EXERCISE AND EATING DISORDERED BELIEFS AND BEHAVIORS:
A STUDY USING ECOLOGICAL MOMENTARY ASSESSMENT

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CHAPTER I

INTRODUCTION

While exercise has long been known to be associated with positive outcomes for most people, researchers recently have begun to investigate the potential negative correlates and consequences of exercise behaviors in clinical and subclinical eating disordered populations. This research has created significant questions for future researchers. A primary question is how exercise and eating behaviors interact with one another. While research suggests that individuals who exercise endorse greater eating symptomatology than non-exercisers (Holm-Denoma, Scaringi, Gordon, Van Orden, & Joiner, 2009) and individuals with and without eating disorders use exercise as a compensatory weight control strategy, especially after periods of overeating (Diagnostic and Statistical Manual of Mental Disorders [DSM-IV TR], American Psychiatric Association [APA], 2000; Crowther, Armey, Luce, Dalton, & Leahey, 2008), it is unclear how exercise impacts subsequent eating behaviors and attitudes and vice versa. Studies using ecological momentary assessment, a form of in vivo data collection, may be the key for understanding this complex relationship by allowing researchers to examine both behaviors as they occur in the naturalistic environment.

In earlier research, LePage and Crowther (2010) used ecological momentary assessment to examine differences in the effects of exercise on state body dissatisfaction
and affect among those with and without body dissatisfaction. This study found that exercise was associated with positive correlates for all women, regardless of level of trait body dissatisfaction. Given the number of studies finding that exercise is associated with negative correlates (Mond, Hay, Rodgers, & Beumont, 2004; Krejci, Sargent, Forand, Ureda, Saunders, & Durstine, 1992), it is important to identify and examine possible populations for whom exercise may be associated with these negative experiences. Since research indicates that exercise in eating disordered populations is often pathological (Brewerton, Stellefson, Hibbs, Hodges, & Cochrane, 1995; Davis et al., 1997; Solenberger, 2001), the next step in examining possible negative effects from exercise would be to study individuals with disordered eating behaviors and beliefs. Disordered eating beliefs and behaviors includes many elements including cognitive elements like body dissatisfaction and thin ideal internalization, as well as behavioral elements like restricting caloric intake, fasting, purging, extreme exercise behaviors, using laxatives, etc (Garner, Olmstead, Bohr, & Garfinkel, 1982). Examining this population would allow researchers to better understand the immediate effects of exercise in a population of people at risk for developing future eating disorders. Furthermore, since exercise in disordered populations seems to be associated with eating behaviors, a study utilizing an ecological momentary assessment protocol to examine the relationships between exercise and eating behaviors would allow for a better understanding of the day to day impact of exercise on eating and vice versa.

In order to facilitate a better understanding of the specific aims of the present study, a thorough description of the many facets of exercise and its related factors
follows. First, this introduction will review the literature on the relationship between exercise and eating disordered behaviors and beliefs. Furthermore, laboratory studies that have previously examined caloric expenditure and intake will be presented to give the reader a clearer understanding of the present state of the field. In addition, information will also be provided on previous work examining the impact of exercise on several other variables of interest, including positive and negative affect and state body dissatisfaction. Finally, research examining the impact of exercise specific characteristics, notably motivations for exercise and type of exercise, will be discussed.

**Exercise, Eating Disorders, and Eating**

Correlational studies have found significant relationships between exercise and eating psychopathology in non-clinical samples. For example, there is a greater prevalence of eating disorders among athletes, especially if their sport glorifies a thin ideal (e.g., gymnastics or figure skating) (Smolak, Murnen, & Ruble, 2000). While this does not necessarily indicate that physical activity is causing eating disordered behaviors in athletes, it does suggest that the two are related in some way. In addition, individuals in the general population who exercise at high levels exhibit greater eating pathology and other related characteristics, including body dissatisfaction and body focus, than individuals who exercise at moderate levels or those who do not exercise at all (Mond, Hay, Rodgers, Owen, & Beumont, 2004; Krejci, Sargent, Forand, Ureda, Saunders, & Durstine, 1992; Davis, Fox, Cowles, Hastings, & Schwass, 1990). A recent meta-analysis confirmed these findings, that exercising populations report significantly higher levels of eating pathology than non-exercising populations (LePage, in preparation). Given that
exercise has been shown to be associated with increased levels of body focus, it is possible that for some individuals, exercise is associated with greater attention to physical appearance, increasing the likelihood of becoming fixated on perceived flaws, thus resulting in attempts to modify one’s figure, potentially through eating disordered behaviors.

Research suggests that there may be a biological or physiological basis to the relationship between exercise and disordered eating behaviors, specifically restriction. Much of this research is based on the work of Epling and Pierce (1988). These researchers discovered that when laboratory rats were given free access to an exercise wheel and were placed on a restricted diet, the rats engaged in increased amounts of exercise and reduced their food intake to less than what was provided for them. The increase in energy output and the reduction of food intake resulted in weight loss. As weight loss continued, the rats began to exercise more and began to consume less than one gram of their meal. After weeks of this cycle, many of the rats died. This behavior has been called “activity based anorexia” or “semi-starvation-induced hyperactivity” (Hebebrand et al., 2003), and Epling and Pierce (1988) suggest that this phenomenon may provide a model for understanding anorexic over-exercising in human beings, specifically in anorexics. In their human model, Epling and Pierce posit that strenuous exercise in conjunction with dieting behaviors suppresses appetite and leads to unavoidable weight loss. Due to the rewarding properties of weight loss for most young women, this weight loss may reinforce both dieting and exercise behaviors, thus increasing the motivation to engage in both activities, further increasing energy
expenditure and reducing energy intake. Epling and Pierce believe that this exercise-eating relationship will only occur if food is already at a diminished level and the opportunity for exercise is present. This suggests that among humans, individuals who are engaged in dieting behaviors and exercise may be at greater risk for developing this pattern.

Interestingly, a recent study found that food restriction and anxiety work together to contribute to increases in physical activity (Holtkamp, Hebebrand, Herpentz-Dahlmann, 2004). Specifically these researchers examined precursors to exercise behaviors in an inpatient eating disordered population. They found that food restriction and anxiety significantly predicted physical activity levels. One explanation for this finding is that exercise serves as a way to cope with anxiety. It may be that when individuals feel they are not meeting their expectations in terms of dietary restriction, they exercise as a way to cope with the resultant anxiety and guilt. In other words, imagined or real failures in one behavior may increase motivation to engage in the other.

While Epling and Pierce’s theory of “activity anorexia” in human beings may warrant further investigation, Hebebrand and colleagues posit that the relationship between exercise and dieting behaviors is due specifically to neurological changes in the brain associated with both behaviors. These researchers believe that the motivational property is not simply weight loss, but the increase in serotonin created by increased exercise and starvation states (Hebebrand et al., 2003). This increase of serotonin creates a mild euphoria in dieting exercisers and acts as an internal motivator to continue both diet and exercise. In addition to the influx of serotonin in the brain, the release of cortisol
resulting from the stress of exercise and starvation results in increased quantities of dopamine in the brain, also causing an increase in positive affect. These rewarding chemical changes in the brain may classically condition dieting exercisers to continue their behaviors. Increased exercise behaviors in low weight status individuals also have been linked to reduced levels of leptin in the brain. This hormone increases in inpatient populations as weight is regained and is associated with a decrease in motor restlessness (Hebebrand et al., 2003). Hebebrand’s research suggests that by artificially providing anorexic over-exercisers with leptin, clinicians may be able to end the over-exercising, or at least reduce the inherent drive for it. Another group of researchers have examined the neurological “reward” to hyperactivity at length and suggest that it is dopamine and hypothalamic orexin neurons that result in the reinforcing quality of exercise in malnourished populations (Scheurink, Boersma, Nergardh, & Sodersten, 2010).

Regardless of the exact neurochemical relationship between exercise and dieting behaviors, research on eating disordered populations supports the notion of a cyclical relationship, with one behavior directly affecting the other. Large proportions of patients with eating disorders report excessive exercise behaviors during the acute phase of their illness (Davis et al., 1997; Brewerton, Stellefson, Hibbs, Hodges, & Cochrane, 1995). Excessive or over-exercise has been defined as “intense exercising to control shape or weight on average at least five days a week” (Cooper, Taylor, Cooper, & Fairburn, 1987). Prevalence rates of reported over-exercising in anorexic populations range from 30 to 80%. These rates tend to be higher in anorexic populations versus bulimic populations (Hebebrand et al., 2003). The most concerning aspect of this relationship is that for most
individuals, high levels of exercise predate dieting behaviors, suggesting that exercise may play a causal role in the development of eating pathology (Davis, Kennedy, Ravelski, & Dionne, 1994; Hebebrand et al., 2003).

Davis, Kennedy, Ravelski, and Dionne (1994) examined differences in reported exercise behaviors in a sample of patients with eating disorders and a control group of individuals without eating disorders who were matched on age, sex, and race. The researchers found that patients with eating disorders retrospectively reported having engaged in higher levels of activity in their childhoods than the control group of non-disordered females. Of the eating disordered group, over 78% engaged in excessive exercise during their illness, and 75% reported an activity increase during the period of greatest food restriction. To further support the idea that exercise predates eating pathology, 60% reported being an athlete prior to disorder onset and 60% reported exercise at high levels before any dieting began. Although this research suggests that exercise may, in fact, act as a stepping stone towards eating pathology, one potential limitation of these findings is the retrospective nature of data collection; individuals with eating disorders may be biased towards remembering increased quantities of exercise even if they are inaccurate.

While the research comparing inpatients with eating disorders to non-disordered populations is intriguing, what is most disturbing with respect to the issue of exercise in the eating disorders are the findings of studies comparing exercising eating disordered groups to their non-exercising eating disordered counterparts. While both groups demonstrate disordered eating behaviors, eating disorder patients who engage in
excessive levels of exercise also demonstrate higher levels of drive for thinness, a core component to eating pathology (Solenberger, 2001). In addition, exercising patients with eating disorders also report lower body mass indexes and more anxiety and perfectionism than non-exercising patients with eating disorders (Shroff et al., 2006). Moreover, patients who exercise begin hospitalizations at younger ages (Shroff et al., 2006) and are hospitalized for significantly longer periods of time (Solenberger, 2001). These findings suggest that when exercise is part of the disorder, it is much more serious in nature.

In response to the increase in research on the topic, clinicians are beginning to understand the complex role of exercise in eating disorders. In fact, 84.8% of clinicians working with eating disordered patients report that they believe exercise to be an important aspect of the disorder (Hechler, Beumont, Marks, & Touyz, 2005). While excessive exercise is included as a compensatory weight control strategy in the DSM-IV TR (APA, 2000), it is rarely included in the treatment of eating disorders (Hechler, Beumont, Marks, & Touyz, 2005). This is unfortunate, as recent research suggests that when exercise is included in the treatment of eating disorders, more positive outcomes are found. Specifically, researchers have discovered that the inclusion of exercise in treatment results in greater overall patient compliance with treatment and does not negatively impact weight regain in any way (Thien, Thomas, Markin, & Birmingham 2000; Touyz, Lennerts, Arthur, & Beumont, 1993).

A recent study by Bratland-Sanda, Sundgot-Borgen, Rosenvinge, Hoffart, & Martinesen (2010) examined the impact of eating disorder treatment on excessive exercisers, specifically when that treatment involved work on exercise behaviors. The
researchers found that while the excessive exercisers did not significantly reduce their exercise behaviors over the course of treatment, there was a trend toward significance. Furthermore, as eating disordered psychopathology decreased in the excessive exercisers, these individuals reported a decrease in both exercise dependence and the belief that they needed exercise to manage negative affect. This latter finding is important because it highlights the affect regulation function of exercise for these women. Once they have gained alternative strategies for dealing with negative emotions, they are no longer so dependent on their exercise behaviors.

While there is an understanding that exercise and eating psychopathology are associated, the majority of this research is cross-sectional in nature and has utilized patients with eating disorders, generally inpatient populations. Few studies exist that examine the relationship between exercise and eating in non-clinical samples and few examine the direct effect of exercise performance on eating behaviors. One recent study examined the relationship of exercise and eating longitudinally over the course of one year (Dutton, Napolitano, Whiteley, & Marcus, 2008). These researchers examined whether encouraging the addition of exercise into one’s lifestyle with the goal of increasing exercise levels in their participants would be associated with changes in their eating behaviors. Participants were randomly assigned to either a physical activity program (programs designed to encourage exercise behaviors) or a wellness program (a program designed to target healthy behaviors unrelated to exercise, but including nutrition). Results suggested that attending a class designed to increase exercise behaviors was unrelated to making healthy changes to one’s diet. There were no
significant changes in the amount of fruits and vegetables in the participants’ diets and
participants actually increased in the amounts of fat consumed. Initially this seems to
contradict the theory of Epling and Pierce (1988); however, when the researchers
examined the “stage of change” of their participants with respect to exercise behaviors,
i.e., how committed they were to making the exercise changes, individuals in more
advanced stages of change reported significant changes to their eating habits. Individuals
in the “action” and “maintenance” stages of change reported significant increases in
consumption of fruits and vegetables. Since participants in these stages had actually
increased their exercise behaviors, it does seem that increases in exercise activity were
related to changes in eating habits.

Other studies have examined the immediate effects of exercise on eating
behaviors. Harris and George (2008) examined the impact of moderate intensity exercise
on the caloric intake of sedentary males. These researchers examined whether or not
energy intake (caloric intake) would match energy expenditure (from exercise) in
sedentary males. Specifically, they wanted to see if males would eat less than they
expended during exercise (a negative energy balance, eventually causing weight loss) or
more than they expended (a positive energy balance, eventually causing weight gain).
Participants engaged in either 60 minutes of exercise (walking on a treadmill) or 60
minutes of quiet rest, counterbalanced on two separate days. To measure caloric intake,
researchers observed eating habits during a meal provided immediately following
exercise and calculated approximate food consumed. Researchers noted no significant
difference in caloric intake between the two conditions. This suggests that one exercise
experience is not necessarily enough to change caloric intake, particularly in a male population.

A similar study found slightly different results in a female population of habitual exercisers (Finlayson, Bryant, Blundell, & King, 2009). This study empirically identified two groups, one whose post-exercise caloric intake was less or equal to what was expended during exercise (non-compensators), and one whose post-exercise caloric intake was greater than what was expended during exercise (compensators). In addition to higher post-exercise caloric intake, compensators reported that presented foods were more desirable post exercise than non-compensators. Compensators had significantly higher body mass indexes (BMIs) and percent body fat than non-compensators, and also reported significantly less frequency in their usual exercise behaviors. These results suggest that individuals who compensated for their caloric expenditure after exercise engaged in exercise much less frequently then those who ate less than what they expended during exercise. This is perhaps the result of the neurochemical or physiological properties of exercise previously discussed (Epling & Pierce, 1988; Hebebrand et al., 2003).

**Exercise and Body Dissatisfaction**

Research examining the relationship between exercise and body dissatisfaction yields discrepant findings. Some studies suggest that exercise is related to increased levels of body dissatisfaction (Imm & Pruitt, 1991; Matheson & Crawford-Wright, 2000), while others report that it is associated with lower levels of body dissatisfaction (Fisher & Thompson, 1994; Depick & Williams, 2004; Williams & Cash, 2001). A recent meta-
analysis including both experimental and correlational studies found that exercise is associated with significantly lower levels of body dissatisfaction (Hausenblas & Fallon, 2006). There are several possible explanations for the differences in findings. Characteristics of the population being examined or the type of exercise engaged in may impact the effects of exercise. For example, the Matheson and Crawford-Wright (2000) study examined a group of obligatory exercisers, individuals who exercise compulsively. These individuals may be more likely to experience body dissatisfaction than non-obligatory exercisers because their psychological attachment to exercise may be caused by an inherent body dissatisfaction. The Imm and Pruitt (1991) study examined high level exercisers compared to moderate or low level exercisers. Again, it may be that when individuals exercise at high frequencies they may be more likely to experience body dissatisfaction because of an increased amount of body focus. In addition, it may be that the frequency of exercise, intensity of exercise, or quality of exercise may be associated with different results.

Most of the research in this area has been conducted by Davis and her colleagues. They have found that while exercisers may not always endorse higher levels of body dissatisfaction than non-exercisers, they do consistently report higher levels of body focus and a greater importance of physical appearance in self-esteem (Davis & Fox, 1993; Davis et al., 1990) Furthermore Davis found that while BMI was related to weight preoccupation in a population of non-exercisers, subjective body shape beliefs were related to weight preoccupation in exercisers (Davis et al., 1990). In other words, feelings about how their body looks are more important than their actual weight status for
exercisers. Davis has investigated the hypothesis that high levels of exercise may enhance a type of “body narcissism,” and possibly an incorrect perception of body size. So as exercise levels increase, so does body narcissism and the possibility of developing body dissatisfaction. This would support the research that has found higher levels of body dissatisfaction in high level exercisers (Imm & Pruitt, 1991).

