Examining Unhealthy Exercise among Individuals with Binge Eating and Restrictive Eating: Emotion Regulation as a Mechanism for Differential Exercise Presentations

A thesis presented to
the faculty of
the College of Arts and Sciences of Ohio University

In partial fulfillment
of the requirements for the degree
Master of Science

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April 2017
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This thesis titled
Examining Unhealthy Exercise among Individuals with Binge Eating and Restrictive Eating: Emotion Regulation as a Mechanism for Differential Exercise Presentations

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Abstract

MARTIN, SHELBY J., M.S., April 2017, Clinical Psychology

Examining Unhealthy Exercise among Individuals with Binge Eating and Restrictive Eating: Emotion Regulation as a Mechanism for Differential Exercise Presentations

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Unhealthy exercise (UE) is a core symptom of eating disorders (EDs) characterized by exercising out of compulsion, obligation, or to counteract the effects of recent food intake on weight/shape. There appears to be two distinct forms of UE that may be differentially associated with eating pathology (i.e., dietary restriction, binge eating). Specifically, compulsive exercise may be more characteristic of anorexia nervosa (AN)/restriction, whereas compensatory exercise may be more characteristic of bulimia nervosa (BN)/binge eating. One factor that may account for the differential presentations of UE among individuals with different core ED symptoms is emotion dysregulation, as research has found that unique emotion regulation difficulties characterize dietary restriction (i.e., primary emotion avoidance) and binge eating (i.e., secondary emotion avoidance). The current study examined differences in UE and emotion regulation among females who restrict their diet ($n = 28$), females who report binge eating ($n = 31$), and female controls ($n = 71$), with eating pathology defined based on a semi-structured interview. The study also explored whether emotion regulation deficits mediated the relationship between eating pathology and UE presentation. Results revealed higher levels of UE and emotion dysregulation in both the Restricting and Binge Eating groups, relative to controls, across self-report and interview measurements. Limited support for
compulsive exercise being more prevalent in individuals with dietary restriction, and compensatory exercise and secondary emotion avoidance being more prevalent in individuals with binge eating, also emerged. Finally, emotion dysregulation and features of UE were not strongly correlated, and emotion dysregulation did not mediate the relationship between eating pathology and UE presentation. Future research should replicate these findings in a sample of individuals with AN and BN to further elucidate the distinction and overlap of compulsive and compensatory exercise. Continuing to examine the role of emotion dysregulation, as well as exploring alternative mechanisms, that link disordered eating and UE will be a critical next step in the development of UE prevention and treatment targets.

*Keywords*: unhealthy exercise, emotion regulation, dietary restriction, binge eating
Dedication

To my mother, Colleen Martin, for giving me the wings to fly.
Acknowledgements

I would like to express my deepest gratitude to my advisor, Dr. Sarah Racine, for her unrelenting mentorship, dedication, support and guidance in the completion of this document. I would also like to thank my other committee members, Dr. Tim Anderson and Dr. Frances Wymbs, for their time, commitment, and insightful feedback. Finally, I would like to thank all the undergraduate research assistants and graduate student interviewers who devoted countless hours of their time to data collection for this project.
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Eating Disorders

Eating Disorders (EDs) are serious psychiatric disorders that involve disturbances in eating patterns that significantly impair physical or psychosocial functioning (American Psychiatric Association [APA], 2013). Currently, the DSM-5 recognizes three primary ED diagnoses: anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED). Lifetime prevalence rates for EDs range from 0.9-3.5% for females (AN: 0.9%, BN: 1.5%, BED: 3.5%), who are up to 10 times more likely to be diagnosed with an ED than males (APA, 2013; Hudson, Hiripi, Pope, & Kessler, 2007). EDs are associated with various physical and psychological detriments, including both health-related and subjective poor quality of life, low self-esteem, suicidal ideation, and numerous medical problems (e.g., cardiac complications, osteoporosis; Cervera et al., 2003; Favaro & Santonastaso, 1997; Misra et al., 2004; Mond, Owen, Hay, Rodgers, & Beumont, 2005; Olivares et al., 2005). Importantly, if untreated, EDs may result in death, with current mortality rates of AN (i.e., 0.51% per year) and BN (i.e., 0.19% per year) being among the highest of any mental illness (Arcelus, Mitchell, Wales, & Nielsen, 2011). As such, it is critical to examine the clinical correlates (e.g., emotional functioning, personality traits) and symptom presentations of these illnesses in order to inform treatment options and identify prevention and treatment targets.

Despite the relatively low prevalence of diagnosed EDs, research has found that 57.8% of adolescents, 49% of college students, and 46.7% of athletes report engaging in at least one of the core ED symptoms (Berg, Frazier, & Sherr, 2009; Neumark-Sztainer et al., 2006; Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). Two core symptoms of
particular importance are excessive dietary restriction and binge eating. Excessive dietary restriction involves a significant reduction in caloric intake relative to needed requirements, which may result in a low body weight. Binge eating involves consuming a large amount of food (e.g., a pint of ice cream) in a short period, and experiencing a loss of control over eating during the episode. Although excessive dietary restriction is thought to primarily characterize AN, whereas binge eating is most characteristic of BN, these symptoms may co-occur across ED diagnostic categories, or exist independent of a diagnosis. For instance, individuals with AN that also engage in binge eating and/or purging are given the diagnosis of AN binge eating/purging subtype (AN-BP), whereas those with AN who only engage in excessive dietary restriction are given the diagnosis of AN restricting subtype (AN-R). Further, many individuals with BN engage in dietary restriction to counteract the effects of binge eating episodes on their shape/weight. In non-clinical female samples (e.g., undergraduates, adolescents, athletes), rates of excessive dietary restriction and binge eating are estimated to be between 46.7-57.8% (Berg et al., 2009; Neumark-Sztainer et al., 2006; Torstveit et al., 2008).

Importantly, many individuals who do not meet full criteria for an ED, but experience one or more of these core ED symptoms, go undetected and untreated, which places them at greater risk for developing a full ED diagnosis and related psychological and physical health problems (Eisenberg, Nicklett, Roeder, & Kirz, 2011; Kotler, Cohen, Davies, Pine, & Walsh, 2001; Liechty & Lee, 2013; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999). As such, it is essential to study the primary ED symptoms characteristic of
AN and BN, rather than only diagnoses, to guide early detection and interventions for those at risk, and to develop symptom-specific treatment options.
Unhealthy Exercise in EDs

One important, yet understudied, symptom of EDs is unhealthy exercise (UE), which involves exercising excessively out of a sense of compulsion, obligation, or to counteract the effects of recent food intake on weight or shape. Although UE is present across ED diagnoses (Boyd, Abraham, & Luscombe, 2007; Davis et al., 1997; Peñas-Lledó, Vaz Leal, & Waller, 2002) and is significantly correlated with other facets of eating pathology (e.g., dietary restriction, binge eating; e.g., Holland, Brown, & Keel, 2014; Peñas-Lledó et al., 2002; Taranis & Meyer, 2011), a robust conceptualization and understanding of UE and its role in disordered eating is lacking. Research indicates that UE may affect up to 81% of individuals with AN and 57% of those with BN (Davis et al., 1997). Importantly, UE is associated with poorer outcomes among those with disordered eating, including greater levels of ED and comorbid psychopathology, an increased risk for relapse, and more chronic disease durations (Dalle Grave, Calugi, & Marchesini, 2008; Mond, Myers, Crosby, Hay, & Mitchell, 2008; Solenberger, 2001). Thus, it is important to better elucidate the construct of UE, how it presents across EDs, and what factors contribute to its development and maintenance.

Research suggests that UE is a multidimensional, rather than a monolithic, construct (Holland et al., 2014; Meyer, Taranis, Goodwin, & Haycraft, 2011), and distinct features of UE may be differentially associated with EDs and their component symptoms. Compulsive exercise represents regular, rule-driven exercise performed out of a sense of urgency, dependence, or preoccupation (Taranis & Meyer, 2011), while compensatory exercise is obligatory exercise performed to counteract the effects of food
intake on weight or shape (LePage, Crowther, Harrington, & Engler, 2008). Some research suggests that AN/restriction may be linked with compulsive exercise features (e.g., Dalle Grave et al., 2008; Davis et al., 1997; Holtkamp, Hebebrand, & Herpertz-Dahlmann, 2004), whereas BN/binge eating may be associated with exercise to burn calories and compensate for overeating episodes (e.g., Anderson & Bulik, 2004; Garner, Davis-Becker, & Fischer, 2014; Holland et al., 2014). Nonetheless, this body of research is limited by a focus on compulsive exercise as the primary form of UE. Indeed, despite the fact that compensatory behavior (e.g., exercise) is one of the key diagnostic criteria for BN, compensatory exercise has not been thoroughly examined as a unique form of UE, independent of compulsive exercise (Holland et al., 2014). Moreover, it is often simplified as exercise to control weight/shape, rather than “undo” the effects of a specific eating episode (Holland et al., 2014). Examining whether compulsive and compensatory exercise are unique forms of UE that are differentially associated with specific forms of disordered eating (i.e., dietary restriction, binge eating) is critical, as different motivations to engage in UE may necessitate different treatment approaches.

**UE in Individuals with AN/Restriction**

Although research has yet to examine the distinct, clinical presentation of UE in AN, it can be theorized that individuals with AN/restriction may be more likely to engage in compulsive exercise than individuals with BN/binge eating. First, across multiple studies, the highest rates of UE have been reported among patients with AN who engage in restrictive eating, but not binge eating (Bewell-Weiss & Carter, 2010; Dalle Grave et al., 2008; Shroff et al., 2006). For instance, in a study that examined differences in UE
among ED subtypes, Dalle Grave and colleagues (2008) found that intense, compulsive exercise, as assessed by the Eating Disorder Examination (EDE), was significantly greater among those with AN-R (80%) compared to AN-BP (43.3%) and BN (39.3%). Since the highest rates of excessive exercise were found in individuals with AN who only engaged in excessive dietary restriction, findings suggest that compulsive exercise may be more strongly related to excessive dietary restriction in the absence of binge eating.

Second, UE has been found to persist following weight restoration, and can significantly impact relapse and long-term recovery rates, in those with AN (Long, 1995; Solenberger, 2001). Among patients with a history of AN, UE was a significant predictor of relapse, such that continued engagement in UE within the first 3 months following discharge was associated with a shorter mean recovery time (i.e., 12 months), as compared to more healthy levels of exercise (i.e., 19 months; Carter, Blackmore, Sutandar-Pinnock, & Woodside, 2004). UE was also correlated with longer periods of inpatient treatment (i.e., 3 weeks longer; Solenberger, 2001) in a sample of inpatients with an ED (58% had a diagnosis of AN), and was one of the last symptoms to remit following weight restoration among patients with AN (Long, 1995). Results support the conceptualization of exercise as habitual and compulsive in individuals with AN, such that rigid, rule-driven adherence to exercise may become a routine pattern that cannot be easily controlled or stopped, despite its adverse consequences.

Finally, research on the temporal precedence of UE in AN suggests that regular exercise is often present before the onset of AN and, thus, may represent a risk factor for the excessive dietary restriction that characterizes the disorder. Indeed, Davis and
colleagues (1997) found that 56% of individuals with AN engaged in regular exercise/sport one year prior to the onset of their illness, and 50% reported being more active than the “average girl” their age, both before and during their disorder. These findings were replicated in a second retrospective study in which inpatients with AN were found to have had a significant increase in compulsive, routine exercise one year prior to the onset of their disorder, and a greater amount of physical activity both before and during the course of their illness, relative to healthy controls (Davis, Blackmore, Katzman, & Fox, 2005). Overall, the reviewed research supports the theory that compulsive exercise is characteristic of AN, and may be specifically associated with excessive dietary restriction.

**UE in Individuals with BN/Binge Eating**

Based on the diagnostic criteria for BN as well as a small body of literature examining UE in relation to bulimic pathology, it is hypothesized that compensatory exercise is more characteristic of those with BN/binge eating, relative to those with AN/restriction. Although UE is a common symptom in individuals with BN, it is typically found at lower rates than in those with AN (Brewerton, Stellefson, Hibbs, Hodges, & Cochrane, 1995; Davis et al., 1997; Shroff et al., 2006), suggesting UE in BN may be more sporadic and inconsistent in nature. For instance, in a sample of ED patients with lifetime diagnoses of AN or BN, compulsive exercise, as defined by engagement in exercise to lose weight at least once a day for 1 hour, was found at a significantly lower rate among those with BN (22.5%), relative to those with AN (38.5%; Brewerton et al., 1995). Moreover, individuals who did not compulsively exercise had significantly higher
rates of binge eating compared to those who compulsively exercised (Brewerton et al., 1995). These observed differences in UE prevalence may be due to the fact that those with BN exercise only in response to binge eating episodes, which is consistent with the DSM-5 diagnostic criteria for BN. Specifically, one of the required diagnostic criteria is the presence of compensatory behaviors, which can include exercise, to “undo” the effects of objective binge eating episodes ([OBEs]; APA, 2013).

Although compensatory exercise is believed to be most strongly related to binge eating, research to date has primarily examined exercising to control weight/shape without a specific emphasis on deliberately counteracting the effects of recent food intake. Importantly, however, exercising to control weight/shape is a primary motivation for compensatory exercise, as exercising to negate the effects of OBEs involves a desire to reduce the impact of caloric intake on weight/shape. Across non-ED samples, exercise to control weight/shape has been associated with bulimic pathology, including binge eating frequency (e.g., LePage et al., 2008; Taranis & Meyer, 2011). In the first and only study to date to examine the unique correlates of compensatory exercise—rather than simply exercise to control weight—as compared to compulsive exercise, compensatory exercise (i.e., engaging in excessive exercise specifically to counteract the effects of overeating episodes) was more strongly correlated with bulimic pathology than compulsive exercise (Holland et al., 2014). Moreover, compensatory exercise was independently associated with bulimic pathology, over and above the effects of compulsive exercise. Together, findings indicate that binge eating may be more strongly
associated with exercising to control one’s weight/shape and to negate the effects of large eating episodes, versus exercising in a rigid and compulsive manner.

Finally, unlike individuals with AN, the onset of UE in BN is more likely to follow the development of the disorder, rather than precede it (Davis et al., 1997). This suggests that UE may be triggered by engaging in the OBEs that characterize BN. Specifically, in a retrospective study of inpatients with an ED, 65% of individuals with BN reported dieting before they began to exercise, or dieting without ever exercising (Davis et al., 1997). Further, only 24% reported that their childhood/adolescent activity level was greater than the “average girl” their age, which was significantly less than the percentage of those with AN (50%) who endorsed this statement (Davis et al., 1997). Results indicate that, for individuals with BN/binge eating, exercise may primarily emerge following the development of dieting and subsequent bulimic pathology (e.g., binge eating), and, thus may not be as compulsive or habitual as the exercise that characterizes AN/restriction. Overall, findings suggest that intense, sporadic exercise to counteract the effects of recent eating episodes may be most characteristic of those with BN. However, given limited research on compensatory exercise and an oversimplification of compensatory exercise as exercising to control weight/shape, future research is needed to examine compensatory exercise as a distinct form of UE and determine whether it is especially present among those with BN/binge eating.

Taken together, initial findings suggest that distinct UE presentations may be differentially related to the core ED symptoms of excessive dietary restriction and binge eating. Specifically, compulsive exercise may be more prevalent among those with
AN/restriction, whereas compensatory exercise may be more common among those with BN/binge eating. However, due to limited research examining specific forms of UE, differential relationships among ED symptoms and UE presentations have not been fully elucidated. As such, research needs to confirm the existence of these differential relationships, and identify specific mechanisms that might contribute to distinct presentations of UE across AN/restriction and BN/binge eating.

