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# Body image, eating disturbance and estrogen levels across the menstrual cycle

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# BODY IMAGE, EATING DISTURBANCE AND ESTROGEN LEVELS

# ACROSS THE MENSTRUAL CYCLE

An Abstract of a Thesis

Submitted

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts

Mei-Chuan Wang

University of Northern Iowa

August 2003

ABSTRACT

The principal interest of the current study was to examine estrogen levels across the menstrual cycle related to body image and eating disturbance. Participants were undergraduate female students at a medium size Midwestern university. There were two phases of this study—a between-subjects aspect ($N$ = 119) followed by a within-subjects aspect ($N$ = 41). Multivariate analyses of covariance (MANCOVA) were used to analyze the first phase data. Results showed that when eating disorders were viewed as a whole, eating patterns were stable across the menstrual cycle; but if looked at separately, symptoms of anorexia were worse when estrogen levels were high. In the follow-up phase of this study, results from repeated measures analyses of covariance (ANCOVA) suggest that women experience greater body dissatisfaction when estrogen is low. Discussion of the findings and their clinical implications are addressed.

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This Study by: Mei-Chuan Wang

Entitled: Body Image, Eating Disturbance and Estrogen Levels across the Menstrual

Cycle

has been approved as meeting the thesis requirements for the Degree of Master of Arts

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TABLE OF CONTENTS

LIST OF TABLES

## LIST OF FIGURE

CHAPTER 1

REVIEW OF THE LITERATURE

Eating disorders are a serious health concern and disturbances in eating behaviors can be life threatening. Anorexia nervosa is one of the few psychopathologies that can lead to mortality. The mortality rate due to all causes of death for patients with anorexia nervosa may be as high as 5.9% (Sullivan, 1995). In addition, the annual death rate for women with anorexia nervosa is 12 times higher compared to normal women at age 15 to 24 years old (Sullivan, 1995). Eating disorders are most prevalent among young women. More than 90% of individuals with eating disorders are female (American Psychiatric Association, 1994). In addition, eating disorders rarely occur before adolescence and after age 25 (Carson, Butcher, & Mineka, 2000). When a pronounced sex difference emerges around the time of adolescence, the possibility that hormonal factors are playing some role is at least suggested (Seeman, 1997). In other words, although socialization is likely to play a large role in the sex difference, it is also possible hormones play some role in the development of eating disorders.

It has been suggested that binge eating might be directly related to the change of reproductive hormones (Gladis & Walsh, 1987). Because there have been a small number of studies which directly investigated this hypothesis (Altabe & Thompson, 1990; Carr-Nangle, Johnson, Bergeron, & Nangle, 1994; Gladis & Walsh, 1987; Leon, Phelan, Kelly, & Patten, 1986), the results have been inconsistent and the different methodologies employed make straightforward comparisons difficult. Nonetheless, if estrogen is playing

a role in eating disorders, then changes in symptom expression across the menstrual cycle should be apparent.

## Eating Disorders

Individuals with eating disorders have maladaptive eating behavior and are extremely concerned about body shape and weight. Public awareness of the two types of eating disorders—anorexia nervosa, and bulimia nervosa—has increased in the past few decades through the mass media. However, while Russell (1979) first described bulimia nervosa in 1979, anorexia nervosa has been known as intentional self-starvation since the 1870's (Williamson, Zucker, Martin, & Smeets, 2001).

The current Diagnostic and Statistical Manual of Mental Disorders (4th edition; DSM-IV; American Psychiatric Association, 1994) provides four diagnostic criteria for anorexia nervosa: refusal to maintain normal body weight; fear of gaining weight, even when below normal weight; distorted self image regarding weight; and the presence of amenorrhea in postmenarcheal females. There are two subtypes of anorexia: the restricting subtype, lacking binge-eating or purging behavior, and the binge-eating/ purging subtype, involving regularly engaged in binge-eating or purging behavior. More than ninety percent of those diagnosed are females, usually during late adolescent or early adulthood (APA, 1994). The prevalence rates for anorexia nervosa among females in late adolescence and early adulthood range from 0.5% to 1% (APA, 1994).

Bulimia nervosa is characterized by episodes of binge eating followed by an inappropriate compensatory behavior in order to prevent weight gain. The most

frequently used compensatory behaviors for controlling weight gain are self-induced vomiting and laxative and diuretic abuse.

The diagnostic criteria for bulimia nervosa in DSM-IV are recurrent episodes of binge eating, marked by (a) eating an amount of food that is significantly larger than others would eat in a similar time period and under similar circumstances; and (b) a sense of lack of control over eating during the episode. Other criteria for bulimia nervosa include recurrent use of inappropriate compensatory behaviors including fasting, excessive exercise, self-induced vomiting, and/or the misuse of laxatives. In addition, body weight and shape must have a major influence on the individual's self-evaluation. There are two subtypes of bulimia nervosa: purging type, in which the person has regularly engaged in self-induced vomiting or the misuse of laxatives, and nonpurging type, in which the person has used fasting or excessive exercise, but not self-induced vomiting or the misuse of laxatives, diuretics, or enemas in order to prevent weight gain. The prevalence rates for bulimia are approximately 1-3% among adolescent females. The prevalence rate for bulimia nervosa among males is one-tenth that of females (APA, 1994).

Etiology

Different theories of the etiology of eating disorders have been proposed. However, it is generally agreed that the etiology of eating disorders is multidimensional. These multiple factors include sociocultural, psychosocial, and biological factors.

Eating disorders appear to be more prevalent in industrialized cultures (APA, 1994). This may be due to Western society's media which links thinness and physical

appearance to personal happiness, attraction, and self-control (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Since eating disorders appear to be more common in women than men, it is possible that gender role identification plays a role in this disorder. Women and girls are more likely than boys to associate physical appearance and body sizes to self-esteem and identity (Striegel-Moore, Silberstein, & Rodin, 1986). Bigger body sizes have been associated with strong predictors of body image dissatisfaction in college women (Burger & Dolny, 2002). As a result, discontent with own body appearance may lead individuals' attempts to lose weight. Therefore, body dissatisfaction (e.g., McKnight investigators, 2003) and dieting (e.g., Patton, Selzer, Coffey, Carlin, & Wolfe, 1999) have been seen as significant precursors of eating disorders among women.

Several psychological and psychosocial factors have been reported antecedents for eating disorders such as stress and negative mood (for a review, see Polivey & Herman, 2002). For example, Friedman, Wilfley, Welch, and Kunce (1997) found that participants with bulimia have significantly higher self-directed hostility scores compared to overweight binge eating participants. Poor psychosocial functioning has been associated with a worse outcome for those with anorexia (Wentz, Gillberg, Gillberg, & Rastam, 2001). Furthermore, Flament, Godart, Fermanian, and Jeammet (2001) found that almost 90% of persons with anorexia were either socially avoidant or met the diagnostic criteria for separation anxiety disorder.

Cognitive behavioral theories (Fairburn, 1981; Fairburn, Shafran & Cooper, 1998; Garner & Bemis, 1982) propose that cognitive distortions are the prominent feature of bulimia and anorexia nervosa. Individuals with eating disorders are found to have

irrational beliefs related to body shape and weight. By restricting their food intake, individuals with anorexia nervosa obtain a sense of self-control and self-worth. According to the principles of reinforcement, the positive feedback from dieting combined with a fear of weight gain promote future restrained eating and maintain the disorders (Fairburn et al., 1998).

Psychodynamic perspectives of anorexia nervosa view diagnosed individuals as using restrained eating to compensate for their perceived lack of identity and self-control (Bruch, 1973). Through overcoming their biological urges, these individuals escape the hypothesized sense of imperfection and ineffectiveness. Another psychodynamic view maintains that anorexia nervosa is based on fears of maturation and adult sexuality (Crisp, 1997). By avoiding food intake, individuals cease menstruation and maintain a child-like body shape; thus they are thought to seek escape from their anxiety about adulthood challenges.

Several biological factors have been associated with eating disorders. Family and twin studies suggest that eating disorders run in families (for a review, see Klump, Kaye, & Strober, 2001). Twin studies have shown greater concordance rates for identical twins than for fraternal twins in both anorexia nervosa and bulimia nervosa. Heritability estimates range from .5 to .8 (Klump et al., 2001), suggesting that genetic factors play a significant role in eating disorders.

Certain neurotransmitters appear to play an important role in eating disorders. Serotonergic systems have been associated with eating disorders and serotonin is known to modulate both appetite and mood (for a review, see Brewerton, 1995). Serotonin

systems have been related to eating behaviors in both laboratory animals and humans (Blundell, 1984; Jimerson, Lesem, Hegg, & Brewerton, 1990; Leibowitz & Alexander, 1998; Wallin & Rissanen, 1994; Weiss, Papadakos, Knudson, & Leibowitz, 1986). Central serotonin pathways, particularly the region of the paraventricular nucleus (PVN) of the hypothalamus, play a role in termination of eating and inhibition of over-eating but not initiation of eating (Blundell, 1986). Injections of serotonin agonists into the PVN of rats cause a decrease in the meal size and a reduction of eating rate (Blundell, 1986). In contrast, blocking serotonin receptor activation or injecting serotonin antagonists lead to an increase in food intake and weight gain (Blundell, 1984). Moreover, some evidence indicates that alteration of serotonin in PVN is most likely to affect the consumption of carbohydrate intake and least likely to effect protein and fat diets (Leibowitz, Weiss, & Shor-Posner, 1988). Overall, the role of serotonin in eating behaviors has been fairly well established.