Although research on non-clinical populations has yielded conflicting findings regarding the relationship between exercise and various components of body image, the relationship in clinical populations is much clearer. In inpatient eating disordered populations, patients who exercise have been shown to demonstrate higher levels of body dissatisfaction (Davis, 1990) as well as higher levels of drive for thinness (Solenberger, 2001) than disordered individuals who do not exercise. In addition to disordered populations, general populations utilizing exercise as a compensatory behavior (in the same way as disordered populations) report higher levels of body dissatisfaction as well (LePage, Crowther, Harrington, & Engler, 2008).

**Exercise and Affect**

The majority of research on exercise and mood has shown that exercise is effective in reducing reported negative mood, including depression and anxiety, and increasing overall feelings of well-being and positive mood (Stephens, 1988; Annesi & Whitaker, 2008). With respect to the short term effects of exercise, i.e., the effects immediately following exercise behavior, research also suggests that exercise is related to reductions in negative affect and increases in positive affect (Berk, 2007). A recent meta-analysis found that exercise causes immediate significant increases in positive affect.
After just one session of aerobic dance, participants have been shown to report increases in vigor and decreases in anxiety, confusion, depression, and tension (McInman & Berger, 1993). Furthermore, numerous studies have found that one single exercise experience is also associated with increases in revitalization (Focht & Hausenblas, 2001; Rejeski, Gauvin, Hobson, & Norris, 1995) as well as positive engagement and tranquility, and decreases in anxiety (Focht & Hausenblas, 2001). Although the sample was relatively small, a recent study utilizing an ecological momentary approach to data collection found that individuals reported greater positive affect following physical activity episodes than following non-active episodes (during a ten-week measurement period) (Kanning & Schlicht, 2010). Medical researchers have shown that individuals experience an immediate improvement in their affect following exercise due to beta-endorphins (Morgan, 1982), changes in body temperature, distraction, and/or mastery experiences (Yeung, 1996). Thus, individuals experience positive physiological and psychological consequences as a result of exercising.

However, this positive mood enhancement is not found for all people. Research suggests that exercise may have different effects on mood depending on the characteristics of the exercisers and the exercise. Specifically, researchers have shown that exercisers who are “extremely fit” report less positive mood increases following exercise than those who are just moderately fit, even after accounting for pre-exercise differences (Choi, Van Horn, Picker, & Roberts, 1993). Thome and Espelage (2004) examined the impact of participant characteristics on the relationship between exercise and affect. They gave the Eating Attitudes Test (EAT-26), a well-known measure of
eating disorder pathology, to a group of high-level exercisers. They found that for high-level exercisers who scored in the upper tertile of the EAT-26, exercise was related to higher levels of negative affect. However, when Thome and Espelage examined the high-level exercisers who had scored in the lower tertile on the EAT-26, their exercise was associated with increased positive affect. This indicates that the presence of eating psychopathology moderates the relationship between exercise and affect. Other research suggests that age may impact the relationship between exercise and affect. After five minutes of cycling, older adults report significant decreases in revitalization (Focht, Knapp, Gavin, Raedeke, & Hickner, 2007), while younger populations have found increases in the same feeling state (Focht & Hausenblas, 2001; Rejeski, Gauvin, Hobson, & Norris, 1995).

With respect to exercise characteristics and mood, Steptoe and Cox (1998) found that mood response to exercise may be moderated by the intensity of exercise experiences. Specifically, they found that high intensity exercise was related to higher levels of tension, fatigue, and anxiety, while positive mood was found only after engaging in low intensity exercise. The location of exercise behaviors has also been identified as impacting the relationship of exercise and mood. One recent study examined the experiences of high social physique anxiety females in both public and private exercise environments (Focht & Hausenblas, 2006). These researchers found that these women reported increases in positive affective states following exercise in private environments and decreases in positive affective states following exercise in public environments. Another study examined the impact of exercising in front of a mirror or in
a non-mirrored room on the affect of sedentary females (Martin Ginis, Jung, & Gauvin, 2003). Individuals reported that they felt worse following exercise in the mirrored room than after exercising in the un-mirrored room.

Characteristics of Exercise

Several specific exercise characteristics have been identified as important elements in understanding the relationship of exercise to eating disordered beliefs and behaviors. These characteristics include exercise intensity, frequency, and type, and motivations for exercise. With respect to the intensity and frequency of exercise, it has been established by the APA (DSM-IV TR, 2000) that when exercise is excessive in nature, it is pathological. In fact, excessive exercise has been included in the list of compensatory behaviors utilized by individuals with eating disorders in the DSM-IV TR (APA, 2000). Individuals exercising at higher frequencies report greater body dissatisfaction and a more negative view of their body shape than individuals who do not exercise or individuals who exercise at only moderate levels (Imm & Pruitt, 1991).

Obligatory exercise has been proposed as a more appropriate descriptor for pathological exercise (Mond, Hay, Rodgers, & Owen, 2006). Obligatory exercisers are defined as individuals who continue to exercise regardless of any pain, illness or disruption to their work or social life (Polivy, 1994). Obligatory exercisers have a strong psychological attachment to their exercise behaviors and report significant guilt and shame when they are unable to exercise (Ackard, Brehm, & Steffen, 2002; Mond, Hay, Rodgers, & Owen, 2006). Therefore, obligatory exercise includes a frequency element as well as a compulsion or obligation to engage in the exercise act element. Obligatory
exercise has been shown to be highly associated with eating pathology (Adkins & Keel, 2005; Thome & Espelage, 2007). Furthermore, obligatory exercisers report higher levels of overall obsessive compulsiveness (Gulker, Laskis, & Kuba, 2001), perfectionism (Yates, Crago, Allender, & Shisslak 1994), and drive for thinness (Matheson, 2000).

Potentially the most important exercise characteristic for eating disorder researchers to examine is the specific motivations for exercise that an individual endorses. There are numerous measures designed to assess why an individual chooses to exercise, including the Reasons for Exercise Inventory (REI; Silberstein et al., 1988) and the Function of Exercise Scale (FES; Dibartalo, Lin, Monoya, Neal, & Shaffer, 2007). Based on data from these scales, researchers have concluded that there are between two and four primary motivations for exercise. Data based on the REI result in four major motivations for exercise, including exercising for appearance and weight reasons, exercising for fitness and health reasons, exercising for stress reduction and mood management, and exercising for social enjoyment reasons (Cash, Novy, & Grant, 1994; Silberstein, Mishkind, Striegal-Moore, Timko, & Rodin, 1988). Data based on the FES result in two primary motivations for exercise including exercising for weight and appearance reasons and exercising for health and enjoyment reasons. This second motivation for exercise includes elements from the latter three motivations of the REI (DiBartolo et al., 2007).

Regardless of the classification for motivations that one uses, when individuals are motivated to exercise for appearance or weight related reasons, their exercise is associated with more negative correlates and consequences (Cash, Novy, & Grant, 1994;
DiBartolo et al., 2007), and appearance and weight related reasons for exercise seem to be much more commonly endorsed reasons for exercise for women than for men (Tiggemann & Williamson, 2000). Individuals who engage in exercise for appearance or weight management reasons report more negative body images regardless of their actual BMI. They also endorse lower levels of body esteem and more self-objectification (Strelan, Mehaffey, & Tiggemann, 2003). Appearance motivated exercisers also show higher levels of body dissatisfaction (Silberstein, Mishkind, Striegal-Moore, & Timko, 1988; Strelan, Mehaffey, & Tiggemann, 2003; Tiggemann & Williamson, 2000) and more disregulated eating behaviors (Silberstein, Mishkind, Striegal-Moore, & Timko, 1988). They also exhibit higher frequencies of exercising (Cash, Novy, & Grant, 1994) and lower levels of self-esteem (DiBartolo et al., 2007; Furnham, Badmin, & Sneade, 2002; Strelan, Mehaffey, & Tiggemann, 2003; Tiggemann & Williamson, 2000) than individuals who indicate different motivations for exercise.

Recent findings by DiBartolo and colleagues (2007) suggest that weight and appearance motivations are associated with eating disorder symptomatology and are predictive of the later emergence of full blown eating disorders. In this particular study, researchers examined motivations for exercise and eating pathology at two times five months apart. Researchers concluded that in addition to the reported eating pathology endorsed at the first data collection time point, appearance and weight related reasons for exercise added significantly to predicting the development of an eating disorder at the second assessment. Finally, in addition to the eating specific correlates of appearance and
weight motivations for exercise, this study also found that these motivations were associated with greater depressive symptomatology.

In general, other motivations for exercise are associated with more positive correlates and consequences. Specifically, fitness and health motivations for exercise are related to less body dissatisfaction and eating disturbance and higher self-esteem and psychological well-being than other motivations for exercise (DiBartolo et al., 2007; Furnham et al., 2002; McDonald & Thompson, 1992; Strelan, Mehaffey, & Tiggemann, 2000; Tiggemann & Williamson, 2000.

While most individuals with fitness and health motivations experience these positive correlates, recent research (LePage & Crowther, 2010) suggests that not all individuals with these motivations experience positive consequences. LePage and Crowther utilized ecological momentary assessment to study the consequences of exercise in the moment. Individuals with high and low body dissatisfaction completed diaries at random times throughout the day, as well as immediately following exercise. They were also asked to complete a questionnaire assessing motivations for each exercise session. Results suggest that for the individuals with low body dissatisfaction, fitness and health motivations were associated with reductions in state body dissatisfaction, but for individuals with high body dissatisfaction, fitness and health motivations were associated with higher state body dissatisfaction levels. It is possible that for body dissatisfied women, fitness and health are so strongly associated with appearance and weight that these motivations have become entwined, thus resulting in the same psychological consequences. While this particular study examined body dissatisfied females, given the
strong correlation between body dissatisfaction and eating pathology, these results may
be applicable to a group of exercisers with eating disorders. Therefore, one might predict
that exercisers with eating disorders would endorse strong appearance and weight
motivations for exercise and may also experience increases in body dissatisfaction when
exercise occurs for those reasons.

While these findings are intriguing, given that motivations for exercise may be a
symptom rather than a cause of disordered eating behaviors, studies that can manipulate
motivations for exercise may facilitate our understanding of the impact of exercise
motivations. One study that attempted to do just that utilized fitness classes with leaders
either focusing on fitness and health benefits or focusing on weight and appearance
benefits to exercise (Raedeke, Focht, & Scales, 2007). In this study, the voiced
motivations of the leader were hypothesized to impact the motivations of the participants.
The leader accentuating appearance-related reasons for exercise wore tight fitting clothes
and made comments throughout the class related to how the exercise could change the
participants’ appearance. These statements included statements like “let’s get your legs
toned so they look good” and “burn calories.” The leader accentuating fitness and health
reasons for exercise wore loose fitting clothes and made statements throughout the class
like, “let’s get healthy.” The researchers found that when leaders focused on the fitness
and health consequences of the exercise, the participants reported higher levels of
positive affect, including greater arousal, positive engagement, revitalization, and less
exhaustion, than participants in the appearance and weight focused class.
In addition to exercise motivations, researchers have begun to focus on the possible effects of exercise type as well. Researchers have discovered that there are differences between the correlates and consequences of aerobic exercise and exercise focused on increasing overall strength and flexibility. Aerobic exercise includes behaviors such as running, jogging, bicycling, walking on an elliptical, climbing stairs or a stair stepper, and taking step aerobics classes. Exercise designed to increase overall strength and flexibility includes behaviors such as yoga, pilates, and weight lifting. The primary goal of aerobic exercise is caloric expenditure and increasing cardiovascular health. Aerobic exercise participation, especially jogging and running behaviors, has been shown to be correlated to higher levels of eating pathology (Richert & Hummers, 1986). It has also been related to a higher drive for thinness in eating disorder patients and longer hospitalizations (Solenberger, 2001). In contrast, exercise with a focus on gaining strength and flexibility appears to be associated with more positive correlates. Specifically, weight lifting has been found to be associated with reductions in social physique anxiety, increases in physical self-efficacy (Williams & Cash, 2001), and increases in body image satisfaction (Depick & Williams, 2004; Williams & Cash, 2001). Exercise intervention studies suggest that weight lifting interventions are associated with greater improvements in body image satisfaction than their aerobic counterparts (Tucker & Mortell, 1993). Currently, yoga is the most common type of exercise intervention used in the treatment of eating disorders (Hechler et al., 2005). Individuals who participate in yoga interventions report significant increases in their body satisfaction and reductions in
their disordered eating attitudes and self-objectification (a preoccupation with one’s physical appearance) (Daubenmier, 2005).

A recent study examined different types of exercise in a large sample of women and found that cardio-based workouts, both those done individually or in a group class environment, were associated with increased self-objectification, disordered eating behaviors, and poor body esteem (Prichard & Tiggemann, 2008). In addition, this study found that individuals engaging in these cardio-based workouts were more likely to endorse appearance or weight motivations for exercise than those engaging in other types of exercise. Furthermore, this study found that participation in yoga-based fitness classes was associated with lower self-objectification and that individuals participating in yoga classes as well as those engaged in weights-based fitness classes were more likely to endorse fitness and health motivations. Overall, exercise type seems to be a significant variable; however, it is unclear whether disordered populations simply seek out cardio-based exercise activities or if these activities are more likely to result in eating pathology.

The Present Study

The present study sought to answer several questions regarding the effects of exercise in women with and without eating disordered attitudes and behaviors. Specifically, this research examined the immediate impact of exercise on state body dissatisfaction, affect and desire for body change. This research also sought to better understand the delayed effects of exercise on caloric intake and the reciprocal effects of caloric intake on exercise behaviors. This study also examined whether group (the presence or absence of disordered eating attitudes and behaviors) moderated the
immediate effects of exercise on state variables and the delayed effects of exercise on eating behaviors and caloric intake. Furthermore, this study investigated the nature of the exercise engaged in by women with and without disordered eating attitudes and behaviors, including the frequency, intensity and duration of exercise, the type of exercise, and the motivations for exercise behaviors. Motivations for exercise were further examined to see if specific motivations moderated the effects of exercise on relevant outcome variables. Finally, group membership was examined as a possible moderator for the effects of different motivations for exercise on outcome variables.

The use of ecological momentary assessment allowed this research to examine relationships between exercise and eating in the naturalistic environment. Ecological momentary assessment is a data collection method in which individuals report their behaviors and emotions as they happen in the moment (Stone & Shiffman, 1994). The majority of research on the effects of exercise is collected retrospectively, possibly resulting in inaccuracy of reporting either from misremembering or forgetting of experiences, emotions, and thoughts. Ecological momentary assessment allows researchers to assess more accurately the effects of different behaviors, by minimizing the necessity for long term recall. The study employed exercise diaries so that participants could record their exercise behaviors as well as feelings about their exercise before and after they exercised. Thus, this research examined exercise behaviors and their immediate impact on affect, thoughts about body change behaviors, and state body dissatisfaction over a one-week period. Furthermore, participants were asked to complete food diaries, recording the type and quantity of food they consumed, the time and
location of their eating episode, people present, their mood at the time of consumption, and whether or not they considered what they ate to be a binge eating episode. This allowed the researcher to examine how eating changes as a result of exercise behaviors and vice-versa. Finally, at the end of each day, participants were asked to complete questionnaires assessing their general affect, body dissatisfaction, and feelings of wanting to change their body. This provided a comparison score for these variables for the day. In other words, it allowed the researcher to examine possible differences between general mood and pre- and or post-exercise mood. In addition these values allowed the researcher to compare average mood on non-exercising to exercising days. Ecological momentary assessment has been shown to be a valid method of collecting information about compensatory behaviors (in this case, exercise) (Stein & Corte, 2003). It has also been shown to be subject to little reactivity to measurement effects (LePage & Crowther, 2010). However, to assess for reactivity, individuals were asked to report the extent to which they felt their behaviors and thoughts changed as a result of completing daily diaries.

This study has the potential to make an important contribution to the field for several reasons. First, while studies have examined the quantity and nature of reported exercise behaviors in eating disordered populations, no study has examined the relationship of these behaviors to eating habits. It has been shown that eating disordered inpatients utilizing high levels of exercise demonstrate more significant eating pathology, especially with respect to their drive for thinness, length of hospitalization (Solenberger, 2001), body mass index, and levels of anxiety and perfectionism (Shroff et al., 2006).
However, we do not yet understand the implications of exercise for actual eating behaviors. It is possible that the associations between exercise and eating may be distinctly different for those with and without disordered eating attitudes and beliefs. It is also possible that among individuals with disordered eating attitudes and beliefs, the relationship between exercise and eating may differ based on the purpose of exercise for the individual (i.e. compensatory function or inhibitory function). Finally, this study allowed researchers to examine exercise behaviors in a population of individuals experiencing significant levels of eating disordered attitudes and behaviors, but not necessarily full blown disorders. This may have implications for our understanding of the potential pathogenesis of eating disorders, particularly as they relate to exercise, and may allow for the recognition of specific exercise risk factors that could be used for identifying at risk populations.