**UE and Emotion Regulation**

One potential mechanism for the different presentations of UE across AN and BN is the distinct role that UE may play in emotion regulation. Specifically, individuals with AN/restriction and BN/binge eating may engage in the UE presentation (i.e., compulsive or compensatory) that parallels their specific maladaptive emotion regulation style. It is well-established that emotion dysregulation is a significant risk and maintenance factor for EDs and their component symptoms (Lavender et al., 2015; Luck, Waller, Meyer, Ussher, & Lacey, 2005). Indeed, various etiological models posit that ED symptoms are maintained through their ability to regulate difficult emotions, by either preventing the initial onset of aversive states (i.e., primary emotion avoidance), or by reducing aversive emotional states after they have been triggered (i.e., secondary emotion avoidance; Hawkins & Clement, 1984; Slade, 1982; Stice, Shaw, & Nemeroff, 1998; Treasure & Schmidt, 2013). Evidence of significant emotion dysregulation in individuals with EDs has been found across research using multiple methods of assessment (e.g., self-report scales, experimental paradigms, ecological momentary assessment; e.g., Brockmeyer et
Importantly, however, findings suggest that different emotion regulation deficits may be associated with distinct forms of eating pathology. While AN symptoms (e.g., excessive dietary restriction) are thought to be associated with primary emotion avoidance and related deficits in emotional clarity, awareness, and acceptance, BN symptoms (e.g., binge eating) are thought to be strongly associated with secondary emotion avoidance and difficulties maintaining impulse control and goal-directed behavior when distressed (Andreescu, 2015; Brockmeyer et al., 2014; Culbert et al., 2016; Oldershaw, Lavender, Sallis, Stahl, & Schmidt, 2015; Slade, 1982; Wolz et al., 2015). More specifically, excessive dietary restriction may serve to prevent the onset of aversive emotions among those who are avoidant of strong feelings. Conversely, binge eating may function as an impulsive coping mechanism used to immediately reduce negative affect in individuals who are intolerant of negative affective states. UE may also be used as a maladaptive form of emotion regulation, such that rigid, rule-driven compulsive exercise may function to prevent the initial onset of intolerable states, whereas impulsive compensatory exercise may alleviate distress after it has arisen. In other words, UE may serve a distinct emotion regulation function, similar to restriction or binge eating, among individuals with AN and BN.

Research examining UE and emotion regulation provides support for the theory that UE functions to either reduce or avoid aversive states (De Young & Anderson, 2010a, 2010b; Goodwin, Haycraft, & Meyer, 2012; Taranis, 2010; Vansteelandt, Rijmen,
Pieters, Probst, & Vanderlinden, 2007). For instance, ecological momentary assessment research suggests that the momentary urge to engage in UE may be higher among those with chronic levels of negative affect (Vansteelandt et al., 2007), and this urge may be maintained by decreases in negative emotion following exercise engagement (Engel et al., 2013). The negative reinforcement component of UE (i.e., exercising to avoid negative emotions, affective withdrawal, guilt, or distress) was also highly correlated with the severity of ED psychopathology (i.e., restraint, and eating, and shape/weight concerns) and frequency of ED behaviors (i.e., OBEs, purging, hard exercise) in a sample of college students (Taranis & Meyer, 2011). Findings suggest that exercising specifically to prevent or reduce aversive states may be an important motivation for and/or function of exercise in the context of disordered eating.

Importantly, exercising to reduce negative affect appears to be a unique motivation for exercise that distinguishes UE from normal exercise. Among inpatients with AN and healthy controls, the feature that discriminated the two groups was the combination of exercising as a means of weight control and exercising to regulate negative affect. Specifically, exercising as a means of weight control was present across both groups, but exercising to control negative mood states was exclusive to patients with AN (Long, Smith, Midgley, & Cassidy, 1993). In another study, exercising to reduce negative affect was found to moderate the relationship between UE and eating pathology, such that obligatory exercise was associated with eating pathology (i.e., dietary restraint, eating, shape, and weight concerns), but only among individuals who endorsed exercising in response to negative affect (De Young & Anderson, 2010b). It is important to note that
exercising to reduce negative affect is different than exercising to increase positive affect, which is a well-documented effective emotion regulation strategy found across multiple non-ED samples (e.g., Arent, Landers, & Etnier, 2000; Biddle & Nigg, 2000; Gowans et al., 2001; Hoffman et al., 2010). Exercising to regulate distress may be an attempt to either avoid or immediately diminish negative affective states, and may lead to either rigid and compulsive exercise adherence, or impulsive and obligatory exercise engagement. On the other hand, exercising to increase positive affect is likely to be associated with engaging in exercise that brings enjoyment and wellness, which may be a protective factor against UE and EDs. Thus, among those with eating pathology, the potential to reduce distress through physical activity may motivate unhealthy, compulsive or compensatory exercise.

Research examining the link between emotion dysregulation and UE is more sparse, but overall, findings indicate that UE may be associated with dysfunctional strategies for coping with negative affect. In one large study of non-clinical adolescent females, emotion dysregulation was a consistent predictor of UE, even when controlling for other ED variables (Goodwin et al., 2012). This finding was replicated in a 12-month longitudinal study in which emotion dysregulation at month 1 significantly predicted increases in UE at month 12, after controlling for baseline levels of UE (Goodwin, Haycraft, & Meyer, 2014).

There is also some initial evidence to support the theory that individuals with AN/restriction and BN/binge eating may engage in UE in a manner that is consistent with their specific emotion regulation deficits. Among a sample of non-clinical females,
Taranis (2010) found significant correlations between both avoidance of affect and non-acceptance of emotions with avoidance and rule-driven exercise, as assessed by the Compulsive Exercise Test (CET). Additionally, lack of emotional clarity and awareness were significantly associated with the CET Exercise Rigidity subscale (Taranis, 2010). Given that the Avoidance and Rule-Driven Behavior and Exercise Rigidity subscales of the CET are most representative of compulsive exercise, results suggest that compulsive exercise may be strongly associated with primary emotion avoidance and associated emotion regulation deficits (i.e., lack of emotional clarity, awareness, and acceptance) characteristic of individuals with AN/restriction.

On the other hand, among adults with BN, frequency of driven exercise intended to control weight/shape or to burn off calories was significantly correlated with difficulties maintaining goal-directed behavior (Lavender et al., 2014). Although not all participants who endorse “driven exercise” are exercising to specifically counteract the effects of eating, the fact that this was a sample of individuals with BN makes this more likely, and indicates that compensatory exercise may be strongly related to dimensions of secondary emotion avoidance (i.e., difficulties maintaining impulse control and goal-oriented behavior when distressed). Despite little research examining the association between UE and maladaptive emotion regulation among individuals with disordered eating, the reviewed studies provide initial support for the notion that compulsive and compensatory exercise may be serving distinct emotion regulation functions.
Proposed Study

Taken together, UE is a multidimensional symptom of EDs that may present differently in individuals who excessively restrict their diet versus those who binge eat. UE appears to regulate negative emotions, and it may be that individuals with AN/restriction engage in rigid, rule-driven, compulsive exercise to prevent and avoid the onset of aversive emotional states, whereas individuals with BN/binge eating engage in impulsive, compensatory exercise to alleviate aversive states after they have arisen. Given limited research on UE among those with disordered eating (e.g., Meyer, Taranis, & Touyz, 2008; Meyer & Taranis, 2011), and failure to distinguish between compulsive and compensatory exercise (see Holland et al., 2014 for only example), additional research is needed to explore how UE differs across type of eating pathology, and whether emotion dysregulation accounts for these differences.

The aim of the present study was to examine whether the presentation of UE differs across individuals who excessively restrict their diet and those who binge eat, and whether specific dimensions of emotion dysregulation mediate the relationship between eating pathology (i.e., dietary restriction, binge eating) and UE (i.e., compulsive, compensatory) presentation. Females who engage in excessive dietary restriction, females who endorse binge eating, and healthy female controls were recruited to complete measures of UE and emotion dysregulation. The final Restricting (n = 28), Binge Eating (n = 31), and Control (n = 71) groups were determined based on participants’ endorsement of eating pathology on the modified Eating Disorder Examination (EDE). Ultimately, this study aimed to inform the development of a
functional model of UE and its correlates, which will help to advance early identification of UE, guide the development of UE presentation-specific treatment options, and better elucidate the role of emotion dysregulation in UE.

**Aims and Hypotheses**

This study tested the following aims and hypotheses:

Aim 1: To examine the multidimensional presentation (i.e., compulsive, compensatory) of UE in individuals who engage in excessive dietary restriction and those who report binge eating.

Hypothesis 1.1: Females who engage in excessive dietary restriction or who report binge eating were expected to have higher overall levels of UE compared to healthy female controls.

Hypothesis 1.2: Females who engage in excessive dietary restriction or who report binge eating were predicted to have higher levels of exercising to improve their mood compared to healthy female controls.

Hypothesis 1.3: Females who engage in excessive dietary restriction were hypothesized to have higher levels of compulsive exercise compared to females who report binge eating and compared to healthy female controls.

Hypothesis 1.4: Females who report binge eating were expected to have higher levels of compensatory exercise compared to females who engage in excessive dietary restriction and compared to healthy controls.

Aim 2: To examine the presentation of maladaptive emotion regulation in individuals who engage in excessive dietary restriction and those who report binge eating.
Hypothesis 2.1: Females who engage in excessive dietary restriction or who report binge eating were predicted to have higher overall levels of maladaptive emotion regulation compared to healthy female controls.

Hypothesis 2.2: Females who engage in excessive dietary restriction were hypothesized to exhibit higher levels of primary emotion avoidance (i.e., difficulties with emotional clarity, awareness, and acceptance) compared to females who report binge eating and compared to healthy female controls.

Hypothesis 2.3: Females who report binge eating were expected to exhibit higher levels of secondary emotion avoidance (i.e., difficulties with impulse control and maintaining goal-directed behavior when distressed) compared to females who report excessive dietary restriction and compared to healthy female controls.

Aim 3: To examine the relationship between UE presentations and specific emotion regulation deficits.

Hypothesis 3.1: Compulsive exercise was expected to be more strongly associated with primary emotion avoidance (i.e., difficulties with emotional clarity, awareness, and acceptance) than with secondary emotion avoidance (i.e., difficulties maintain impulse control and goal-directed behavior when distressed).

Hypothesis 3.2: Compensatory exercise was predicted to be more strongly associated with secondary emotion avoidance (i.e., difficulties maintaining impulse control and goal-directed behavior when distressed) than with primary emotion avoidance (i.e., difficulties with emotional clarity, awareness, and acceptance).
Aim 4: To explore whether maladaptive emotion regulation explains the relationship between type of eating pathology (i.e., excessive dietary restriction, binge eating) and UE presentation (i.e., compulsive, compensatory).

Hypothesis 3.1: Primary emotion avoidance (i.e., difficulties with emotional clarity, awareness, and acceptance) was hypothesized to mediate the relationship between type of eating pathology and compulsive exercise.

Hypothesis 3.2: Secondary emotion avoidance (i.e., difficulties with impulse control and maintaining goal-directed behavior when distressed) was expected to mediate the relationship between type of eating pathology and compensatory exercise.
Methods

Participants

Participants consisted of 130 undergraduate females recruited from Ohio University. Individuals with excessive dietary restriction and individuals with binge eating, rather than individuals with DSM-5 EDs, were recruited given the relatively low prevalence of EDs in the general population. Moreover, examining a non-clinical population allowed me to determine how UE manifests in those with disordered eating rather than only DSM-diagnosed EDs, which is important for early identification of those at risk for EDs. Participants ranged in age from 18-23 (M (SD) = 18.78 (0.99)) years with body mass indexes (BMIs) from 17.70 to 54.55 (M (SD) = 24.23 (5.17)). Most of the sample (88.5%) identified as Caucasian, with 8.5% identifying as African American, 1.5% as Asian, and 1.5% as bi- or multi-racial.

Eligibility to participate in the study was determined based on participants’ pre-screen responses to the Eating Pathology Symptoms Inventory (EPSI) Restricting and Binge Eating subscales (Forbush et al., 2013), as well as to questions that assessed current dieting and binge eating. The Restricting group was required to score in the top 33rd percentile on the EPSI Restricting subscale, endorse dietary restriction, and deny OBEs over the previous 3 months. The Binge Eating group was required to score in the top 33rd percentile on the EPSI Binge Eating subscale, and endorse OBEs over the previous 3 months. Finally, the Control group consisted of individuals who scored in the bottom 33rd percentile on the EPSI Binge Eating subscale, and who denied OBEs over the previous 3 months.
Given that it can be difficult for participants to accurately self-report whether they have consumed an objectively large amount of food or engaged in an excessively restrictive diet, the final group selection was determined based on participants’ endorsement of eating pathology on the semi-structured interview (i.e., modified EDE; see below). Specifically, participants in the Restricting group were required to endorse dietary restriction and deny OBEs over the previous 3 months. Of the original Restricting group \((n = 49)\) recruited based on pre-screen responses, 13 (26.5%) endorsed dietary restriction on the interview. The Binge Eating group was required to endorse OBEs over the previous 3 months on the modified EDE, and 25 of 47 (53.2%) participants in the pre-screen Binge Eating group did so. Since dietary restriction is a common compensatory behavior characteristic of BN, participants in the Binge Eating group were not required to be free from dietary restriction. On the modified EDE, nine of the 47 (19.1%) participants in the pre-screen Binge Eating group endorsed dietary restriction and OBEs. Finally, the control group consisted of individuals who denied dietary restriction, OBEs, and loss of control over normal amounts of food during the previous 3 months on the modified EDE. Forty of the 51 (78.4%) participants recruited for the control group denied ED behaviors on the interview.

Some participants endorsed behaviors on the modified EDE that resulted in them being eligible for a group different from the one in which they were originally recruited. Specifically, six of the 47 (12.7%) participants originally recruited for the Binge Eating

---

1 Mean differences and correlation analyses for eating pathology, UE, and emotion dysregulation variables among the pre-screen measure-classified Restricting \((n = 49)\), Binge Eating \((n = 47)\), and Control \((n = 51)\) groups were conducted and are located in Appendix E.
group were reassigned to the Restricting group, whereas five of 49 (10.2%) participants originally recruited for the Restricting group were reassigned to the Binge Eating group. Additionally, nine of the 51 (17.6%) participants in the original Control group met eligibility for the Restricting group, and one (2.0%) met eligibility for the Binge Eating group. The final interviewer-assessed groups were as follows: Restricting: \( n = 28 \); Binge Eating: \( n = 31 \); Control: \( n = 71 \).

**Procedure**

Participants came into the laboratory and completed questionnaires assessing eating pathology, UE, and emotion dysregulation. A modified version of the EDE (see below) was then administered to all participants to classify them into Restricting, Binge Eating, and Control groups and to assess UE. A trained clinical graduate student conducted the modified EDE with each participant individually. Participants were informed that they would be asked a series of questions pertaining to their dietary and exercise patterns, and should respond to the questions as accurately as possible. The interview took approximately 60 minutes, depending on the participant’s endorsement of disordered eating and exercise. Final diagnostic decisions were made in a consensus case conference with the principal investigator and all interviewers.

**Measures**

**The Eating Disorder Examination (EDE; Cooper & Fairburn, 1987).** The EDE is the “gold-standard” semi-structured interview for assessing ED psychopathology and generating DSM-5 ED diagnoses. Participants are asked questions about their eating and exercise behavior over the past 3 months, as well as over their lifetime. The EDE
Binge Eating section was enhanced to improve its use for assessing binge eating in a non-clinical sample. OBEs were evaluated by obtaining a minimum of two detailed examples of times during which the participant ate an objectively large amount of food in a short period time and felt like they could not control what or how much they were eating over the previous 3 months. Objectively large was defined as eating an amount of food (e.g., large pizza) in a discrete period (i.e., < 2 hours) that is definitely larger than what other people would consume under similar circumstances. Loss of control was assessed through participant endorsement of multiple behavioral (e.g., feeling like you cannot stop yourself once you have started eating), and emotional indicators (e.g., feeling sad or upset after eating) of loss of control.

The original EDE Binge Eating section has well-established psychometric properties (see Berg, Peterson, Frazier, & Crow, 2012). Excellent inter-rater reliability ($rs = .98-.99$; Grilo, Masheb, Lozano-Blanco, & Barry, 2004; Rizvi, Peterson, Crow, & Agras, 2000) and test-retest reliability of OBEs across periods of 2-7 days ($r = .70$) and 6-14 days ($r = .85$) have been reported (Grilo et al., 2004; Rizvi et al., 2000). Finally, OBE frequency assessed via the EDE and daily food records is highly correlated ($rs = .56-93$; Loeb, Pike, Walsh, & Wilson, 1994; Rosen, Vara, Wendt, & Leitenberg, 1990).

The Dietary Restriction section of the EDE was modified to assess successful restriction of daily caloric intake intended to influence weight/shape, rather than merely dietary restraint (i.e., attempts to reduce dietary intake or adhere to dietary rules, regardless of success). Dietary restriction was evaluated by obtaining a description of 2 full days of food intake that were considered restrictive over the previous 3 months and
asking about other associated features, such as having others comment on how little one is eating and skipping two or more meals in a row.