Although social factors clearly play an important role in the development of eating disorders, the proposed research is an attempt to clarify the biological aspects of the disorder, and, in particular, the possibility that female sex hormones may play some role in the expression of eating disorders.

<div align="center">Hormones and Estrogen Effects</div>

Typical Cycle

Women from menarche to menopause experience physical and psychological changes associated with the menstrual cycle. Menstrual cycles consist of a series of hormonal changes that are controlled by the pituitary gland and ovaries. Two major sex

hormones—estrogen and progesterone— regularly fluctuate across the menstrual cycle. Both estrogen and progesterone are at the lowest levels during menstruation. Estrogen levels slowly increase from the onset of menstrual bleeding and then accelerate until they reach a peak at or near day 13. After estrogen reaches peak levels, there is a sharp drop. Within 24 hours, the levels of estrogen levels drop as low as at the beginning of menstruation. The surge of estrogen coincides with ovulation. After ovulation, both estrogen (and progesterone) levels increase, as depicted in Figure 1.

There is growing awareness of estrogen's effects on neural functions beyond those directly related to reproductive functions. The importance of hormones and hormonal fluctuations has been studied and associated with memory and cognitive functions (Hampson, 1990; Hoff et al., 2001; Kimura & Hampson, 1994; Maki, Rich, & Rosenbaum, 2002; Thompson, Sergejew, & Kulkarni, 2000), with schizophrenic symptoms (Hallonquist, Seeman, Lang, & Rector, 1993; Kulkarni et al., 2001; Seeman, 1997; Seeman & Lang, 1990), and with mood disorders (Fink, Sumner, Roise, Wilson, & McQueen, 1999; Joffe & Cohen, 1998). A brief review of research investigating the influence of estrogen on mood and behavior follows.

Estrogen and Cognition

Hampson (1990) investigated the influence of estrogen-related variations on cognitive functions and found that women exhibited different patterns of scores as a function of menstrual phase. In a within-subjects comparison, women performed better on tasks which commonly favor men, namely, spatial ability and deductive reasoning when measured during day 3 to day 5 of menstrual cycles, which is the time of low

estrogen levels. However, this study failed to demonstrate any significant differences in tasks involving verbal fluency and perceptual speed across menstrual cycles, tasks which normally favor women.

Maki et al. (2002) investigated estrogen levels across a menstrual cycle and memory function. This study replicated Hampson's (1990) findings regarding estrogen's effect on spatial skills and reported that high estrogen levels decreased mental rotation abilities. However, Maki also found that high estrogen levels facilitated verbal fluency and fine motor abilities. The authors attributed the difference in results for verbal skills due to the difference in measures. Maki et al. employed a test of rhyme fluency for assessment of verbal fluency. This study also defined the high estrogen level differently than did Hampson, using days 19 to 24, in which both estrogen and progesterone are high (see figure 1). Therefore, the finding could conceivably also be due to progesterone as well as estrogen.

The effect of estrogen on cognitive abilities has been well replicated by different research groups (e.g., Hoff et al., 2001; Thompson et al., 2000) in both normal women and women with psychosis. For example, Thompson et al. (2000) reported that both groups of women performed better on tasks involved with mental rotation when estrogen levels are low. However, this study failed to support that high estrogen levels are related to producing a better performance on verbal fluency and motor tasks in both groups. Moreover, the group of women with psychosis performed significantly worse on tasks involving verbal and articulatory-motor functioning during high estrogen phases.

*Figure 1.* Change in estrogen across the menstrual cycle.
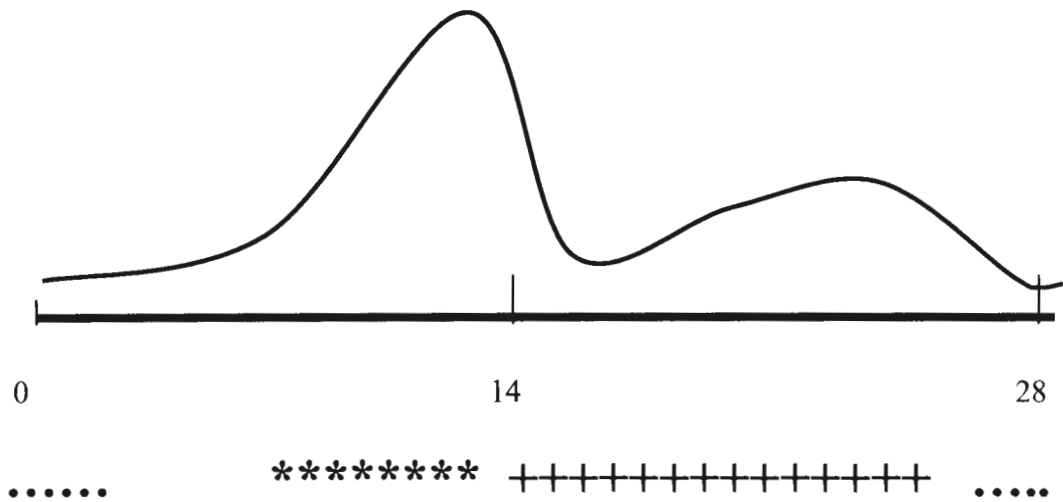


.... = Days of Low Estrogen   **** = Days of Rising/ High Estrogen

++++ = Days when estrogen may be rising or falling and co-occurs with high

progesterone.

Therefore, the study speculated that estrogen levels might have different effects on motor function on women with psychosis than normal women. However, another study (Hoff et al., 2001) found that estrogen levels were positively associated with global cognitive functions but not significantly correlated with psychiatric symptoms among women with schizophrenia. Overall, research suggests that estrogen levels influence spatial skills, at least in terms of mental rotation skills, and may possibly have some influence on some types of verbal skills.

Estrogen Effects on Psychopathologies

Estrogens have been proposed to play a protective role in relation to schizophrenia due to the observation that women, compared to men, with schizophrenia have later onset and their symptoms are relatively mild in the first decade but more severe later (Seeman, 1997; Seeman & Lang, 1990). Osterlund and Hurd (2001) stated that the mechanisms of estrogen protection in schizophrenia are not clearly understood but may be due to estrogen's modulation of dopaminergic systems. In addition, a placebo-controlled study (Kulkarni et al., 2001) reported estrogen could be a potential treatment for schizophrenia. The results of this study demonstrated that women who received estradiol treatment reduced their schizophrenic symptoms of hallucination and delusions.

Studies have shown that the sex hormones exert significant effects on moods and mental states (Fink et al., 1999; Joffe & Cohen, 1998). It has been hypothesized that the cyclic fluctuation of estrogen and progesterone may add vulnerability to depression in some reproductive age women (Joffe & Cohen, 1998). Mood disorders such as premenstrual syndrome, postnatal depression, and postmenopausal depression are

associated with periods of hormone change. This may be especially true among women who have a history of depression, that is, such women may be more vulnerable to significant reproductive hormone changes (Bloch et al., 2000; Endicott, 1993; Joffe & Cohen, 1998).

Serotonin and Estrogen

The serotonergic system has been strongly associated with mood, personality disorders, and impulsiveness (Coccaro, 1998; Osterlund & Hurd, 2001). It has been hypothesized that the interaction of estrogen and serotonergic systems is the possible mechanism that links gonadal hormones with behavior and mood states (DeSoto, Geary, Hoard, Sheldon, & Cooper, in press; Fink et al., 1999; Joffe & Cohen, 1998; Osterlund & Hurd, 2001). Estrogens modulate the serotonergic system leading to increases in serotonin concentrations (Rubinow, Schmidt, & Roca, 1998). Estrogen modulates the serotonergic system in several limbic areas and appears directly to increase the serotonin sensitivity in some serotonin receptors and decrease the sensitivity in others (Osterlund & Hurd, 2001). In addition, a number of pharmacological treatments for mood and personality disorders such as fluoxetine (brand name Prozac, Serafem), sertraline (Zoloft), and fluvoxamine (Luvox) specifically, are designed to target serotonin in the central nervous system. Furthermore, estrogen containing hormone replacement therapy (HRT) has been reported to facilitate response to antidepressants in postmenopausal women with major depression (Schneider et al., 1997) and this effect of estrogen has recently been replicated (Rasgon, Altshuler, & Fairbanks, 2001).