The following hypotheses were investigated:

Hypothesis 1: Given the association between exercise and eating disorders noted in inpatient and outpatient populations (Davis, Kennedy, Ravelski, & Dionne, 1994; Mond, Hay, Rodgers, Owen, & Beumont, 2004), it was hypothesized that participants with eating disordered attitudes and behaviors would engage in more frequent exercise behavior, a longer duration of exercise behavior, and more intense exercise than non-eating disordered participants. Furthermore, given the documented associations between motivations for exercise, type of exercise, and disordered eating behaviors, participants with eating disordered attitudes and behaviors would also report greater weight and shape motivations for exercise
than the non-disordered population and a higher frequency of cardiovascular types of exercise compared to other exercise types (Cash, Novy, & Grant, 1994; Solenberger, 2001). Non-disordered populations would report higher scores for all other motivations for exercise and equal amounts of cardiovascular and strength/flexibility related types of exercise.

Hypothesis 2: Given the association between disordered eating attitudes and beliefs and body dissatisfaction, depression, and desire for body change (Stice, 2002), it was hypothesized that participants with disordered eating attitudes and behaviors would show greater state body dissatisfaction, more thoughts about body change behaviors, less positive affect, and greater negative affect than non-disordered participants regardless of time of assessment.

Hypothesis 3: Given that exercise has been shown to be associated with immediate decreases in body dissatisfaction and negative affect and increases in positive affect (Hausenblas & Fallon, 2006; LePage & Crowther, 2010; Reed & Ones, 2006), it was hypothesized that all participants would experience decreases in state body dissatisfaction, thoughts about body change, and negative affect and increases in positive affect following exercise. However given the long term correlates of exercise in eating disordered populations (Solenberger, 2001; Thome & Espelage, 2004; Matheson & Crawford-Wright, 2000), it was hypothesized that group would moderate these effects with participants with eating disordered attitudes and behaviors experiencing smaller changes than those experienced by the non-disordered participants.
Hypothesis 4: Given that women with disordered eating attitudes and behaviors often use exercise to counteract the effects of their caloric intake (Crowther, Armey, Luce, Dalton, & Leahey, 2008), it was hypothesized that participants with eating disordered attitudes and behaviors would report significantly more negative moods, greater state body dissatisfaction, and more thoughts about body change behaviors on non-exercising days than on exercising days. Given that exercise is associated with increased psychological well-being (Stephens, 1988), it was hypothesized that non-disordered participants may experience similar differences but to a much less significant degree.

Hypothesis 5: Given the relationship between exercise motivations and body dissatisfaction and affect (Cash, Novy, & Grant, 1994; DiBartolo et al., 2007; LePage & Crowther, 2010), it was hypothesized that motivations for exercise would moderate the relationship between exercise and body dissatisfaction, thoughts about body change behaviors, and positive and negative affect, with higher levels of weight and appearance motivations for exercise resulting in greater body dissatisfaction, more thoughts about body change, and negative affect, and less positive affect for all participants.

Hypothesis 6: Given the findings that fitness and health motivations are associated with negative outcomes (LePage & Crowther, 2010), it was hypothesized that group membership would moderate the effects of fitness and health motivations on body dissatisfaction, thoughts about body change behaviors, and negative and positive affect. Specifically, given previous research (DiBartolo et al., 2007;
LePage & Crowther, 2010; McDonald & Thompson, 1992; Tiggemann & Williamson, 2000), participants without disordered beliefs and behaviors would experience less body dissatisfaction, thoughts about body change behaviors, and negative affect, and more positive affect when their exercise was motivated by fitness and health concerns, and participants with disordered beliefs and behaviors would experience more body dissatisfaction, thoughts about body change behaviors, and negative affect, and less positive affect when their exercise was motivated by fitness and health concerns.

In addition to the above hypothesis, the following research question was addressed:

Research Question 1: Participants with eating disordered attitudes and behaviors would demonstrate a relationship between their eating and their exercise. It was unclear how this relationship would manifest itself, but several possibilities were likely based on the function that the exercise might serve. First, it was possible that exercise would serve a compensatory function, with individuals following binge eating episodes or periods of excessive caloric intake with extreme exercise behaviors (APA, 2000). It was also possible that exercise would serve a permissive function, with exercise being followed by periods of greater caloric intake, due to a perception that exercise created a deficit in calories and the right to consume more (Finlayson, Bryant, Blundell, & King, 2008). Finally, it might have been that exercise would serve an inhibitory function in that it would suppress overall appetite, as suggested by Epling & Pierce’s “activity anorexia”
(1988). It was expected that non-disordered participants would show no significant relationships between their exercise behaviors and their eating behaviors.
CHAPTER II

METHOD

Participants

Approximately nine hundred female undergraduates completed the Eating Attitudes Test-26 (EAT-26; Garner, Olmstead, Bohr, & Garfinkel, 1982), a measure of disordered eating attitudes and behaviors, and provided information about their weekly frequency of exercise during a mass screening session for psychology undergraduates enrolled in courses which require study participation. Participants were selected if they reported engaging in exercise at least two days per week and had an EAT-26 score which placed them in either the upper or lower quartile for eating disordered attitudes and behaviors. The quartile cut off scores were approximately four or below for the low eating disordered group (LED) and 13 or above for the high eating disordered group (HED). Of the 305 eligible participants who were eligible for inclusion in the study, 95 responded affirmatively to an e-mail request for their participation in the present study.

Of the 95 women, 20 were not included in the final sample for the following reasons. One participant reported extremely low compliance on the Likert measure given at the end of data collection. Two participants completed less than 4 full days of data collection, while one participant did not return at all for the second session (follow-up) of
data collection. Two participants reported not fully understanding the study and reported not having correctly followed the instructions as a result.

The remaining 14 participants were excluded from the study because their scores on the EAT-26 changed from mass testing to the baseline session of data collection for the study (for 13) or they were diagnosed with an eating disorder based on their responses to the Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000) (for just one participant with an anorexia diagnosis). Nine participants who previously fell in the LED group at mass testing, reported scores at the baseline assessment somewhere in the middle range (>4 and <13). Four participants who previously fell in the HED range at mass testing reported scores at the baseline assessment that fell out of the HED range. These participants were removed so that only the upper and lower tertiles (according to the EAT given at the first data collection session, but using the cut points established at mass testing) were included in the final study. The remaining 75 participants included 46 who met criteria for the HED group and 29 who met criteria for the LED group. These participants had a mean age of 19.08 (SD=2.86), and 86.2% were Caucasian. The majority were in their first (68.4%) or second (18.4%) year of college. The average BMI for the population was 22.46 (SD=3.64) and BMI did not significantly differ between the HED (M=22.88, SD=3.82) and LED (M=21.79, SD=3.27) groups (t(74)=-1.27, p=.21). A paired samples t-test was run to compare individuals’ reported frequency of exercise per week at mass testing (M=2.68, SD=1.49) with the frequency with which they exercised over the course of the study (M=3.66, SD=1.57). The results suggest that participants
reported significantly more exercise behavior at mass testing then they actually engaged in during the course of the study \( t(72) = 4.32, p < .001 \).

**Procedure**

After completing informed consent, all participants who were invited and agreed to participate completed baseline measures in the laboratory. These measures included the EAT-26, which was re-administered to determine whether an individual’s score had changed significantly from their reported disordered eating attitudes and behaviors at mass testing. Additional baseline measures included questionnaires assessing eating pathology (the Eating Disorder Diagnostic Scale; EDD-S; Stice, Telch, & Rizvi, 2000) and body dissatisfaction (Body Shape Questionnaire; BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) (see Appendix A).

Participants in both groups were trained to complete the exercise and food diaries. All participants were also provided with written instructions. They were given these instructions to take with them should they need to refer to them throughout the course of the week. They were also given contact information for the principal investigator in case they had questions throughout the week not addressed by the written materials. Finally, participants were given a binder filled with their diaries and divided into two sections, exercise diaries and food diaries (see Appendix B and Appendix C for sample diaries).

Participants were instructed to complete diaries prior to exercise and following exercise. At both of these assessment times, they completed the State Self-Esteem Scale-Appearance Subscale (SSES), the Positive Affect, Negative Affect, and Guilt subscales of the Positive and Negative Affect Scale - Expanded Form (PANAS-X; Watson &
Clark, 1994), and the Body Change Inventory (BCI; McCable, Ricciardelli, & Banfield, 2001). Immediately before exercise, participants were also asked to complete the Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988; Silberstein, Mishkind, Striegel-Moore, Timko, & Rodin, 1989) and immediately after exercise they were asked to answer some questions assessing the amount and type of exercise they engaged in and the intensity of their exercise.

Participants also completed daily food diaries assessing when they ate, what they ate, where they ate, whether they ate alone or with other people, whether they experienced a binge eating episode (either subjective or objective), and their mood rating (reported on a 7 point Likert Scale from negative to positive). (See Appendix B for sample diary.) Participants were instructed to complete the diaries as close to the eating episode as possible in order to improve the accuracy of their self-report.

Finally, participants were asked to complete the SSES, BCI, and PANAS-X at the end of each day to assess their general mood and body dissatisfaction for that day. After completing the seven-day diary protocol, individuals returned to the laboratory where they completed the questionnaires assessing eating pathology (the Eating Disorder Diagnostic Scale; EDD-S) and body dissatisfaction (Body Shape Questionnaire; BSQ). They also answered questions regarding whether or not their beliefs or behaviors changed as a result of participating in the study in order to assess reactivity to diary completion. At this point, they returned their diaries and were debriefed as to the purpose of the study. Participants were awarded credits toward their general psychology research requirement for their participation. The number of credits awarded varied depending on the total
number of end of day assessments completed. Individuals who completed all of the end of the day assessments were awarded 10 credits in total, while participants who did not complete all of the end of day assessments were docked one credit for each missing day. After participants had turned in their materials and been told the number of credits they would be awarded, they were asked to fill out a compliance question to assess how compliant they were with following study instructions. Participants were informed that their responses to this question would in no way impact the number of points they were awarded.

**Measures**

**Baseline and Follow-up Measures**

*Disordered eating.* The Eating Attitudes Test -26 (EAT-26; Garner, Olmstead, Bohr, & Garfinkel, 1982) was used to measure the frequency of disordered eating behaviors and attitudes. The measure consists of 26 items assessing a wide range of disordered feelings and behaviors. Responses are given using a Likert-type scale (responses ranging from 0= *never, rarely, or sometimes*, 1= *often*, 2= *usually*, and 3= *always*). One item is reverse scored. Higher scores indicate greater reported disordered eating attitudes and behaviors. Some of the items from this measure include “am terrified about being overweight,” “like stomach empty,” and “feel extremely guilty after eating.” The measure has been shown to be reliable and valid (Garner, Olmstead, Bohr, & Garfinkel, 1982; Raciti & Norcross, 1987; Berland, Thompson, & Linton, 1986). The measure has been shown to demonstrate a strong correlation with both the original
Eating Attitudes Test and the Eating Disorder Inventory (Berland, Thompson, & Linton, 1986). Furthermore, the measure has been shown to demonstrate correlations to relevant variables, including dieting behaviors, body image dissatisfaction, and weight status (Koslowsky et al., 1992). The Cronbach’s alpha for the present sample was quite high, indicating excellent internal consistency ($\alpha=.91$). This measure was used as a selection tool as well as a baseline measure of pathology.

The Eating Disorder Diagnostic Scale (EDD-S; Stice, Telch, & Rizvi, 2000) is a 22-item self report measure that assesses anorexia nervosa, bulimia nervosa, and binge eating disorder symptoms. The scale can be used to diagnose individuals with these eating disorders as well as to assess subclinical symptomatology. The scale also generates a continuous score of general eating disorder symptomatology, with higher scores indicating greater eating disorder symptomatology. There are a variety of response formats for this scale including yes/no questions, frequency items (0 to 14), and 6-point scales (0=not at all to 6=extremely) assessing eating and body image disordered feelings. The scale has been shown to have excellent content validity, temporal reliability (kappa of .83), criterion validity (compared to an interview diagnosis, kappa of .80), and convergent validity with other validated eating disorder scales (Stice et al., 2000; Stice, Fisher, & Martinez, 2004). In addition to providing information for the reactivity analyses, this scale was also used to remove individuals from the LED group who met full diagnostic criteria for an eating disorder.

**Body dissatisfaction.** The Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper & Fairburn, 1987) is comprised of 34 items designed to assess an individual’s
worries about his/her body shape. The respondents use a 6-point Scale (1=never to 6=always) to rate how much they experience specific feelings, cognitions, or behaviors related to their body. Higher scores indicate higher levels of body dissatisfaction. The BSQ has shown excellent test-retest reliability with a correlation of .93 (Cooper et al., 1987). The BSQ is correlated with both the Eating Attitudes Test and the Eating Disorder Inventory (coefficients from .35 to .61) (Cooper et al., 1987). The BSQ has also been found to predict whether or not an individual has an eating disorder as determined by other self-report diagnostic measures. Reliability analyses using the present sample found a high Cronbachs’ alpha (α=.98) indicating excellent internal consistency.

**Reactivity and Compliance Questions**

Two questions assessing perceived reactivity were included in the follow-up assessment questionnaires. These questions were “How much did your thoughts and feelings change as a result of participating in this study?” and “How much did your behaviors change as a result of participating in this study?.” Participants responded to the items using a 5-point scale (1=not at all to 5=a lot).

One question assessing the accuracy with which one followed the instructions for the research study (compliance) was given following study completion. It consisted of a 5-point scale (1=never to 5=always) in respect to the frequency with which they followed the study instructions.
Diary Measures

The SSES, the BCI, and the PANAS-X were contained in the pre-exercise diaries, along with the REI. The BCI, SSES, and PANAS-X were included in the post-exercise diaries. The PANAS-X, SSES, and BCI were also included in the daily food diary for completion at the conclusion of each day in order to provide a general mood, body dissatisfaction, and body change desire for each day.

The Body Change Inventory (McCabe, Ricciardelli, & Banfield, 2001; Ricciardelli & McCabe; 2002) is an 18-item self-report questionnaire designed to assess body change strategies, specifically the desire to engage in particular strategies as a way of losing weight, gaining muscle or tone, or maintaining shape and size. Respondents rate how often they have thought about a list of body change strategies using a 5-point scale (1 = never to 5 = always). Items include “how often have you thought about exercising to decrease body size” and “how often have you felt like changing the foods you eat to decrease body size.” This measure was selected for use with this population because it specifically measures the desire to use exercise as a method of changing one’s body, a method believed to be of special significance for this population. The questionnaire consists of three body change scales, including scales assessing strategies to decrease body size, strategies to increase body size, and strategies to increase muscle size. The BCI has been shown to demonstrate internal consistency and significant content validity, construct validity, and concurrent and discriminant validity with relevant measures (Ricciardelli & McCabe, 2002).
The BCI was embedded in the diary with the following three types of instructions depending on the time of assessment: “Answer the following based on what you have been thinking about so far today” (for pre-exercise), “Answer the following questions based on what you were thinking about during exercise” (for post-exercise), and “Answer the following questions based on how you’ve generally thought today” (for the end of the daily food diary). For data analyses, only the subscale with strategies to decrease body size was used. Very few participants reported using strategies for body increase of any kind, and body decrease strategies are more relevant for a population of exercisers with eating pathology. Two smaller scales were derived from this larger one so that the researcher could independently assess the participants’ desire to use eating as a method of body change and exercise as a method of body change. The first scale assessed the frequency of reported thoughts of changing eating to decrease body shape or weight and consisted of three items (Items 1, 2, and 5). The reliability estimate of this measure was .95. The second scale assessed the frequency of reported thoughts of changing exercise behaviors to decrease body shape or weight and consisted of three items (Items 3, 4, and 6). The reliability estimate of this measure was .96.

The State Self-Esteem Scale (SSES; Heatherton, & Polivy, 1991) is a 20 item self-report questionnaire designed to measure state self-esteem. The measure was designed to be sensitive to temporary shifts in self-esteem due to the experience of some environmental experience or laboratory manipulation. The scale was developed using items from the Janis-Field Feelings of Inadequacy Scale (Janis & Field, 1959), a widely used multi-dimensional measure of self-esteem. Respondents rate their present agreement
with statements about the self on a 5-point scale (1 = not at all to 5 = extremely). With reference to reliability, the SSES has an internal consistency coefficient of .92 for the entire test and an average test-retest correlation of .71. This test-retest correlation is larger than that of general mood, which suggests that the SSES is more stable than mood shifts. The SSES shows excellent convergent validity with measures such as the Rosenberg Self-Esteem Scale (Linton & Marriott, 1996; Heatherton & Polivy, 1991).