Finally, the modified EDE also included an assessment of both compulsive and compensatory exercise. Questions from the original Driven Exercise section were separated into compulsive and compensatory exercise sections and supplemented with additional questions that were selected based on the available UE literature. In order to help support and validate the modifications made to the EDE, analyses examining the convergence of eating pathology and UE measured via the diagnostic interview and self-report questionnaires were conducted (see Group differences and Post-hoc analyses).

**Eating Pathology Symptoms Inventory (EPSI; Forbush et al., 2013).** The EPSI is a 45-item questionnaire that assesses specific aspects of ED psychopathology. Items are rated on a 5-point scale from 0 (never) to 4 (very often) based on the past 4 weeks. The 6-item Restricting (i.e., explicit efforts to reduce or avoid food intake) and 8-item Binge Eating (i.e., consumption of large amounts of food and accompanying cognitive symptoms) subscales were administered twice—once during the pre-screen to determine eligibility for participation, and again in the laboratory to examine mean differences on the subscales across the three groups. Excellent internal consistencies in samples of ED patients and college students have been found for both the Restricting ($\alpha = .89$ and $\alpha = .83$, respectively) and Binge Eating subscales ($\alpha = .93$ and $\alpha = .83$, respectively; Forbush et al., 2013). Adequate test-retest reliability of the subscales was also reported in undergraduates across 2-4 weeks ($rs = .71$-.75; Forbush et al., 2013). EPSI subscales have strong correlations with other measures of eating pathology and
lower correlations with measures of internalizing symptoms. (Forbush et al., 2013). In the current sample, internal consistency estimates were .85 for the Restricting subscale and .93 for the Binge Eating subscale.

Compulsive Exercise Test (CET; Taranis, Touyz, & Meyer, 2011). The CET is a 24-item self-report questionnaire that assesses the core features of UE in EDs. Items are rated on a 6-point scale from 0 (never true) to 5 (always true). This study used the CET Total score as a measure of overall UE. Both the Avoidance and Rule-Driven Behavior (8 items) and the Exercise Rigidity (3 items) subscales were used to characterize compulsive exercise, whereas the Weight Control Exercise (5 items) subscale was used to assess compensatory exercise. Excellent internal consistency estimates for the CET Total score have been reported in samples of adolescents (α = .88), college undergraduates (α = .85), and females with an ED (α = .93; Goodwin et al., 2012; Meyer et al., 2016; Taranis et al., 2011). All of the CET subscales have also demonstrated adequate internal consistencies across samples (αs = .73-.96; Meyer et al., 2016; Swenne, 2016; Taranis et al., 2011). Finally, the CET total score is significantly correlated with other excessive exercise and ED assessments, and has been found to account for greater variance in ED pathology than other measures of UE (Cunningham, Pearman, & Brewerton, 2016; Formby, Watson, Hilyard, Martin, & Egan, 2014; Taranis et al., 2011). Internal consistency estimates in the current sample were: Total Score = .89; Avoidance and Rule-Driven Behavior = .90; Exercise Rigidity = .81; Weight Control Exercise = .82.

Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). The REI is a self-report questionnaire designed to assess motivations for
exercise—reasons for actually exercising in contrast to reasons why an individual should exercise. The REI consists of seven subscales that assess different motivations for exercising, which are rated on a 7-point scale from 0 (not important at all) to 7 (extremely important). The Mood subscale (3 items) was used to assess exercise to regulate emotions. Adequate internal consistency ($\alpha = .79$) of the Mood subscale has been reported in a sample of undergraduates (Silberstein et al., 1988). The Mood subscale also exhibited a significant correlation with eating pathology ($r = .29$) among undergraduates (Silberstein et al., 1988) and with another measure of UE in patients with AN ($r = .74$; Keyes et al., 2015).

In order to better capture the compensatory component of UE thought to be associated with BN/binge eating, I developed three additional questions that are consistent with the format of the REI and that measure the motivation to exercise in order to get rid of food that was eaten. They include: a) “To burn off the calories I just ate” (b) “To “undo” my eating” and (c) “To counteract the effects of eating too much or what I think is too much.” To validate the REI Compensatory subscale, analyses examining correlations between the REI Compensatory subscale and other UE measures were conducted (see Table 2). Additionally, analyses investigating the convergence of compensatory exercise measured via the REI subscale and the modified EDE were also performed (see Post-hoc analyses). In the current sample, the internal consistency estimate was .76 for the Mood subscale and .92 for the Compensatory subscale.

**Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004).** The DERS is a 36-item self-report questionnaire designed to assess the multidimensional
construct of emotion dysregulation. Participants are asked to rate how often an item applies to them on a 5-point scale from 1 (almost never, 0-10%) to 5 (almost always, 91-100%). I used the DERS Total score as a measure of overall emotion dysregulation in my sample. The Clarity (5 items), Awareness (6 items), and Non-Acceptance (6 items) subscales were used to measure primary emotion avoidance, whereas the Impulse (6 items) and Goals (5 items) subscales were used to capture secondary emotion avoidance. Reliability has been established, with good internal consistencies reported for the DERS Total Score and all subscales in undergraduate students (αs = .80-.93; Gratz & Roemer, 2004) and in ED samples (αs = .72-.92; Racine & Wildes, 2013; Svaldi et al., 2012). All the DERS subscales have demonstrated adequate test-retest reliability across 4 to 8 weeks (ρIs = .69-.89; Gratz & Roemer, 2004). Internal consistency estimates in the current sample were: Total Score = .94; Clarity = .80; Awareness = .84; Non-Acceptance = .93; Impulse = .80; Goals = .93.

Statistical Analyses

Group differences. Analyses of variance (ANOVA) were used to examine mean differences in self-reported eating pathology across the interview-assessed Restricting, Binge Eating, and Control groups. The between-subjects factor of Group (i.e., Restricting, Binge Eating, Control), as based on the modified EDE, was the independent variable, whereas the EPSI Restricting and Binge Eating subscales were the dependent variables. This analysis allowed me to confirm that the interviewer-defined groups differed on self-reported restriction and binge eating as expected.
**Analyses for aim 1 and 2.** ANOVAs were used to examine potential differences in features of UE and emotion dysregulation across the Restricting, Binge Eating, and Control groups. The between-subjects factor of Group (i.e., Restricting, Binge Eating, Control) was the independent variable. For aim 1 analyses, the dependent variables included measures of overall UE (i.e., CET Total Score), exercise to improve mood (i.e., REI Mood), compulsive exercise (i.e., CET Avoidance and Rule-Driven Behavior; CET Exercise Rigidity), and compensatory exercise (i.e., CET Weight Control Exercise; REI Compensatory). For aim 2 analyses, the dependent variables included measures of overall emotion dysregulation (i.e., DERS Total Score), as well as primary emotion avoidance (i.e., DERS Clarity; DERS Awareness; DERS Acceptance) and secondary emotion avoidance (i.e. DERS Impulse; DERS Goals).

**Analyses for aim 3.** Bivariate Pearson’s correlations were used to examine associations between UE features and emotion regulation deficits across the entire sample ($N = 130$). A separate correlation ($r$) between each UE measure and emotion regulation measure was computed. Measures of overall UE and emotion dysregulation were not examined, as I was interested in differential associations between the specific facets of UE and emotion dysregulation hypothesized to be characteristic of excessive dietary restriction and binge eating. Although this examination involved running a large number of correlations, it also represented the first test of associations among compulsive and compensatory exercise and emotion regulation. To balance these two-considerations, an alpha value of .01 was used to evaluate statistical significance.
**Analyses for aim 4.** To test the hypothesis that emotion regulation deficits mediate the relationship between eating pathology and UE presentations, simple mediation models for a multi-categorical variable were conducted in PROCESS, a macro developed for SPSS (Hayes, 2013). The independent variable was the multi-categorical Group variable (i.e., Restricting, Binge Eating, Control), mediator variables were the DERS subscales measuring primary and secondary emotion avoidance, and the dependent variables consisted of the measures of compulsive and compensatory exercise. In order to conduct a mediation model with a multi-categorical independent variable, \( k-1 \) indicator variables, where \( k = \) number of groups, must first be created for use in the mediation model (Hayes & Preacher, 2014). Indicator variables are specified with one group being set as the reference group (i.e., coded 0 across all indicator variables) and the other groups coded as 1 on one or more indicator variables. In the current study, the multi-categorical Group variable was recoded into two indicator variables. For indicator variable 1, the Control and Binge Eating groups were coded 0 and the Restricting group was coded 1. For indicator variable 2, the Control and Restricting groups were coded as 0 and the Binge Eating group was coded as 1. Thus, coefficients representing the effect of each indicator variable on emotion dysregulation and UE represent the effect of each clinical group, relative to the control group, on these outcomes. Similarly, the indirect effect estimate for each indicator variable represents the degree to which being in the clinical group, relative to the control group, is associated with UE through emotion dysregulation. Mediation is considered present when the bias-corrected bootstrap confidence intervals for one or both of the indirect effects do not overlap with zero
Consistent with recommendations to only proceed with mediation when the relationships between the independent variable and mediator, and mediator and dependent variable, are significant (Hayes, 2013; Hayes & Preacher, 2014), mediation models were only run for variables for which statistically significant group differences in Aim 2 and associations in Aim 3 were found in ANOVA and correlation analyses, respectively.

**Post-hoc analyses.** Post-hoc analyses were conducted to examine whether Group (i.e., Restricting, Binge Eating, Control) predicted endorsement of compulsive exercise and compensatory exercise on the modified EDE. Binary logistic regression was used for these analyses. Prior to running these analyses I examined the convergence of UE assessed via the interview versus self-report questionnaires to help support the validity of the modified EDE Exercise section. Specifically, independent-samples t tests were used to examine mean differences in questionnaire-based compulsive and compensatory exercise among individuals with versus without compulsive and compensatory exercise based on the interview.
Results

Group Differences

Descriptive statistics and ANOVA results for self-report measures of dietary restriction and binge eating are presented in Table 1. As expected, ANOVAs revealed significant group differences on EPSI Restricting and Binge Eating subscales. Individuals in the Restricting group scored significantly higher on the EPSI Restricting subscale than both the Binge Eating and Control groups \( (p = .001-.004; \text{Cohen’s } d = 0.68-0.78) \). Despite the fact that individuals in the Binge Eating group were permitted to have dietary restriction, no significant differences in restriction between the Binge Eating and Control groups were found \( (p = .87; d = 0.03) \). The Binge Eating group had significantly higher scores on the EPSI Binge Eating subscale, relative to the Restricting and Control groups \( (p < .001; d = 1.11-1.75) \). The Restricting group also scored significantly higher on the EPSI Binge Eating subscale than the Control group \( (p = .02; d = 0.51) \), although the effect size was much smaller than the Binge Eating-Control comparison. Overall, results support the convergence of self-reported and interview-assessed eating pathology, and provide evidence for the utility of the modified EDE for assessing specific facets of eating pathology.
Table 1. Eating, Exercise, and Emotion Regulation Correlates of the Interview-Classified Restricting, Binge Eating, and Control Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Restricting (n = 28)</th>
<th>Binge Eating (n = 31)</th>
<th>Control (n = 71)</th>
<th>F (df)</th>
<th>η²</th>
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<td>EPSI Restricting</td>
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<tr>
<td>M (SD)</td>
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<td>6.15 (4.33)</td>
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<td>.10</td>
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<td>0.00-17.00</td>
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<td></td>
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<td>EPSI Binge Eating</td>
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<td></td>
</tr>
<tr>
<td>M (SD)</td>
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<td>16.84 (7.30)</td>
<td>6.04 (4.81)</td>
<td>35.92 (2, 127)**</td>
<td>.36</td>
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<td><strong>Exercise Features</strong></td>
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</tr>
<tr>
<td>M (SD)</td>
<td>17.57 (3.68)</td>
<td>18.18 (3.69)</td>
<td>15.13 (3.30)</td>
<td>10.91 (2, 127)**</td>
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<td><strong>CET Avoidance and Rule-driven Behavior</strong></td>
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<td>.15</td>
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<td><strong>M (SD)</strong></td>
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<td>2.73 (1.27)\textsubscript{a}</td>
<td>1.96 (0.86)\textsubscript{b}</td>
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<td><strong>CET Weight Control Exercise</strong></td>
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<td>4.49 (1.20)\textsubscript{a}</td>
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<td><strong>REI Compensatory</strong></td>
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<td></td>
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<td></td>
<td>M (SD)</td>
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<tr>
<td>Range</td>
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<td>DERS Clarity</td>
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Note. EPSI = Eating Pathology Symptoms Inventory; CET = Compulsive Exercise Test; REI = Reasons for Exercise Inventory; DERS = Difficulties in Emotion Regulation Scale; \(\eta^2\) = eta-squared.

Alphabetic subscripts that differ represent pairwise differences between the groups that are significant at \(p < .05\).

\(*p < .05; \***p < .001\).
**Aim 1 Analyses**

Descriptive statistics and ANOVAs for each UE measure are presented in Table 1. ANOVAs revealed significant group differences on the CET Total Score, and some measures of compulsive (i.e., CET Avoidance and Rule-Driven Behavior) and compensatory (i.e., CET Weight Control; REI Compensatory) exercise. As hypothesized, both individuals in the Restricting and Binge Eating groups scored significantly higher on the CET Total Score than individuals in the Control group ($p$ $<$ $.001-.001; d$s = 0.75-0.87). Although the omnibus test for group differences was not significant for REI Mood, pairwise comparisons revealed that the Restricting group scored significantly higher on this subscale relative to the Control group ($p$ = .03; $d$ = 0.46).

With regard to compulsive exercise, significant group differences emerged for the CET Avoidance and Rule-Driven Behavior, but not the CET Exercise Rigidity subscale (see Table 1). Both the Restricting and Binge Eating groups scored significantly higher on the CET Avoidance and Rule-Driven Exercise subscale than the Control group ($p$ $<$ $.001-.001; d$s = 0.72-0.89). In addition, despite no significant omnibus effect, the mean difference in CET Exercise Rigidity scores between the Restricting and Control groups was close to statistically significant ($p$ = .057; $d$ = 0.44). Contrary to hypotheses, comparisons between the Restricting and Binge Eating groups were not statistically significance ($p$ $<$ .30-.44), although the Restricting group had numerically higher levels of avoidance and rule-driven exercise behavior and exercise rigidity compared to the Binge Eating group, with differences corresponding to small effect sizes ($d$s = 0.17-0.27).
ANOVARs revealed group differences on both measures of compensatory exercise (see Table 1). Both the Binge Eating and Restricting group scored significantly higher on the CET Weight Control Exercise subscale, relative to the Control group ($p s = < .001-.009; d s = 0.61-0.84$). However, significantly higher levels of exercise to control weight were not found in the Binge Eating Group compared to the Restricting group ($p = .32; d = 0.25$). Similarly, the Binge Eating and Restricting group scored significantly higher on the REI Compensatory subscale than the Control group ($p s = < .001-.001; d s = 0.75-1.20$), but the Binge Eating and Restricting groups did not significantly differ from one another ($p = .12; d = 0.40$). Despite non-significant differences between the two clinical groups, mean levels of compensatory exercise were numerically higher in the binge eating group relative to the restricting group, and differences corresponded to small-to-medium effect sizes ($d s = 0.25-0.40$).

**Aim 2 Analyses**

Descriptive statistics and ANOVA results for each measure of emotion dysregulation are presented in Table 1. ANOVAs revealed significant group differences on the DERS Total score and some measures of primary (i.e., DERS Clarity, Non-Acceptance) and secondary (i.e., DERS Impulse, Goals) emotion avoidance. As hypothesized, both the Restricting and Binge Eating groups had significantly higher levels of overall emotion dysregulation, relative to controls ($p s = < .001-.04; d s = 0.47-0.92$).

Significant group differences on the DERS Clarity and Non-Acceptance subscales also emerged, but group differences in lack of emotional awareness were non-significant
(see Table 1). Both the Binge Eating and Restricting groups scored significantly higher on the DERS Non-Acceptance subscale than the Control Group ($ps = < .001-.008; ds = 0.60-0.85$), whereas only the Binge Eating group had higher scores on the DERS Clarity subscale relative to Controls ($p = .008; d = 0.56$). Importantly, no significant differences between the Restricting and Binge Eating groups emerged on the DERS Clarity ($p = .06; d = -0.43$) and Non-Acceptance ($p = .29; d = -0.23$) subscales, and mean scores for the subscales were higher in the Binge Eating group compared to the Restricting group.

