorder and its correlates. Anorexia nervosa, bulimia nervosa, and binge eating disorder often are discussed as a cluster of diagnoses, which minimizes the unique individual differences of each disorder. The current study attempted to better understand the variation in binge eating behaviors in those who are obese versus those who are not obese, as research suggests that the presentation and experiences of BED may differ in these two types of individuals. Not surprisingly, the current study suggests binge eating increased with BMI confirming previous literature (Telch et al., 1988):

however, a group comparison between obese and nonobese individuals revealed no significant differences in binge eating behaviors or physical activity habits, including both aerobic and strength training activity. This finding provides a unique contribution to the literature confirming that both obese and nonobese individuals with BED are likely not participating in compensatory behaviors, but rather practicing similar eating and physical activity regimes. The lack of difference between the two groups suggests obese individuals with BED are likely overeating outside their binge eating episodes (Keel, 2005).

In addition, the current study suggests that those with BED who are nonobese participate in more strength-based activity. Although this finding is interesting, it should be interpreted with caution due to limitations of self-report, as discussed in the limitations section. Current literature is lacking in understanding how those with BED benefit from strength training exercise and more research is needed to explore the differences between obese and nonobese individuals with BED. It may be beneficial for future research to assess daily dietary consumption to better assess regular eating habits and better estimate daily caloric intake in order to conclude that obese individuals with BED are overeating outside of a binge eating episode.

The relationship between social anxiety and disordered eating is well-established (e.g., Grilo, White, & Masheb, 2008; Hudson et al., 2007; Kaye, Bulik, Thornton, Barbarick, Masters, & Price Foundation Collaborative Group, 2004) and fear regarding social performance situations focusing on negative evaluation is positively correlated with BED (Ostrovsky et al. 2013). However, the current study examined three specific aspects of social anxiety including social physique anxiety, social appearance anxiety,

and social exercise anxiety. Given the relationship between the broader construct of social anxiety and binge eating, the second hypothesis suggested there would be positive relationships among social physique, appearance, and exercise anxiety. The strongest relationship was represented in social appearance anxiety and binge eating, supporting a possible disturbance in body image. In other words, those with binge eating are more likely to experience anxiety in social situations where their body shape or the way they look is being evaluated. Similarly, social physique anxiety was associated with binge eating, but this finding should be interpreted cautiously given the poor psychometric properties of the scale.

The current study did find an unexpected negative relationship between social exercise anxiety and binge eating. Based upon initial hypotheses, one might expect any form of anxiety to perpetuate binge eating behaviors. Rather, binge eating was more likely to decrease with increases in social exercise anxiety. The current study did not examine the individual subscales of this measure, but the negative relationship may stem from self-efficacy related to social exercise, the amount of gym avoidance, or the amount of importance one contributes to exercise. Similarly, the environment of social exercise may be a positive coping mechanism for binge eating. For example, participating in exercise classes may create a stronger support network. Future studies should examine the unique characteristics of social exercise anxiety as it may affect binge eating differently when compared to other types of anxiety.

There is a substantial amount of literature supporting binge eating as a maladaptive response to negative affect or emotions (Gianini et al., 2013). As expected, results of the current study suggest a positive relationship between emotional eating and

binge eating. There is conflicting literature examining negative affect and its role in maintaining binge eating behaviors. This finding supports previous literature establishing that difficulties in emotion regulation and emotional eating may parallel binge eating episodes (Dingemans, Martijn van Furth, & Jansen, 2009; Stice, Bohon, Marti, & Fischer 2008). In fact, individuals experiencing a binge eating episode are likely trying to reduce, eliminate, or distract from feelings off negative affect (Dingemans, Martijn van Furth, & Jansen, 2009; Stice, Bohon, Marti, & Fischer 2008).

Limitations

As noted previously, an a priori power analysis suggested a sample size of 136 participants was needed to obtain adequate power. Our less than optimal power affects the degree of confidence in the results of the present study; future studies should use an increased sample size. In addition, the current sample was primarily undergraduate students limiting generalizability; however, this group is one that is commonly affected by eating disorders.