A factor analysis of the SSES revealed 3 distinct factors of self-esteem: performance, social, and appearance (Heatherton, & Polivy, 1991). In this study, only the appearance subscale of the SSES was used as a measure of overall body satisfaction or body esteem, with higher scores indicating greater body dissatisfaction. The appearance subscale is highly correlated with respondent’s current satisfaction with their figure as well as dieting behavior, social anxiety, and body size estimation (Heatherton, & Polivy, 1991). The SSES was embedded in the diary with the following three types of instructions depending on the time of assessment: “Answer the following based on how you currently feel” (for pre-exercise), “Answer the following questions based on how you have felt since completing exercise” (for post-exercise), and “Answer the following questions based on how you have felt in general today” (for the end of the daily food diary). In this sample the reliability estimate for the SSES was .94.

**Positive and negative affect.** The Positive and Negative Affect Scale – Expanded Form (PANAS-X; Watson, & Clark, 1994) is a 60-item self-report questionnaire assessing the type and intensity of emotions a person is experiencing at the assessment
time. Respondents rate how much they are feeling the emotion on a 5-point scale (1 = very slightly or not at all to 5 = extremely). Higher scores indicate more negative or positive affect, respectively. The scale was expanded from the original PANAS (Watson, Clark, & Tellegen, 1988) to include emotions beyond the simple positive and negative affect factors of the original. The original 10-item positive and 10-item negative affect scales have been shown to be internally consistent and have high test-retest reliability (Watson, Clark, & Tellegen, 1988; Huebner & Dew, 1995; Crawford & Henry, 2004). The PANAS-X has also been shown to have good criterion validity, with the negative affect scale correlated to measures of external locus of control and the positive affect scale correlated to internal locus of control (Hensen, & Chang, 1998). In this sample, the positive affect scale had a reliability estimate of .88, while the negative affect scale had a reliability estimate of .92. The guilt subscale of the PANAS-X consists of six items and has been shown to be internally consistent and have high test-retest reliability (Watson, Clark, & Tellegen, 1988; Huebner & Dew, 1995). In this sample, the guilt subscale had a reliability estimate of .94. For the purposes of this study only the positive affect, negative affect, and guilt subscales of the questionnaire will be included, leaving a total of 24 items.

Motivation for exercise. The Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988; Silberstein, Mishkind, Striegel-Moore, Timko, & Rodin, 1989) is a 25-item self-report questionnaire assessing the respondent’s perceived reasons for engaging in physical activity. Individuals report how important each reason
for exercise was/is for them on a 7-point scale (1 = not at all important to 7 = extremely important). This measure was embedded in the pre-exercise diary to provide information on the respondent’s reasons for exercising on that particular exercise session.

A factor analysis of the original measure (with the addition of the 25th item) revealed four distinct factors (Cash, Novy, & Grant, 1994). The factors include Fitness/Health Management motivations, Appearance/Weight Management motivations, Stress/Mood Management, and Socializing. Higher scores on these factors indicate greater endorsement of those specific reasons for exercising. The four factors have internal consistency coefficients ranging from .73 to .91. The REI has been shown to have good validity, with individuals who indicate more appearance motivated reasons for exercise exhibiting more body dissatisfaction, body image distress (Cash, Novy, & Grant, 1994), and disordered eating behaviors (Silberstein, et al., 1988). Individuals who indicate exercising for more Fitness/Health Management motivations for exercise report less disordered eating and greater self-esteem (Furnham, 2002). In this sample, the reliability estimates for appearance and weight motivations and fitness and health motivations for exercise were .84 and .85 respectively.

In addition to the PANAS-X, the SSES, and the BCI, the post-exercise exercise diary (see Appendix B) contained questions regarding the duration, type, and intensity of exercise. For every exercise session, up to three types of exercise could be reported and rated for intensity on a 6-point scale (1 = least intense to 6 = most intense). The respondents were instructed to focus on the three types of exercise they spent the most time doing.
Statistical Analyses Program

The majority of the proposed hypotheses were analyzed using Hierarchical Linear Modeling (HLM). HLM is an effective method of statistical analysis when several data points from the same person, i.e., repeated measures, are an issue. Most statistical analyses require independent observations that do not allow researchers to answer questions for which repeated measures is a necessity. Furthermore, HLM allows researchers to draw conclusions about cross-level interactions (Osborne, 2000). In this case, HLM allowed the researcher to examine intra-individual differences among individuals in separate groups (high and low disordered eating attitudes and behaviors). Specifically, HLM allowed the examination of how exercise may impact state body dissatisfaction, desire for body change, positive affect, negative affect, guilt, and whether an individual’s level of disordered eating attitudes and behaviors moderated these changes. So, HLM can be used to model between-subject moderators of within-subject relationships. In other words, it examines whether intra-individual variables (i.e., body dissatisfaction, desire for body change, affect) are related to between-person characteristics (i.e., high or low disordered eating attitudes and behaviors). HLM was also used to examine the effects of moderators within individuals, for example, motivations for exercise.

One of the major assumptions of HLM is that there is a sufficient sample to maintain adequate power (Bryk & Raudenbush, 1992). For longitudinal data, investigators suggest that each participant have at least three time points of data (Kreft,
One of the benefits of HLM is that it allows for unequal numbers of data points for each individual. Some individuals may have only one or two exercise data points, while others may have many more. Despite being pre-selected for exercise frequency, the number of exercise sessions varied in the current sample and HLM can manage these differences.
CHAPTER III

RESULTS

Quality Analyses

To assess the quality of the data provided by the participants who met inclusion criteria, several analyses were performed. Frequency statistics were calculated to determine the number of useable days of data provided. Participants with less than four completed days of data were not included in the analyses, as was noted in the Participants section of the Methods. Of the remaining 75 participants, two people (2.67%) supplied four days of usable data, two (2.67%) supplied five days, ten (13.33%) supplied six days, and the remaining 61 (81.33%) participants completed all days of data collection. With respect to exercise sessions, all but five of the 75 included participants with usable data exercised at least once during the data collection period. Eight participants exercised only one time during the measurement period and the remaining 62 participants exercised on multiple days. The average number of exercise sessions reported was 2.72 (SD=1.54).

There were no significant differences between the two groups on the number of completed days of data (HED: $M=7.21$ [SD=.15], LED: $M= 7.18$ [SD=.27]; $t(72)=-.10$, $p = .92$) or completed exercise questionnaires (HED: $M=2.65$ [SD=1.38], LED: $M= 2.86$ [SD=1.86], $t(74)=.923$, $p=.36$). Differences between the groups were also assessed on all of the measures with independent sample t-tests (see Table 1).
Table 1

*Descriptive Statistics for Demographic and Psychosocial Variables at Baseline Separated by Group*

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Significance Level</th>
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<tbody>
<tr>
<td>Age</td>
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<tr>
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</tr>
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<tr>
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<tr>
<td>Eating Attitudes Test</td>
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<td>4.57</td>
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<tr>
<td>EDDS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>HED</td>
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<td>BSQ</td>
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<td>124.17</td>
<td>30.48</td>
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<tr>
<td>LED</td>
<td>65.14</td>
<td>17.17</td>
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</table>

*BMI= Body Mass Index, EDDS= Eating Disorder Diagnostic Scale symptomatology subscale, BSQ= Body Shape Questionnaire*
Following completion of the study, participants were asked to report on a Likert scale (1 (never) to 5 (always)) how compliant they were in following instructions for the study. Participants who reported anything below a three (sometimes) were removed from the study (only one person). Seven participants (9.3%) reported that they were sometimes compliant, 29 (38.67%) reported that they were always compliant, and 40 (53.33%) reported that their compliance fell between sometimes and always. There were no group differences on reported compliance (HED: $M = 4.29 \ [SD= .58]$, LED: $M =4.29 \ [SD=.71]$, $t(74)=.226, p=.82$).

In order to assess reactivity to the diary protocol, several analyses were performed. Participants were asked to report how much they felt they changed their thoughts and behaviors on two separate Likert scales, ranging from 1 (not at all) to 5 (a lot). With reference to behavior change, 26.3% of participants reported no behavior change, 28.9% reported a small amount of behavior change, 34.2% reported that they changed their behaviors somewhat, and the remaining 7.9% reported that their behaviors changed significantly (4 or 5). With reference to changes in thoughts, 35.5% reported little to no change in their thoughts (1 or 2), 40.8% reported that their thoughts changed somewhat, and the remaining 21% reported that their thoughts had changed significantly (4 or 5). There were no group differences on reported behavior (HED: $M =2.31 \ [SD=1.02]$, LED: $M=2.15 \ [SD=.91]$, $t(72)=-.533, p=.60$) or thought change (HED: $M=2.72 \ [SD=.97]$, LED: $M=2.74 \ [SD-1.23]$, $t(72)=.351, p=.73$).

Participants were given a measure of eating pathology (the EAT-26) and a measure of body dissatisfaction (the BSQ) before and after the week-long diary protocol.
To assess for reactivity, a 2 X 2 (group by assessment time) mixed design ANOVA was conducted to determine whether reported eating pathology changed from baseline to follow-up and whether or not the groups differed in respect to their change in reported eating pathology from baseline to follow-up. There was a significant main effect for group membership (LED: $M = 4.68, SE = 1.66$; HED: $M = 23.75, SE = 1.27$, $F(1,74) = 83.71, p<.001$), indicating that HEDs reported more eating pathology regardless of time of assessment than LEDs. However, the main effect for assessment time ($M = 16.57, SE = 13.02$ and $M = 16.88, SE = 13.17$; $F(1,74) = .55, p = .46$) and the group by assessment time interaction were not significant (LED Baseline: $M = 3.96, SE = 4.57$; LED Follow-up: $M = 5.39, SE = 4.95$; HED Baseline: $M = 23.92, SE = 10.43$; HED Follow-up: $M = 23.58, SE = 11.72$; $F(1,74) = 1.42, p = .24$). A similar 2 X 2 (group by assessment time) mixed design ANOVA was using reported body dissatisfaction as the dependent measure. There was a significant main effect for BSQ score by assessment time ($M = 94.66, SE = 3.14$ and $M = 89.02, SE = 3.10$; $F(1,74) = 9.57, p<.01$), indicating that body dissatisfaction decreased from baseline to follow-up. There was also a significant main effect for group membership (LED: $M = 63.36, SE = 4.74$; HED: $M = 120.31, SE = 3.62$, $F(1,74) = 9.57, p<.01$), indicating that HEDs reported more body dissatisfaction regardless of time of assessment than LEDs. However, the group by time interaction was not significant (LED Baseline: $M = 65.14, SE = 4.99$; LED Follow-up: $M = 61.57, SE = 4.92$; HED Baseline: $M = 124.17, SE = 3.81$; HED Follow-up: $M = 116.46, SE = 3.76$, $F(1,74) = 1.29, p = .26$), suggesting that group membership was not associated with a difference in the change in BSQ score from baseline to follow-up.
Finally, the end of day assessments for all participants were examined using Hierarchical Linear Modeling to determine if reported body dissatisfaction, exercise thoughts, eating thoughts, and affect changed significantly during the week-long data collection process. The following equation was used for the HLM analyses performed with each variable of interest as a separate outcome variable for the full sample.

$$\gamma = P_0 + P_1(Day) + E$$

$$P_0 = \beta_{00} + R_0$$

$$P_1 = \beta_{10}$$

To assess for group differences in the reactivity to measurement over the week, additional HLM analyses were conducted with group added as a Level-2 variable. The following equation was used to examine group impact on reactivity as expressed on each of the different outcome variables.

$$\gamma = P_0 + P_1(Day) + E$$

$$P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0$$

$$P_1 = \beta_{10} + \beta_{11} \text{ (ED group)}$$

To examine change in body dissatisfaction over the week, the SSES was included in the analyses as a Level-1 outcome variable and the day of assessment was included as a Level-1 variable. Body dissatisfaction did not change significantly across the week when examined in the full sample ($\beta_{00}=15.87$ [SE=.56], $\beta_{10}=.00$ [SE=.06], $t(517)=.02$, $p=.98$), but when group was added as a Level-2 moderator variable, differences were discovered. LEDs showed significant increases in body dissatisfaction as the week progressed ($\beta_{00}=12.13$ [SE=.54], $\beta_{10}=.19$ [SE=.08], $t(515)=2.34$, $p<.05$) and there was a
significant difference between the groups on the size of this effect, with HEDs showing
significantly less of an increase in body dissatisfaction as the week progressed \((\beta_{11} = -0.30 \ [SE=.12], \ t(515) = -2.56, \ p<.05)\). To examine whether or not HEDs were experiencing a
statistically significant decrease in body dissatisfaction across the week, the analyses
were re-run with the group variable dummy coded in the opposite way (HEDs=0 and
LEDs = 1). HEDs did not report a significant decrease in body dissatisfaction across the
week \((\beta_{00}=18.09 \ [SE=.65], \beta_{10} = -0.13 \ [SE=.10], \ t(485)=2.34, \ p=.17)\). To examine change
in eating and exercise thoughts, separate analyses were run with thoughts of changing
one’s body through eating and exercise as separate Level-1 outcome variables. There
were no significant changes in either type of thought over the course of the week, even
when group was added as a Level-2 moderator (all \(p>.05\)).

To examine change in affect over the course of the week, positive affect, negative
affect, and guilt were examined independently as Level-1 outcome variables. Reported
positive affect decreased significantly over the course of the week when all participants
were examined \((\beta_{00}=29.03 \ [SE=.93], \beta_{10} = -0.49 \ [SE=.12], \ t(517) = -3.99, \ p<.001)\), and
there were no group differences when group was added as a Level-2 moderator variable
\((\beta_{11} = 0.11 \ [SE=.26], \ t(515) = 0.42, \ p=.68)\). Reported negative affect also decreased over the
course of the week \((\beta_{00}=18.21 \ [SE=.93], \beta_{10} = -0.28 \ [SE=.13], \ t(517) = -2.07, \ p<.05)\); when
group was added as a Level-2 moderator, there were significant differences between the
groups on the change in negative affect over the course of the week \((\beta_{00}=14.24
[SE=1.05], \beta_{10} = 0.06 \ [SE=.19], \ t(484)=3.31, \ p=.75, \beta_{11} = -0.60 \ [SE=.27], \ t(484)= -2.28,
\ p<.05)\). LEDs showed no significant change in negative affect over the course of the
week and HEDs showing a significantly different change in slope. To examine whether or not HEDs were experiencing a statistically significant decrease in negative affect across the week, the analyses were re-run with the group variable dummy coded in the opposite way (HEDs=0 and LEDs = 1). HEDs reported a significant decrease in negative affect across the week ($\beta_{00}=20.74$ [SE=1.26], $\beta_{10}=-.55$ [SE=.19], $t(484)=-2.89$, $p<.01$).

No significant change in guilt was discovered when the entire sample was examined ($\beta_{00}=10.44$ [SE=.69], $\beta_{10}=-.14$ [SE=.08], $t(517)=-1.76$, $p=.08$); however, when group was added as a Level-2 moderator variable, differences between the groups emerged. There were significant differences between the groups on the change in guilt over the course of the week ($\beta_{00}=6.75$ [SE=.38], $\beta_{10}=.10$ [SE=.09], $t(485)=1.16$, $p=.25$, $\beta_{11}=-.37$ [SE=.15], $t(485)=-2.44$, $p<.05$) with LEDs showing no significant change in negative affect over the course of the week and HEDs showing a significantly different slope in change. To examine whether or not HEDs were experiencing a statistically significant decrease in guilt across the week, the analyses were re-run with the group variable dummy coded in the opposite way (HEDs=0 and LEDs = 1). HEDs reported a significant decrease in guilt across the week ($\beta_{00}=12.52$ [SE=.95], $\beta_{10}=-.27$ [SE=.13], $t(485)=-2.16$, $p<.05$).

**Hypothesis One**

Hypothesis 1 stated that HEDs would engage in more frequent exercise behavior, longer duration of exercise behavior, and more intense exercise than LEDs. Frequency of exercise was determined by summing the total number of reported exercise sessions for each participant during the data collection period. Intensity of exercise was reported by
each participant on a 5-point scale from 1 (not at all intense) to 5 (extremely intense). Since participants could report intensity scores for up to three different types of exercise each time they filled out an exercise diary, an intensity value for each exercise session was created by calculating a weighted average intensity score, with intensity values weighted by the percent of total time spent doing that intensity exercise. Finally, duration of exercise was determined by the reported total time spent exercising for each exercise questionnaire.