Estrogen, Serotonin and Eating Behavior

Sex Difference

The gender difference in appetite and eating patterns has been investigated on a

variety of levels and many differences have been found. For example, Leibowitz, Lucas,

Leibowitz, and Jhanwar (1991) found that female rats demonstrated a stronger preference

and consumed more calories on carbohydrates than male rats. This gender difference food

preference of carbohydrates has been found among humans as well (Drewnowski, Kurth,

Holden-Wiltse, & Saari, 1992).

Serotonin has been hypothesized to play a role in the gender difference related to

eating pattern and food preference (Wurtman & Wurtman, 1989). There are marked

gender differences of responsiveness to brain serotonin. Research found that female rats

have a higher density of serotonin receptors in the hypothalamus and demonstrated a

faster turnover rate and responsiveness to serotonergic agonists than male rats (Datla &

Curzon, 1997). In addition, dieting has been reported to alter women's response to

serotonin, but this is not found in men (Goodwin, Fairburn, & Cowen, 1987).

Serotonin and Eating Disorders

Clinical studies have consistently associated serotonin dysregulation with specific

eating disorders (for a review, see Brewerton, 1995; Wolfe, Metzger, & Jimerson, 1997).

In patients with anorexia nervosa, reductions in serotonin synthesis, uptake, turnover, as

well as reduced postsynaptic 5-HT1 receptors sensitivity have been found (for a review,

see Brewerton, 1995). Patients with anorexia nervosa have a low level of serotonin

metabolite (5-hydroxyindolacetic acid also called 5-HIAA) in their cerebrospinal fluid

(CSF) while they are underweight. Although their serotonin functions appear to normalize after reestablishing normal body weight, the alterations in brain serotonin may still play a role in maintenance of eating disorders (Kaye et al., 2001; Kaye, Gendall, & Strober, 1998; Kaye & Strober, 1999). In addition, challenge studies (challenge studies are used to determine if an individual's central nervous system responds normally to a particular interest neurotransmitter) have demonstrated that patients with anorexia nervosa have a blunted response following administration of a serotonin releasing agent, suggesting the serotonin system is not as responsive as it should be (Brewerton, Brandt, Lessem, Murphy, & Jimerson, 1990).

The extreme eating behaviors associated with bulimia have been linked with an impairment of satiety signals, which are linked to serotonergic systems (Jimerson et al., 1997). Like patients with anorexia nervosa, when participating in challenge studies, patients with bulimia nervosa demonstrate a dysregulation of serotonin system (for a review, see Brewerton, 1995). In addition, patients in long-term recovery from bulimia nervosa may demonstrate a reversal of the low levels serotonin concentration during the acute phase of the illness; Kaye, Greeno, et al. (1998) reported an elevation of 5-HIAA in the CSF of recovered patients with bulimia. Thus, like patients with anorexia nervosa, diminished serotonin functions appear to be state-dependent (Wolfe et al., 2000). Moreover, serotonin-selective reuptake inhibitors (SSRIs) have been demonstrated to reduce the frequency of binge eating in double-blind, placebo-controlled randomized trials (Fluoxetine Bulimia Nervosa Collaborative Study Group, 1992; Walsh, 1991).

The question of whether serotonin affects eating directly or indirectly through mood is important to consider. Although it is possible that SSRIs work by elevating mood, which in turn improves symptoms of bulimia nervosa, it is also possible that the SSRIs work directly on eating disorders symptoms. In support of this, some studies have shown that pretreatment levels of depression do not predict if patients with bulimia nervosa will response to these SSRIs medication or not (Agras, Dorian, Kirkley, Arnow, & Bachman, 1987; Walsh, Hadigan, Devlin, Gladis, & Roose, 1991). Together, it seems possible that disturbances in eating behaviors are not directly related to mood states or premenstrual anxiety but due to the underlying mechanism of estrogen and its interaction with central serotonin pathway.

Estrogen and Eating Behavior

Both animal and human studies have shown that estrogen inhibits eating behaviors. Animal studies demonstrate a sex difference in terms of eating patterns (Wade & Schneider, 1992; for a review, see Buffenstein, Poppitt, McDevitt, & Prentice, 1995). While male rats showed a consistent eating pattern, female rats decreased in both food intake and weight during ovulation and increased after ovulation. Because progesterone treatment showed no effect on food intake (Czaja, 1978), estrogen, rather than progesterone, has been associated with the effect of suppressant appetite. In addition, after oophorectomy, resulting in the absence of physiologic and behavioral estrus, the ovarian eating pattern on female rats no longer exists (Wade & Schneider, 1992).

Human research also indicates that women experience a variation of food intake with cyclical fluctuations in hormones across the menstrual cycle (Dye & Blundell, 1997).

Food intake decreases during the periovulatory phase when estrogen is at its peak and increases during the luteal phase when progesterone is elevated (Gong, Garrel, & Calloway, 1989; for a review, see Geary, 2001). One placebo controlled, randomized clinical trial of postmenopausal estrogen/progestin interventions showed that women in the treatment group significantly gained less weight compared to women in the placebo group at the end of 3 years (Espeland et al., 1997).

Because appetite seems responsive to the fluctuation of estrogen, the link between estrogen and the etiology of anorexia nervosa has been investigated. Research found that estrogen therapy may produce anorexia nervosa symptoms in girls without eating disorders and worsen symptoms of anorexia nervosa in patients suffering from anorexia (for a review, see Young, 1991). Therefore, Geary (1998) suggested that estrogen may be the underlying mechanism distinguishing normal and disordered eating behaviors in women.

Previous Studies of Hormonal Links.

Because of the links between eating disorders, estrogen, and serotonin, some researchers (e.g., Gladis & Walsh, 1987) have hypothesized that estrogen levels could have some effect on the symptoms of eating disorders. One way to investigate this hypothesis is to check for changes across the menstrual cycle. In fact, studies have directly investigated the link between menstrual cycle with the symptoms of eating disorders and body image (Altabe & Thompson, 1990; Carr-Nangle et al., 1994; Gladis & Walsh, 1987; Leon et al., 1986).

Carr-Nangle et al. (1994) were interested in the relationship between menstrual distress and body dissatisfaction among normal women, that is, with no history of eating disorders. Menstrual phases were measured through basal body temperature and serum levels of ovarian hormones. The study employed a series of body image questionnaires and a menstrual distress instrument to examine changes in body image across menstrual cycles. The results indicated that perimenstrual phase (low estrogen) was associated with a higher level of body-related negative thoughts and anxiety compared to follicular and luteal phases. In addition, anxiety about appearance and body image (automatic negative thoughts) were significantly related to menstrual distress. However, because the study did not report any data regarding if or how menstrual distress was statistically controlled, the relationship between menstrual cycles and body image could be mediated by general mood states. Even so, this study does suggest that body image may be a source of relatively greater distress during the perimenstrual phase that is, when estrogen levels are lowest.

Altabe and Thompson (1990) used a self-report method to estimate menstrual phase and defined perimenstrual phase as five days prior to the onset of menstrual bleeding (low estrogen); and intermenstrual phase as one week after cessation of menstrual bleeding to one week prior to onset of menstrual bleeding. The study reported that body image and eating disturbances were greater during the perimenstrual phase than intermenstrual phase. In contrast to the authors' hypothesis, individuals with higher menstrual distress did not demonstrate greater change in body image and eating disturbances during different menstrual phases. Therefore, the results indicate that body

image and eating disturbance vary as a function of menstrual phases independent of pre-menstrual distress. Together with the study above (Carr-Nangle et al., 1994), results suggest that times of low estrogen are associated with symptoms of eating disorders, and this relationship is not simply due to global negative mood effects that may occur perimenstrually.

Two studies have investigated the specific relationship between bulimic symptoms and menstrual cycle among patients with bulimia nervosa but have yielded inconsistent results. While Gladis and Walsh (1987) reported the premenstrual exacerbation of binge eating in patients with bulimia, Leon and colleagues (Leon et al., 1986) reported the stability of binging and purging behavior across menstrual cycles. These mixed findings might be due to some methodological considerations and different ways of dividing and comparing the menstrual cycle. The study from Leon et al. (1986) defined the perimenstrual phase as three days prior to onset of menstruation, the menstrual phases as the first three days of menstruation, and the intermenstrual phases as days 13 to 15 before the onset of menstruation. The study reported there was no difference in binging and purging behaviors across the menstrual cycle. However, when compared to Carr-Nangle et al. (1994), and Altabe and Thompson (1990), several methodological considerations are of note. This study included participants who were taking various medications, including oral contraceptives (which suppress the fluctuations they are trying to study) and antidepressants (which will influence serotonin levels). Thus, these results may be less reliable than other studies with more stringent methods.

The study of diagnosed and active bulimics conducted by Gladis and Walsh (1987) divided a menstrual cycle into 5-day segments and computed the average number of binge eating in each segment. Participants were women who were experiencing normal menstrual cycles, were not using hormone based methods of birth control and were not taking any drugs known to affect the serotonin system. The results indicate that number of binge eating episodes was higher in the five days prior to the onset of menstrual bleeding and fewer five to ten days after the onset of menstruation. Moreover, there was no significant association between mood states (measured by the Beck Depression Inventory) and the number of binge eating episodes. Therefore, the authors speculated that the link between menstrual cycles and binge eating might be directly due to the change of reproductive hormones rather than an indirect influence on eating behaviors mediated by changes of mood.