Because BED prevalence rates in the general population are relatively low, it may be beneficial for researchers to examine binge eating behaviors on a continuum. In this study, 16 participants met the cut-off for BED using cut-off scores from the BES, although they may not meet full DSM-5 diagnostic criteria. Although the BES has shown an adequate ability to correctly characterize persons with BED, the specificity of this measure is only 49.4% increasing the chance of false negatives (Ceilo et al., 2011). The use of a continuous measure is useful, particularly as persons with subclinical levels of binge eating symptoms may be at-risk for a binge eating diagnosis. Thus, future studies may benefit from also including diagnosis using a structured diagnostic interview.

A final limitation of the current study is the self-reported height and weight values; initially, the study planned on having participants come to the lab to obtain these measures. Population-level surveillance and health research regularly utilize self-report height and weight values because obtaining objective levels is deemed as costly (Ezzati, Martin, Skjold, Hoorn, & Murray, 2006). Similarly, the current study lacked resources to collect objective values of weight and height. Notably, relying on self-reported height and weight can introduce random error to research and systematic reporting bias (c.f., Ezzati et al., 2006). This bias is due to the underestimation of weight and overestimation in height. Because the current study examined BMI using self-report values, these results should be interpreted with extreme caution. Likewise, self-report was used for physical activity measures and generally, people tend to overestimate their physical activity levels. The current study did not examine exercise intensity and conclusions regarding the quality of physical activity or caloric expenditure can not be concluded using current study findings. Thus, future studies should use more objective methods of exercise and intensity to gain more accurate measures of caloric expenditure and current findings should be interpreted with caution.

Conclusions and Clinical Implications

This study provides useful information regarding characterizing a relatively new disorder within the DSM-5 and helps identify gaps within the current literature. Physical activity benefits on mental health is well-established within the literature, and adjustment in physical activity may be a useful tool for clinicians treating those with BED. Based on the current study and previous literature, negative affect is associated with emotional eating (Heatherton & Baumeister, 1991; Stice et al., 2001) and likely is a trigger for

emotionally-driven eating during binge eating episodes (Gianini et al., 2013). Not only is exercise a healthful habit, but exercise can improve negative affect by providing a non-pharmacological equivalent to antidepressants (Smits & Otto, 2009).

The current study found a significant relationship between binge eating and all three subtypes of social anxiety. Social appearance anxiety and its correlation to binge eating is the most salient finding here, suggesting a disturbance in body image. Body image disturbance among disordered eating is well-established in the literature, suggesting a disturbance in the perception of weight and shape among women with eating disorders (Keel, 2005). Therefore, it may be beneficial for the clinician to evaluate potential body image disturbance and how the body image disturbance changes in social evaluative situations.

Finally, no significant differences were found regarding physical activity between obese and nonobese individuals with binge eating behaviors. However, binge eating severity did increase in relation to BMI. Therefore, those who are obese are likely to be overeating outside of binge eating episodes, and it may be beneficial for a clinician to provide integrative care involving a dietician who can assist in shaping eating behaviors and reduce overeating outside of a binge eating episodes. Generally, cognitive behavior therapy (CBT) is one of the most well-researched psychotherapies and has been researched to assess its effectiveness for the treatment of BED and obesity (Grilo, 2017). Notably, CBT is effective for reducing impairing symptomology of BED, but long-term effectiveness studies examining symptom reduction produce only moderate results (Hilbert et al., 2012). In addition, research has not demonstrated adequate efficacy of weight loss promotion in individuals with BED for CBT interventions (Vocks et al.,

2010). Therefore, involving a dietician or integrating exercise interventions may promote weight loss better than CBT alone.