To assess group differences in frequency of exercise, an independent samples t-test was run, and no significant differences were found, (HED: $M=2.65 \ [SD=1.38]$, LED: $M=2.86 \ [SD=1.86]$, $t(74)=.923, p=.36$). Hierarchical Linear Modeling (HLM) was used to assess differences between the groups on reported intensity of exercise and the reported duration of exercise. Each participant reported the duration and intensity of her exercise following every exercise session, thus providing multiple data points per person for these analyses. Two separate HLM analyses were run with intensity of exercise and reported duration of exercise as outcome variables and group as a Level Two variable. The following equation was used for both analyses.

$$\gamma = P_0 + E$$

$$P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0$$

There were no significant differences between the groups on intensity of exercise ($\beta_{00}=3.46, SE=.13, \beta_{01}=.09, SE=.15, t(63)=.531, p=.597$). There were also no significant differences between the groups on reported duration of exercise ($\beta_{00}=83.12, SE=11.10, \beta_{01}=-6.24, SE=14.14, t(63)=-.463, p=.645$).
Hypothesis 1 also posited that compared to LEDs, HEDs would report greater weight and shape motivations for exercise and a greater frequency of cardiovascular types of exercise compared to strength focused exercises; in contrast, LEDs were expected to report higher scores for all other motivations for exercise and comparable frequencies of cardiovascular and strength/flexibility related types of exercise. HLM analyses were run to examine differences in the reported exercise motivations of the groups. Four separate analyses were run with scores on the Fitness and Health subscale of the REI, scores on the Appearance and Weight Subscale, scores on the Stress and Mood Management subscale, and scores on the Social subscale as dependent variables and group membership as a Level Two variable. The following equation was used for each analysis, with the appropriate outcome variable.

\[ \gamma = \beta_0 + R \]

\[ \beta_0 = G_{00} + G_{01} \text{ (ED group)} + U_0 \]

Significant differences were found between the groups on the Appearance and Weight subscale of the REI (\(G_{00} = 27.51, SE=1.64, G_{01}=13.48, SE=2.13, t(63)=6.32, p<.001\)), indicating that HEDs reported more appearance and weight related reasons for exercise than women in the LED group. There were no significant differences found on the Fitness and Health subscale (\(G_{00} = 37.13, SE=1.74, G_{01}=-.05, SE=2.37, t(63)=-.02, p=.98\)), the Stress and Mood Management subscale (\(G_{00} = 13.96, SE=1.03, G_{01}=.73, SE=1.33, t(63)=.55, p=.59\)), and the Social subscale (\(G_{00} = 7.36, SE=.76, G_{01}=-.55, SE=.89, t(63)=-.62, p=.54\)), indicating that women reported similar levels of these motivations regardless of their level of eating pathology.
Analyses examining group differences in the type of exercise (cardiovascular oriented exercise versus strength oriented exercise) were unable to be run due to the small number of reported exercise sessions with only one type of exercise. With respect to strength only exercise, 62 of the participants reported no sessions with just strength exercises, 11 people had one reported exercise session that was strength only and 3 people had two reported exercise sessions that were strength only. With respect to cardiovascular oriented exercise, 41 people reported no sessions that were cardiovascular only, 11 people reported one session that was cardiovascular oriented only, 14 people reported two sessions, 5 people reported 3 sessions, and 4 people reported 3 sessions that were strength only. The majority of participants reported engaging in both types of exercise at the same time. Since participants could report up to 3 different types of exercise, analyses were run to determine if HEDs were more likely to report more types of exercise per session. Specifically, an HLM analysis was run with number of types of reported exercise as the dependent variable and group as a Level 2 variable. The following equation was used.

\[ \gamma = P_0 + E \]

\[ P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0 \]

No significant differences between the groups were found (\( \beta_{00} = 2.12, SE = .13, \beta_{01} = .08, SE = .17, t(63) = .439, p = .66 \)).

**Hypothesis Two**

Hypothesis 2 stated that HEDs would show greater state body dissatisfaction, more thoughts about body change behaviors, less positive affect, and greater negative
affect and guilt than LEDs regardless of time of assessment. To assess this, separate HLM analyses were run for each dependent variable. The dependent variables were entered as Level-1 outcome variables and group (high or low eating disordered) was entered as a Level-2 variable. The following equation was used for all of the analyses, with the variable of interest as the outcome variable.

\[ \gamma = P_0 + E \]

\[ P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0 \]

Significant differences were found between the groups on all of the dependent variables. Compared to LEDs, HEDs reported more body dissatisfaction regardless of time of assessment \((\beta_{00} = 13.23, SE=.59, \beta_{01}=4.46, SE=.81, t(73)=5.48, p<.001)\), more eating thoughts \((\beta_{00} = 5.99, SE=.49, \beta_{01}=4.47, SE=.61, t(73)=7.37, p<.001)\) and more exercise thoughts \((\beta_{00} = 6.69, SE=.55, \beta_{01}=4.38, SE=.65, t(73)=6.76, p<.001)\). HEDs reported lower levels of positive affect \((\beta_{00} = 29.26, SE=1.17, \beta_{01}=-3.06, SE=1.49, t(73)=-2.05, p<.05)\) and higher levels of both negative affect \((\beta_{00} = 13.89, SE=.61, \beta_{01}=3.62, SE=1.07, t(73)=3.38, p<.01)\) and guilt \((\beta_{00} = 7.06, SE=.29, \beta_{01}=3.84, SE=.78, t(73)=4.92, p<.001)\) than LEDs.

**Hypothesis Three**

Hypothesis 3 stated that all participants would experience decreases in state body dissatisfaction, exercise thoughts, eating thoughts, and negative affect and guilt, and increases in positive affect following exercise. To assess this, six separate HLM analyses were run with each of the variables of interest as a Level-1 outcome variable and time of
assessment (pre or post exercise) as a Level-1 variable. The following equation was used for these analyses with the variable of interest as the outcome variable.

\[
\gamma = P_0 + P_1(\text{Pre or Post Exercise}) + E
\]

\[
P_0 = \beta_{00} + R_0
\]

\[
P_1 = \beta_{10}
\]

Significant differences were found for the impact of exercise on reported body dissatisfaction ($\beta_{00} = 17.18$, $SE = 1.29$, $\beta_{01} = -1.15$, $SE = .29$, $t(356) = -3.97$, $p < .001$), with participants reporting a decrease in body dissatisfaction following exercise. Significant differences were also found for the impact of exercise on negative affect ($\beta_{00} = 18.01$, $SE = 2.53$, $\beta_{01} = -1.54$, $SE = .63$, $t(356) = -2.44$, $p < .05$) with participants reporting a decrease in negative affect following exercise. Significant differences were not found for the impact of exercise on exercise thoughts ($\beta_{00} = 8.35$, $SE = .77$, $\beta_{01} = -.25$, $SE = .19$, $t(356) = -1.36$, $p = .18$), eating thoughts ($\beta_{00} = 4.88$, $SE = 1.27$, $\beta_{01} = .48$, $SE = .35$, $t(356) = 1.36$, $p = .17$), positive affect ($\beta_{00} = 23.85$, $SE = 4.99$, $\beta_{01} = 1.72$, $SE = 1.32$, $t(356) = 1.30$, $p = .19$) or guilt ($\beta_{00} = 8.19$, $SE = 1.24$, $\beta_{01} = -.35$, $SE = .29$, $t(356) = -1.21$, $p = .23$).

Analyses were also run to determine if group membership (high or low eating disordered) moderated the impact of exercise on body dissatisfaction, eating thoughts, exercise thoughts, negative affect, positive affect, or guilt. Separate analyses were run with each of the variables as a Level-1 dependent variable, time of assessment (pre or post exercise) as a Level-1 variable, and group membership as a Level-2 moderating variable. The following equation was used for each of these analyses.
\[ \gamma = \beta_0 + \beta_1(\text{Pre or Post Exercise}) + R \]

\[ \beta_0 = G_{00} + G_{01} + U_0 \]

\[ \beta_1 = G_{10} + G_{11} \text{ (ED group)} \]

Group membership did not moderate the relationship for body dissatisfaction
\((G_{00} = 17.18, SE=1.29, G_{10}=-1.15, SE=.40, G_{11}=-.40, SE=.48, t(356)= -.84, p=.40)\),
exercise thoughts \((G_{00}= 8.35, SE=.77, G_{10}=-.25, SE=.19, G_{11}=44, SE=.28, t(356)= 1.57, p=.12)\), eating thoughts \((G_{00}= 4.88, SE=1.27, G_{10}=.48, SE=.35, G_{11}=-.58, SE=.43, t(356)= -1.35, p=.18)\), negative affect \((G_{00} = 18.01, SE=2.53, G_{10}=-1.54, SE=.63, G_{11}=-.55, SE=.85, t(356)= -.64, p=.52)\), or positive affect \((G_{00} = 23.85, SE=4.99, G_{10}=1.72, SE=1.32, G_{11}=2.27, SE=1.61, t(356)= 1.41, p=.16)\). Group status moderated the impact of exercise on guilt \((G_{00}= 8.19, SE=1.24, G_{10}=-.35, SE=.29, G_{11}=-1.00, SE=.46, t(356)= -2.19, p<.05)\), with HEDs reporting a larger decrease in guilt following exercise behaviors than LEDs.

**Hypothesis Four**

Hypothesis 4 stated that all participants would report overall more negative moods at the end of the day (less positive affect and more negative affect and guilt) on non-exercising days than on exercising days as well as higher levels of body dissatisfaction and more exercise and eating thoughts, but that these effects might be significantly less for non-disordered participants. To assess this hypothesis, six separate HLM analyses were run with each of those variables as a separate dependent variable. Day of measurement (exercise day or non-exercise day) was added as a Level-1 variable.
The following equation was used for each of these analyses.

\[ \gamma = P_0 + P_1(\text{Exercise day or non-exercise day}) + E \]

\[ P_0 = \beta_{00} + R_0 \]

\[ P_1 = \beta_{10} \]

Significant differences were found for positive affect (\( \beta_{00} = 26.53, SE = .82, \beta_{10} = 1.41, SE = .72, t(517) = 1.96, p < .05 \) and negative affect (\( \beta_{00} = 17.41, SE = .75, \beta_{10} = -1.95, SE = .47, t(517) = -2.01, p < .05 \)), indicating that participants reported more positive affect and less negative affect on exercising days than non-exercising days. Significant differences were also found for the impact of day on exercise thoughts (\( \beta_{00} = 8.94, SE = .39, \beta_{10} = .58, SE = .19, t(517) = 2.96, p < .01 \)), with individuals reporting more thoughts of exercising to decrease their body shape and weight on exercise days than on non-exercise days. There were no significant differences found for the impact of day (exercise or non-exercise) on body dissatisfaction (\( \beta_{00} = 16.04, SE = .51, \beta_{10} = -1.73, SE = .27, t(517) = -1.73, p = .08 \), guilt (\( \beta_{00} = 9.96, SE = .58, \beta_{10} = -1.08, SE = .32, t(517) = -1.08, p = .28 \), or eating thoughts (\( \beta_{00} = 8.58, SE = .39, \beta_{10} = .04, SE = .19, t(517) = .21, p = .83 \)).

To examine whether or not group membership (high or low eating disordered) moderated the impact of day (exercise or non-exercise), the same HLM analyses were run with group added as a Level-2 moderator variable.

\[ \gamma = \beta_0 + \beta_1(\text{Exercise or non-exercise day}) + R \]

\[ \beta_0 = G_{00} + G_{01} + U_0 \]

\[ \beta_1 = G_{10} + G_{11} \text{ (ED group)} \]
Group was a significant moderator variable for eating thoughts \((G_{00} = 5.80, SE=.55, G_{10}=-.53, SE=.27, \beta_{11}=.91, SE=.36, t(515)= 2.56, p<.05)\), with HEDs experiencing an increase in thoughts of changing their eating and LEDs experiencing a decrease in these thoughts on exercising days. No significant moderation was found for group on body dissatisfaction \((G_{00} = 13.07, SE=.60, G_{10}=-.44, SE=.37, G_{11}=-.03, SE=.51, t(515)= -.07, p=.95)\), exercise thoughts \((G_{00} = 6.23, SE=.55, G_{10}=.17, SE=.30, G_{11}=.66, SE=.38, t(7515)= 1.71, p=.09)\), positive affect \((G_{00} = 27.95, SE=1.25, G_{10}=2.94, SE=1.24, G_{11}=-2.40, SE=1.50, t(515)= -1.61, p=.11)\), negative affect \((G_{00} = 15.00, SE=.80, G_{10}=-1.33, SE=.62, G_{11}=.57, SE=.89, t(515)= -2.12, p=.53)\), or guilt \((G_{00} = 7.35, SE=.42, G_{10}=-.45, SE=.39, G_{11}=.16, SE=.59, t(515)= .27, p=.79)\).

**Hypothesis Five**

Hypothesis 5 stated that exercise motivations would moderate the effects of exercise on body dissatisfaction, exercise thoughts, eating thoughts, guilt and positive and negative affect, with higher levels of weight and appearance motivations for exercise resulting in more body dissatisfaction, exercise thoughts, eating thoughts, and negative affect, and less positive affect for all participants. To assess the impact of different types of motivations for exercise on body dissatisfaction, eating thoughts, exercise thoughts, positive affect, negative affect, and guilt, separate HLM analyses were run for each dependent variable and two types of motivations for exercise (appearance and weight motivations and fitness and health motivations). Motivations for exercise (group mean centered) were entered as Level-1 variables and the individual dependent variables were entered as outcome variables at Level-1.
The first group of analyses examined the impact of appearance and weight motivations on the variables of interest. The following equation was used for all of the analyses examining the impact of appearance and weight motivations on the variables of interest.

\[ \gamma = \beta_0 + \beta_1 (R_{EIAW}) + R \]

\[ \beta_0 = G_{00} + U_0 \]

\[ \beta_1 = G_{10} \]

Appearance and weight motivations for exercise had a significant effect on exercise thoughts (G00 = 10.13, SE = .41, G10 = .11, SE = .03, \( t(358) = 3.60, p < .01 \)) and eating thoughts (G00 = 9.18, SE = .42, G10 = .04, SE = .02, \( t(358) = 2.02, p < .05 \)), indicating that with each unit increase in reported appearance or weight related reasons for exercise, there was a significant increase in thoughts of changing one’s exercise or eating behaviors to decrease body shape or size. Significant differences were not found for the impact of appearance and weight motivations on body dissatisfaction (G00 = 15.82, SE = .51, G10 = .04, SE = .05, \( t(358) = .77, p = .44 \)) negative affect (G00 = 13.84, SE = .48, G10 = .05, SE = .04, \( t(358) = -1.21, p = .23 \)), positive affect (G00 = 28.54, SE = .86, G10 = .05, SE = .12, \( t(358) = .42, p = .68 \)), or guilt (G00 = 8.32, SE = .43, G10 = -.01, SE = .05, \( t(358) = -.12, p = .90 \)).

The second set of analyses examined the impact of fitness and health motivations for exercise on the variables of interest and used the following equation.

\[ \gamma = \beta_0 + \beta_1 (R_{EIFH}) + R \]

\[ \beta_0 = G_{00} + U_0 \]

\[ \beta_1 = G_{10} \]
Fitness and health motivations for exercise had a significant effect on body dissatisfaction (G₀₀ = 15.82, SE = .51, G₁₀ = -.07, SE = .04, t(358) = -.197, p < .05), indicating that as fitness and health related reasons increased body dissatisfaction decreased. Significant differences were not found for the impact of fitness and health motivations on exercise thoughts (G₀₀ = 10.13, SE = .41, G₁₀ = .03, SE = .02, t(358) = 1.51, p = .13), eating thoughts (G₀₀ = 9.18, SE = .42, G₁₀ = .02, SE = .02, t(358) = .71, p = .48), negative affect (G₀₀ = 13.84, SE = .48, G₁₀ = -.05, SE = .03, t(358) = -1.53, p = .13), positive affect (G₀₀ = 28.54, SE = .86, G₁₀ = .07, SE = .09, t(358) = .77, p = .44), or guilt (G₀₀ = 8.32, SE = .43, G₁₀ = -.06, SE = .37, t(358) = -1.69, p = .09).