As can be seen from the above review of the literature, there is no universally accepted definition for the perimenstrual versus intermenstrual phase. Some might define intermenstrual phase as the time of ovulation, others might define it somewhere between perimenstrual and menstrual phases. However, it is important to have a clear rationale as to how one parses the menstrual cycle. If one hypothesizes the importance of sex hormones—estrogen and progesterone—then it makes the most sense to define phases based on what is known about the level of these hormones during a typical cycle. Furthermore, Hunter (1990) has reported estrogen alone has positive mental effect but a combination of estrogens and progesterone therapy may diminish the mental effects of estrogen. Therefore, in order to study estrogen effects and avoid co-occurrence with high

progesterone levels and the sudden sharp drop of estrogen levels, the proposed research will define the high estrogen phase as days 7 to13, when estrogen levels are high and increasing and progesterone levels remain low as depicted in Figure 1.

To summarize, there is a paucity of research on the role of hormones on eating disorder symptoms. Of the four studies on the subject the author is aware of, only three have yielded consistent results and have not adequate distinguish between anorexia and bulimia symptoms which may differ under the influence of estrogen. The current study was an attempt to clarify the relationship between varying levels of estrogen as they occur during a normal menstrual cycle with the symptoms of eating disorders and body image. The principal comparison of interest was between the high and low levels of estrogen during a menstrual cycle related to body images and eating disturbances. This study hypothesized that a cross section of normally menstruating women measured during times of low estrogen levels would show more bulimic behaviors and more disturbed body images compared to women measured during times of high estrogen levels who would show more symptoms of anorexia. In addition, women who were relatively high in regards to eating disorder symptoms were expected to exhibit an exacerbation of their bulimic symptoms during the times in their menstrual cycle when estrogen levels are low, and an increase in anorexia symptoms when estrogen levels are high. This study also assessed general mood states across a menstrual period in order to determine if mood states play a mediating role related to maladaptive eating patterns and body images.

CHAPTER 2

METHOD

There were two phases of the study. First a between subjects aspect, followed by a within-subjects aspect, each of which is reviewed below. This study employed a set of self-report questionnaires to assess the body images, eating patterns, and mood states of participants. A calendar method similar to that used in previous research (Altabe & Thompson, 1990; DeSoto et al., in press; Gladis & Walsh, 1987) was used to estimate time in menstrual cycle. This study used this method to count forward from the day of menstrual onset to estimate the estrogen levels in a menstrual period. The low estrogen phase was defined as days zero to three and three days before the onset of menstruation, and the high estrogen phase was defined as day 6 to day 13 after the onset of menstruation (refer to Figure 1).

Phase 1: Between Subjects Design

Participants

Participants were 303 female undergraduates enrolled in Introduction to Psychology classes at a medium-sized Midwestern university who reported they did not use contraceptive pills/patches and were experiencing normal menstrual cycles. Participants received partial course credit for their participation. These participants completed a brief background information questionnaire including age, ethnic group, weight and height, the regularity of their menstrual cycle, the date their last menstrual period (LMP) began (see Appendix A), as well as a set of questionnaires including the EAT, BULIT-R, BIS, and BESAA (described below). Participants ($N = 39$) who reported irregular menstrual cycles

(varying by more than a week in length) or missed four or more periods over the past six months were excluded from the data analyses. There was no significant difference between the excluded and included women in terms of age, $t(301) = -1.21, p > .05$, or Body Mass Index, $t(301) = .002, p > .05$. Thus, 264 women were included and the average age of the sample was 18.81 years ($SD = 2.29$ years, range, 18-42 years). The majority were Caucasian (94.7 %), with 1.9 % African American, and 3.4 % other ethnic groups.

Participants who reported their LMP to be between day 6 and 13 were assigned into the high/rising estrogen level group (HE; N = 63), and participants who reported their LMP to be either 0-3 days ago or 26- 29 days ago were assigned into the low estrogen level group (LE; N = 56). Participants (N = 145) whose LMP was not in either of these windows were not included. There was no significant difference between the high estrogen group and the low estrogen group in term of age (mean age of HE = 18.86 years, LE = 18.96), $t(117) = -.21, p > .05$ or Body Mass Index (mean scores of HE = 22.45 years, LE = 22.19), $t(117) = .45, p > .05$.

Measures and Procedures

The study was approved by the Institutional Review Board at the University of Northern Iowa and all participants gave informed consent to participate. Participants completed a brief demographic questionnaire including age, ethnicity, weight, height, the regulation of menstrual cycles, the date of last menstrual period (see Appendix A). All questions were administered in group classroom settings.

Eating Attitudes Test-26 (EAT-26). The EAT-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982) is a 26-item abbreviated version of the EAT (Garner & Garfinkel, 1979)

consisting of three subscales—Dieting (EAT-D), Bulimia and Food preoccupation (EAT-BU), and Oral Control (EAT-OC) subscales. It is highly correlated with total scores on the original EAT ($r = .98$; Garner et al., 1982). The EAT is a self-report assessment developed to evaluate a broad range of attitudes and behaviors related to anorexia nervosa. Each item is rated on a 6-point scale ranging from "Always" to "Never." Higher scores are indicative of a greater level of anorexic symptoms. High internal consistency ($\alpha = .94$) and test-retest reliability ($\alpha = .84$) have been reported (Carter & Moss, 1984). In addition, study (Gross, Rosen, Leitenberg, & Willmuth, 1986) showed that the concurrent validity of the EAT-26 with the Drive for Thinness, Body Dissatisfaction, and Bulimia of Eating Disorder Inventory (EDI) scales were .81, .50, and .42, respectively. Garner et al. (1982) suggested a cutoff score of 20 on the EAT-26 to identify disordered eating attitudes and behaviors. There were 13% of participants in the current sample with scores above the cutoff score, which is consistent with the EAT-26 normative data for nonclinical female samples (13%). The EAT-26 is given in Appendix B.

Bulimia Test-Revised (BULIT-R). The BULIT-R (Thelen, Farmer, Wonderlcih, & Smith, 1991) was designed to assess the symptoms of bulimia nervosa based on the DSM-IV criteria (APA, 1994). The BULIT-R consists of 28 items with a multiple-choice format that are scored and 8 items related to weight control behavior that are not scored. For a clinical population, a 104 cutoff score has been used for screening purposes. However, for research and non-clinical population purposes, a cutoff score of 85 is applied to identify individuals with bulimic symptomatology (Thelen et al., 1991). The internal consistency of BULIT-R is high ($\alpha = .97$), and the test-retest reliability has been

found to be stable over a 2-month interval ($\alpha$ = .95; Thelen et al., 1991). The BULIT-R is presented in Appendix C.

Body Esteem Scale for Adolescents and Adults (BESAA). The BESAA (Mendelson, Mendelson, & White, 2001; Mendelson & White, 1998) is a 23-item, self-report measure for assessing body esteem. Individuals rate their agreement with various statements about their bodies. Each item is rated on a 5-point scale that ranges from 0 (never) to 4 (always). Three factors have been reported (Mendelson et al., 2001)—BE-Appearance (BEAPP; general feelings about appearance), BE-Attribution (BEATT; others' evaluation about one's body and appearance), and BE-Weight (BEWT; weight satisfaction). Three subscale scores are derived by the average of items in each subscale. Lower scores indicate lower body esteem. Test-retest reliability ranged from .83 to .92 in a three-month interval (Mendelson et al., 2001). The internal consistency was high ($\alpha$ = .81 to .94; Mendelson et al., 2001). The BESAA is presented in Appendix D.

Body Image Silhouettes (BIS). The BIS (Cooley & Toray, 2001) is a figure rating scale designed to assess individuals' satisfaction with their own body weights. Participants were asked to choose the figure closest to how they look and the figure closest to how they would like to look. A higher discrepancy between the sizes of the two images suggests greater body image dissatisfaction. The correlation between their ratings to their own body figure with body mass index was .79 ($p$ < .001), and the test-retest reliability was from .70 to .77 (Cooley & Toray, 2001). The BIS is given in Appendix E.

Body Mass Index (BMI). Body Mass Index is a calculation of weight in kilograms divided by height in meters squared (BMI = $W/H^2$). The BMI was calculated relying on

participants' self-report height and weight in the brief background questionnaire. For adult women (age > 18), the classification of "Underweight" is BMI under 20, "Acceptable" is between 20 to 25, "Overweight" is between 25 to 30, and above 30 is "Obese" (Robert-McComb, 2001). Because previous evidence (Burger & Dolny, 2002) indicated that BMI is a strong predictor of both body dissatisfaction and eating disturbance, BMI was entered as the covariate in order to test if changes of symptoms were fully explainable by a change of estrogen level above and beyond those already accounted for by BMI. The mean BMI of the samples was 22.79 ($SD$ = 3.43, range, 14.66 to 40.78).