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Appendix A

Table 1

Means and Standard Deviations of Demographic Variables

	N (%)	*M (SD)*
Age	96	19.28 (1.37)
Race	96	
White/Caucasian	64 (66)	
Black/African American	21 (21.6)	
Asian	2 (2.1)	
Hispanic/Latino	5 (5.2)	
Multi-racial	2 (2.1)	
Prefer Not to Answer	1 (1.0)	
Unknown	1 (1.0)	
BMI		
Obese	27	35.60 (5.69)
Nonobese	68	23.08 (2.89)
Current Living Location	96	
On Campus	73 (75.3)	
Off Campus – House	5 (5.2)	
Off Campus – Apartment	13 (13.4)	
With Parents/Guardian	5 (5.2)	
Student Status		
Full-Time	96 (99.0)	
Part-Time	0 (0.0)	
Single-Course Only	0 (0.0)	
Meal Plan		
No Plan	21 (21.6)	
7 Plus Plan	22 (34.0)	
10 Plus Plan	14 (14.4)	
12 Plus Plan	27 (27.8)	
Off-Campus Dining	1 (1.0)	
Location of Physical Activity	95 (97.9)	
Campus Recreation	53 (54.6)	

Fitness Center	10 (10.3)
At your home	3 (3.1)
Outdoors	16 (16.5)
Other	13 (13.4)
Motivation of Physical Activity	95 (97.9)
Weight Management	13 (13.4)
Health	27 (27.8)
Muscle Definition	8 (8.2)
Appearance	27 (27.8)
Stress reliever	9 (9.3)
Competition	1 (1.0)
Enjoyment/Recreation	9 (9.3)
Other	1 (1.0)

Table 2

Means and Standard Deviations for Aerobic Exercise

	N (%)
Days of Exercise Per Week	96 (99.0)
I don't exercise	26 (26.8)
1 day per week	10 (10.3)
2 days per week	8 (8.2)
3 days per week	12 (12.4)
4 days per week	15 (15.5)
5 days per week	13 (13.4)
6 days per week	7 (7.2)
7 days per week	5 (5.2)
Days of at least 20 Minutes of Aerobic Exercise	96 (99.0)
None	22 (22.7)
1 day per week	13 (13.4)
2 days per week	15 (15.5)
3 days per week	18 (18.6)
4 days per week	13 (13.4)
5 days per week	6 (6.2)
6 days per week	4 (4.1)
7 days per week	5 (5.2)
Average Minutes of Aerobic Activity	96 (99.0)
Less than 10 minutes	20 (20.6)
10-20 minutes	12 (12.4)
20-30 minutes	15 (15.5)
30-40 minutes	27 (27.8)
40-50 minutes	9 (9.3)
50-60 minutes	7 (7.2)
1-2 hours	4 (4.1)
2-3 hours	2 (2.1)

Table 3

Means and Standard Deviations for Strength Training Exercise

	N (%)
Days of at least 20 minutes of Strength Exercise	95 (97.9)
None	33 (34.0)
1 day per week	17 (17.5)
2 days per week	7 (7.2)
3 days per week	16 (16.5)
4 days per week	9 (9.3)
5 days per week	8 (8.2)
6 days per week	2 (2.1)
7 days per week	3 (3.1)
Average Minutes of Strength Based Activity	96 (99.0)
Less than 10 minutes	27 (27.8)
10-20 minutes	14 (14.4)
20-30 minutes	12 (12.4)
30-40 minutes	20 (20.6)
40-50 minutes	4 (4.1)
50-60 minutes	10 (10.3)
1-2 hours	8 (8.2)
2-3 hours	1 (1.0)

Table 4

Hierarchical Regression Analysis of Variables Predicting Binge Eating ($N = 92$)