**Hypothesis Six**

Hypothesis 6 stated that group membership would moderate the effects of motivations for exercise on body dissatisfaction, eating thoughts, exercise thoughts, positive affect, negative affect, and guilt. To assess for differences on the impact of exercise motivations between the groups, group membership was added as a Level-2 moderator variable to the analyses presented in Hypothesis Five to determine whether or not group moderated the relationship between motivations for exercise and the relevant variables. The first set of analyses examined appearance and weight motivations and used the following equation.

\[
\gamma = \beta_0 + \beta_1 (\text{REIAW}) + R
\]

\[
\beta_0 = G_{00} + G_{01} (\text{ED group}) + U_0
\]

\[
\beta_1 = G_{10} + G_{11} (\text{ED group})
\]
There were no moderating effects for group membership on any of the relevant variables (Body dissatisfaction- $G_{00} = 17.18$, $SE = 1.29$, $G_{10} = .01$, $SE = .04$, $t(354) = -.22$, $p = .83$, $G_{11} = .08$, $SE = .08$, $t(354) = 1.05$, $p = .29$; eating thoughts- $G_{00} = 4.88$, $SE = 1.27$, $G_{10} = .07$, $SE = .02$, $t(354) = 3.22$, $p < .01$, $G_{11} = .05$, $SE = .03$, $t(354) = -1.53$, $p = .13$; exercise thoughts- $G_{00} = 8.35$, $SE = .77$, $G_{10} = .12$, $SE = .07$, $t(354) = 1.85$, $p = .06$, $G_{11} = .02$, $SE = .07$, $t(354) = -.35$, $p = .73$; negative affect- $G_{00} = 18.01$, $SE = 2.53$, $G_{10} = -.03$, $SE = .05$, $t(354) = -.57$, $p = .57$, $G_{11} = -.03$, $SE = .08$, $t(354) = -.33$, $p = .74$; positive affect- $G_{00} = 23.85$, $SE = 4.99$, $G_{10} = .16$, $SE = .22$, $t(354) = .74$, $p = .46$, $G_{11} = -.21$, $SE = .24$, $t(354) = -.87$, $p = .38$; or guilt $G_{00} = 8.19$, $SE = 1.24$, $G_{10} = -.00$, $SE = .01$, $t(354) = -.08$, $p = .94$, $G_{11} = -.00$, $SE = .08$, $t(354) = -.00$, $p = .99$).

The second set of analyses examined the fitness and health motivations for exercise and used the following equation.

$$\gamma = \beta_0 + \beta_1(\text{REIFH}) + R$$

$$\beta_0 = G_{00} + G_{01} \text{ (ED group)} + U_0$$

$$\beta_1 = G_{10} + G_{11} \text{ (ED group)}$$

Group membership was not a significant moderator of the relationship between fitness and health motivations and negative affect ($G_{00} = 18.01$, $SE = 2.53$, $G_{10} = -.03$, $SE = .07$, $t(354) = -.47$, $p = .64$, $G_{11} = -.03$, $SE = .08$, $t(354) = -.33$, $p = .74$), positive affect ($G_{00} = 23.85$, $SE = 4.99$, $G_{10} = .04$, $SE = .12$, $t(354) = .35$, $p = .73$, $G_{11} = .05$, $SE = .17$, $t(354) = .28$, $p = .78$), guilt ($G_{00} = 8.19$, $SE = 1.24$, $G_{10} = -.00$, $SE = .02$, $t(354) = -.03$, $p = .98$, $G_{11} = -.08$, $SE = .05$, $t(354) = -1.58$, $p = .12$), or eating thoughts ($G_{00} = 4.88$, $SE = 1.27$, $G_{10} = -.03$, $SE = .02$, $t(354) = -1.19$, $p = .24$, $G_{11} = .06$, $SE = .04$, $t(354) = 1.48$, $p = .14$). However, group
membership did moderate the relationship of fitness and health motivations on body
dissatisfaction ($G_{00}=17.18, SE=1.29, G_{10}=-.19, SE=.05, G_{11}=.14, SE=.07, t(354)=1.96,\
p<.05$) and exercise thoughts ($G_{00}=8.35, SE=.77, G_{10}=-.05, SE=.02, G_{11}=.10, SE=.03,\
t(354)=2.94, p<.01$), indicating that as fitness and health motivations increase, HEDs
experience a smaller decrease in body dissatisfaction than LEDs and a larger increase in
thoughts of exercise to decrease their body shape and weight than LEDs.

**Research Question**

A final goal of this study was to examine the relationship of exercise to eating
behaviors and possible differences in this relationship for women with and without eating
pathology. In order to examine this relationship, caloric intake (in calories) and fat intake
(in fat grams) were calculated for each eating episode using the website
www.nutritiondata.com. If information regarding nutrition was not available on this site,
the nutrition information was retrieved from the manufacturer’s website. Eating episodes
were also labeled as binges (subjective or objective) or non-binge eating episodes. An
objective binge eating episode was defined as the individual reporting having eaten more
than another person would in the same situation and feeling out of control. A subjective
binge eating episode was defined as the individual reporting that they felt out of control
of their eating, but did not eat more than another would in the same situation.

Fourteen objective and 74 subjective binge eating episodes were identified. These
two types of binges were collapsed due to the small number of reported objective binge
eating experiences in the sample, creating a total sample of 88 binge eating episodes.
Daily caloric intake and daily fat intake was calculated for each day by summing all of
the eating episodes in that day. Caloric expenditure from exercise was also calculated using the website www.nutritiondata.com. This website enabled the researcher to enter information regarding the participant’s height, weight, and gender into the program, as well as the specific type of exercise and its duration in order to calculate the most accurate estimate of caloric expenditure for that person and that exercise.

To assess for differences in caloric intake on exercise versus non-exercise days, an HLM analysis was run with daily caloric intake as the outcome variable and day (exercise or non-exercise) as a Level-1 variable. The following equation was used.

\[ \gamma = P_0 + P_1(\text{Exercise or non-exercise day}) + E \]

\[ P_0 = \beta_{00} + R_0 \]

\[ P_1 = \beta_{10} \]

There was no significant difference on caloric consumption on exercise vs. non-exercise days (\( \beta_{00} = 1349.44, SE = 130.82, \beta_{10} = 62.81, SE = 42.86, t(545) = 1.47, p = .14 \)).

Group was added as a level-2 moderator to determine if level of eating pathology would impact caloric intake on exercise versus non-exercise days. The following equation was used.

\[ \gamma = P_0 + P_1(\text{Exercise or non-exercise day}) + E \]

\[ P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0 \]

\[ P_1 = \beta_{10} + \beta_{11} \text{ (ED group)} \]

No significant differences were found between the groups (\( \beta_{00} = 1552.43, SE = 336.36, \beta_{01} = -323.73, SE = 341.03, t(73) = -.95, p = .35, \beta_{10} = 116.68, SE = 65.94, t(543) = 1.77, p = .08, \beta_{11} = -88.02, SE = 86.21, t(543) = -1.02, p = .31 \)).
To examine differences in fat consumption, similar analyses were run with daily fat intake as the outcome variable using the first of the previous two equations. There were no significant differences in fat intake on exercise versus non-exercise days \((\beta_{00}=48.30, SE=4.21, \beta_{10}=1.87, SE=2.29, t(545)=.82, p=.42)\), and group membership did not moderate this relationship when added as a Level-2 moderator variable in the same manner as the above equation \((\beta_{00}=54.26, SE=10.54, \beta_{01}=-9.41, SE=10.85, t(73)=-.87, p=.39, \beta_{10}=5.25, SE=3.71, t(543)=1.42, p=.16, \beta_{11}=-5.53, SE=4.70, t(543)=-1.18, p=.24)\). These results suggest that fat and calorie consumption is not impacted by whether or not the individual has exercised on that given day, regardless of level of eating pathology.

To examine the relationship between binge eating and exercise, objective and subjective binge eating episodes were identified from the food records. Days were then coded as either containing or not containing a binge eating episode. As mentioned previously, 88 binge eating episodes were identified. HLM analyses were run to determine if there were differences in caloric expenditure (via exercise) between the two groups on binge eating days versus non-binge eating days using the following equation.

\[
\gamma = P_0 + P_1(Binge \text{ or non-binge day}) + E
\]

\[
P_0 = \beta_{00} + \beta_{01} \text{ (ED group)} + R_0
\]

\[
P_1 = \beta_{10} + \beta_{11} \text{ (ED group)}
\]

Significant differences were found between the eating disorder groups on caloric expenditure on binge versus non-binge days \((\beta_{00}=178.31, SE=41.59, \beta_{01}=-24.33, SE=46.78, t(73)=-.52, p=.60, \beta_{10}=229.98, SE=135.83, t(539)=1.69, p=.09, \beta_{11}=-296.81, SE=236.72, t(539)=-1.19, p=.23)\).
\( SE=140.65, t(539)= -2.11, p<.05), \) with HEDs reporting significantly less caloric expenditure on binge eating days than LEDs.

Given that binge eating episodes and exercise may occur at any point throughout the day, these analyses examined only daily rates of caloric intake and expenditure and may not reflect the true impact of eating on exercise and vice versa. For example, an individual may have a binge eating episode late in the day and not be able to exercise until the next morning. For that reason, two additional sets of analyses were run examining these relationships in a more episode specific way.

To examine the relationship of exercise sessions to binge eating episodes, one binge eating episode was selected from each participant who engaged in binge eating. Some participants had multiple binges so the first binge that did not occur on the first day of data collection was selected for each person. This resulted in a sample of 29 people (5 LEDs and 24 HEDs). Each of these binge episodes was then examined to determine whether or not an exercise session had occurred in the 24 hours prior to the binge or the 24 hours after the binge. Some participants (n = 7) engaged in exercise both prior to and after their binge eating episode. Seventeen people engaged in exercise in the 24 hours prior to a binge and 18 people engaged in exercise in the 24 hours following a binge. Given the small number of LEDs with binge eating episodes, group differences could not be assessed. Furthermore, given the relatively equal numbers of exercise sessions prior to and after binge eating episodes, there does not appear to be a clear relationship between binge eating and exercise.
To examine exercise sessions, one exercise session was selected for each participant (the first exercise session that did not occur on the first day of data collection) and caloric intake was calculated for the 24 hours prior to and following an exercise session. A 2 x 2 (Group x Time) mixed design ANOVA was run to determine if there were group differences in caloric intake differed before and after exercise. No group differences were discovered on overall caloric intake (LED: $M = 1447.81, SE = 94.03$; HED: $M = 1330.00, SE = 71.08, F(1,64) = 1.0, p = .32$). No significant differences were discovered on caloric intake pre- and post-exercise (Pre: $M = 1353.91, SE = 604.52$; Post: $M = 1391.78, SE = 587.04, F(1,64) = .42, p = .52$). There was a non-significant Group x Time interaction (Pre LED: $M = 1371.46, SE = 576.62$; Post LED: $M = 1524.17, SE = 554.73$; Pre HED: $M = 1343.88, SE = 626.54$; Post HED: $M = 1316.13, SE = 597.99, F(1,64) = .87, p = .36$) These results suggest no difference in the impact of exercise on food consumption and vice versa.

Participants were given a measure (the EDD-S) at baseline which assesses a variety of aspects of eating pathology, including reported use of compensatory mechanisms, including excessive exercise. In order to determine if reported use of exercise as a compensatory behavior on the EDD-S would be related to eating and exercise patterns in the diary data, two sets of analyses were run. First, analyses were run to determine the relationship between the self-report of exercise as a compensatory strategy and the use of excessive exercise following a binge eating episode. Thirty participants reported a binge eating episode and were included in the analyses. A chi square analysis was conducted to determine whether the use of exercise as a
compensatory behavior (yes/no) predicted a post binge exercise session (yes/no). Results show no significant relationship between these two variables ($\chi^2(1)=.24$, $p=.63$). To examine whether or not reported use of exercise as a compensatory behavior was related to pre-exercise calorie consumption, a point biserial correlation analysis was conducted and no significant relationship was found ($r=-.06$, $p=.62$). This would suggest that the participants reported use of compensatory exercise behavior was not associated with actual eating and exercise experiences.
CHAPTER IV

DISCUSSION

The present study increases our understanding of the complicated nature of exercise in disordered populations in three distinct ways. First, the results provide some information regarding the potential function of exercise, specifically why women with disordered eating are engaging in exercise and how they are using it in their everyday lives. Second, the present study provides information regarding the general impact of exercise on individuals and the specific impact of different motivations for exercise on an individual’s affect and thoughts. In addition, the present study addresses how exercise may differentially impact individuals with and without eating pathology. Finally, the present study confirms differences in affect and cognitions experienced by individuals with and without disordered eating beliefs and behaviors, thus supporting the distinctions of these two groups.

The Function of Exercise

While the majority of analyses examining the relationship of exercise and eating failed to reach significance, some interesting findings about the potential function of exercise for women with disordered eating attitudes and behaviors emerged. First, high eating disordered participants experienced a greater decrease in guilt following exercise sessions when compared to low eating disordered participants. The current body of
literature suggests that guilt is significantly higher in women with eating pathology (Willcox & Sattler, 1996) and seems to be a significant part of exercise experiences for them (Mond & Calogero, 2009). Specifically, a recent study found that women with eating disorders experienced a significant increase in reported guilt on days when they missed their exercise sessions and that this difference was one of the strongest differentiators between exercisers with high and low levels of eating pathology (Mond & Calogero, 2009). The decrease in guilt following exercise behaviors in the participants with eating disorders likely reflects this connection between exercise and eating pathology. This is consistent with past research on compensatory behaviors, which suggests that one of the consequences of engaging in compensatory behaviors is a decrease in anxiety and negative affect in general (Powell & Thelen, 1996; Steinberg, Tobin, & Johnson, 1990).

Furthermore, research suggests that exercise behavior in eating disordered females is best defined as being pathological when it is obligatory in nature (Adkins & Keel, 2005). Guilt is strongly tied to exercise for obligatory exercisers (Ackard, Brehm, & Steffen, 2002; Mond, Hay, Rodgers, & Owen, 2006), in that when obligatory exercisers are unable to exercise, they feel increases in guilt. The participants with eating disordered attitudes and behaviors may have felt less guilt immediately after exercise, because they had met their obligation to exercise for the day (Adkins & Keel, 2005; Thome & Espelage, 2007). Strangely though, this difference does not remain when examining differences between the groups on exercise versus non-exercise days. This may be due to the fact that guilt is a state affect and is therefore more susceptible to
The findings of the present study suggest that exercise may be serving a compensatory function for disordered individuals. Eating disordered females may have felt less guilty following exercise because they had actively done something to impact their body shape or weight.

Second, in addition to the findings on guilt, the present study also found group differences on eating thoughts, which suggest potential functional differences in exercise for the groups. While it is not surprising that all participants reported thinking more about exercise to change their appearance on exercise days, high eating disordered participants reported increased thoughts of changing their eating to reduce their body shape or weight on exercising days compared to low eating disordered participants who reported significantly decreased thoughts. It may be that when individuals with disordered eating are using one compensatory strategy they are more likely to think about using another as well. It is also possible that the positive consequences they experienced from participating in exercise provided increased motivation for the individuals with high levels of eating pathology, such that they felt more motivated to focus on changing their bodies through additional mechanisms. In addition, individuals without disordered eating may be experiencing decreased thoughts of changing their eating behaviors on exercise days because they are confident in their abilities to control their weight or shape through the use of their current exercise program. They may be more confident in their ability to control their physical appearance through exercise than the disordered individuals who may feel the need to come up with alternate or additional techniques for compensating for their appearance concerns.
Third, the findings of group differences on reported motivations for exercise may provide further insight into the reported function of exercise for the different groups examined. Results indicated that females with disordered eating had significantly higher scores on appearance and weight reasons for exercise than those with low eating disorder pathology. This is consistent with past research which suggests that these are the most common motivations for exercisers with eating disorders (DiBartolo et al., 2007). However, given that other motivations for exercise are often associated with positive outcomes, most notably fitness and health related reasons for exercise (DiBartolo et al., 2007; Furnham et al., 2002; McDonald & Thompson, 1992; Strelan, Mehaffey, & Tiggemann, 2000; Tiggemann & Williamson, 2000), it is surprising that the present study failed to find significant differences between the groups on reported fitness and health motivations for exercise. However, the findings do support the notion that for women with eating disorders, the primary function of exercise is to impact their appearance and weight.

While the majority of analyses regarding caloric expenditure and intake failed to meet significance, results do suggest that females with high levels of eating pathology reported less caloric expenditure on binge eating days than females with low levels of eating pathology. This would suggest that the females with high levels of eating pathology are not using exercise in a compensatory fashion. However, given the small number of individuals without eating pathology who engaged in binge eating episodes, it would be premature to draw any definitive conclusions. Still, it is possible that disordered individuals are less likely to engage in exercise on binge eating days for a
variety of reasons. For example, they may be in a state of disinhibition so they are unlikely to consider utilizing a behavior like exercise which requires a certain degree of control and motivation. It is also possible that the individuals’ binge eating episode is occurring at a point in the day when they are no longer able to engage in exercise.