It was hypothesized that during times of high/rising estrogen levels, women would experience (a) more symptoms of anorexia, (b) fewer symptoms of bulimia, and (c) better body image compared to low estrogen levels.

### Phase 2: Within Subjects Design

The second phase of this study was designed to examine if women who were relatively high in regards to eating disorder symptoms would exhibit an increase in anorexia symptoms during the times in their menstrual cycle when estrogen levels are high and exacerbation of their bulimic symptoms when estrogen levels are low. This phase of the study also assessed general mood states across a menstrual period in order to determine if mood states play a mediating role related to disturbance eating behavior and body dissatisfaction.

Participants

Using the data from the initial data collection of the 303 women, 48 participants who scored above the cutoff scores on either EAT-26 or BULIT-R, were invited to participate in follow-up sessions. These participants received additional course credits as well as a small gift certificate as a bonus for completing the two follow-up surveys. These two additional sessions were scheduled based on the participants self-reported LMP to ensure the participants were measured during different menstrual phases. Order of testing-- high versus low estrogen time in cycle-- was counterbalanced. Forty one (mean age = 18.8 years; mean BMI = 23.4) out of 48 invited participants completed the follow-up sessions.

Measures

Participants were given a questionnaire packet with some of the same questionnaires in the initial session as well as additional measures regarding their current eating behavior and body image. Specifically, these participants completed the background information questionnaire, BIS, BESAA, PASTAS, EDI, and POMS.

Physical Appearance State and Trait Anxiety Scale (PASTAS). The PASTAS (Reed, Thompson, Brannick, & Sacco, 1991) was designed to assess anxiety associated with 16 specific body sites. Two components were found: PASTAS-Weight scale was correlated with measuring body dissatisfaction and eating disturbance, and PASTAS-Non-Weight scale was not correlated with these measurements. The authors (Reed et al., 1991) reported a high internal consistency ($\alpha$ = .82 to .92) and test-retest reliability ($\alpha$ = .87). Because the state version of the PASTAS allows for the assessment of current body image

related to anxiety (Reed et al., 1991), this study used the state version of the PASTAS-Weight scale. The PASTAS is given in Appendix F.

Eating Disorder Inventory (EDI)—Drive for Thinness (EDI-DT), Bulimia (EDI-B), and Body Dissatisfaction(EDI-BD). The EDI (Garner, Olmstead, & Polivy, 1983) is a 64-item self-report instrument designed to assess psychological characteristic and behavioral symptoms common in anorexia nervosa and bulimia nervosa. This study used three subscales (23 items) of the EDI, namely, the Drive for thinness (EDI-DT), the Bulimia (EDI-B), and the Body dissatisfaction (EDI-BD) subscale scores to assess body image and eating disturbance in the follow-up sessions. The author reported (Garner et al., 1983) a good internal consistency estimates of the EDI-DT, EDI-B, and EDI-BD subscales ($a$ = .85, .85, & .90, respectively) for patients with Anorexia Nervosa. The EDI-23 is given in Appendix G.

Profile of Mood States—Short Form (POMS-SF). The POMS (McNair, Lorr, & Droppleman, 1981) is a self-report instrument used to measure psychological distress. Participants respond according to a five-point scale ranging from "Not at all" (0) to "Extremely" (4)." A 30-item short-version of the POMS (POMS-SF) has been developed. The POMS-SF demonstrated a high internal consistency compared to the original POMS. Correlation between the POMS –SF to POMS in the total mood disturbance score and subscale scores exceeded .95 (Curran, Andrykowski, & Studts, 1995). These scores were included for use as a covariate to determine if changes in level of symptoms were fully explainable by a change in general mood. Note that the POMS-SF is protected by copyright; these items could not be reproduced.

CHAPTER 3

RESULTS

Data Analysis-Phase I

Reliability Analyses

Cronbach's alpha was used to estimate the internal consistency reliability of the study measures. The reliability estimates for these measures on the high estrogen group ($N$ = 63; EAT-26, $\alpha$ = .89; EAT-D, $\alpha$ = .90; EAT-BU, $\alpha$ = .83; BULIT-R, $\alpha$ = .95; BEATT, $\alpha$ = .73; BEWT, $\alpha$ = .93; BEAPP, $\alpha$ = .94) and the low estrogen group ($N$ = 56; EAT-26, $\alpha$ = .87; EAT-D, $\alpha$ = .88; EAT-BU, $\alpha$ = .72; BULIT-R, $\alpha$ = .94; BEATT, $\alpha$ = .83; BEWT, $\alpha$ = .90; BEAPP, $\alpha$ = .92) were adequate except for the EAT-OC subscale which showed a somewhat low internal consistency estimate (HE, $\alpha$ = .46; LE, $\alpha$ = .43).

Between Subject Design

Multivariate analyses of covariance (MANCOVA) were used to examine the difference between the two estrogen groups (High vs. Low) in measurements of body image and eating disturbance. In the eating disturbance analyses, estrogen groups were entered as an independent variable, the EAT-26 and BULIT-R scores were entered as dependent variables, and the BMI scores were entered as the covariate. No significant differences between the two estrogen groups were detected by these measures [$F(1, 115)$ = 2.54 , $p$ = .08].

To test the hypothesis that symptoms of anorexia and symptoms of bulimia would be differentially affected by estrogen levels, the measure of restricting anorexia (EAT-OC) and symptoms of bulimia (EAT-BU and BULIT-R) were analyzed separately. For the

symptoms of anorexia, results from the univariate analyses of covariance (ANCOVA) indicated that the high estrogen group showed higher scores in the EAT-Oral control subscale [$F(1, 116) = 4.05, p = .05$, partial eta squared $= .03$]. In measures of bulimic symptoms, the EAT-BU and BULIT-R were entered as dependent variables. There was no significant difference between the two estrogen groups [$F(1, 115) = 1.22, p = .3$].

In the body image analyses, with estrogen levels entered as the independent variable, BEATT, BEAPP, BEWT, and BIS entered as dependent variables, and BMI entered as a covariate, no significant differences between the two estrogen groups were found by these measures [$F(1, 113) = .75, p = .56$]. Table 1 presents the means and standard deviations of each measurement.

Interscale Correlations

Post hoc analyses of interscale correlations were used Pearson correlation coefficients. Because the reliability estimate of the EAT-OC was somewhat low, the correlations of the EAT-OC and the other measures were recalculated by using the AssiStat for Windows Version 1.1 software—correlation for criterion unreliability (MicroMetrix Corp, 1998). Table 2 presents interscale correlations by measures of eating disturbance (EAT-D, EAT-BU, EAT-OC, and BULIT-R), and body image (BEAPP, BEWT, BEATT, BIS, and BMI) on each estrogen group (HE, $N = 63$; LE, $N = 56$).

Table 1

*Unadjusted Means and Standard Deviations of the EAT-26, BULIT-R, BIS, and BESAA scales*

| Scales | High Estrogen (N = 63) | | Low Estrogen (N = 56) | |
| --- | --- | --- | --- | --- |
| | Mean | SD | Mean | SD |
| Eating disturbance measures | | | | |
| EAT-26 Total | 8.69 | 9.74 | 8.45 | 8.37 |
| EAT-D | 5.78 | 7.37 | 5.95 | 6.66 |
| EAT-BU | 0.92 | 2.26 | 1.07 | 1.92 |
| EAT-OC* | 1.94 | 2.21 | 1.26 | 1.68 |
| BULIT-R | 51.41 | 18.51 | 55.77 | 19.76 |
| Body image measures | | | | |
| BEAPP | 2.01 | .86 | 2.06 | .85 |
| BEWT | 1.90 | 1.01 | 1.94 | .96 |
| BEATT | 2.07 | .50 | 2.21 | .57 |
| BIS | -2.45 | 2.57 | -2.49 | 2.15 |

*Note.* EAT-26 = Eating Attitudes Test-26; EAT-D = EAT-Dieting subscale, EAT-BU = EAT-Bulimia and Food preoccupation subscale; EAT-OC = EAT-Oral Control subscale; BULIT-R = Bulimia Test-Revised; BEAPP = Body Esteem Scale for Adolescents and Adults-Appearance subscale; BEWT = Body Esteem Scale for Adolescents and Adults-Weight subscale; BEATT = Body Esteem Scale for Adolescents and Adults-Attribution subscale; BIS = Body Image Silhouettes.

* $p < .05$.