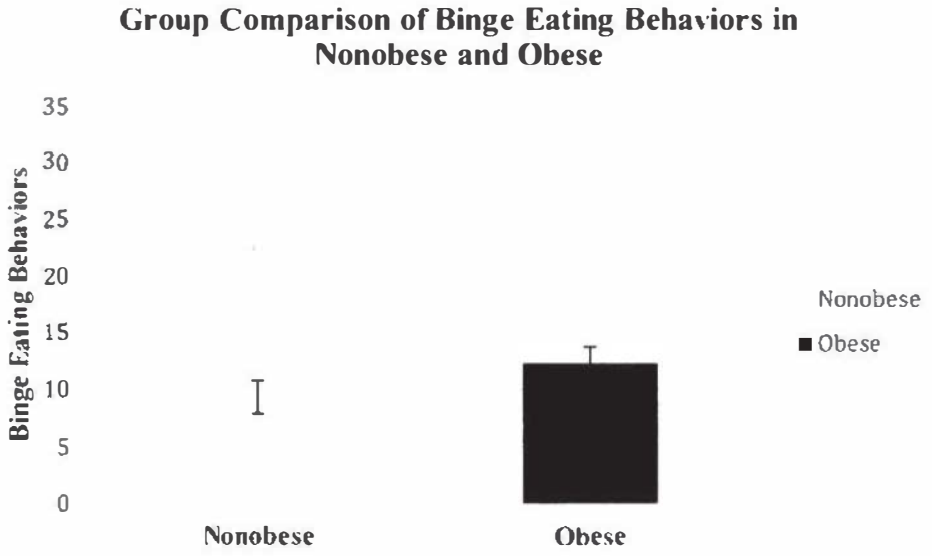
	Variable	B	SE B	β
Step 1				
	Age	-.18	.62	-.03
	Sex	.63	1.84	.04
	Race/Ethnicity	.26	.37	.08
Step 2				
	Age	-.08	.61	-.01
	Sex	1.18	1.84	.07
	Race/Ethnicity	.15	.37	.04
	BMI	.24	.13	.04
Step 3				
	Age	.65	.53	.11
	Sex	2.09	1.55	.12
	Race/Ethnicity	.26	.31	.08
	BMI	.17	.11	.15
	SAAS	.28	.05	.54***
	SEAM	-.01	.01	-.07
Step 4				
	Age	.50	.29	.09
	Sex	1.08	1.44	.06
	Race/Ethnicity	.22	.28	.06
	BMI	.24	.09	.20

SAAS	.20	.05	.38***
SEAM	-.00	.01	-.05
DERS	.07	.03	.22*
EES	.11	.04	.27**

$p < .05$*, $p < .01$**, $p < .001$***

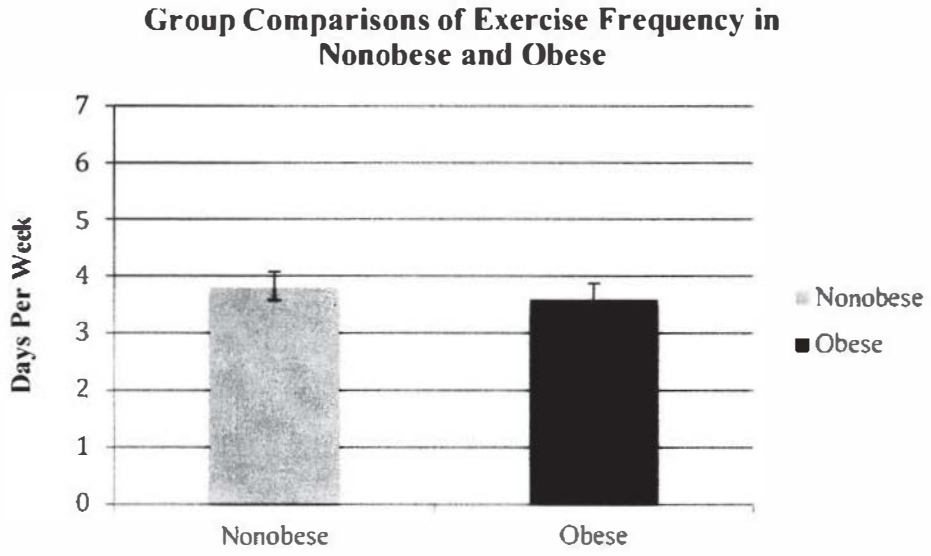
Note. $R^2 = .009$ for Step 1 ($p = 84$); $\Delta R^2 = .04$ for Step 2 ($p = .35$); $\Delta R^2 = .31$ for Step 3 ($p < .001$); $\Delta R^2 = .14$ for Step 4 ($p < .001$).