**The Impact of Exercise**

The present study found that exercise in general was associated with positive consequences, with all exercisers experiencing a decrease in state body dissatisfaction and negative affect following their exercise sessions. In addition, exercise days were associated with higher positive affect, lower negative affect, and less frequent reported thoughts of using exercise to change one’s shape or weight. This suggests that for the most part, exercise is a positive experience for all exercisers. This is somewhat consistent with past research examining females with high and low levels of body dissatisfaction, which found that both groups experienced less state body dissatisfaction and negative affect and more positive affect when they engaged in exercise (LePage & Crowther, 2010). Furthermore, these findings are somewhat consistent with research on the physiological impact of exercise, which has shown that exercise is effective at reducing negative mood experiences and increasing overall wellbeing and positive mood (Stephens, 1988; Annesi & Whitaker, 2008). However, it is somewhat surprising that while participants reported higher levels of positive affect on exercising versus non-exercising days, they did not report an immediate increase in positive affect following exercise. Past research on the short term effects of exercise suggest that exercise is
associated with increases in positive affect, even after just one exercise session (Berk, 2007; Focht & Hausenblas, 2001; McInman & Berger, 2006; Rejeski, Gauvin, Hobson, & Norris, 1995). It is possible that individuals were already experiencing significant positive effects from exercise prior to beginning it, in that they had already made a commitment to exercise at that time and were anticipating the positive benefits. The decision alone to engage in exercise activity may result in positive affect consequences.

In addition to the immediate effects of exercise, the present study also examined the impact of different motivations for exercise on affect, body dissatisfaction, and cognition. For all participants, fitness and health related reasons for exercise were associated with decreased body dissatisfaction, while appearance and weight motivations for exercise were associated with more frequent reported thoughts of changing both exercise and eating habits to decrease body shape or weight. However, fitness and health motivations seemed to be less beneficial for participants with high levels of eating pathology than exercisers with low levels of eating pathology, with people with high levels of eating pathology reporting a smaller decrease in body dissatisfaction than people with low levels of eating pathology as these motivations increased. Moreover, participants with high levels of eating pathology also reported an increase in thoughts of exercise to decrease their body shape and weight as fitness and health motivations increased.

The findings on the impact of fitness and health motivations are consistent with previous research examining the impact of different motivations for exercise on women with high and low levels of body dissatisfaction (LePage & Crowther, 2010), which
found that fitness and health motivations were less beneficial for females with high body dissatisfaction than for females with low body dissatisfaction. However, in that study, the women with high body dissatisfaction experienced an increase in body dissatisfaction, while in this study the women with disordered eating simply experienced less of a decrease in body dissatisfaction as their fitness and health motivations increased. This may be due to differences in the samples themselves, since the LePage and Crowther (2010) study examined body dissatisfied women rather than women with disordered eating. It may also be due to methodological differences between the two studies. In the LePage and Crowther (2010) study, participants reported on their affect and body dissatisfaction immediately following exercise and at random times throughout the day. The impact of exercise was assessed by examining differences between the random assessments and the post-exercise ones. In the present study, affect, body dissatisfaction, and cognitions were measured immediately prior to and immediately following exercise. In addition to findings on body dissatisfaction, women with disordered eating experienced an increase in thoughts of exercise to decrease their body shape or weight as their fitness and health motivations increased while the low disordered individuals did not experience such an increase. These findings suggest that fitness and health motivations are less beneficial for women with high eating disorder scores than for women with low levels of eating pathology.

However, some of the findings on the impact of motivations for exercise are curious. For example, while increased levels of appearance and weight motivations were associated with increased thoughts of adapting eating and exercise behaviors to decrease
body shape or weight, these motivations were not associated with any other variables, including body dissatisfaction, negative affect, or positive affect. It makes sense that an individual who is motivated to exercise to change their body shape or weight would also be thinking about exercise and eating changes in general, but the lack of other findings is surprising. Most notably, the lack of findings is inconsistent with the LePage and Crowther (2010) study which found that as these motivations increased, so did reported body dissatisfaction following exercise. The findings are also inconsistent with other studies that have shown levels of appearance and weight motivations to be strongly tied to body dissatisfaction (Cash, Novy, & Grant, 1994; DiBartolo et al., 2007). This may be due again to the impact of deciding to exercise on the measures. Specifically, when individuals have already decided that they are going to exercise, they may be less inclined to feel poorly about their bodies because they are actively working on changing them. Instead they may simply be focused more on the body change strategies themselves.

Evidence Supporting Group Distinctions

Several findings suggest significant differences between high and low eating disordered individuals on the variables of interest. Specifically, high eating disordered participants reported more body dissatisfaction, negative affect, guilt, and thoughts about changing one’s eating or exercise to decrease shape or weight, as well as less positive affect than low eating disordered participants at all assessment times (pre and post exercise as well as at end of day assessment times). Given what is known about the
characteristics of individuals with eating disorders individuals, this is unsurprising. Body dissatisfaction in particular is strongly associated with eating disordered behaviors (Stice, 2002). Individuals with eating disorders also report increased levels of depression, guilt, and, as a result, negative affect (Willcox & Sattler, 1996). The group differences identified by the present study are not only consistent with the aforementioned longitudinal research, but also with previous research examining these factors using ecological momentary assessment. Specifically, in a study that examined the mood and state body dissatisfaction levels of high and low body dissatisfied females, differences were identified between the groups on negative affect and body dissatisfaction (higher in body dissatisfied females at all assessment times) as well as positive affect (lower in body dissatisfied females at all assessment times (LePage & Crowther, 2010).

In reference to exercise behaviors in general, the eating disorder groups did not differ on the majority of exercise characteristics (frequency, intensity, duration), but they did differ on reported reasons for exercise, with high eating disordered participants reporting more appearance and weight related reasons for exercise than low eating disordered participants. This is consistent with the work by DiBartolo and colleagues (2007), who found that appearance motivations are associated with eating disorder symptomatology and are predictive of the later emergence of full blown eating disorders. It is surprising that more differences were not found in respect to the other exercise characteristics, including frequency and duration. However, all participants had to engage in a minimum amount of weekly exercise to be eligible for the study and this may have restricted the range on the other associated exercise variables.
Exercise and Eating: Possible Explanations for a Lack of Findings

The lack of findings with respect to the relationship between exercise and eating are surprising. Past research in rat populations supports the notion that exercise impacts hunger and subsequent eating behaviors (Epling & Pierce, 1988), while research in humans suggests that the neuro-chemical response to exercise may increase motivations to restrict eating behaviors (Hebebrand et al., 2003). However, a study looking at males in a laboratory environment failed to find that one exercise session was enough to impact subsequent eating behaviors (Harris & George, 2008). The results of the present study may indicate that individual exercise sessions do not immediately impact eating behaviors and vice versa. However, this may be due to an inadequate sample size and the sample itself.

It is possible that the sample of high eating disordered participants was not a clinically significant population. A clinically significant cutoff score for the EAT-26 is a score of 21 or more (Garner, Olmstead, Bohr, & Garfinkel, 1982). While the mean EAT-26 score for participants in the disordered group was above this cutoff ($M=23.75$), individuals were classified as high disordered if they fell into the upper quartile on the EAT-26; a cutoff of 13 or more. Therefore, some participants included in the high eating disordered group did not exceed the clinically significant cutoff score. Furthermore, exceeding the cutoff does not necessarily mean that an individual has an eating disorder. If one were to examine inpatient or clinical populations rather than participants selected by one questionnaire assessment, it is possible that stronger relationships would be identified.
Furthermore, given that the high eating disordered group contained individuals with a variety of disorders, including Bulimia Nervosa, sub-threshold Anorexia Nervosa, sub-threshold Bulimia Nervosa, and sub-threshold Binge Eating disorder, it is also possible that the relationships differed between these diagnostic groups, and these differences may have obscured the findings. Specifically, it was hypothesized that individuals with eating disorders may utilize exercise in a number of different ways, including as a compensatory behavior, a permissive behavior, or aid to restriction. It is likely that individuals with bulimia would be using exercise in a compensatory function, as a way to counteract the effects of binge eating episodes, while someone in a sub-threshold Anorexia population may be using it in a more permissive or restrictive function. Sub-threshold Bulimics may be using it in restrictive, compensatory, or permissive ways, depending on the nature of their disorder. It would be interesting to examine different diagnostic groups in comparison to one another to determine if differences exist in how they experience or utilize exercise.

Finally, many of the individuals originally categorized as exercisers with low levels of eating pathology had to be removed from the study because their scores changed from mass testing to the baseline assessment. It is possible that the measure used to identify women with eating disordered beliefs and behaviors was inaccurate in this population, or more likely, that this population was actually experiencing changes in eating and exercise behaviors as a result of their age and current life stage. There are a number of reasons why an individual might change in respect to their reported eating pathology over a relatively short period of time. First, given that the majority of these
participants were in their first year of college (68.4%), it is possible that they may have experienced changes in their eating related behaviors due to increased freedoms. Living away from one’s parents for the first time gives an individual increased control over what and how much they eat as well as the strategies they use to maintain or lose weight. Participants would also have experienced an increase in contact with other young females if living on campus and would therefore have greater exposure to the techniques used by other females to manage or lose weight. Second, the amount of time between mass testing and baseline assessment varied from person to person, ranging from a couple of weeks to a couple of months. Due to the fact that participants were identified only by numbers, it was impossible to match participants to their testing date to assess whether the time lapse between mass testing and assessment was related to greater changes in reported eating disordered attitudes and behaviors. Finally, it is possible that participants were not as motivated to provide accurate data when faced with online testing then when faced with a researcher in the laboratory and thus for those women, the initial mass testing score was not a true representation of their degree of eating pathology. It is equally possible that they were more likely to provide accurate data during online testing because it was more anonymous then the laboratory testing session. Regardless, the change of testing technique, from online to in-person, may have shifted their desire to report accurate information regarding their eating behaviors.
Limitations and Future Directions

There are a number of limitations to this study in addition to the ones already discussed regarding the sample itself. This study utilized an ecological momentary assessment approach and thus required that questionnaires be completed in a naturalistic setting. While this has some obvious benefits, most notably an ability to examine behaviors as they occur naturally, there are some drawbacks as well. Participants are experiencing a wide range of environments and these may differentially impact their experiences. Future research may want to examine the context of the exercise as a potential moderator variable to account for these differences. In addition, the researcher has less ability to judge compliance because they did not observe the behaviors directly.

The present study sought to control for issues of compliance by querying the participants regarding their reported compliance after conclusion of the study. Reported and observed compliance with the diary protocol seemed to be quite high. Still, the benefits of examining exercise behavior using an ecological momentary assessment approach outweigh the potential consequences of reduced control over compliance. Ecological momentary assessment provides researchers with the ability to examine these behaviors as they naturally occur and extend the body of literature outside of the realm of the laboratory.

While the present study did examine exercise behaviors as they naturally occur, it did not account for or measure other kinds of physical activity. Individuals may not endorse that they have specifically “exercised” but were in fact very active that day through other means. Past research has found that non-exercise activity may be an
important predictor of resistance to weight regain (Levine, Schlesner, & Jensen, 2000). It is therefore likely that is also impacts mood and cognitions. Furthermore, it may also be associated with caloric intake. Future research may want to utilize technology like accelerometers, which measure physical activity in the moment, to get accurate information on caloric expenditure from daily non-exercise physical activity.

Another potential issue is reactivity to the diary protocol. It is possible that participants did not provide an accurate representation of their eating and exercise behaviors as well as their body dissatisfaction, mood, and thoughts because the simple act of recording changed these variables. There were mixed findings in respect to reactivity. When examining solely self report of behavior and thought change, it does appear that people experienced some degree of change, especially in reference to thoughts of changing one’s eating or exercise behaviors to decrease body size. Additionally, while participants did not report significant levels of change in their eating disorder symptomatology as measured by the EAT-26 at baseline and follow-up, they did report significant changes in body dissatisfaction. Both groups reported a significant decrease in body dissatisfaction from baseline to follow-up, although women with high levels of eating pathology continued to report more body dissatisfaction than those with low levels of eating pathology. The end of day analyses revealed that people did not change their thinking in respect to using exercise or eating as a method to change their bodies, but that they may have experienced changes in body dissatisfaction, negative affect, positive affect, and guilt. For the most part these changes appeared to be in positive directions (less pathological) and so people did not appear to be negatively impacted in any way by
study participation. It is likely that recording their exercise and eating habits made them more aware of these behaviors in general. Thus, in order to ensure that day of the week was not impacting the results, the analyses were re-run with day of assessment added at Level-1. There were no changes to the findings when it was included and so for the sake of parsimony in reporting, it was removed from the reported equations and results for this document.

Another limitation is the use of self-report. Participants may not have followed instructions for filling out the diaries at the correct times or they may have not provided accurate information in order to appear more socially desirable. For example, participants may not have filled the eating records out immediately after eating episodes, thus resulting in less accurate food reporting, or they may have felt ashamed by their eating behaviors and may not have wanted to fully report all that they consumed. Participants were asked to report when they were completing the exercise and eating questionnaires as a partial check on the accuracy of reporting as well. Furthermore, the length of the study (7 days) may have resulted in people providing less accurate data as time went on due to fatigue with the study itself. Attempts were made to counteract poor study compliance by excluding participants who reported low levels of compliance and not penalizing participants who admitted to not following directions. However, given that only one individual reported low levels of compliance, it is possible that some non-compliant individuals reported being compliant in order to be socially desirable. A related limitation is that the present study used pen and pencil diaries to assess the variables of interest instead of palm pilots or other electronic delivery systems. While this method was
selected in an attempt to replicate the method used in related research (LePage & Crowther, 2010), it makes it impossible to determine when participants were filling out the questionnaires. The electronic technique would have allowed the researchers to have an accurate time stamp for when all of the questionnaires were completed. This forces the researcher to rely solely on the self-reported compliance of the participants.

Regardless of the limitations, this study is still a valuable addition to the research field. It is the first of its kind to examine both exercise and eating behaviors in the field using an ecological momentary assessment approach. In addition, it confirms previous research examining the effects of exercise on high and low body dissatisfied populations and extends it to high and low eating disordered groups. Specifically it confirms that exercise is associated with positive outcomes for all populations. It also suggests that fitness and health motivations are not as beneficial for individuals with eating pathology as for those without eating disorders. In addition, it examines the Body Checking Inventory, a measure of thoughts of body change strategies, which has not been used in this way before. Finally it provides a detailed view of the exercise and eating experiences of college aged women.

Future research should continue to refine the longitudinal data collection approach of this study and its predecessor (LePage & Crowthe, 2010). More specifically, by examining these variables in clinical populations identified through structured clinical interviews or physician or psychologist diagnosis, we can better understand the effects of exercise on a clinical population. In addition, future studies may want to utilize advanced data collection techniques like palm pilots to assess compliance by examining the actual
time of data input. Actometers (or activity monitors) would also be a great addition to this research field as it would allow researchers to examine the actual physical activity output of an individual as opposed to just self-report. The present study provides a strong springboard for this future research.
REFERENCES


Services. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.


APPENDICES
APPENDIX A

BASELINE AND FOLLOW-UP

BSQ

DIRECTIONS: We would like to know how you have been feeling about your appearance over the PAST FOUR WEEKS. Please read each question and fill in the appropriate number on your Scantron (items 18-51). Please answer all the questions using the following scale:

1- Never 4- Often
2- Rarely 5- Very Often
3- Sometimes 6- Always

OVER THE PAST FOUR WEEKS

18. Has feeling bored made you brood (think a lot) about your shape?
19. Have you ever been so worried about your shape that you have been feeling that you ought to diet?
20. Have you thought that your thighs, hips or bottom are too large for the rest of you?
21. Have you been afraid that you might become fat (or fatter)?
22. Have you worried about your flesh not being firm enough?
23. Has feeling full (e.g. after a large meal) made you feel fat?
24. Have you felt so bad about your shape that you have cried?
25. Have you avoided running because your flesh might wobble?
26. Has being with thin women made you feel self-conscious about your shape?
27. Have you worried about your thighs spreading out when sitting down?
28. Has eating even a small amount of food made you feel fat?
29. Have you noticed the shape of other women and felt self-conscious about your shape?
30. Has thinking about your shape interfered with your ability to concentrate (e.g. while watching TV, reading, listening to conversations)?
31. Has being naked, such as when taking a bath, made you feel fat?
32. Have you avoided wearing clothes which make you particularly aware of the shape of your body?
33. Have you imagined cutting off fleshy areas of your body?
34. Has eating sweets, cakes, or other high calorie food made you feel fat?
35. Have you not gone to social occasions (e.g. parties) because you have felt bad about your shape?
36. Have you felt excessively large and rounded?
37. Have you felt ashamed of your body?
38. Has worry about your shape made you diet?
39. Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?
40. Have you thought that you are the shape you are because of your lack of self-control?
41. Have you worried about other people seeing rolls of flesh around your waist or stomach?
42. Have you felt that it is not fair that other women are thinner than you?