Table 2

*Interscale Correlations of Eating Disturbance and Body Image Measures*

| Scales | EAT-D | EAT-BU | EAT-OC | BULIT-R | BEAPP | BEWT | BEATT | BIS | BMI |
|---|---|---|---|---|---|---|---|---|---|
| EAT-D | 1 | .48** | .34**<br>(.40**) | .65** | -.62** | -.61** | -.03 | -.26 | .11 |
| EAT-BU | .73** | 1 | -.01<br>(-.02) | .68** | -.57** | -.55** | -.25 | -.57** | .34* |
| EAT-OC | .18<br>(.27) | .04<br>(.06) | 1 | .08<br>(.12) | .10<br>(.20) | .11<br>(.17) | .35**<br>(.53**) | .17<br>(.26) | -.24<br>(-.37) |
| BULIT-R | .76** | .71** | .03<br>(.04) | 1 | -.72** | -.69** | -.25 | -.51** | .27* |
| BEAPP | -.62** | -.53** | -.05<br>(-.07) | -.75** | 1 | .85** | .60** | .66** | -.36** |
| BEWT | -.62** | -.49** | -.10<br>(-.15) | -.75** | .86** | 1 | .40** | .63** | -.52** |
| BEATT | -.21 | -.26* | .28<br>(.41) | -.38** | .61** | .48** | 1 | .50** | -.36** |
| BIS | -.37** | -.28* | .22<br>(.32) | -.47** | .57** | .62** | 42** | 1 | -.73** |
| BMI | .16 | .17* | -.27*<br>(-.40*) | .35** | -.49** | -.54** | -.43** | -.81** | 1 |

*Note.* Shaded numbers are high estrogen group (*N*= 63) interscale correlations and non-shaded numbers display low estrogen group (*N* = 56) interscale correlations. Corrected correlations of EAT-OC are in the parentheses. EAT-26 = Eating Attitudes Test-26; EAT-D = EAT-Dieting; EAT-BU = EAT-Bulimia and Food preoccupation; EAT-OC = EAT-Oral Control; BULIT-R = Bulimia Test-Revised; BEAPP = Body Esteem Scale for Adolescents and Adults-Appearance subscale; BEWT = Weight subscale; BEATT = Attribution subscale; BIS = Body Image Silhouettes; BMI = Body Mass Index.  ** *p* < .01; * *p* < .05.

## Data Analysis-Phase II

### Reliability Analyses

The internal consistency reliability estimates were evaluated using Cronbach's alpha. The reliability estimates for scores on these measures were good ($a$ range = .79 to .92). Table 3 displays reliability estimates and interscale correlations on each measure in the separate estrogen levels ($N = 41$).

### Correlation Analyses

The correlation between the two times of measures in each measure was significant ($p < .01$). Pearson correlation coefficients were as follows: EDI-DT, $r = .85$; EDI-BU, $r = .80$; EDI-BD, $r = .87$; PASTAS, $r = .85$; BEAPP, $r = .94$; BEWT, $r = .86$; BEATT, $r = .94$; BIS, $r = .93$.

Several interscale correlations changed between the two estrogen phases. For examples, the correlations between the BEATT and EDI-BU ($r = -.37, p < .05$); BEATT and BEWT ($r = .44, p < .01$) were significant when estrogen levels were high. The relationships were no longer significant during low estrogen phases ($r = -.29, r = .27$, respectively, $p > .05$) as shown in Table 3.

Table 3

*Reliability Estimates and Interscale Correlations of Two Times Measures on Each Measure*

| Scales | EDI-DT | EDI-BU | EDI-BD | PASTAS | BEAPP | BEWT | BEATT | BIS | BMI | $\alpha$ |
|--------|--------|--------|--------|--------|-------|------|-------|-----|-----|----------|
| EDI-DT | .85** | .28 | .46** | .53** | -.53** | -.55** | -.07 | -.02 | -.01 | .86 |
| EDI-BU | .39* | .80** | .2 | .34** | -.40** | -.35* | -.29 | .23 | .06 | .79 |
| EDI-BD | .41** | .25 | .87** | .78** | -.73** | -.77** | -.50** | .37* | .35* | .90 |
| PASTAS | .55** | .37* | .70** | .85** | -.73** | -.71** | -.34* | .41** | .28 | .84 |
| BEAPP | -.45** | -.37* | -.77** | -.72** | .94** | .84** | .45** | -.27 | -.26 | .85 |
| BEWT | -.49** | -.35* | -.75** | -.69** | .90** | .86** | .27 | -.35* | -.28 | .79 |
| BEATT | -.04 | -.37* | -.55** | -.38* | .52** | .44** | .94** | -.50** | -.53** | .88 |
| BIS | .09 | .21 | .34* | .34* | -.31 | -.40* | -.56** | .93** | .75** | |
| BMI | -.09 | .15 | .23 | .34* | -.30 | -.37* | -.53** | .74** | | |
| $\alpha$ | .81 | .81 | .92 | .84 | .84 | .81 | .85 | | | |

*Note.* $N = 41$; Shaded numbers are high estrogen phase interscale correlations and above the diagonal display low estrogen phase interscale correlations; EDI-DT = Eating Disorder Inventory-Drive for thinness subscale; EDI-BU = Bulimia subscale; EDI-BD = Body dissatisfaction subscale; PASTAS = Physical Appearance State and Trait Anxiety Scale; BEAPP = Body Esteem Scale for Adolescents and Adults-Appearance subscale; BEWT = Body Esteem Scale for Adolescents and Adults - Weight subscale; BEATT = Body Esteem Scale for Adolescents and Adults -Attribution subscale; BIS = Body Image Silhouettes; BMI = Body Mass Index. ** $p < .01$; * $p < .05$.

Within Subject Analyses

Repeated measure MANCOVA (BMI and POMS entered as covariates) was used to analyze the within subjects data for eating disturbance (as measured by the EDI-DT, EDI-BU, and EDI-BD), and body image (as measured by the BEAPP, BEWT, BEATT, PASTA, and BIS). Mood states, as assessed by POMS during two phases of estrogen, were highly correlated ($r = .71$, $p < .001$). Analyses showed no significant differences between the high estrogen level (mean scores = 33.44, $SD = 23.45$) and the low estrogen level (mean scores = 36.32, $SD = 22.1$), $t(40) = -1.06$, $p = .3$. Therefore, the average scores of the POMS were used to assess mood states. Results showed there was no significant estrogen effects assessed by measures of eating disturbance regardless of including the effects of mood states [$F(1, 38) = 1.53$, $p = .22$; covariates: BMI and POMS] or not [$F(1, 39) = 1.03$, $p = .32$; covariate: BMI].

In terms of measures of body image, no significant differences were detected during the two estrogen phases in spite of excluding the effects of mood states [$F(1, 39) = .03$, $p = .89$; covariate: BMI] or not [$F(1, 38) = .06$, $p = .82$; covariates: BMI and POMS]. At the subscale level of analyses, results from the repeated measures analyses of covariance (ANCOVA) showed there was a significant difference between two estrogen levels on the figure rating of body dissatisfaction measure [$F(1, 39) = 4.1$, $p = .05$, partial eta squared = .10]. While participants rated self figures fairly consistently across two phases of menstrual period [$F(1, 39) = .03$, $p = .87$], participants rated a thinner ideal figure when estrogen level was low [($F(1,39) = 8.05$, $p = .007$)]. Table 4 presents the means and standard deviations of each measure.

Table 4

*Unadjusted Means and SDs of the EDI, PASTAS, BESAA, and BIS*

| Scale | High Estrogen ($N = 41$) | | Low Estrogen ($N = 41$) | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Eating disturbance measures | | | | |
| EDI-DT | 12.85 | 4.71 | 12.63 | 5.19 |
| EDI-BU | 3.59 | 3.79 | 3.54 | 3.55 |
| EDI-BD | 17.46 | 7.31 | 17.37 | 7.25 |
| Body image measures | | | | |
| BEAPP | 1.21 | .75 | 1.23 | .72 |
| BEWT | 1.04 | .79 | .91 | .79 |
| BEATT | 1.82 | .69 | 1.88 | .66 |
| PASTAS | 20.8 | 6.01 | 21.32 | 6.16 |
| BIS* | 3.55 | 2.51 | 3.83 | 2.97 |
| S-self | 7.65 | 3.34 | 7.73 | 3.26 |
| S-ideal | 4.10 | 1.65 | 3.90 | 1.41 |

*Note.* EDI-DT = Eating Disorder Inventory-Drive for thinness subscale; EDI-BU = EDI-Bulimia subscale; EDI-BD = EDI- Body dissatisfaction subscales; BEAPP = Body Esteem Scale for Adolescents and Adults-Appearance subscale; BEWT = Body Esteem Scale for Adolescents and Adults-Weight subscale; BEATT = Body Esteem Scale for Adolescents and Adults- Attribution subscale; BIS = Body Image Silhouettes; BMI = Body Mass Index.
* $p < .05$.