Figure 1



Note. Error bars are based on +/- 1 SEM. Body Mass Index groups are based on the National Institute of Health cut-offs.

Figure 2.



Note. Error bars are based on +/- 1 SEM. Body Mass Index groups are based on the National Institute of Health cut-offs.

Appendix B

CONSENT TO PARTICIPATE IN RESEARCH

Evaluation of Eating Habits in College Students

You are invited to participate in a research study conducted by Taylor McMillan B.A., and Wesley D. Allan Ph.D., from the Psychology Department at Eastern Illinois University. Your participation in this study is completely voluntary.

- **PURPOSE OF THE STUDY**

This study examines people's eating attitudes and behaviors.

- **PROCEDURES**

If you volunteer to participate in this study:

You will be asked to read an informed consent form. If you agree to participate in this study, then you will complete several online measures about different eating and exercise behaviors you may or may not experience. After completing these measures, objective measures of height and weight will be obtained and you will receive a printable debriefing form, which explains the study and provides you with the contact information of the investigators, who you may contact if you have any questions about the study. The total length of participation will be approximately 40 minutes.

- **POTENTIAL RISKS AND DISCOMFORTS**

There are no foreseeable risks or discomforts beyond those involved in a typical psychological study. If you become upset while participating in the research, you may skip any question that upsets you or withdraw from participation without penalty.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

For your participation, you will receive one hour of subject pool credit that partially fulfills course requirements for Psy 1879. Also, the results of the study will help us gain a better understanding of factors related to the mental health of college students and may ultimately contribute to the development of improved stress reduction programs.

- **INCENTIVES FOR PARTICIPATION**

Participants will receive course credit for participation in this study.

- **CONFIDENTIALITY**

Any information obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of ensuring that electronic data will be password

protected. Hard copies of data will be kept in a locked office. Data will not be connected to names but will be assigned to code numbers.

- **PARTICIPATION AND WITHDRAWAL**

Participation in this research study is voluntary and not a requirement or a condition for being the recipient of benefits or services from Eastern Illinois University. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits or services to which you are otherwise entitled. You may also refuse to answer any questions you do not want to answer.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about this research, please contact:

Taylor McMillan (tmmcmillan@eiu.edu

Wesley D. Allan, Ph.D. (Psychology Department Faculty Sponsor: 217-581-6611; wallan@eiu.edu)

- **RIGHTS OF RESEARCH SUBJECTS**

If you have any questions or concerns about the treatment of human participants in this study, you may call or write:

Institutional Review Board
Eastern Illinois University
600 Lincoln Ave.
Charleston, IL 61920
Telephone: (217) 581-8576
E-mail: eiuirb@www.eiu.edu

You will be given the opportunity to discuss any questions about your rights as a research subject with a member of the IRB. The IRB is an independent committee composed of members of the University community, as well as lay members of the community not connected with EIU. The IRB has reviewed and approved this study.

I voluntarily agree to participate in this study. I understand that I am free to withdraw my consent and discontinue my participation at any time. I can print a copy of this form for my records.

Demographics

1. What is your age?_____

2. What is your sex?

Male	Female

3. What is your race/ethnicity? (allow multiple answers)

White	Black or African American	Asian
Multi-Racial	American Indian/Alaska Native	Hispanic/Latino
Other_____	Prefer not to answer	

4. Where do you currently live?

On Campus	Off Campus – Apartment
Off Campus – House	At Home (with parents/guardians)
Other: _____	

5. What is your student status?

Full-Time	Part-Time	Single-Course Only

6. What type of meal plan do you have?

7 plus plan	10 plus plan	12 plus plan
No plan	Off-campus dining	

7. On average, how many days per week do you exercise?

I don't exercise	3 days per week	6 days per week
1 day per week	4 days per week	7 days per week
2 days per week	5 days per week	

8. On the days you exercise, how many days are devoted to at least 20 minutes of aerobic activity (i.e. Running/jogging, biking/cycling, swimming, walking, elliptical, tennis, basketball)?