Finally, ANOVAs revealed significant group differences on the DERS Impulse and Goals subscales. The Binge Eating group reported greater difficulties with maintaining impulse control and goal-directed behavior when distressed relative to the Control group ($ps = < .001-.001; ds = 0.74-0.98$). Consistent with hypotheses, DERS Goals scores were significantly higher in the Binge Eating group, relative to the Restricting group ($p = < .001; d = 0.73$), while differences in DERS Impulse scores in the Binge Eating group compared to the Restricting group were trending towards significance ($p = .06; d = 0.50$).

**Aim 3 Analyses**

Pearson’s correlations among specific facets of UE and emotion dysregulation calculated across the entire sample are presented in Table 2. Only correlations with a $p$-value of less than .01 were considered statistically significant. Two significant correlations between facets of UE and emotion dysregulation emerged. Specifically, there was a significant positive correlation between CET Avoidance and Rule-Driven Behavior and DERS Non-Acceptance ($r = .24$), which is consistent with the hypothesis that
measures of compulsive exercise would be significantly related to measures of primary emotion avoidance. Interestingly, a significant negative correlation between CET Weight Control and DERS Awareness ($r = -.25$) was found, suggesting that exercise to control weight is associated with greater awareness of emotions.
Table 2. *Pearson Correlations among Unhealthy Exercise and Emotion Dysregulation Features in the Entire Sample*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CET Avoidance and Rule-driven Behavior</td>
<td>--</td>
<td>.65***</td>
<td>.54***</td>
<td>.40***</td>
<td>.01</td>
<td>-.06</td>
<td>.24**</td>
<td>.09</td>
<td>.13</td>
</tr>
<tr>
<td>2. CET Exercise Rigidity</td>
<td>--</td>
<td>--</td>
<td>.40***</td>
<td>.16</td>
<td>-.22*</td>
<td>-.18*</td>
<td>.09</td>
<td>-.05</td>
<td>-.06</td>
</tr>
<tr>
<td>3. CET Weight Control Exercise</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>.74***</td>
<td>-.12</td>
<td>-.25**</td>
<td>.09</td>
<td>.08</td>
<td>.19*</td>
</tr>
<tr>
<td>4. REI Compensatory</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>-.03</td>
<td>-.22</td>
<td>.16</td>
<td>.12</td>
<td>.18</td>
</tr>
<tr>
<td>5. DERS Clarity</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>.46***</td>
<td>.51***</td>
<td>.50***</td>
<td>.39***</td>
</tr>
<tr>
<td>6. DERS Awareness</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>.24**</td>
<td>.05</td>
<td>-.02</td>
</tr>
<tr>
<td>7. DERS Acceptance</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>.46***</td>
<td>.39***</td>
</tr>
<tr>
<td>8. DERS Impulse</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>.53***</td>
</tr>
<tr>
<td>9. DERS Goals</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
</tbody>
</table>

*Note. CET = Compulsive Exercise Test; REI = Reasons for Exercise Inventory; DERS = Difficulties in Emotion Regulation Scale.*

*p < .05; **p < .01; ***p < .001.
Aim 4 Analyses

A mediation model with the multi-categorical Group variable as the independent variable, DERS Non-Acceptance as the mediator variable, and CET Avoidance and Rule-Driven Behavior as the dependent variable was conducted. Results are presented in Figure 1. Analyses revealed that, relative to the control group, individuals with restriction and binge eating had greater non-acceptance of emotions. Additionally, when controlling for non-acceptance of emotions, both clinical groups had significantly greater avoidance and rule-driven exercise behavior than controls. However, non-acceptance of emotions was unrelated to avoidance and rule-driven exercise behavior after controlling for group membership. As such, the indirect effect of Group on CET Avoidance and Rule-Driven Behavior through DERS Non-Acceptance was not significant, as 95% confidence intervals for the indirect effect for the Control group versus the Restricting group (b (SE) = 0.08 (.07); 95% CIs: -.009, .29), and the Control group versus the Binge Eating group (b (SE) = 0.12 (.09); 95% CIs: -.02, .34) overlapped with 0. Although there was a significant negative correlation between the DERS Awareness and CET Weight Control subscales, a mediation model with these variables was not conducted, as there were no significant differences in lack of emotional awareness among the three groups.
Figure 1. Mediation model for the indirect effect of eating pathology (control versus restrict; control versus binge) on avoidance and rule-driven exercise behavior through non-acceptance of emotions.

*p < .05; **p < .01; ***p < .001.
Post-hoc Analyses

Descriptive statistics and independent samples t-tests for measures of self-reported UE among individuals who did \( n = 17 \) and did not \( n = 113 \) report compulsive exercise, and did \( n = 34 \) and did not \( n = 96 \) report compensatory exercise, on the modified EDE are reported in Table 3. Within the total sample \( N = 130 \), nine (6.9%) participants endorsed only compulsive exercise, while 26 (20%) endorsed only compensatory exercise, and eight (6.1%) endorsed both UE presentations. Individuals with interview-assessed compulsive exercise scored significantly higher on the CET Total score and on specific facets of compulsive exercise (i.e., CET Avoidance and Rule-Driven Behavior and Exercise Rigidity) as compared to individuals without compulsive exercise \( (ps < .001; \, ds = 1.12-1.57) \). Significantly higher CET Total scores, and scores on both measures of compensatory exercise (i.e., CET Weight Control; REI Compensatory) were found in individuals with interview-assessed compensatory exercise compared to individuals without compensatory exercise \( (ps < .001; \, ds = 1.13-1.43) \). Together, findings support the convergence of interview-assessed and questionnaire-based measures of UE, as well as the potential utility of the modified EDE compulsive and compensatory exercise sections and the investigator-created REI Compensatory subscale.

Binary logistic regressions revealed that endorsement of compulsive exercise significantly differed across the three eating pathology groups, \( X^2_{\text{wald}} (2, \, N = 130) = 10.07, \, p = .007 \). Individuals with dietary restriction were more likely to endorse compulsive exercise than individuals who did not endorse eating pathology \( (OR = 11.49, \, p = .004) \), but not than individuals with Binge Eating \( (OR = 0.96, \, p = .94) \). The Binge
Eating group was also more likely to endorse Compulsive Exercise, relative to the Control group (OR = 12.04, \( p = .003 \)). In addition, the presence of compensatory exercise significantly differed across groups, \( \chi^2_{\text{wald}} (2, N = 130) = 13.26, p = .001 \). As expected, individuals in the Binge Eating group were more likely to endorse compensatory exercise than the Restricting (OR = 3.20, \( p = .04 \)) and Control (OR = 5.81, \( p < .001 \)) groups. In contrast, no significant difference was found in endorsement of Compensatory Exercise between the Restricting and Control groups (OR = 1.82, \( p = .27 \)).
Table 3. *Unhealthy Exercise Correlates of the Interview-Classified Exercise Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Compulsive (n = 17)</th>
<th>Non-Compulsive (n = 113)</th>
<th>Compensatory (n = 34)</th>
<th>Non-Compensatory (n = 96)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CET Total Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>t (df)</em></td>
<td>4.01*** (128)</td>
<td>5.04*** (128)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M (SD)</em></td>
<td>19.63 (2.50)</td>
<td>15.94 (3.66)</td>
<td>19.12 (2.87)</td>
<td>15.47 (3.54)</td>
</tr>
<tr>
<td>CET Avoidance and Rule-Driven Behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>t (df)</em></td>
<td>5.80*** (128)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M (SD)</em></td>
<td>3.71 (0.94)</td>
<td>2.15 (1.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>2.38-5.38</td>
<td>1.00-5.50</td>
<td></td>
<td></td>
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<tr>
<td>CET Exercise Rigidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>t (df)</em></td>
<td>3.83*** (128)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M (SD)</em></td>
<td>4.57 (1.02)</td>
<td>3.16 (1.46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>3.00-6.00</td>
<td>1.00-6.00</td>
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</table>
Table 3: Continued

<table>
<thead>
<tr>
<th></th>
<th>CET Weight Control</th>
<th>REI Compensatory</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>4.92 (0.77)</td>
<td>17.23 (3.80)</td>
</tr>
<tr>
<td>t (df)</td>
<td>6.63*** (128)</td>
<td>6.55*** (128)</td>
</tr>
<tr>
<td>M (SD)</td>
<td>4.92 (0.77)</td>
<td>17.23 (3.80)</td>
</tr>
<tr>
<td>Range</td>
<td>3.40-6.00</td>
<td>9.00-21.00</td>
</tr>
<tr>
<td></td>
<td>1.40-6.00</td>
<td>3.00-21.00</td>
</tr>
</tbody>
</table>

*Note.* CET = Compulsive Exercise Test; REI = Reasons for Exercise Inventory.

***p < .001.
Discussion

The current study examined differential relationships among eating pathology (i.e., dietary restriction, binge eating), UE (i.e., compensatory exercise, compulsive exercise), and emotion dysregulation (i.e., primary emotion avoidance, secondary emotion avoidance) features. Findings revealed greater endorsement of both conceptualizations of UE and emotion dysregulation in the Restricting and Binge Eating groups, relative to the Control Group. Most comparisons between participants in the two eating pathology groups were not significant, suggesting that individuals with dietary restriction and binge eating may have similar patterns of maladaptive exercise and emotion regulation. However, effect sizes provided some preliminary support for the hypothesis that features of compulsive exercise may be more characteristic of individuals with dietary restriction, while compensatory exercise and secondary emotion avoidance may be more characteristic of individuals with binge eating. Surprisingly, emotion dysregulation and UE features were largely unrelated, with only two significant correlations emerging. Moreover, emotion dysregulation failed to mediate the effect of eating pathology group on UE behavior. Together, results suggest that multiple conceptualizations of UE and emotion dysregulation are associated with dietary restriction and binge eating. Further, there is only limited support for the hypothesis of differential relationships among UE and emotion dysregulation features and core ED symptoms (i.e., Restricting, Binge Eating).
Eating Pathology and UE

Compared to the Control group, the eating pathology groups had higher levels of self-reported and interview-assessed UE. Indeed, the eating pathology groups scored significantly higher on multiple self-report measures of distinct UE features, and had greater endorsement of both compulsive and compensatory exercise on a semi-structured interview, as compared to individuals without restriction or binge eating. These results are consistent with previous findings of higher UE in individuals with AN and BN versus healthy controls (e.g., Boyd et al., 2007; Long et al., 1993; Mond & Calogero, 2009), and significant correlations between UE and eating pathology in undergraduate and non-clinical samples (e.g., Adkins & Keel, 2005; Holland et al., 2014; Taranis et al., 2011). Given that the eating pathology groups scored higher on a wide range of distinct UE features, these results suggest that both compulsive and compensatory exercise features are important to consider in the context of disordered eating. However, based on the pattern of correlations among compulsive and compensatory exercise measures, my results also indicate that these two UE presentations are not completely distinct constructs. Specifically, although the largest correlations were those between the two compulsive exercise measures ($r = .65$) and the two compensatory exercise measures ($r = .74$), medium-to-large correlations were also found between facets of compulsive and compensatory exercise ($rs = .40-.54$). Moreover, in the current sample, nine of 130 (6.9%) individuals endorsed compulsive and compensatory exercise on the clinical interview, whereas the overlap between self-reported compulsive and compensatory exercise was 20.4% in the study by Holland and colleagues (2014). One possibility is that
compulsive and compensatory exercise range on two continuums, in which an individual presents with one primary UE form, but also may experience some features of the other presentation. Thus, compulsive and compensatory exercise features may overlap or exist simultaneously in some individuals.

Contrary to hypotheses, the two disordered eating groups did not significantly differ on self-report questionnaire measures of compulsive and compensatory exercise. Thus, our inferential statistics did not support the notion that compulsive exercise is more prominent among those with dietary restriction, while compensatory exercise is more common among those with binge eating. However, the pattern of findings was supportive of initial hypotheses, in that the Restricting group had numerically higher scores on measures of compulsive exercise (i.e., CET Avoidance and Rule-Driven Behavior, Exercise Rigidity), whereas the Binge Eating group had numerically higher scores on measures of compensatory exercise (i.e., CET Weight Control Exercise, REI Compensatory), with differences primarily corresponding to small effect sizes ($ds = 0.17-0.40$). Given that my study was powered for medium effect sizes, these mean differences may have been present, but I did not have the statistical power to detect them. Analyses examining interviewer-assessed exercise did suggest that the Binge Eating group was more likely to endorse compensatory exercise on the modified EDE than the Restricting group, but no differences were found for compulsive exercise between the two groups. Findings for questionnaire measures are consistent with these interview results, as effect sizes corresponding to differences between the Restricting and Binge Eating groups were
larger for compensatory exercise features ($d_s = 0.25-0.40$) than for compulsive exercise features ($d_s = 0.17-0.27$).

One explanation for the lack of significant differences in compulsive exercise between the eating pathology groups may be the lower endorsement of compulsive exercise than compensatory exercise in the current sample. Only 13% of participants met criteria for compulsive exercise on the modified EDE. Further, mean scores on the CET Avoidance and Rule-Driven Behavior and Exercise Rigidity subscales in the Restricting group were similar to those found in an unselected undergraduate sample (Taranis et al., 2011). Given that compulsive exercise is habitual in nature, it may take longer to develop, and thus, may be more prevalent in individuals with long-standing AN versus those with recently developed dietary restriction. Indeed, the highest rates of compulsive exercise (i.e., 81%) have been found in adult female inpatients with clinical AN diagnoses (Davis et al., 1997). Since the mean age of onset of dietary restriction in our Restricting sample was relatively recent ($M (SD) = 17.20$ (2.27) years) relative to the mean age of the Restricting sample ($M (SD) = 18.53$ (0.64) years), rule-driven habitual exercise may have not yet developed.

On the other hand, 26% of individuals met criteria for compensatory exercise on the modified EDE, suggesting that compensatory exercise may represent a less pathological form of UE that is not as strongly linked to the chronicity of eating pathology. Davis and colleagues (1994) found that most individuals with BN started exercising following the onset of their illness and binge eating. Compensatory exercise may develop soon after the onset of OBEs because individuals are using exercise to
counteract the effects of their large eating episodes. Continuing to explore compulsive and compensatory exercise as two distinct constructs, and evaluating them separately in the assessment of UE among individuals with AN/restriction and BN/binge eating, is needed to validate the existence of these two UE presentations and to clarify their areas of overlap and distinction.

**Eating Pathology and Emotion Dysregulation**

In terms of emotion dysregulation, significant group differences were found for several DERS scales. Both disordered eating groups endorsed higher emotion regulation difficulties than the Control group, although the Binge Eating group significantly differed from the Control group on more features of emotion dysregulation (i.e., Total Score; Clarity; Non-Acceptance; Impulse; Goals) than the Restricting group did (i.e., Total Score; Non-Acceptance). Contrary to hypotheses, the Restricting and Binge Eating groups only significantly differed on one facet of maladaptive emotion regulation. Specifically, the Binge Eating group endorsed greater difficulties maintaining goal-directed behavior when distressed than the Restricting group. The greater difficulties maintaining impulse control of the Binge Eating group compared to the Restricting group was also trend-level significant ($p = .057$), with differences corresponded to a medium-effect size ($d = .50$). These findings are consistent with some emotion regulation studies conducted in patients with EDs that support the link between binge eating and secondary emotion avoidance. For instance, Wolz et al. (2015) reported significantly greater difficulties maintaining goal-directed behavior when distressed among individuals with BN relative to those with AN ($d = 0.56$). Further, among patients with AN, DERS
Impulse was the only DERS subscale on which significant differences emerged between patients who did versus did not report recurrent binge eating over the previous 3 months ($d = 0.72$; Racine & Wildes, 2013). Together, findings provide some support for the hypothesis that secondary emotion avoidance is more characteristic of BN/binge eating than AN/restriction, and suggest that binge eating functions as an impulsive coping mechanism to decrease state-levels of aversive distress that have already been triggered.