CHAPTER 4

DISCUSSION

Eating disorders occur predominantly in women at late adolescence and early

adulthood. The prevalence rate of bulimia nervosa in males is only one-tenth that of

females (APA, 1994). Seeman (1997) has suggested that hormonal factors are possibly

playing some role when a marked gender difference appears around the time of

adolescence. Because appetite seems responsive to the fluctuation of estrogen, a

neuorendocrine approach views anorexia nervosa and bulimia nervosa as normal appetite

gone awry into two extreme directions—starving versus bingeing (Polivy & Herman,

2002). Although a few researchers have investigated the role of hormones across the

menstrual cycle on eating disorders, studies have not reported consistent findings and

have also not distinguished between anorexia and bulimia symptoms. Therefore, the aim

of the current study was to examine if the sex hormone estrogen influences symptoms of

eating disorders and body dissatisfaction and if the symptoms will exacerbate in women

who are relatively high in regards to eating disorder symptoms

The principal comparison of interest was between high and low levels of estrogen

during a menstrual cycle related to body images and eating disturbances. As mentioned in

the literature review, estrogen affects the serotonin system and because previous research

has linked serotonin and eating behaviors, this study hypothesized that people with

disturbed eating symptoms or body dissatisfaction would show more symptoms of

bulimia and body dissatisfaction during low estrogen phases. In addition, because

research has shown that estrogen suppresses appetite, more restrictive eating patterns might appear when estrogen levels were high.

Participants were female undergraduate students who experienced regular menstrual cycles and were not using any hormone related contraception. There were two phases of this study: a between-subjects design followed by a within-subject design. In the first phase, participants completed a demographic information questionnaire, two self-report measures on eating disorders and two self-report measures on body image. Women who displayed some eating disturbance symptoms via the self-report measures of the first phase study were invited to participate in the follow-up phase. Participants in the follow-up sessions completed four self-report measures related to body image and eating disturbance as well as a mood state questionnaire.

Discussion-Phase I

In the Phase I analyses, the hypotheses that symptoms of anorexia and bulimia would be influenced by estrogen levels was partially confirmed. Women in this sample showed greater symptoms of anorexia when estrogen levels were high. In symptoms of bulimia, the results were not significant, but the trend was in the direction hypothesized. Because the effect sizes were relatively small, larger sample sizes might yield significant findings.

Results of this study indicated that when eating disturbances were considered as a whole, results were fairly stable across the menstrual cycle, but when looked at separately, both anorexia and bulimia may be influenced by estrogen levels. Specifically, results, as hypothesized, indicate that women tended to endorse a higher oral control eating pattern,

especially for item-19, "Display self-control around food," when estrogen is high. This is especially interesting in the context of previous research. The finding is consistent with estrogen suppressing appetite (Geary, 1998), and with women experiencing a lower amount of food intake before ovulation, when estrogen levels are in their peak phases. The current results may indicate that women perceive themselves as having a stronger ability to control their food intake during high estrogen phases.

Regarding the bulimia symptoms, results of the current study did not show significant changes during the two estrogen phases of measurement. The current sample did not replicate the Gladis and Walsh's (1987) findings that binge eating in women with bulimia was exacerbated during premenstrual phases (low estrogen). The different findings could possibly be explained by the different measures of bulimic symptoms. While Gladis and Walsh only measured the number of binge episodes, the current study measured bulimic symptoms as a whole. If binge episodes are the only aspect of bulimia that is worsened at times of low estrogen; when a large number of bulimic symptoms are queried, the effect on binge episodes alone is diluted. Therefore, it is suggested that future investigators employ both a direct measure of binge/purging episode numbers and self-report measures of overall bulimic symptoms in order to clarify relationships between estrogen levels and symptoms of bulimia.

Together, results from the current study suggest a possible reason for the discrepancy found in the previous research investigating the effect of estrogen on eating disturbances reviewed in Chapter 1. Estrogen levels may have an opposite effect on symptoms of bulimia versus symptoms of anorexia. Therefore, it is possible to report a

stability of eating symptoms across the menstrual cycle if one were to study eating disturbance as a whole; a worsening at times of low estrogen if bulimia is studied; and an improvement if anorexia symptoms are studied. It is recommended that future research investigating changes across the menstrual cycle in eating disturbance should not use measures that combine symptoms of binge eating with anorexic symptoms into a unitary score of overall eating disturbance. In addition, because the effect sizes for estrogen were small, it is possible that a larger sample size is needed to have adequate statistical power. Future studies with larger sample sizes may be able to yield significant findings.

In terms of body image, results from the first phase showed no difference across the menstrual cycle. Because both the study of Altabe and Thompson (1990) and the study of Carr-Nangle et al. (1994) were a within-subjects design, the non-significant results from the first phase of the current between-subjects design may not be comparable to their studies. In addition, although Carr-Nagle et al. (1994) reported body image changes across the menstrual cycle, the changes were only observed in measures of negative body image thoughts and body anxiety scales. Therefore, it seems that estrogen can account for slight changes of body image.

A post hoc review of the interscale correlations yielded some interesting patterns. Different estrogen groups showed different patterns of relationships between some measures. For example, the correlation between other people's evaluation about one's appearance (as measure by BEATT) was significantly correlated with bulimia symptoms (as measure by BULIT-R). Research (Macrae, Alnwick, Milne, & Schloerscheide, 2002) has suggested that women show enhanced sensitivity to stimuli that are related to

reproduction during the time when conception risk is increased. Because the time of high/rising estrogen is the time closest to ovulation in women, the reproductive mechanism may lead women to be more sensitive and vulnerable to other people's evaluations regarding to their body appearance.

### Discussion-Phase II

In the eating disturbance measures, results from repeated measures MANCOVA showed a stable pattern across the two times of measurement. It could be due to the measures of eating disorders are sensitive to traits rather than states. Therefore, the change of symptoms of anorexia and bulimia might not be detected by the measures. Again, it is desirable that future studies investigating eating disorders across the menstrual cycle use direct measures which count numbers of binge/purging episodes.

In terms of body image, although the measures related to body esteem and body anxiety did not show differences across the menstrual cycle, the direct measure of self and ideal body figures showed that women demonstrated greater body dissatisfaction during low estrogen phases with a small effect size. Again, it is possible that direct measures are more sensitive to detect the change during the two times of measure. This finding is consistent with the study by Altabe and Thompson (1990) showing that the perimenstrual phase (low estrogen) was associated with poorer body image. Of interest, women in this sample rated stable body figures about themselves across the two times of measurement, but they had a tendency to choose thinner figures for their ideal body image when the estrogen level was low. One possible explanation is that during low estrogen phases, women experience a greater drive for food and as some sort of

compensation for their eating behaviors, they turn to desire a thinner ideal body figure. Researchers have repeatedly recognized a weight lose and gain pattern over periods of time among women called weight cycling or repeat dieting (Graham, Chang, Lin, Yakubu, & Hill, 1990). In addition, weight cycling has been associated with the development of binge eating (Polivy & Herman, 1985). Therefore, one area for future studies could be to investigate whether the time of women start dieting is associated with levels of estrogen in the menstrual cycle.

In the post hoc analyses of interscale correlations, again, estrogen levels seem to be a moderator of the strength of relationships between some measures. For examples, while others' evaluations about one's body and appearance (as measure by BEATT) were significantly correlated to symptoms of bulimia (as measure by EDI-BU) and weight satisfaction (as measure by BEWT) when estrogen levels were high, the relationships were no longer significant during low estrogen phases. From the both between and within-subjects aspects of this current study, results suggested that women might have different degrees of sensitive to other people's evaluations during different estrogen levels.

## Conclusion and Limitations

The thoughts and motivations of slimness and beauty have been idealized via mass media and the drive to be thin occupies most young women. Not surprisingly, there is an increase in eating disorders in young women. Understanding all aspects of the etiology of eating disorders will facilitate the treatment of young women suffering from these disorders. Because the primary feature of all eating disorders involves food intake—from

extremely restricted eating patterns to an uncontrollable, large appetite, a biological perspective of etiology of eating disorder has been extensively studied (e.g., Blundell, 1984; Dye & Blundell, 1997). The current study examined the effects of neuroendocrine factors, namely, estrogen changes, to eating disturbance during the menstrual cycle. In the first phase study, findings showed that women experience more symptoms of anorexia in the high estrogen phase compared to low estrogen phase in the menstrual cycle. In the second phase study, results indicated that women showed higher body dissatisfaction in the low estrogen phase.

Findings in this current study are limited to a college female sample. Because data were collected from undergraduate psychology classes at one specific university, it might have demographics and other characteristics differing from other universities. Also, because men were excluded from this study, whether hormone affects eating disorders in men is not answered. In addition, although some participants in the research likely demonstrate some clinical symptoms related to eating disorders, few were likely to meet the full criteria of eating disorders. Therefore, this study may not generalize to those with diagnosed eating disorders. Methodologically, although a calendar method has been widely used in research related to estimate time in menstrual cycle, a more direct measure of estrogen via saliva or blood could be more accurate.

Nonetheless, the results help clarify previous mixed findings about menstrual cycles related to eating disturbances and body image and aids in the understanding of the etiology of eating disorders. Clinical implications of these findings suggest that clinicians should be aware of the possible exacerbation of anorexic symptoms during high estrogen

phases. In addition, it may be that estrogen therapy or the use of oral contraceptions could potentially worsen patients' anorexia symptoms. Future studies with a larger sample size in both clinical and nonclinical populations are recommended to verify the findings from this study. Specifically, this study suggests that future investigators interested in estrogen effects on eating disorders use measures that separate anorexia and bulimia symptoms. In the measures of bulimic symptoms, directly measure of number of binging/purging episodes may be more sensitive to evaluate changes of symptoms during the menstrual cycle.