None	3 days per week	6 days per week
1 day per week	4 days per week	7 days per week
2 days per week	5 days per week	

9. For each session of aerobic activity, how many minutes on average are spent doing that activity?

Less than 10 minutes	30-40 minutes	1-2 hours
10-20 minutes	40-50 minutes	2-3 hours
20-30 minutes	50-60 minutes	4+ hours

10. On the days you exercise, how many days are devoted to strength training activities (i.e. weight lifting, yoga, Pilates, body weight exercise, resistance training)?

None	3 days per week	6 days per week
1 day per week	4 days per week	7 days per week
2 days per week	5 days per week	

11. For each session of strength training activities, how many minutes on average is spent doing that activity?

Less than 10 minutes	30-40 minutes	1-2 hours
10-20 minutes	40-50 minutes	2-3 hours
20-30 minutes	50-60 minutes	4+ hours

12. At what location do you typically participate in the majority of physical activity?

Campus recreation center	Outdoors	Other_____
Fitness center	At your home	

13. What is the primary motivation for you to participate in physical activity? (allow multiple answers)

Weight management	Appearance	Competition
Health	Stress reliever	Enjoyment/Recreation
Muscle definition	Other_____	

Eating Questionnaire

Copyright Fairburn and Beglin, 2008

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

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

On how many of the past 28 days...	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
1. Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2. Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3. Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4. Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5. Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6

6. Have you had a definite desire to have a totally flat stomach?	0	1	2	3	4	5	6
7. Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, reading)?	0	1	2	3	4	5	6
8. Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, reading)?	0	1	2	3	4	5	6
9. Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10. Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6
11. Have you felt fat?	0	1	2	3	4	5	6
12. Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

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

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

13. Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?	
14. ....On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?	
15. Over the past 28 days, on how many **DAYS** have such episodes of overeating occurred (i.e., you have eaten unusually large amount of food and have had a sense of loss of control at the time)?	

16. Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?	
17. Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight?	
18. Over the past 28 days, how many times have you exercised in a "drive" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories?	

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

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

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

Over the past 28 days...	Not at all		Slightly		Moderately		Markedly
22. Has your weight influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6

23. Has your shape influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
24. How much would it upset you 9if you had been asked to weigh yourself once a week (no more, or less often) for the next four weeks?	0	1	2	3	4	5	6
25. How dissatisfied have you been with your weight?	0	1	2	3	4	5	6
26. How dissatisfied have you been with your shape?	0	1	2	3	4	5	6
27. How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?	0	1	2	3	4	5	6
28. How uncomfortable have you felt about others seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?	0	1	2	3	4	5	6

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

_____

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

_____

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

If so, how many? _____

Have you been taking the "pill"? _____

THANK YOU

Binge Eating Scale

(Gormally, Black, Daston, & Rardin, 1982)

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

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

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

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

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

5.
   a) I'm usually physically hungry when I eat something.
   b) Occasionally, I eat something on impulse even though I really am not hungry.

c) I have the regular habit of eating foods, that I might not really enjoy, to satisfy a hungry feeling even though physically, I don't need the food.
d) Even though I'm not physically hungry, I get hungry feeling in my mouth that only seems to be satisfied when I eat a food, like a sandwich, that fills my mouth. Sometimes, when I eat the food to satisfy my mouth hunger, I then spit the food out so I won't gain weight.

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

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

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

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

10.
a) I usually am able to stop eating when I want to. I know when "enough is enough."
b) Every so often, I experience a compulsion to each which I can't seem to control.
c) Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.

d) I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

11.
a) I don't have nay problem stopping eating when I feel full.
b) I usually can stop eating when I feel full but occasionally overeat leaving me feeling uncomfortably stuffed.
c) I have a problem stopping eating once I start and usually I feel uncomfortably stuffed after I eat a meal.
d) Because I have a problem not being able to stop eating when I want, I sometimes have to induce vomiting to relieve my stuffed feeling.