The lack of significant differences between the eating pathology groups on primary emotion avoidance (i.e., DERS Clarity, Awareness, Non-Acceptance) may not be that surprising. Indeed, several studies have found no significant differences in features of primary emotion avoidance (i.e., Clarity, Awareness, Non-Acceptance) between individuals with AN and BN (Brockmeyer et al., 2014; Gilboa-Schechtman, Avnon, Zuber, & Jeczmin, 2006; Harrison, Sullivan, Tchanturia, & Treasure, 2009; Svaldi et al., 2012). Moreover, one study found significantly higher levels of non-acceptance of emotions in individuals with BN than individuals with AN ($d = 0.47$; Wolz et al., 2015). Thus, when assessing emotion dysregulation via self-report measures individuals with distinct forms of disordered eating may demonstrate comparable presentations on some facets of emotion dysregulation.

One possibility is that the DERS Clarity, Awareness, and Non-Acceptance subscales may not fully capture the most important facets of primary emotion avoidance (i.e., attempts to prevent the initial onset of aversive states), which is what is expected to be particularly linked with anorexic pathology (Slade, 1982). While emotion avoidance refers to deliberate attempts to try and avoid initiating the onset of any strong emotion,
the DERS Clarity, Awareness, and Non-Acceptance subscales measure features often
associated with primary emotion avoidance, such as the tendency to negatively judge
distress and an inability to understand and acknowledge emotions. Thus, measures that
specifically assess efforts to evade emotional experiences, such as the Emotion
Avoidance Questionnaire (EAQ), may have more utility than the DERS in identifying
significant differences in primary emotion avoidance among those with AN/restriction
and BN/binge eating. Patients with AN have demonstrated higher scores on the EAQ
(example item: I don’t let myself get really happy about things because it’s better to keep
your feelings under control) relative to healthy controls, and comparable scores to other
psychiatric populations (Wildes, Ringham, & Marcus, 2010). However, due to minimal
research examining emotion avoidance in BN, differences in EAQ scores between
individuals with AN and BN have yet to be examined.

**UE and Emotion Dysregulation**

Overall, emotion dysregulation and UE were not strongly related. Indeed, 18 of
20 correlations between UE and emotion dysregulation features were not statistically
significant at a *p*-value of less than .01. Overall, research examining the relationship
between these two constructs is sparse, with only one other study examining correlations
among distinct facets of maladaptive emotion regulation and exercise (Taranis, 2010).
However, based on the findings from the present study, as well as a multitude of research
examining the relation between disordered eating and emotion dysregulation (e.g.,
Harrison et al., 2010; Lavender et al., 2015; Svaldi et al., 2012), it appears that emotion
regulation may be more strongly associated with eating pathology than UE. A significant
correlation between the CET Avoidance and Rule-driven Behavior and DERS Non-Acceptance subscales did emerge, which was consistent with initial expectations that components of primary emotion avoidance would be related to compulsive exercise features. Interestingly, in the only other study to have examined correlations between UE (assessed with the CET) and emotion dysregulation (measured with the DERS), Taranis (2010) found a significant relationship between the CET Avoidance and Rule-driven Behavior subscale and the DERS Non-Acceptance subscale among undergraduates. Therefore, individuals with compulsive exercise features may be using exercise to avoid emotional experiences that feel intolerant.

Contrary to expectations, DERS Non-Acceptance failed to mediate the effect of eating pathology group on CET Avoidance and Rule-driven Behavior. Thus, emotion dysregulation does not appear to be the primary mechanism that accounts for the relation between eating pathology and UE. It may instead be that emotion dysregulation is more strongly associated with eating pathology (i.e., dietary restriction, binge eating), which may then influence UE. This is supported by a multitude of research reporting higher levels of emotion dysregulation among those with eating pathology (e.g., Harrison et al., 2010; Lavender et al., 2015; Svaldi et al., 2012), and significant associations between eating pathology and UE (e.g., Holland et al., 2014; Taranis & Meyer, 2011; Zmijewski & Howard, 2003). As such, a reverse mediation model, in which emotion dysregulation impacts UE features through eating pathology, may be more fitting. Another possibility is that an alternative mechanism, such as personality traits (e.g., perfectionism and obsessive-compulsiveness), may play a more important role in influencing UE than
emotion regulation. In a sample of adolescents, Goodwin, Haycraft, Willis, and Meyer (2011) found that, in addition to drive for thinness, perfectionism and obsessive-compulsiveness were the best predictors of UE, as measured by the CET Total score. Additionally, among undergraduates, level of exercise commitment mediated the relationship between perfectionism and dietary restraint, suggesting that perfectionism may be associated with the link between rigid and rule-driven behaviors, such as dietary restriction and compulsive exercise (McLaren, Gauvin, & White, 2001). Thus, personality features may be more directly related to UE, while emotion dysregulation may be more indirectly related to UE through eating pathology (e.g., dietary restriction, binge eating).

Limitations and Future Directions

Although the present study yielded several important findings, it is not without limitations, and there are numerous future directions for research on eating pathology, UE, and emotion dysregulation. A primary limitation of the study is that individuals with restriction and binge eating were recruited as analogs of patients with AN and BN. Research in clinical populations has found overall UE (i.e., obsessive, driven, or out of control exercise 1 hour a day for 6 days per week) in up to 81% of patients with AN and 57% of individuals with BN (Davis et al., 1997), which contrasts sharply with the 13% of participants that endorsed compulsive exercise and 26% that endorsed compensatory exercise in the current sample. Thus, future research that examines the presence of compensatory and compulsive UE features separately in patients with AN and BN with
higher rates of UE is needed to help elucidate the true relation of UE and eating pathology.

On a related note, when determining the sample size needed to detect significant effects for the current study, I based my effect sizes off clinical samples. My pre-screen-assessed groups were not as pathological as expected, with only 26.5% of individuals originally recruited for the Restricting group endorsing dietary restriction on the interview, and only 53.2% of individuals originally recruited for the Binge Eating group endorsing binge eating on the interview. As a result, I chose to use interview-assessed groups to more closely mirror clinical samples, which resulted in smaller Restricting \((n = 28)\) and Binge Eating \((n = 31)\) sample sizes than I originally proposed. Thus, some of my results may have been significant in a larger sample with more statistical power if effect sizes remained the same. As such, re-examining UE and emotion dysregulation in a larger sample of individuals with dietary restriction and binge eating will be a critical next step in determining the distinction between compulsive and compensatory exercise and their differential relations to core ED symptoms. Moreover, when examining mean differences between groups I did not correct for familywise type I error. Although most of my significant \(p\)-values were less than .001, I will want to control for type I error as much as possible in future replications, given the large number of inferential statistical analyses that were run.

Additionally, it will be important to study relationships among eating pathology, UE, and emotion dysregulation in more diverse samples. The current sample consisted of all undergraduate females, most of whom were Caucasian (88.5%). Exploring
relationships among these constructs in alternative samples that differ in terms of age, sex, race, and ethnicity will be essential for generalizing findings and identifying additional demographic factors that may influence ED symptom presentation. One interesting area of future research would be to examine UE and eating pathology in males, as some studies have found higher rates of UE in males than females (Holland et al., 2014; Murray, Griffiths, Rieger, & Touyz, 2014). For example, in addition to having greater CET Total scores than females with AN, Murray et al. (2014) reported that males with AN endorsed higher levels of exercise rigidity and using exercise to avoid negative affect and increase positive affect than females. As such, among males, emotion regulation may be an especially important mechanism that contributes to the link between eating pathology and UE. Males were also found to have significantly higher rates of excessive exercise (i.e., engaging in exercise once per day for more than 60 minutes), but not compulsive and compensatory exercise, than females, suggesting that the quantitative component of UE may be a more important feature for males than females (Holland et al., 2014). Finally, given the high comorbidity of EDs and muscle dysmorphia in males (i.e., preoccupation with becoming more lean and muscular; Murray et al., 2012), research identifying different UE presentations that may be unique to males seeking out musculature should also be conducted.

**Clinical Implications**

Taken together, findings indicate that UE and emotion dysregulation are key clinical correlates associated with disordered eating. My study provided initial support for the distinct existence of compulsive and compensatory exercise and potential differential
relationships with excessive dietary restriction and binge eating. Given the detrimental outcomes associated with UE (Dalle Grave et al., 2008; Haddad, Bann, Hill, & Jones, 1997; Mond et al., 2008; Olivares et al., 2005; Solenberger, 2001), continuing to examine the presentation of UE in ED populations is essential to combat this specific symptom and inform treatment options. Currently, there is very little research on treatment and prevention methods for UE, as UE is often expected to remit as weight is restored and eating behaviors are normalized (Zunker, Mitchell, & Wonderlich, 2011). However, UE is associated with longer periods of inpatient hospitalization, higher relapse rates, and often persists following weight restoration (Carter et al., 2004; Long et al., 1995; Solenberger, 2001). As such, outlining UE presentation-specific prevention and treatment options is critical in breaking the cycle of maladaptive eating and exercise. For instance, interventions that incorporate psychoeducation on healthy levels of physical activity, while promoting mindful movement through identification of enjoyable exercise, may be especially advantageous for individuals struggling with compulsive exercise. On the other hand, treatment that detangles the relationship between food and exercise, and explores the utility of physical activity outside of weight/shape purposes may be beneficial for those with compensatory exercise. Preliminary research suggests that targeting UE specifically in ED treatment can be beneficial in the promotion of both healthy exercise and eating patterns (Calogero & Pedrotty-Stump, 2010.; Zunker et al., 2011). The Loughborough Eating Disorders Activity Therapy Program (LEAP), created by the developers of the CET, is one such example. LEAP uses cognitive-behavioral therapy to target UE in patients with EDs, and has been found to reduce hospital stays
from 41 to 31 days, improve quality of life, and decrease anxiety among patients with AN
("Reducing Compulsive Exercise Among Eating Disorder Patients," n.d.). However, this
program is currently the only of its kind and is exclusive to treating compulsive exercise
features. LEAP does not consider compensatory exercise as a unique UE form, or address
how differences in UE may uniquely affect patients and require distinct treatment
approaches. Thus, researchers, practitioners, and patients would benefit from clinical
trials exploring the efficacy of UE-specific therapies.

Clarifying the role of emotion regulation in UE, or identifying an alternative
mechanism that accounts for potential differential relationships between UE and eating
pathology, is also an important next step. Indeed, to accumulate enough research to
inform treatment and prevention models and identify treatment targets, more information
on the function and purpose of UE is needed. Ecological momentary assessment research
that provides rich data on the antecedents of engagement in UE may be one way to help
capture the nature of UE more specifically, and guide future research on this symptom.
Only through an increase in research on UE and eating pathology will we be able to truly
develop a functional model of UE, obtain the research necessary to inform clinical
intervention options, and provide relief and recovery for individuals suffering from UE
and EDs.
References


### Appendix A: SONA Study Materials

<table>
<thead>
<tr>
<th>Study Name</th>
<th>Examining the impact of Attention on Cognitive Tasks, Social Tasks and Taste Preferences</th>
</tr>
</thead>
</table>
| **Study Type** | ![Standard (lab) study](image)  
This is a standard lab study. To participate, sign up, and go to the specified location at the chosen time. |
| **Study Status** | Visible to participants: Approved  
Active study: Appears on list of available studies |
| **Duration** | 120 minutes |
| **Credits** | 2 Credits |
| **Description** | The purpose of this study is to see how training in attention strategies affects cognitive skills, social skills, and taste preferences. You will be paid $10.00 in addition to receiving 2 credits for your participation. As part of the study procedures, you will be completing a social and cognitive task and will be asked to taste test some foods. You must also be willing and able to consume chocolate and pretzels, meaning you should not participate if you have food allergies or dietary restrictions that make you unable to consume these foods. You also need to avoid consuming any food two hours prior to study participation in order to accurately measure taste preferences. This study will take approximately 120 minutes to complete. The study will take place in Room 034 (on the ground floor) of Porter Hall. |
SONA Study Emails

SONA Study Email for Control Group

Dear Participant,
I want to draw your attention to a study for which you are eligible to participate based on your responses to the psychology experiment pre-screen. This is a standard (lab) study that examines the impact of attention on cognitive and social tasks among college students. The study also examines individual differences in taste preferences. The study will take approximately 2 hours, and you will earn 2 research credits for participating. I hope you will consider it!

Best,
Shelby Martin

SONA Study Email for Restriction and Binge Eating Groups

Dear Participant,
I want to draw your attention to a study for which you are eligible to participate based on your responses to the psychology experiment pre-screen. This is a standard (lab) study that examines the impact of attention on cognitive and social tasks among college students. The study also examines individual differences in taste preferences. The study will take approximately 2 hours, and you will earn 2 research credits and $10 for participating. I hope you will consider it!

Best,
Shelby Martin
Appendix B: Consent Forms

Ohio University Consent Form – Control Group

**Title of Research:** Examining the Impact of Attention on Cognitive Tasks, Social Tasks, and Taste Preferences

**Researchers:** Akanksha Srivastav, M.S., Shelby Martin, B.S., and Sarah Racine, Ph.D.

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

**Explanation of Study**

The purpose of the study is to examine the effect of attention training on cognitive tasks, social tasks, and taste preferences. As part of study procedures, you will be asked to undergo training in attention skills before completing a paper-pencil cognitive task, and a computerized social task – both of which will be video recorded. In order to assess taste preferences, you will also be asked to rate and taste different foods. You can only take part in the study if are willing and able to consume pretzels and chocolates, meaning that you should not participate if you have food allergies or other dietary restrictions that make you unable to consume these foods. In addition, you will be asked to complete questionnaires that assess your emotional and behavioral health, as well as past and present medical conditions. Finally, you will be asked to complete an interview with a trained graduate student. You will be asked about your eating and exercise habits, and the interview will be recorded for the purposes of supervising study staff.

At the end of the study, you will asked whether you agree to be contacted in case the graduate student interviewer has follow-up questions for you after the study has ended. In addition, you will be asked whether you are interested in being contacted about future
research studies. Based on your responses during today’s study, you may be eligible for future studies for which you can earn course credit or monetary compensation. It is completely up to you whether you choose to provide contact information so that you can be contacted with follow-up questions or for future study opportunities. This decision will not influence the assignment of course credit for today’s study.

You should not participate in this study if you are under 18 years old or if you are not comfortable reading and responding to questions in English. You also should not participate if you have consumed food in the past 2 hours.

This study will take approximately 120 minutes to complete. You may withdraw from the study at any time without fear of penalty.

Risks and Discomforts
There are minimal risks associated with participating in this study. Some individuals may experience mild, transient discomfort during some of the study activities like completing social and cognitive tasks or while answering questions about eating and exercise habits. You will be provided with resources for psychological services before leaving the laboratory, in the event that you are concerned about any of the study materials or wish to speak with a professional.

You should know that you have the right to opt out of any of the procedures, or withdraw from the study at any time without fear of penalty. However, if you withdraw during the first hour and a half of study participation, you will only receive partial credit (See “Compensation”).

Benefits
After completing the study, you will be provided with a debriefing of the hypotheses of the study, and you will learn about the procedures used in this psychological research study. You will also learn how studies like this one can provide researchers with important information regarding attention training and taste preferences. You will also receive feedback regarding the results of the interview, which many people find helpful.

Confidentiality and Records
All information that is collected from you during your
participation in this study will be protected. Once you have consented to participate in the study, your responses will be assigned an arbitrary participant identification number. If you choose not to provide consent to be contacted regarding follow-up questions from the interview OR because you are interested in future research opportunities, your name (or other identifying information) will not be linked in any way to your study materials or audio recordings (see exceptions below). Your study responses will be stored separately from this consent form.

Your audio-recorded interview will be kept on a password-protected computer in a locked laboratory. Only people directly connected with the study will have access to these audio recordings. The audio-recorded interviews will be destroyed approximately one year after data collection for the study is complete (~April, 2018).

If you provide consent to be contacted regarding follow-up questions from the interview OR because you are interested in future research opportunities, you will be asked to provide your name, phone number, and OU email address. This information will be stored separate from your study responses and linked only to your arbitrary participant identification number via a master list. This master list will be stored in password-protected files on secure study computers located in a locked laboratory. Only the researchers listed on this consent form will have access to this master list. If you only consent to being contacted regarding follow-up questions from the interview, any identifying information (i.e., the master list) will be deleted at the end of the semester. If you consent to being contacted regarding future research opportunities, your identifying information will be deleted in April 2022.

While every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU

Compensation
You will receive 2 research credits for completing this study. You
may withdraw from this study at any time without fear of penalty. If you choose to withdraw in the first half hour of the study or decide not to consent to participate, you will receive 0.5 research credits for your time. If you choose to withdraw after half an hour, but before an hour, you will receive 1 research credit for your time. Finally, if you choose to withdraw after one hour, but before 1.5 hours, you will receive 1.5 research credits for your time.