43. Have you vomited in order to feel thinner?
44. When in company are you worried about taking up too much room (e.g. sitting on a sofa or a bus seat)?
45. Have you worried about your flesh being dimply?
46. Has seeing your reflection (e.g in a mirror or shop window) made you feel bad about your shape?
47. Have you pinched areas of your body to see how much fat is there?
48. Have you avoided situations where people could see your body (e.g., communal changing rooms or swimming baths)?
49. Have you taken laxatives in order to feel thinner?
50. Have you been particularly self-conscious about your shape when in the company of other people?
51. Has worry about your shape made you feel you ought to exercise?
EAT-26

Highest Adult Weight: _______    Lowest Adult Weight: _________

<table>
<thead>
<tr>
<th>Question</th>
<th>Always</th>
<th>Usually</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Am terrified about being overweight</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. Avoid eating when I am hungry</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Find myself preoccupied with food.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Have gone on eating binges where I feel I may not be able to stop.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. Cut my food into small pieces.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. Aware of the calorie content of foods I eat.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. Particularly avoid food with a high carbohydrate content (bread, rice,</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>potatoes, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Feel that others would prefer if I ate more.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9. Vomit after I have eaten.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10. Feel extremely guilty after eating</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11. Am preoccupied with a desire to be thinner.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12. Think about burning up calories when I exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13. Other people think I'm too thin.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14. Am preoccupied with the thought of having fat on my body.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Question</td>
<td>Always</td>
<td>Usually</td>
<td>Often</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td>-------</td>
<td>-----------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>16. Avoid foods with sugar in them.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17. Eat diet foods.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18. Feel that food controls my life.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19. Display self-control around food.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20. Feel that others pressure me to eat.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21. Give too much time and thought to food.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22. Feel uncomfortable after eating sweets.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23. Engage in dieting behavior.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>24. Like my stomach to be empty.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25. Have the impulse to vomit after meals.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26. Enjoy trying new rich foods.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
EDD-S

DIRECTIONS: Circle the appropriate answer

Over the past 3 months……

<table>
<thead>
<tr>
<th>Extremely</th>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you felt fat?</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Have you had a definite fear that you might gain weight or become fat?</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Has your weight influenced how you think about (judge) yourself as a person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Has your shape influenced how you think about (judge) yourself as a person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. During the past 6 months have there been times when you felt you have eaten what other people would regard as an unusually large amount of food (e.g., a quart of ice cream) given the circumstances?
   Yes       No

6. During the times when you ate an unusually large amount of food, did you experience a loss of control (feel you couldn’t stop eating or control what or how much you were eating)?
   Yes       No

7. How many DAYS per week on average over the past 6 MONTHS have you eaten an unusually large amount of food and experienced a loss of control?
   0  1  2  3  4  5  6  7

8. How many TIMES per week on average over the past 3 MONTHS have you eaten an unusually large amount of food and experiences a loss of control?
   0  1  2  3  4  5  6  7  8  9  10  11  12  13  14
DURING THESE EPISODES OF OVEREATING AND LOSS OF CONTROL DID YOU.....

9. Eat much more rapidly than normal? Yes No

10. Eat until you felt uncomfortably full? Yes No

11. Eat large amounts of food when you didn’t feel physically hungry? Yes No

12. Eat alone because you were embarrassed by how much you were eating? Yes No

13. Feel disgusted with yourself, depressed or very guilty after overeating? Yes No

14. Feel very upset about your uncontrollable overeating or resulting weight gain? Yes No

15. How many times per week on average over the past 3 months have you made yourself vomit to prevent weight gain or counteract the effects of eating?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

16. How many times per week on average over the past 3 months have you used laxatives or diuretics to prevent weight gain or counteract the effects of eating?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

17. How many times per week on average over the past 3 months have you fasted (skipped at least 2 meals in a row) to prevent weight gain or counteract the effects of eating?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

18. How many times per week on average over the past 3 months have you engaged in excessive exercise specifically to counteract the effects of overeating episodes?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

19. How much do you weight? If uncertain, please give your best estimate. _____ lb

20. How tall are you? _____ ft _____ in.

21. Over the past 3 months, how many menstrual periods have you missed?

1 2 3 4 na

22. Have you been taking birth control pills during the past 3 months? Yes No
APPENDIX B

PRE/POST EXERCISE DIARY
APPENDIX B

PRE/POST EXERCISE DIARY

FILL THIS OUT BEFORE YOU EXERCISE

Date:_________  Time:_________ am/pm (please circle)

1. Please rate the following statements keeping in mind how you currently feel. Circle the appropriate answer using the scale below.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A Little bit</th>
<th>Somewhat</th>
<th>Very Much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

a. I feel satisfied with the way my body looks. 1 2 3 4 5
b. I feel that others respected and admired me. 1 2 3 4 5
c. I am dissatisfied with my weight. 1 2 3 4 5
d. I feel good about myself. 1 2 3 4 5
e. I am pleased with my appearance. 1 2 3 4 5
f. I feel unattractive 1 2 3 4 5
2. How much are you currently thinking about the following things? Use the scale below to select the appropriate answer and write that number in the space provided.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td>Always</td>
</tr>
</tbody>
</table>

1. Feel like changing foods you eat to **decrease body size**? __________
2. Change eating to **decrease body size**? __________
3. Change levels of exercise to **decrease body size**? __________
4. Think about exercise to **decrease body size**? __________
5. Worry about eating to **decrease body size**? __________
6. Think about exercise to **lose weight**? __________
7. Change eating to **increase body size**? __________
8. Change levels of exercise to **increase body size**? __________
9. Think about eating to **increase body size**? __________
10. Think about exercise to **increase body size**? __________
11. Worry about eating to **increase body size**? __________
12. Worry about exercise to **increase body size**? __________
13. Use exercise to **increase muscle size**? __________
14. Take food supplements to **increase muscle size**? __________
15. Think about eating to **increase muscle size**? __________
16. Think about exercise to **increase muscle size**? __________
17. Worry about eating to **increase muscle size**? __________
18. Worry about exercise to **increase muscle size**? __________

3. Rate each of the following words with regard to how you currently feel. Use the following scale to record your answers.

<table>
<thead>
<tr>
<th>very slightly</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

| ___attentive | ___scared | ___strong | ___angry at self |
| ___irritable | ___enthusiastic | ___inspired | ___disgusted with self |
| ___distressed | ___afraid | ___blameworthy | ___alert |
| ___determined | ___upset | ___interested | ___active |
| ___guilty | ___nervous | ___excited | ___dissatisfied with self |
| ___hostile | ___proud | ___jittery | ___ashamed |

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4. To what extent is each of the following an important reason that you have for exercising **right now**? Use the scale below, ranging from 1 to 7, in giving your answers.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>To be slim _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>To improve my muscle tone _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>To cope with sadness, depression _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>To improve my cardiovascular fitness _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>To improve my appearance _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>To meet new people _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>To redistribute my weight _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>To lose weight _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>To improve my strength _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>To cope with stress, anxiety _____</td>
<td></td>
<td></td>
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<tr>
<td>11.</td>
<td>To improve my overall health _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12.</td>
<td>To be sexually desirable _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13.</td>
<td>To socialize with friends _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14.</td>
<td>To improve my overall body shape _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>15.</td>
<td>To maintain my current weight _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>16.</td>
<td>To improve my endurance, stamina _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>17.</td>
<td>To increase my energy level _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>18.</td>
<td>To increase my resistance to illness and disease _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19.</td>
<td>To be attractive to members of the opposite sex _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>20.</td>
<td>To have fun _____</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>21.</td>
<td>To alter a specific area of my body _____</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>22.</td>
<td>To improve my flexibility, coordination _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>To improve my mood _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>To maintain my physical well-being _____</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>To do what is socially expected _____</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
FILL THIS OUT ONCE YOU HAVE FINISHED EXERCISING

Date:_________ Time:_________ am/pm (please circle)

1. How long did you exercise? _______hr(s)___________minutes

2. Type of Exercise (Fill out one section for each type of exercise that you did) (If you did more than 3 types of exercise choose the 3 you spent the most time doing)

   A. What type of exercise did you do? (check the type)
      _____walking  _____running  _____stationary bike  _____elliptical
      _____spinning  _____pilates  _____yoga  _______sit ups
      _____weight training  _______other (please write in) ____________

      How long did you do this type? ________hr(s)________minutes

      Perceived Intensity (circle one)

      1  2  3  4  5
      Not at all  Extremely
      Intense  Intense

   B. What type of exercise did you do? (check the type)
      _____walking  _____running  _____stationary bike  _____elliptical
      _____spinning  _____pilates  _____yoga  _______sit ups
      _____weight training  _______other (please write in) ____________

      How long did you do this type? ________hr(s)________minutes

      Perceived Intensity (circle one)

      1  2  3  4  5
      Not at all  Extremely
      Intense  Intense
C. What type of exercise did you do? (check the type)

____walking  ____running  ____stationary bike  ____elliptical
____spinning  ____pilates  ____yoga  ____sit ups  ____weight training
____other (please write in) ____________

How long did you do this type? __________hr(s)________ minutes

Perceived Intensity (circle one)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not at all</td>
<td>Extremely</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intense</td>
<td>Intense</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. During your exercise session, did you have thought(s) about your own body shape/weight?
   ______a. yes  ______ b. no (If no, please skip to Question #8)

   If yes, how many?
   ____One  ____Four
   ____Two  ____Five or more
   ____Three

4. Did any of these thoughts involve comparisons of your shape/weight to another individual?
   ______a. yes  ______ b. no (If no, please skip to Question #8)

   If yes, how many comparisons did you engage in?
   ____One  ____Four
   ____Two  ____Five or more
   ____Three

   (Answer the following questions keeping in mind the most recent comparison you made)

5. Did you think that, compared to the other individual, you looked? (Please Circle)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much</td>
<td>Worse</td>
<td>Same</td>
<td>Better</td>
<td>Much</td>
<td>Better</td>
</tr>
</tbody>
</table>
6. After making the comparison did you think about exercising more as a means of controlling your weight, altering your shape or amount of fat, or burning your calories? (circle one)

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

7. After making the comparison, did you think about trying to restrict the amount of food you eat in order to influence your shape or weight? (circle one)

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

8. Please rate the following statements keeping in mind how you currently feel. Circle the appropriate answer using the scale below.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A Little bit</th>
<th>Somewhat</th>
<th>Very Much</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. I feel satisfied with the way my body looks. 1 2 3 4 5
b. I feel that others respected and admired me. 1 2 3 4 5
c. I am dissatisfied with my weight. 1 2 3 4 5
d. I feel good about myself. 1 2 3 4 5
e. I am pleased with my appearance. 1 2 3 4 5
f. I feel unattractive 1 2 3 4 5

9. How much are you currently thinking about the following things. Use the scale below to select the appropriate answer and write that number in the space provided.

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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<td>3</td>
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<tr>
<td>4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

1. Feel like changing foods you eat to decrease body size? 
2. Change eating to decrease body size? 
3. Change levels of exercise to decrease body size? 
4. Think about exercise to decrease body size?
5. Worry about eating to decrease body size? _________
6. Think about exercise to lose weight? _________
7. Change eating to increase body size? _________
8. Change levels of exercise to increase body size? _________
9. Think about eating to increase body size? _________
10. Think about exercise to increase body size? _________
11. Worry about eating to increase body size? _________
12. Worry about exercise to increase body size? _________
13. Use exercise to increase muscle size? _________
14. Take food supplements to increase muscle size? _________
15. Think about eating to increase muscle size? _________
16. Think about exercise to increase muscle size? _________
17. Worry about eating to increase muscle size? _________
18. Worry about exercise to increase muscle size? _________

10. Rate each of the following words with regard to how you currently feel. Use the following scale to record your answers.

<table>
<thead>
<tr>
<th>very slightly or not at all</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

___attentive       ___scared      ___strong       ___angry at self
___irritable       ___enthusiastic ___inspired      ___disgusted with self
___distressed      ___afraid       ___blameworthy   ___alert
___determined      ___upset        ___interested    ___active
___guilty          ___nervous      ___excited      ___dissatisfied with self
___hostile         ___proud        ___jittery      ___ashamed

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APPENDIX C

FOOD DIARY

Day _______________ Date _______________

Every time you eat please fill out one of the Eating Episodes below. Try to fill them out as close to the time that you ate as possible. At the end of today please fill out the questionnaires at the end of the food diary section.

Eating Episode #1

- Time_______
- I was ___ alone ___ with others
- My location was ______________________________________________
- I felt that I ate
  ___ more than others would in the same situation
  ___ the same as others would eat in the same situation
  ___ less than others would eat in the same situation
- I felt that my eating was ___ out of control, ___ in control
- My Mood was (circle the appropriate number)
  1  2  3  4  5  6  7
  Strongly Negative  Neutral  Strongly Positive

I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Eating Episode #2

- Time________
- I was ___ alone ___ with others
- My location was _______________________________
- I felt that I ate
  ___ more than others would in the same situation
  ___ the same as others would eat in the same situation
  ___ less than others would eat in the same situation
- I felt that my eating was ___ out of control, ___ in control
- My Mood was (circle the appropriate number)
  1 2 3 4 5 6 7
  Strongly Negative Neutral Strongly Positive

I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
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<tbody>
<tr>
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</tbody>
</table>

Eating Episode #3

- Time________
- I was ___ alone ___ with others
- My location was _______________________________
- I felt that I ate
  ___ more than others would in the same situation
  ___ the same as others would eat in the same situation
  ___ less than others would eat in the same situation
- I felt that my eating was ___ out of control, ___ in control
- My Mood was (circle the appropriate number)
  1 2 3 4 5 6 7
  Strongly Negative Neutral Strongly Positive

I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
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<tbody>
<tr>
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</tbody>
</table>
Eating Episode #4

- Time_______
- I was ___ alone ___ with others
- My location was ________________________________
- I felt that I ate
  ____ more than others would in the same situation
  ____ the same as others would eat in the same situation
  ____ less than others would eat in the same situation
- I felt that my eating was ____ out of control, ____ in control
- My Mood was (circle the appropriate number)

1 2 3 4 5 6 7
Strongly Neutral Strongly Negative Positive

I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
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</table>

Eating Episode #5

- Time_______
- I was ___ alone ___ with others
- My location was ________________________________
- I felt that I ate
  ____ more than others would in the same situation
  ____ the same as others would eat in the same situation
  ____ less than others would eat in the same situation
- I felt that my eating was ____ out of control, ____ in control
- My Mood was (circle the appropriate number)

1 2 3 4 5 6 7
Strongly Neutral Strongly Negative Positive
I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
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</tbody>
</table>

Eating Episode #6

- Time_______
- I was ___ alone ___ with others
- My location was __________________________________________________
- I felt that I ate
  ___ more than others would in the same situation
  ___ the same as others would eat in the same situation
  ___ less than others would eat in the same situation
- I felt that my eating was _____ out of control, _____ in control
- My Mood was (circle the appropriate number)

  1  2  3  4  5  6  7

  Strongly Negative  Neutral  Strongly Positive

I ate… (please write in)

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Quantity of Food</th>
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</thead>
<tbody>
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</tbody>
</table>

Please fill out the following questionnaires keeping in mind how you have been feeling in general today.

1. Please rate the following statements keeping in mind how you felt today. Circle the appropriate answer using the scale below.
Not at all A Little bit Somewhat Very Much Extremely
1 2 3 4 5

a. I felt satisfied with the way my body looks. 1 2 3 4 5
b. I felt that others respected and admired me. 1 2 3 4 5
c. I was dissatisfied with my weight. 1 2 3 4 5
d. I felt good about myself. 1 2 3 4 5
e. I was pleased with my appearance. 1 2 3 4 5
f. I felt unattractive 1 2 3 4 5

2. How much were you thinking about the following things today? Use the scale below to select the appropriate answer and write that number in the space provided.

1 2 3 4 5
Never Always

1. Felt like changing foods you eat to decrease body size? __________
2. Felt like changing eating to decrease body size? __________
3. Felt like changing levels of exercise to decrease body size? __________
4. Thought about exercise to decrease body size? __________
5. Worried about eating to decrease body size? __________
6. Thought about exercise to lose weight? __________
7. Thought about changing eating to increase body size? __________
8. Thought about changing levels of exercise to increase body size? __________
9. Thought about eating to increase body size? __________
10. Thought about exercise to increase body size? __________
11. Worried about eating to increase body size? __________
12. Worried about exercise to increase body size? __________
13. Thought about using exercise to increase muscle size? __________
14. Thought about taking food supplements to increase muscle size? __________
15. Thought about eating to increase muscle size? __________
16. Thought about exercise to increase muscle size? __________
17. Worried about eating to increase muscle size? __________
18. Worried about exercise to increase muscle size? __________
3. Rate each of the following words with regard to how you’ve generally felt today. Use the following scale to record your answers.

<table>
<thead>
<tr>
<th>very slightly or not at all</th>
<th>a little</th>
<th>moderately</th>
<th>quite a bit</th>
<th>extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

- __attentive__
- __scared__
- __strong__
- __angry at self__
- __irritable__
- __enthusiastic__
- __inspired__
- __disgusted with self__
- __distressed__
- __afraid__
- __blameworthy__
- __alert__
- __determined__
- __upset__
- __interested__
- __active__
- __guilty__
- __nervous__
- __excited__
- __dissatisfied with self__
- __hostile__
- __proud__
- __jittery__
- __ashamed__

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