12.
a) I seem to eat just as much when I'm with other (family, social gatherings) as when I'm by myself.
b) Sometimes when I'm with other persons, I don't' eat as much as I want to eat because I'm self-conscious about my eating.
c) Frequently, I eat only a small amount of food when others are present, because I'm very embarrassed about my eating.
d) I feel so ashamed about overeating that I pick times to overeat when I know no one will see me. I feel like a "closet eater."

13.
a) I eat three meals a day with only an occasional between meal snack.
b) I eat three meals a day, but I also normally snack between meals.
c) When I am snacking heavily, I get in the habit of skipping regular meals.
d) There are regular periods when I seem to be continuously eating, with no planned meals.

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

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

16.

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

Social Physique Anxiety Scale (SPAS)

(Hart, Leary, & Rejeski, 1989)

The following questionnaire contains statements concerning your body physique or figure. By physique or figure we mean your body's form and structure; specifically, body fat, muscular tone, and general body proportions.

Instructions: Read each item carefully and indicate how characteristic it is of you according to the following scale.

1 = Not at all characteristic of me
2 = Slightly characteristic of me
3 = Moderately characteristic of me
4 = Very characteristic of me
5 = Extremely characteristic of me

_____ 1. I am comfortable with the appearance of my physique or figure.
_____ 2. I would never worry about wearing clothes that might make me look too thin or overweight.
_____ 3. I wish I wasn't so up-tight about my physique or figure.
_____ 4. There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively.
_____ 5. When I look in the mirror I feel good about my physique or figure.
_____ 6. Unattractive features of my physique or figure make me nervous in certain social settings.
_____ 7. In the presence of others, I feel apprehensive about my physique or figure.
_____ 8. I am comfortable with how fit my body appears to others.
_____ 9. It would make me uncomfortable to know others were evaluating my physique or figure.
_____ 10. When it comes to displaying my physique or figure to others, I am a shy person.
_____ 11. I usually feel relaxed when it's obvious that others are looking at my physique or figure.
_____ 12. When in a bathing suit, I often feel nervous about how well proportioned my body is.

Social Appearance Anxiety Scale (SAAS)

Read each of the following statements carefully and indicate how characteristic it is of you according to the following scale. Fill in a bubble to indicate how characteristic the statement is of you.

1 = **Not at all** characteristic of me
2 = **Slightly** characteristic of me
3 = **Moderately** characteristic of me
4 = **Very** characteristic of me
5 = **Extremely** characteristic of me

	Not at all	**Slightly**	**Moderately**	**Very**	**Extremely**
1. I feel comfortable with the way I appear to others.	①	②	③	④	⑤
2. I feel nervous when having my picture taken.	①	②	③	④	⑤
3. I get tense when it is obvious people are looking at me.	①	②	③	④	⑤
4. I am concerned people won't like me because of the way I look.	①	②	③	④	⑤
5. I worry that others talk about flaws in my appearance when I'm not around.	①	②	③	④	⑤
6. I am concerned people will find me unappealing because of my appearance.	①	②	③	④	⑤
7. I am afraid people find me unattractive.	①	②	③	④	⑤
8. I worry that my appearance will make life more difficult for me.	①	②	③	④	⑤
9. I am concerned that I have missed out on	①	②	③	④	⑤

opportunities because of my appearance.					
10. I get nervous when talking to people because of the way I look.	①	②	③	④	⑤
11. I feel anxious when other people say something about my appearance.	①	②	③	④	⑤
12. I am frequently afraid that I won't meet others' standards of how I should look.	①	②	③	④	⑤
13. I worry people will judge the way I look negatively.	①	②	③	④	⑤
14. I am uncomfortable when I think others are noticing flaws in my appearance.	①	②	③	④	⑤
15. I worry that a romantic partner will/would leave me because of my appearance.	①	②	③	④	⑤
16. I am concerned that people think I am not good looking.	①	②	③	④	⑤

Social Exercise Anxiety Measure (SEAM)

(Levinson et al., 2013)

Please rate how confident you are, where 0 is not at all and 100 is completely confident, that you can:

_____ 1. That I could work out/ exercise at a public gym where strangers also work out.
_____ 2. That I could work out/ exercise at a private gym where only me and my close friends work out.
_____ 3. That I could work out/ exercise with a group of people that I do not know.
_____ 4. That I could work out/ exercise in a crowded gym.
_____ 5. That if I went to the gym I would be successful at attaining my workout goals.