Contact Information
If you have any questions regarding this study, please contact Shelby Martin, B.S., Clinical Psychology Graduate Student, Ohio University at sm221714@ohio.edu or Sarah E. Racine, Ph.D., Assistant Professor of Psychology, Ohio University at (740) 593-1086 at racine@ohio.edu or.

If you have any questions regarding your rights as a research participant, please contact Chris Hayhow, Director of Research Compliance, Ohio University, (740) 593-0664 (hayhow@oho.edu).

By signing below, you are agreeing that:
• you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
• you have been informed of potential risks and they have been explained to your satisfaction.
• you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study
• you are 18 years of age or older
• your participation in this research is completely voluntary
• you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Signature________________________________________ Date____________

Printed Name________________________________________

Version Date: [07/08/16]
Ohio University Consent Form – Restricting and Binge Eating Groups

Title of Research: Examining the Impact of Attention on Cognitive Tasks, Social Tasks, and Taste Preferences

Researchers: Akanksha Srivastav, M.S., Shelby Martin, B.S., and Sarah Racine, Ph.D.

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study

The purpose of the study is to examine the effect of attention training on cognitive tasks, social tasks, and taste preferences. As part of study procedures, you will be asked to undergo training in attention skills before completing a paper-pencil cognitive task, and a computerized social task – both of which will be video recorded. In order to assess taste preferences, you will also be asked to rate and taste different foods. You can only take part in the study if are willing and able to consume pretzels and chocolates, meaning that you should not participate if you have food allergies or other dietary restrictions that make you unable to consume these foods. In addition, you will be asked to complete questionnaires that assess your emotional and behavioral health, as well as past and present medical conditions. Finally, you will be asked to complete an interview with a trained graduate student. You will be asked about your eating and exercise habits, and the interview will be recorded for the purposes of supervising study staff.

At the end of the study, you will asked whether you agree to be contacted in case the graduate student interviewer has follow-up questions for you after the study has ended. In addition, you will be asked whether you are interested in being contacted about future research studies. Based on your responses during today’s study, you
may be eligible for future studies for which you can earn course credit or monetary compensation. It is completely up to you whether you choose to provide contact information so that you can be contacted with follow-up questions or for future study opportunities. This decision will not influence the assignment of course credit for today’s study.

You should not participate in this study if you are under 18 years old or if you are not comfortable reading and responding to questions in English. You also should not participate if you have consumed food in the past 2 hours.

This study will take approximately 120 minutes to complete. You may withdraw from the study at any time without fear of penalty.

Risks and Discomforts
There are minimal risks associated with participating in this study. Some individuals may experience mild, transient discomfort during some of the study activities like completing social and cognitive tasks or while answering questions about eating and exercise habits. You will be provided with resources for psychological services before leaving the laboratory, in the event that you are concerned about any of the study materials or wish to speak with a professional.

You should know that you have the right to opt out of any of the procedures, or withdraw from the study at any time without fear of penalty. However, if you withdraw during the first hour and a half of study participation, you will only receive partial credit (See “Compensation”).

Benefits
After completing the study, you will be provided with a debriefing of the hypotheses of the study, and you will learn about the procedures used in this psychological research study. You will also learn how studies like this one can provide researchers with important information regarding attention training and taste preferences. You will also receive feedback regarding the results of the interview, which many people find helpful.

Confidentiality and Records
All information that is collected from you during your participation in this study will be protected. Once you have
consented to participate in the study, your responses will be assigned an arbitrary participant identification number. If you choose not to provide consent to be contacted regarding follow-up questions from the interview OR because you are interested in future research opportunities, your name (or other identifying information) will not be linked in any way to your study materials or audio recordings (see exceptions below). Your study responses will be stored separately from this consent form.

Your audio-recorded interview will be kept on a password-protected computer in a locked laboratory. Only people directly connected with the study will have access to these audio recordings. The audio-recorded interviews will be destroyed approximately one year after data collection for the study is complete (~April, 2018).

If you provide consent to be contacted regarding follow-up questions from the interview OR because you are interested in future research opportunities, you will be asked to provide your name, phone number, and OU email address. This information will be stored separate from your study responses and linked only to your arbitrary participant identification number via a master list. This master list will be stored in password-protected files on secure study computers located in a locked laboratory. Only the researchers listed on this consent form will have access to this master list. If you only consent to being contacted regarding follow-up questions from the interview, any identifying information (i.e., the master list) will be deleted at the end of the semester. If you consent to being contacted regarding future research opportunities, your identifying information will be deleted in April 2022.

While every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU

**Compensation**

You will receive 2 research credits for completing this study. You may withdraw from this study at any time without fear of penalty. If
you choose to withdraw in the first half hour of the study or decide not to consent to participate, you will receive 0.5 research credits for your time. If you choose to withdraw after half an hour, but before an hour, you will receive 1 research credit for your time. Finally, if you choose to withdraw after one hour, but before 1.5 hours, you will receive 1.5 research credits for your time.

In addition to receiving 2 research credits, you will also receive $10.00 for completing this study. If you choose to withdraw after half an hour, but before an hour, you will receive $2.50 for your time. If you choose to withdraw after one hour, but before 1.5 hours, you will receive $5.00 for your time. Finally, if you choose to withdraw after 1.5 hours, but before the study is complete, you will receive $7.50 for your time. In order to document payment, we will provide the OU Finance Office with your name, address, and signature. The OU Finance Office will not know the nature of this study.

Contact Information
If you have any questions regarding this study, please contact Shelby Martin B.S., Clinical Psychology Graduate Student, Ohio University at sm221714@ohio.edu or Sarah E. Racine, Ph.D., Assistant Professor of Psychology, Ohio University at (740) 593-1086 or at racine@ohio.edu.

If you have any questions regarding your rights as a research participant, please contact Chris Hayhow, Director of Research Compliance, Ohio University, (740) 593-0664 (hayhow@oho.edu).

By signing below, you are agreeing that:
• you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
• you have been informed of potential risks and they have been explained to your satisfaction.
• you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study
• you are 18 years of age or older
• your participation in this research is completely voluntary
• you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.
• Signature________________________ Date__________

Printed Name__________________________________________

Version Date: [07/08/16]
Appendix C: Debriefing Form

Examining the Impact of Attention on Cognitive and Social Tasks

Thank you for taking part in this study.

The primary purpose of this study is to test how training in emotion regulation can affect mood and eating behavior. We expect that emotion regulation training may be particularly helpful for coping with the impact of interpersonal stressors, such as being excluded by one's peers. This study is interested in whether emotion regulation training is particularly helpful for individuals who experience episodes of overeating during which they feel out of control. Thus, participants for this study include individuals who do and do not report eating problems.

This study involved several elements of deception. First, you were told that this study was interested in the impact of attention training on cognitive and social tasks. The training that you received at the beginning of the study was designed to teach you a method to regulate your emotional responses rather than to focus your attention. We used the word “attention” instead of “emotion regulation” so that you were not expecting to experience a negative mood during the study.

Second, you were told that you were being videotaped while completing the cognitive and social tasks. However, you were not being videotaped. We wanted to ensure that you used the emotion regulation skills in which you were trained during the completion of the tasks.

Third, you were told that the letter-circling task was being used to assess your cognitive skills. This exercise was included so that you did not know that a main focus of the study was the computerized social task.

Fourth, you were told that you were playing the ball-tossing game against other students from Ohio University. However, you were actually playing the game against the computer, and the game was designed to exclude you. The reason that you were not informed of this part of the study is because we wanted you to fully experience the bad mood that would result from being excluded by your peers during the social task.

Finally, we presented the study as consisting of two parts, with the second part being a taste test. We were actually interested in how the experience of being excluded by your peers would affect the amount of food you consumed during the taste test. Thus, both “parts” of the study were in fact related.

We ask that you please keep these details about the true purpose of this study to yourself, as it is possible that people that you know may
participate in this study in the future. The results of the study depend on participants being unaware of, for example, the nature of the social task and the measurement of food consumption, and we greatly appreciate your assistance with this. If asked about the study, you can tell people that the study involved attention training, cognitive and social tasks, and a taste test.

We believe that research such as this can provide researchers and clinicians with much needed information about emotion regulation and eating problems. This information is valuable because it can ultimately inform the development of programs designed to prevent and treat psychological disorders characterized by poor emotion regulation, such as eating disorders.

Given that elements of deception were utilized in this study, and you were not informed of these elements when you provided informed consent, you have the right to refuse to allow your data to be used in any future analyses. There is no penalty for refusing to allow your data to be used. If you wish to allow the researchers to use your data after being fully informed of all study goals, please provide your signature below.

Signature:_____________________________________
Date:__________________

If you have any questions regarding this study, please contact Shelby Martin, B.S., Clinical Psychology Graduate Student, Ohio University at sm221714@ohio.edu or Sarah E. Racine, Ph.D., Assistant Professor of Psychology, Ohio University at (740) 593-1086 or racine@ohio.edu.

For your information, if you or someone you know is interested in learning more about, or receiving treatment for, eating disorder problems, or any other psychological problems, you may contact one of the offices below.

Personal Counseling Services at Ohio University:

Psychology and Social Work Clinic (002 Porter Hall) (740) 593-0902
Counseling and Psychological Services (Hudson Health Center, 3rd floor) (740) 593-1616
Appendix D: Questionnaires and Measures

Pre-screen Restricting Eligibility Questions

1. In the past three months, have you purposefully restricted your food intake by eating small amounts of food or certain kinds of food in order to lose or maintain your weight?

**EPSI Restricting Subscale**

Below is a list of experiences and problems that people sometimes have. Read each item to determine how well it describes your recent experiences. Then select the option that best describes how frequently each statement applied to you during the PAST FOUR WEEKS, including today.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Very Often</td>
</tr>
</tbody>
</table>

1. People told me that I do not eat very much.
2. People would be surprised if they knew how little I ate.
3. I got full more easily than most people.
4. I got full after eating what most people would consider a small amount of food.
5. People encouraged me to eat more.
6. I skipped two meals in a row.
Pre-screen Binge Eating Eligibility Questions

1. In the past three months, have you had one or more times when you have eaten what most people would consider an unusually large amount of food (e.g., a pint of ice cream) in a short period of time?
2. During the times when you ate an unusually large amount of food, did you feel like you couldn't stop eating or control what or how much you were eating?

EPSI Binge Eating Subscale

Below is a list of experiences and problems that people sometimes have. Read each item to determine how well it describes your recent experiences. Then select the option that best describes how frequently each statement applied to you during the PAST FOUR WEEKS, including today.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Very Often</td>
</tr>
</tbody>
</table>

1. I ate when I was not hungry.
2. I snacked throughout the evening without realizing it.
3. I ate until I was uncomfortably full.
4. I did not notice how much I ate until after I had finished eating.
5. If someone offered me food, I felt that I could not resist eating it.
6. I stuffed myself with food to the point of feeling sick.
7. I ate as if I was on auto-pilot.
8. I ate a very large amount of food in a short period of time (e.g., within 2 hours).
Eating Pathology Symptom Inventory

Below is a list of experiences and problems that people sometimes have. Read each item to determine how well it describes your recent experiences. Then select the option that best describes how frequently each statement applied to you during the past four weeks, including today.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Very Often</td>
</tr>
</tbody>
</table>

1. I did not like how clothes fit the shape of my body
2. I tried to exclude “unhealthy” foods from my diet
3. I ate when I was not hungry
4. People told me that I do not eat very much
5. I felt that I needed to exercise nearly every day
6. People would be surprised if they knew how little I ate
7. I used muscle building supplements
8. I pushed myself extremely hard when I exercised
9. I snacked throughout the evening without realizing it
10. I got full more easily than most people
11. I considered taking diuretics to lose weight
12. I tried on different outfits, because I did not like how I looked
13. I thought laxatives are a good way to lose weight
14. I thought that obese people lack self-control
15. I thought about taking steroids as a way to get more muscular
16. I used diet teas or cleansing teas to lose weight
17. I used diet pills
18. I did not like how my body looked
19. I ate until I was uncomfortably full
20. I felt that overweight people are lazy
21. I counted the calories of foods I ate
22. I planned my days around exercising
23. I thought my butt was too big
24. I did not like the size of my thighs
25. I wished the shape of my body was different
26. I was disgusted by the sight of an overweight person wearing tight clothes
27. I made myself vomit in order to lose weight
28. I did not notice how much I ate until after I had finished eating
29. I considered taking a muscle building supplement
30. I felt that overweight people are unattractive
31. I engaged in strenuous exercise at least five days per week
32. I thought my muscles were too small
33. I got full after eating what most people would consider a small amount of food
34. I was not satisfied with the size of my hips
35. I used protein supplements
36. People encouraged me to eat more
37. If someone offered me food, I felt that I could not resist eating it
38. I was disgusted by the sight of obese people
39. I stuffed myself with food to the point of feeling sick
40. I tried to avoid foods with high calorie content
41. I exercised to the point of exhaustion
42. I used diuretics in order to lose weight
43. I skipped two meals in a row
44. I ate as if I was on auto-pilot
45. I ate a very large amount of food in a short period of time (e.g., within 2 hours)
## Compulsive Exercise Test

### Instructions
Listed below are a series of statements regarding exercise. Please read each statement carefully and circle the number that best indicates how true each statement is of you. Please answer all the questions as honestly as you can.

<table>
<thead>
<tr>
<th>Never true</th>
<th>Rarely true</th>
<th>Sometimes true</th>
<th>Often true</th>
<th>Usually true</th>
<th>Always true</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1) I feel happier and/or more positive after I exercise.  
2) I exercise to improve my appearance.  
3) I like my days to be organised and structured of which exercise is just one part.  
4) I feel less anxious after I exercise.  
5) I find exercise a chore.  
6) If I feel I have eaten too much, I will do more exercise.  
7) My weekly pattern of exercise is repetitive.  
8) I do not exercise to be slim.  
9) If I cannot exercise I feel low or depressed.  
10) I feel extremely guilty if I miss an exercise session.  
11) I usually continue to exercise despite injury or illness, unless I am very ill or too injured.  
12) I enjoy exercising.  
13) I exercise to burn calories and lose weight.  
14) I feel less stressed and/or tense after I exercise.  
15) If I miss an exercise session, I will try and make up for it when I next exercise.  
16) If I cannot exercise I feel agitated and/or irritable.  
17) Exercise improves my mood.  
18) If I cannot exercise, I worry that I will gain weight.  
19) I follow a set routine for my exercise sessions e.g. walk or run the same route, particular exercises, same amount of time, and so on.  
20) If I cannot exercise I feel angry and/or frustrated.  
21) I do not enjoy exercising.  
22) I feel like I’ve let myself down if I miss an exercise session.  
23) If I cannot exercise I feel anxious.  
24) I feel less depressed or low after I exercise.
Reasons for Exercise Inventory

People exercise for a variety of reasons. When people are asked why they exercise, their answers are sometimes based on the reasons they believe they should have for exercising. What we want to know are the reasons people actually have for exercising. Please respond to the items below as honestly as possible. To what extent is each of the following an important reason that you have for exercising? Use the scale below, ranging from 1 to 7, in giving your answers. (If you never exercise, please skip this section.)

1 = not at all important 2, 3, 4 = moderately important 5, 6, 7= extremely important

1. To maintain my current weight
2. To increase my resistance to illness and disease
3. To cope with sadness, depression
4. To improve my strength
5. To meet new people
6. To redistribute my weight
7. To improve my cardiovascular fitness
8. To improve my endurance, stamina
9. To socialize with friends
10. To be slim
11. To increase my energy level
12. To have fun
13. To loose weight
14. To improve my mood
15. To burn off the calories I just ate
16. To improve my overall body shape
17. To be attractive to members of the opposite sex
18. To “undo” my eating
19. To be sexually desirable
20. To socialize with friends
21. To maintain my physical well-being
22. To improve my appearance
23. To improve my overall health
24. To cope with stress, anxiety
25. To counteract the effects of eating too much or what I think is too much
26. To improve my flexibility, coordination
27. To alter a specific area of my body
28. To improve my muscle tone
Difficulties in Emotion Regulation Scale
Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside 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. _____
MODIFIED EATING DISORDER EXAMINATION
Version 1
Copyright 2014 by Christopher G Fairburn, Zafra Cooper and Marianne O’Connor
VERSION EDITED FOR BEEP LAB AND STREAM LAB

ORIENTATION TO THE TIME PERIOD

What we are going to do is a partially structured interview in which I will ask you about your eating habits as well as your feelings towards your body weight and shape. Because a standard set of questions is going to be asked, please note that some may not apply to you.