The following items are types of behavior. Please think about how much the behavior is typical for you. Please rate the following items on a 1-7 scale where 1 is *not like me at all* and 7 is *completely like me.*

_____ 6. I don't go to the gym because I feel like people are looking at me.
_____ 7. I don't go to the gym because I don't want to interact with the people at the gym.
_____ 8. When I go to the gym I think people are judging me.
_____ 9. I wish that I could go to the gym but I am too afraid of what people will think.

Please think about how much the following behaviors are important to you. Please rate the following items on a 1-7 scale where 1 is *not important to me* and 7 *very important to me.*

_____ 10. How important to you is exercising as a social activity?
_____ 11. How important to you is exercising as an activity to maintain a healthy lifestyle?
_____ 12. How important are exercising and eating healthy in your daily routine?

DERS

(Gratz & Roemer, 2004)

1	2	3	4	5
Almost never (0-10%)	Sometimes (11-35%)	About half the time (36-65%)	Most of the time (66-90%)	Almost always (91-100%)

Please indicate how often the following 36 statement apply to you by writing the appropriate number from the scale above (1-5) in the box alongside each item.

1. I am clear about my feelings.

2. I pay attention to how I feel.

3. I experience my emotions as overwhelming and out of control.

4. I have no idea how I am feeling.

5. I have difficulty making sense out of my feelings.

6. I am attentive to my feelings.

7. I know exactly how I am feeling.

8. I care about what I am feeling.

9. I am confused about how I feel.

10. When I'm upset, I acknowledge my emotions.

11. When I'm upset, I become angry with myself for feeling that way.

12. When I'm upset, I become embarrassed for feeling that way.

13. When I'm upset, I have difficulty getting work done.

14. When I'm upset, I become out of control.

15. When I'm upset, I believe that I will remain that way for a long time.

16. When I'm upset, I believe that I'll end up feeling very depressed.

17. When I'm upset, I believe that my feelings are valid and important.

18. When I'm upset, I have difficulty focusing on other things.

19. When I'm upset, I feel out of control.

20. When I'm upset, I can still get things done.

21. When I'm upset, I feel ashamed with myself for feeling that way.

22. When I'm upset, I know that I can find a way to eventually feel better.

23. When I'm upset, I feel like I am weak.

24. When I'm upset, I feel like I can remain in control of my behaviors.

25. When I'm upset, I feel guilty for feeling that way.

26. When I'm upset, I have difficulty concentrating.

27. When I'm upset, I have difficulty controlling my behaviors.

28. When I'm upset, I believe that there is nothing I can do to make myself feel better.

29. When I'm upset, I become irritated with myself for feeling that way.

30. When I'm upset, I start to feel very bad about myself.

31. When I'm upset, I believe that wallowing in it is all I can do.

32. When I'm upset, I lose control over my behaviors.

33. When I'm upset, I have difficulty thinking about anything else.

34. When I'm upset, I take time to figure out what I'm really feeling.

35. When I'm upset, it takes me a long time to feel better.

36. When I'm upset, my emotions feel overwhelming.

Emotional Eating Scale (EES)

(Arnow, Kenardy, & Agras, 1995)

We all respond to different emotions in different ways. Some types of feelings lead people to experience an urge to eat. Please indicate the extent to which the following feelings lead you to feel an urge to eat by checking the appropriate box.

	No desire to eat	A small desire to eat	A moderate desire to eat	A strong desire to eat	An overwhelming desire to eat
Resentful					
Discouraged					
Shaky					
Worn Out					
Inadequate					
Excited					
Rebellious					
Blue					
Jittery					
Sad					
Uneasy					
Irritated					
Jealous					
Worried					
Frustrated					
Lonely					
Furious					
On Edge					
Confused					
Nervous					
Angry					
Guilty					
Bored					
Helpless					
Upset					