Some questions focus on the past four weeks (that is, the last 28 days), others will cover the previous three months, and there also are questions that ask about your entire lifetime. I know this will test your memory because the weeks tend to blend together.

What I have done to help you is to make this calendar for the last 28 days [show the blank calendar – see Table 2]; it ends yesterday because today is not over yet. So it goes from yesterday [day and date] to [day and date].

And here are the dates for the two months before that, [date] to [date] and [date] to [date]. And to help you remember these periods, I have noted the holidays (e.g., Labor Day, Thanksgiving).

What I would like you to do now is tell me about any events that have happened in the past 28 days since this will help us discuss these four weeks. Have there been any events out of the ordinary, such as celebrations of any type (e.g., birthdays, social gatherings), vacations, or days off work? Then we can note these on the calendar.

How about in the previous month? From [date] to [date], were there any events out of the ordinary, such as celebrations, vacations, or days off work? We also will note these on the calendar to help your memory.

What about two months ago? From [date] to [date], were there any events out of the ordinary, such as celebrations, vacations, or days off work? Let’s note these on the calendar too.

INTRODUCTORY QUESTIONS

To begin, I would like to get a general picture of your eating habits over the last four weeks.

1. What has been your usual eating pattern?

2. Have your eating habits varied much from day to day? YES NO

3. Have weekdays differed from weekends? YES NO

4. What about the previous two months? Specify months. (Were your eating habits pretty much the same or were they different?)
I would like to ask you about any episodes of overeating, or loss of control over eating, that you might have had over the past four weeks.

Different people mean different things by overeating. I am interested in any times when you have felt that you have eaten, or might have eaten, too much at one time and times when you have felt as if your eating is out of control.

**Objective binge eating episodes (OBEs)**

1. In the past four weeks, did you have times when you ate a very large amount of food within one sitting, for example two hours? **YES** NO
   a. If NO: How about in the two months prior to this past month? **YES** NO
   b. If NO: Have you EVER had times where you ate a very large amount of food within one sitting, even if it wasn’t in the past 3 months? **YES** NO

Skip: If NO to OBEs, skip to Subjective binge eating episodes (SBEs).

2. If YES to any of the above, Tell me about the most recent time when you ate a very large amount of food in one sitting. (What did you eat? How much of each food item did you have? After every item, ask: What else did you eat?)

   **OR**

   If participant cannot remember most recent time: That’s ok. Tell me about a typical time when you ate a very large amount of food in a short period of time. (What did you eat? How much of each food item did you have? What else did you eat?)

   Use FOOD LOG to record specific foods and amounts eaten.
   a. Over what period of time did you consume this amount of food? Minutes: _____
   b. What were the circumstances? (Were you with other people? What were others eating at this time? Did you plan to eat as much as you did? Did you finish all of your food?)

   Use FOOD LOG to record circumstances.

   If amount of food described does not seem objectively large: Has there been a time when you have eaten more food than you have just described? (What did you eat? How much of each food item did you have? What else did you eat?)

3. Tell me about another recent or typical time when you ate a very large amount of food in a short period of time. (What did you eat? How much of each food item did you have? What else did you eat?)

   Use FOOD LOG to record specific foods and amounts eaten.
   a. Over what period of time did you consume this amount of food? Minutes: _____
   b. What were the circumstances? (Were you with other people? What were others eating at this time? Did you plan to eat as much as you did? Did you finish all of your food?)

   Use FOOD LOG to record circumstances.

**Objectively large amount of food: Current**

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<tr>
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</thead>
<tbody>
<tr>
<td>-9</td>
<td>-7</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Participant ID: __________

NOTE. If amount of food or circumstances do not indicate presence of current OSEs, re-assess for past

<table>
<thead>
<tr>
<th>Objective large amount of food: Past</th>
<th>9</th>
<th>7</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
</table>

4. Loss of control over eating when eating large amounts of food:

<table>
<thead>
<tr>
<th>During these times...</th>
<th>Current</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Did you feel as though your eating was out-of-control?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>b. Did you feel that you were unable to control when, what, or the amount of food that you were eating?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>c. Did you feel driven or compelled to eat?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>d. Did you feel like you were a ball rolling down a hill - like you just couldn't stop?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>e. Did you feel like you were a ball rolling down a hill - like you just couldn't stop?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>f. Did you keep going back to the cabinets or refrigerator to find more food?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>g. Did you feel sad or upset after eating?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>h. Did you feel guilty or ashamed after eating?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
<tr>
<td>i. Did you feel disgusted or grossed out with yourself after eating?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

Less of control over objectively large amount of food: Current

| -9 | -7 | 0 | 1 | 2 |

5. If NO loss of control over eating (i.e., 4a-4i is NO): Have you EVER had times when you ate a very large amount of food within one sitting AND you felt as though your eating was out-of-control? YES NO

If YES: Ask questions 2, 3 and 4 again for past OSEs.

---

Loss of control over objectively large amount of food: Past

| -9 | -7 | 0 | 1 | 2 |

SKIP: If NO loss of control over eating (i.e., 4a-4i is NO), skip to Objective Overeating Episodes

6. If current frequency of OSEs in past 3 months (RECORD IN TABLE)

| a. Over the past 28 days, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described and you felt out of control over your eating? (Were there any days in which you had more than one episode?) How many total episodes did you have over the past 28 days? |
| b. In Month 2, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described and you felt out of control over your eating? (Did they occur more or less often than in the past 28 days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 2? |
| c. How about in Month 3? (Did they occur more or less often than in Month 2? How many days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 3? |

Current Frequency of OSEs:

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of OSE days per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of OSE episodes per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average # of OSE episodes per week</td>
<td></td>
<td></td>
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</tbody>
</table>
Participant ID:  

7. If current or past: Frequency of OBEs at their worst (RECORD IN TABLE)
   a. If current: Have these eating episodes been more frequent anytime in the past? (When most frequent, how often were they occurring? On average, how many episodes did you have per month?)
   b. If only in past: When your eating episodes were most frequent, how often were they occurring? On average, how many episodes did you have per month? (If not at least once a month, how often did these episodes occur?)
   c. How long did this period of eating last? When was this?
   d. If diagnostic frequency unclear: Have you ever had eating episodes where you ate a similar amount of food to what you described and felt out of control over your eating and you described it as often as once per week for 3 months? YES ___ NO ___

Frequency of OBEs at their worst:

| Dates: | 
| Average # of OBE episodes per month | 
| Average # of OBE episodes per week | 
| Total # of months | 

8. Age of onset/offset: (RECORD IN TABLE)
   a. Initial emergence of episodes: At what age did you first begin having episodes like this, when you ate a similar amount of food as you described and felt out of control over your eating?
   b. If regular episodes: When did you start having regular episodes like this, i.e., on average at least once per week for a 3 month period?
   c. If not current: At what age did you stop having episodes like this?
   d. If regular episodes in past: At what age did you stop having regular episodes, i.e., at least once per week?

Age of onset/offset for current and/or past OBEs:

<table>
<thead>
<tr>
<th>Current OBEs</th>
<th>Past OBEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
<tr>
<td>N/A</td>
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</table>

Binge Eating Disorder Criteria:

9. If Current OBEs: Over the past three months, when you had an eating episode in which you ate a large amount of food and felt out of control over your eating, did you typically:
   a. Eat much more rapidly than normal? YES ___ NO ___
   b. Eat until you felt uncomfortably full? YES ___ NO ___
   c. Eat large amounts of food when you were not physically hungry? YES ___ NO ___
   d. Eat alone because you felt embarrassed about how much you were eating? YES ___ NO ___
   e. Feel disgusted with yourself, depressed, or very guilty? YES ___ NO ___

10. In general, over the past three months, does the fact that you have these eating episodes upset you or cause you distress? YES ___ NO ___
   a. How much do these episodes upset you? (Do you think about the fact that you have these episodes a lot? Do you think this is a big problem for you?)
Participant ID: __________

b. Does having these episodes cause you to feel badly about yourself?  YES__ NO__

c. On a scale from 0-10, with 0 being not at all distressed and 10 being extremely distressed, how distressed are you about having these eating episodes? Rating:___

Marked distress over objective binge eating: Current  -9  -7  0  1  2

11. If OBEs were most frequent in past. Think of the time when your eating episodes were most frequent. When you had an eating episode in which you ate a large amount of food and felt out of control over your eating, did you typically:

   a. Eat much more rapidly than normal?  YES__ NO__
   b. Eat until you felt uncomfortably full?  YES__ NO__
   c. Eat large amounts of food when you were not physically hungry?  YES__ NO__
   d. Eat alone because you felt embarrassed about how much you were eating?  YES__ NO__
   e. Feel disgusted with yourself, depressed, or very guilty?  YES__ NO__

12. In general, when your eating episodes were most frequent, did the fact that you had these eating episodes upset you or cause you distress?

   a. How much did these episodes upset you? (Did you think about the fact that you had these episodes a lot? Did you think this was a big problem for you?)

   b. Did having these episodes cause you to feel badly about yourself?  YES__ NO__

   c. On a scale from 0-10, with 0 being not at all distressed and 10 being extremely distressed, how distressed are you about having these eating episodes? Rating:___

Marked distress over objective binge eating: Past  -9  -7  0  1  2

Objective Overeating Episodes

1. If overeating but no loss of control in past 3 months. Frequency of Objective Overeating Episodes in past 3 months (RECORD IN TABLE)

   a. Over the past 28 days, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described? (Were there any days in which you had more than one episode?) How many total episodes did you have over the past 28 days?

   b. In Month 2, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described? (Did they occur more or less often than in the past 28 days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 2?

   c. How about in Month 3? (Did they occur more or less often than in Month 2? How many days? Were there any days in which you had more the one episode?) How many total episodes did you have in Month 3?
Participant ID: 6

Current Frequency of Objective Overeating:

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
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</thead>
<tbody>
<tr>
<td>Total # of Objective Overeating Days per Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of Objective Overeating Episodes per Month</td>
<td></td>
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<tr>
<td>Average # of Objective Overeating Episodes per week</td>
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Subjective Binge Eating Episodes (SBEs)

1. In the past four weeks, have there been any times when you felt that you have eaten too much, but others might not agree?
   
   YES___ NO___

   a. If NO: How about in the two months prior to this past month? YES___ NO___
   
   b. If NO: Have you ever had episodes when you felt that you ate too much, but others might not agree, even if it wasn’t in the past 3 months? YES___ NO___

   SKIP: If NO to SBEs, skip to Compensatory Behaviors (Exercise)

2. If YES to any of the above: Tell me about the most recent time when you ate an amount of food that you felt was too much but others might not agree. (What did you eat? How much of each food item did you have? After every item, ask: What else did you eat?)

   OR

   If participant cannot remember most recent time: That’s ok. Tell me about a typical time when you ate an amount of food that you felt was too much but others might not agree. (What did you eat? How much of each food item did you have? What else did you eat?)

   Use FOOD LOG to record specific foods and amounts eaten.

   a. Did you view this amount as excessive? YES___ NO___
   
   b. Over what period of time did you consume this amount of food? Minutes:
   
   c. What were the circumstances? (Was this a meal? Were you with other people? What were others eating at this time? Did you plan to eat as much as you did? Did you finish all of your food?)

   Use FOOD LOG to record circumstances.

3. Tell me about another recent or typical time when you felt that you had eaten a large amount of food in a short period of time but others might not agree. (What did you eat? How much of each food item did you have? What else did you eat?)

   Use FOOD LOG to record specific foods and amounts eaten.

   a. Did you view this amount as excessive? YES___ NO___
   
   b. Over what period of time did you consume this amount of food? Minutes:
   
   c. What were the circumstances? (Was this a meal? Were you with other people? What were others eating at this time? Did you plan to eat as much as you did? Did you finish all of your food?)

   Use FOOD LOG to record circumstances.

Subjectively large amount of food: Current | -9 | -7 | 0 | 1 | 2 |
Participant ID: __________

Subjectively large amount of food: Past

<table>
<thead>
<tr>
<th></th>
<th>-5</th>
<th>-3</th>
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<td>4.</td>
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<tr>
<td>Loss of control over eating when eating normal amount of food:</td>
<td>Current</td>
<td>Past</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>During these times...</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>a. Did you feel as though your eating was out-of-control?</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>b. Did you feel like you couldn’t stop yourself once you had started?</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td></td>
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<tr>
<td>c. Did you feel that you were unable to control when, what, or the amount of food that you were eating?</td>
<td>YES</td>
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<td>YES</td>
<td>NO</td>
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<td>f. Did you keep going back to the cabinets or refrigerator to find more food?</td>
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<td>g. Did you feel sad or upset after eating?</td>
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<td>NO</td>
<td></td>
</tr>
<tr>
<td>i. Did you feel disgusted or grossed out with yourself after eating?</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
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</table>

Loss of control over subjectively large amount of food: Current

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<tr>
<td>Loss of control over subjectively large amount of food: Past</td>
<td>Current</td>
<td>Past</td>
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Loss of control over subjectively large amount of food: Past

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<th>-5</th>
<th>-3</th>
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<th>2</th>
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<tbody>
<tr>
<td>6.</td>
<td></td>
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<tr>
<td>If NO loss of control over eating (i.e., 4a-4i is NO): Have you EVER had times when you thought you ate an excessive amount of food but others might not agree AND you felt as though your eating was out-of-control?</td>
<td>YES</td>
<td>NO</td>
<td></td>
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</tbody>
</table>

If YES: Ask questions 2, 3, and 4 again for past SBEs.

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Loss of control over subjectively large amount of food: Past

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<thead>
<tr>
<th></th>
<th>-5</th>
<th>-3</th>
<th>0</th>
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<tbody>
<tr>
<td>6.</td>
<td></td>
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<tr>
<td>If current Frequency of SBEs in past 3 months (RECORD IN TABLE)</td>
<td>Current</td>
<td>Frequency of SBEs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Over the past 28 days, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described and you felt out of control over your eating? (Were there any days in which you had more than one episode?) How many total episodes did you have over the past 28 days?</td>
<td>Month 1</td>
<td>Month 2</td>
<td>Month 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. In Month 2, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described and you felt out of control over your eating? (Did they occur more or less often than in the past 28 days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 2?</td>
<td>Total # of SBE episodes per month</td>
<td>Total # of SBE episodes per month</td>
<td>Total # of SBE episodes per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. How about in Month 3? (Did they occur more or less often than in Month 2? How many days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 3?</td>
<td>Average # of SBE episodes per week</td>
<td>Average # of SBE episodes per week</td>
<td>Average # of SBE episodes per week</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Participant ID: __________**

7. **If current or past**: Frequency of SBEs at their worst *(RECORD IN TABLE)*
   a. *If current:* Have these eating episodes been more frequent anytime in the past? *(When most frequent, how often were they occurring? On average, how many episodes did you have per month?)*
   b. *If only past:* When your eating episodes were most frequent, how often were they occurring? *(On average, how many episodes did you have per month? (If not at least once a month, how often did these episodes occur?)*
   c. How long did this period of eating last? When was this?
   d. "If diagnostic frequency unclear" Have you ever had eating episodes where you ate a similar amount of food to what you described and felt out of control over your eating as often as once per week for 3 months?** YES ** NO **

<table>
<thead>
<tr>
<th>Frequency of SBEs at their worst:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates:</td>
<td></td>
</tr>
<tr>
<td>Average # of SBE episodes per month</td>
<td></td>
</tr>
<tr>
<td>Average # of SBE episodes per week</td>
<td></td>
</tr>
<tr>
<td>Total # of months</td>
<td></td>
</tr>
</tbody>
</table>

8. **Age of onset/offset:** *(RECORD IN TABLE)*
   a. *Initial emergence of episodes:* At what age did you first begin having episodes like this, when you ate a similar amount of food as you described and felt out of control over your eating?
   b. *If regular episodes:* When did you start having regular episodes like this, i.e., on average at least once per week for a 3-month period?
   c. *If not current:* At what age did you stop having episodes like this?
   d. *If regular episodes in past:* At what age did you stop having regular episodes, i.e., at least once per week?

<table>
<thead>
<tr>
<th>Age of onset/offset for current and/or past SBEs:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Emergence of Episodes</td>
<td></td>
</tr>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
<tr>
<td>Current SBEs</td>
<td>N/A</td>
</tr>
<tr>
<td>Past SBEs</td>
<td></td>
</tr>
</tbody>
</table>

9. **If current SBEs:** In general, over the past three months, does the fact that you have these eating episodes upset you or cause you distress? YES ** NO **
   a. How much do these episodes upset you? *(Did you think about the fact that you have these episodes a lot? Did you think this is a big problem for you?)*
   
   b. Does having these episodes cause you to feel badly about yourself? YES ** NO **
   
   c. On a scale from 0-10, with 0 being not at all distressed and 10 being extremely distressed, how distressed are you about having these eating episodes? Rating: __

<table>
<thead>
<tr>
<th>Marked distress over subjective binge eating: Current</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>.8</td>
<td>.7</td>
</tr>
</tbody>
</table>
Participant ID: __________

10. If binge eating was most frequent in past: Think of the time when your eating episodes were most frequent. During this time, did the fact that you had these eating episodes upset you or cause you distress?
   YES __ NO __
   a. How much do these episodes upset you? (Did you think about the fact that you had these episodes a lot? Did you think this was a big problem for you?)
   YES __ NO __
   b. Did having these episodes cause you to feel badly about yourself? YES __ NO __
   c. On a scale from 0-10, with 0 being not at all distressed and 10 being extremely distressed, how distressed are you about having these eating episodes? Rating: __

Marked distress over subjective binge eating: Past: __ __ __ __ __ __

Subjective Overeating Episodes

1. If subjective overeating but no less of control in past 3 months: Frequency of Subjective Overeating Episodes in past 3 months (RECORD IN TABLE)
   a. Over the past 28 days, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described? (Were there any days in which you had more than one episode?) How many total episodes did you have over the past 28 days?
   b. In Month 2, how many days (if any) did you have eating episodes, in which you ate a similar amount of food as you have described? (Did they occur more or less often than in the past 28 days? Were there any days in which you had more than one episode?) How many total episodes did you have in Month 2?
   c. How about in Month 3? (Did they occur more or less often than in Month 2? How many days? Were there any days in which you had more the one episode?) How many total episodes did you have in Month 3?

Current Frequency of Subjective Overeating:

<table>
<thead>
<tr>
<th></th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of Subjective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overeating Days per</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of Subjective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overeating Episodes per</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average # of Subjective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overeating Episodes per</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>week</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMPENSATORY BEHAVIORS

Exercise

1. Over the past four weeks have you exercised as a means of controlling your weight, altering your shape or amount of fat, or burning off calories?
   YES __ NO __
   a. If NO: How about in the two months prior to this past month? YES __ NO __
   b. If NO: Have you ever exercised as a means of controlling your weight, altering your shape or amount of fat, or burning off calories? YES __ NO __

SKIP: If NO to exercise, skip to Dietary Restriction
2. If YES to any of the above: Typically what type of exercise have you done?

   Exercise: Cardio  Strengthening  Both

   a. On average, how long did you spend exercising on the days you did exercise? Minutes: __________

   b. What are/were your reasons for exercising?

<table>
<thead>
<tr>
<th>Compulsive Exercise:</th>
<th>Current</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Was your exercise pattern repetitive or on a routine schedule? (e.g., same number of days per week, same exercises) YES__NO__ YES__NO__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. On a scale from 1-10, with 0 being not at all distressed and 10 being extremely distressed, rate your level of distress if you had to miss a planned exercise session. Rating: __________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Did you exercise even when it might interfere with other commitments? (If YES: Tell me a little more about this.) YES__NO__ YES__NO__</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Did you ever exercise even when it might do you harm—such as when sick or injured? (If YES: Tell me a little more about this.) YES__NO__ YES__NO__</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 7. If YES to any of the above (i.e., Compulsive Exercise Questions 3-6):
  a. Did you feel like you were unable to control when you exercised, or the frequency, intensity, or duration of your exercise? YES__NO__ YES__NO__ |
  b. Did you feel driven or compelled to exercise? (Did you feel like you were unable to prevent yourself from exercising?) YES__NO__ YES__NO__ |
  c. Did you ever feel addicted to exercise—like you just could not exercise enough? YES__NO__ YES__NO__ |
  d. Did you feel less anxious after you exercised? (After you exercised, did you feel relieved and less anxious because you got your exercise in for the day?) YES__NO__ YES__NO__ |

Compulsive Exercise: Current  -9  -7  0  1  2
Compulsive Exercise: Past  -9  -7  0  1  2
<table>
<thead>
<tr>
<th>Participant ID: ____________</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensatory Exercise:</td>
<td>Current</td>
</tr>
<tr>
<td>8. Did the amount or intensity of your exercise routine vary much from day to day?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>a. If YES: Did the amount or intensity of your exercise routine depend on what you ate?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>b. If YES: Did you exercise for longer or at a greater intensity if you felt that you ate too much?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>9. Did you exercise specifically to counteract the effects of eating?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>(When you exercised did you think about burning off the calories you just ate?)</td>
<td></td>
</tr>
<tr>
<td>10. Did you feel obligated to exercise after you ate too much or what you thought was too much?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>11. Did you exercise out of guilt from eating too much, or what you felt was too much?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>a. If YES: Did you feel less guilty after you exercised?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>12. When you exercised, did you strive for a specific goal? (e.g., run a certain number of miles, burn a certain number of calories)</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>a. If Yes: Describe the goal.</td>
<td></td>
</tr>
<tr>
<td>b. If YES: Did this goal vary depending on how much you ate or how much you were planning to eat?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>13. IF GUESSES: Did you plan your exercise around your GBEs/SBEs?</td>
<td>YES__NO__</td>
</tr>
<tr>
<td>(After an eating episode, did you make plans to exercise immediately after or the next day?)</td>
<td></td>
</tr>
</tbody>
</table>

| Compensatory Exercise: Current | 2 | -7 | 0 | 1 | 2 |
| Compensatory Exercise: Past | 2 | -7 | 0 | 1 | 2 |

14. If current exercise not compulsive or compensatory: Have you ever had a time when you exercised more than you just described, exercised in a compulsive or driven way, or exercised specifically to counteract the effects of eating? YES__NO__

If YES: Ask exercise questions 2-13 again for past exercise.

15. If current: Frequency of Compulsive/Compensatory Exercise in past 3 months (Ask for BOTH compulsive and compensatory exercise, if present; RECORD IN TABLES)
   a. How many days did you exercise in the way that you’ve just described over the past four weeks?
Participant ID: __________

1. If CBEs or SBEs AND compensatory exercise present: How many of these episodes of exercise occurred outside of the times that followed (refer to CBEs and SBEs)?

2. In Month 2, how many days (if any) did you engage in the pattern of exercise you just described as a means of controlling your shape and weight? (Did this occur more or less often than in the past 26 days?)

3. If CBEs or SBEs AND compensatory exercise present: How many of these episodes of exercise occurred outside of the times that followed (refer to CBEs and SBEs)?

4. How about in Month 3? (Did they occur more or less often than in Month 2? How many days?)

5. If CBEs or SBEs AND compensatory exercise present: How many of these episodes of exercise occurred outside of the times that followed (refer to CBEs and SBEs)?

**Current Frequency of Compulsive Exercise:**

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of days per month</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Current Frequency of Compensatory Exercise**

<table>
<thead>
<tr>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of days per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of days that followed CBEs/SBEs</td>
<td></td>
<td></td>
</tr>
<tr>
<td># episodes outside of times that followed CBEs/SBEs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. If current or past: Frequency of Compulsive/Compensatory Exercise at its worst (Ask for BOTH compulsive and compensatory exercise, if present. RECORD IN TABLES)

a. If current: Have you exercised more frequently anytime in the past? (When most frequent, how often were you exercising in the way you just described? On average, how many days of exercise did you have per month?)

b. If only past: When you were exercising most frequently, how often was this occurring? On average, how many days did you engage in this pattern of exercise per month?

c. How long did this period of exercise last? When was this?

d. **If diagnostic frequency unclear: Did you ever exercise in the way that you just described as often as once per week for 1 months?** YES ____ NO ____

e. **If CBEs or SBEs AND compensatory exercise present: Did you exercise in the way that you just described following (refer to CBEs/SBEs)? Did this pattern of eating followed by exercising occur as often as once per week for 3 months?** YES ____ NO ____

**Frequency of Compulsive Exercise at its worst:**

<table>
<thead>
<tr>
<th>Dates:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of days per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average # of days per week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant ID:</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
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<td></td>
</tr>
</tbody>
</table>

**Frequency of Compensatory Exercise at its worst:**

<table>
<thead>
<tr>
<th>Average # of days per month</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of days per week</td>
<td></td>
</tr>
<tr>
<td>Total # of months</td>
<td></td>
</tr>
</tbody>
</table>

Average # of episodes per week following OBES/EBEs

17. **Age of onset/offset:**
   - **Initial emergence of exercise:** At what age did you first begin to exercise in the way you just described as a means of controlling your shape and weight?
   - **Regular exercise:** When did you start exercising in this way regularly, i.e., once per week for 3-month periods?
   - **Past exercise:** At what age did you stop exercising like this?
   - **Current exercise:** At what age did you stop exercising like this, i.e., at least once per week?

**Age of onset/offset for Current and/or Past Compensatory Exercise:**

<table>
<thead>
<tr>
<th>Initial Emergence of Exercise</th>
<th>Regular Exercise (%/week for 3 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
</tbody>
</table>

**Age of onset/offset for Current and/or Past Compensatory Exercise:**

<table>
<thead>
<tr>
<th>Initial Emergence of Exercise</th>
<th>Regular Exercise (%/week for 3 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
<tr>
<td>Age onset</td>
<td>Age offset</td>
</tr>
</tbody>
</table>

**Dietary Restriction**

1. Over the past four weeks have you significantly restricted your food intake in order to influence your weight or shape, such that you have been eating considerably less than others around you, gone for several waking hours without eating, or skipped meals? _YES_ _NO_
   - **Past:** How about in the two months prior to this past month? _YES_ _NO_
   - **Current:** Have you ever significantly restricted your food intake in order to influence your weight or shape? _YES_ _NO_

SKIP: If NO to dietary restriction, skip to the End of the Interview.

2. If YES to any of the above, What did you eat in a typical day during the time that you were restricting your food intake?
   Use FOOD LOGS to record specific foods and amounts eaten.
   - *) Did others comment on how little you were eating? _Current_ _Past_ _YES_ _NO_ _YES_ _NO_
**Participant ID:**

b. Did you feel full after eating what others would consider a small amount of food? **YES** **NO**

c. Did you ever skip two meals or more in a row? **YES** **NO**

d. How many waking hours did you go without eating? **Hours:**

e. Did you lose any weight? (If so, how much?) **YES** **NO**

<table>
<thead>
<tr>
<th>Dietary Restriction: Current</th>
<th>-9</th>
<th>-7</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dietary Restriction: Past</th>
<th>-9</th>
<th>-7</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
</table>

3. **If current diet not restrictive:** Have you ever had a time when you restricted your food intake more than you just described? **YES** **NO**

If YES: Ask questions 2-26 again for past dietary restriction.

---

4. **If current:** Frequency of Dietary Restriction in past 3 months *(RECORD IN TABLE)*

   a. How many days did you restrict your food intake in the way that you’ve just described over the past four weeks?

   i. **If OBES or SSEs present:** How many of these episodes of dietary restriction followed (refer to OBES/SSEs)? How many of these episodes of dietary restriction occurred outside of the times that followed (refer to OBES and SSEs)?

   b. In Month 2, how many days (if any) did you engage in the pattern of dietary restriction you just described as a means of controlling your shape and weight? (Did this occur more or less often than in the past 28 days?)

   i. **If OBES or SSEs present:** How many of these episodes of dietary restriction followed (refer to OBES/SSEs)? How many of these episodes of dietary restriction occurred outside of the times that followed (refer to OBES and SSEs)?

   c. How about in Month 3? (Did they occur more or less often than in Month 2? How many days?)

   i. **If OBES or SSEs present:** How many of these episodes of dietary restriction followed (refer to OBES/SSEs)? How many of these episodes of dietary restriction occurred outside of the times that followed (refer to OBES and SSEs)?

**Current Frequency of Dietary Restriction:**

<table>
<thead>
<tr>
<th>Current Frequency of Dietary Restriction:</th>
<th>Month 1</th>
<th>Month 2</th>
<th>Month 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of episodes per month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of episodes that followed OBES/SSEs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># episodes outside of times that followed OBES/SSEs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **If current or past:** Frequency of Dietary Restriction at its worst *(RECORD IN TABLE)*

   a. When you were restricting your food intake most frequently, how often was this occurring? On average, how many days did you engage in this pattern of dietary restriction per month?

   b. How long did this period of dietary restriction last? When was this?
Participant ID: ______________  

6. Age of onset/offset: (RECORD IN TABLE)  

a. Initial emergence of restriction: At what age did you first begin to restrict your food intake in the way that you’ve just described as a means of controlling your shape and weight?  

b. If regular restriction: When did you start restricting your food intake in this way regularly, i.e., on average at least once per week for a 3 month period?  

c. If not current: At what age did you stop restricting your food intake in this way?  

d. If regular restriction in past: At what age did you stop regularly restricting your food intake, i.e., at least once a week?  

<table>
<thead>
<tr>
<th>Age of onset/offset for Current and/or Past Dietary Restriction:</th>
<th>Initial Emergence of Episodes</th>
<th>Regular Episodes (1x/week for 3 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age onset</td>
<td>Age offset</td>
<td>Age onset</td>
</tr>
<tr>
<td>Current dietary restriction</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Past history dietary restriction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

END OF THE EDE INTERVIEW
Appendix E: Tables for Pre-Screen Measure-Classified Groups

Table 4. *Eating, Exercise, and Emotion Regulation Correlates of the Pre-Screen Measure-Classified Restricting, Binge Eating, and Control Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Restricting $(n = 49)$</th>
<th>Binge Eating $(n = 47)$</th>
<th>Control $(n = 51)$</th>
<th>$F$ (df)</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Eating Pathology</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPSI Restricting</td>
<td></td>
<td></td>
<td></td>
<td>9.40 (2, 146)***</td>
<td>.11</td>
</tr>
<tr>
<td>$M (SD)$</td>
<td>9.28 (4.62)$_a$</td>
<td>5.89 (5.12)$_b$</td>
<td>5.49 (4.56)$_b$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.00-24.00</td>
<td>0.00-22.00</td>
<td>0.00-18.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPSI Binge Eating</td>
<td></td>
<td></td>
<td></td>
<td>54.73 (2, 146)***</td>
<td>.43</td>
</tr>
<tr>
<td>$M (SD)$</td>
<td>7.77 (5.47)$_a$</td>
<td>16.66 (7.16)$_b$</td>
<td>5.18 (4.01)$_c$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1.00-22.00</td>
<td>1.00-32.00</td>
<td>0.00-17.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Exercise Features</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CET Total Score</td>
<td></td>
<td></td>
<td></td>
<td>8.06 (2, 146)***</td>
<td>.10</td>
</tr>
<tr>
<td>$M (SD)$</td>
<td>16.08 (3.16)$_a$</td>
<td>18.20 (3.64)$_b$</td>
<td>15.38 (3.94)$_a$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
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<td>8.33-24.75</td>
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<td>2.73 (1.36)_{b}</td>
<td>2.12 (1.05)_{a}</td>
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<td>4.52 (1.26)_{b}</td>
<td>3.69 (1.17)_{a}</td>
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<td>10.86 (5.63)&lt;a&gt;</td>
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*Emotion Regulation*

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<td><em>M (SD)</em></td>
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<td>9.70 (2.23)&lt;c&gt;</td>
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<td><em>M (SD)</em></td>
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Table 4: Continued

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Note. EPSI = Eating Pathology Symptoms Inventory; CET = Compulsive Exercise Test; REI = Reasons for Exercise Inventory; DERS = Difficulties in Emotion Regulation Scale; $\eta^2$ = eta-squared.

Alphabetic subscripts that differ represent pairwise differences between the groups that are significant at $p < .05$.

* $p < .05$; ** $p < .01$; *** $p < .001$
Table 5. *Pearson Correlations among Unhealthy Exercise and Emotion Dysregulation Features in the Pre-Screen Measure- Classified Groups*

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</tbody>
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*Note. CET = Compulsive Exercise Test; REI = Reasons for Exercise Inventory; DERS = Difficulties in Emotion Regulation Scale.*

*p < .05; **p < .01; ***p < .001.