REFERENCES

Agras, W. S., Dorian, B., Kirkley, B. G., Arnow, B., & Bachman, J. (1987). Imipramine in the treatment of bulimia: A double-blind controlled study. *International Journal of Eating Disorders, 6,* 29-38.

Altabe, M., & Thompson, J. K. (1990). Menstrual cycle, body image, and eating disturbance. *International Journal of Eating Disorders, 9,* 395-401.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Bloch, M., Schmidt, P. J., Danaceau, M., Murphy, J., Nieman, L., & Rubinow, D. R. (2000). Effects of gonadal steroids in women with a history of postpartum depression. *American Journal of Psychiatry, 157,* 924-930.

Blundell, J. E. (1984). Serotonin and appetite. *Neuropharmacology, 23,* 1537- 1551.

Blundell, J. E. (1986). Serotonin manipulations and the structure of feeding behaviour. *Appetite, 7,* 39-56.

Brewerton, T. D. (1995). Toward a unified theory of serotonin dysregulation in eating and related disorders. *Psychoneuroendocrinology, 20,* 561-590.

Brewerton, T. D., Brandt, H. A., Lessem, M. D., Murphy, D. L., & Jimerson, D.C. (1990). Serotonin in eating disorders. In D. F. Cocccaro & D. L. Murphy (Eds.), *Serotonin in major psychiatric disorders* (pp. 155-184*).* Washington, DC: American Psychiatric Press.

Bruch, H. (1973). *Eating disorders: Obesity, anorexia nervosa, and the person within.* New York: Harper Collins.

Buffenstein, R., Poppitt, S., McDevitt, R. M., & Prentice, A. M. (1995). Food intake and the menstrual cycle: A retrospective analysis, with implications for appetite research. *Physiology & Behavior, 58,* 1067-1077.

Burger, M., & Dolny, D. (2002). The relationship among body mass index, body image, exercise habits and stage of change in college-aged females. *Women in Sport & Physical Activity Journal, 11,* 1-20.

Carr-Nangle, R. E., Johnson, W. G., Bergeron, K. C., & Nangle D. W. (1994). Body image changes over the menstrual cycle in normal women. *International Journal of Eating Disorders, 16,* 267-273.

Carson, R. C., Butcher, J. N., & Mineka, S. (Eds.). (2000). *Abnormal psychology and modern life* (7th ed.). Needham Heights, MA: Allyn & Bacon.

Carter, P. I., & Moss, R. A. (1984). Screening for anorexia and bulimia nervosa in a college population: Problems and limitations. *Addictive Behaviors, 9,* 417-419.

Coccaro, E. F. (1998). Neurotransmitter function in personality disorders. In K. R. Silk (Ed.), *Biology of personality disorders: Review of psychiatry series* (pp. 1-25). Washington, DC: American Psychiatric Press.

Cooley, E., & Toray, T. (2001). Disordered eating in college freshman women: A prospective study. *Journal of American College Health, 49,* 229-235.

Crisp, A. H. (1997). Anorexia nervosa as flight from growth: Assessment and treatment based on the model. In D. M. Garner & P. E. Garfinkel (Eds.), *Handbook of treatment for eating disorders* (2nd ed., pp. 248-277). New York: Guilford.

Curran, S. L., Andrykowski, M. A., & Studts, J. L. (1995). Short form of the profile of mood states (POMS-SF) psychometric information. *Psychological Assessment, 7,* 80-83.

Czaja, J. A. (1978). Ovarian influences on primate food intake: Assessment of progesterone actions. *Physiology and Behaviors, 21,* 923-928.

Datla, K. P., & Curzon, G. (1997). The effect of D-fenfluramine on brain 5-hydroxytryptamine and 5-hydroxyindoleacetic acid in male and female rats. *European Journal of Pharmacology, 333,* 27-31.

DeSoto, M. C., Geary, D. C., Hoard, M. K., Sheldon, M. S., & Cooper, L. (in press). Estrogen fluctuations, oral contraceptives and borderline personality. *Psychoneuroendocrinology.*

Drewnowski, A., Kurth, C., Holden-Wiltse, J., & Saari, J. (1992). Food preferences in human obesity: Carbohydrates versus fats. *Appetite, 18,* 207-221.

Dye, L., & Blundell, J. E. (1997). Menstrual cycle and appetite control: Implications for weight regulation. *Human Reproduction Oxford, 12,* 1142-1151.

Endicott, J. (1993). The menstrual cycle and mood disorders. *Journal of Affect Disorders, 29,* 193-200.

Espeland, M. A., Stefanick, M. L., Kritz-Silverstein, D., Fineberg, S. E., Waclawiw, M. A., & James, M. K. (1997). Effect of postmenopausal hormone therapy on body weight and waist and hip girths. *Journal of Clinical Endocrinology and metabolism, 82,* 1549-1556.

Fairburn, C. G. (1981). A cognitive behavioural approach to the management of bulimia. *Psychological Medicine, 11,* 707-711.

Fairburn, C. G., Shafran, R., & Cooper, Z. (1998). A cognitive behavioural theory of anorexia nervosa. *Behaviour Research and Therapy, 37,* 1-13.

Fink, G., Sumner, B., Rosie, R., Wilson, H., & McQueen, J. (1999). Androgen actions on central serotonin neurotransmission: Relevance for mood, mental state and memory. *Behavioural Brain Research, 105,* 53-68.

Flament, M. F., Godart, N. T., Fermanian, J., & Jeammet, P. (2001). Predictive factors of social disability in patients with eating disorders. *Eating and Weight Disorders, 6,* 99-106.

Fluoxetine Bulimia Nervosa Collaborative Study Group. (1992). Fluoxetine in the treatment of bulimia nervosa: A multicenter, placebo-controlled, doubled blind trial. *Archives of General Psychiatry, 49,* 139-147.

Friedman, M. A., Wilfley, D. E., Welch, R. R., & Kunce, J. T. (1997). Self-directed hostility and family functioning in normal-weight bulimics and overweight binge eaters. *Addictive Behaviors, 22,* 367-75.

Garner, D. M., & Bemis, K. M. (1982). A cognitive-behavioral approach to anorexia nervosa. *Cognitive Therapy and Research, 6,* 123-150.

Garner, D. M., & Garfinkel, P. E. (1979). The eating attitudes test: An index of the symptoms of anorexia nervosa. *Psychological Medicine, 9,* 273-279.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine, 12,* 871-878.

Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders, 2,* 15-34.

Geary, N. (1998). The effect of estrogen on appetite. *Medscape Women's Health, 3,* 1-13. Retrieved June 6, 2002, from http://www.medscape.com/viewarticle/408893.*com*

Geary, N. (2001). Estradiol, CCK and satiation. *Peptides, 22*, 1251-1263.

Gladis, M. M., & Walsh, B. T. (1987). Premenstrual exacerbation of binge eating in bulimia. *American Journal of Psychiatry, 144*, 1592-1595.

Gong, E. J., Garrel, D., & Calloway, D. H. (1989). Menstrual cycle and voluntary food intake. *American Journal of Clinical Nutrition, 49*, 252-258.

Goodwin, G. M., Fairburn, C. G., & Cowen, P. J. (1987). Dieting changes serotonergic function in women, not men: Implications for the aetiology of anorexia nervosa. *Psychological Medication, 17*, 839-842.

Graham, B., Chang, S., Lin, D., Yakubu, F., & Hill, J. O. (1990). Effect of weight cycling on susceptibility of dietary obesity. *American Journal of Physiology, 259*, R1096-R1102.

Gross, J., Rosen, J. C., Leitenberg, H., & Willmuth, M. (1986). Validity of Eating Attitudes test and the Eating Disorder Inventory in bulimia nervosa. *Journal of Consulting and Clinical Psychology, 54*, 875-876.

Hallonquist, J. D., Seeman, M.V., Lang, M., & Rector, N. A. (1993). Variation in symptom severity over the menstrual cycle of schizophrenics. *Biological Psychiatry, 33*, 207-209.

Hampson, E. (1990). Estrogen-related variations in human spatial and articulatory-motor skills. *Psychoneuroendocrinology, 15*, 97-111.

Hoff, A. L., Kremen, W. S., Wieneke, M. H., Lauriello, J., Blankfeld, H. M., Faustman, W. O., et al. (2001). Association of estrogen levels with neuropsychological performance in women with schizophrenia. *American Journal of psychiatry, 158*, 1134-1139.

Hunter, M. S. (1990). Emotional well-being, sexual behaviour and hormone replacement therapy. *Maturitas, 12*, 299-314.

Jimerson, D. C., Lesem, M. D., Hegg, A. P., & Brewerton, T. D. (1990). Serotonin in human eating disorders. *Annals New York Academy of Sciences, 600*, 532-544.

Jimerson, D. C., Wolfe, B. E., Metzger, E. D., Finkelstein, D. M., Cooper, T. B., & Levine, J. M. (1997). Decrease serotonin function in bulimia nervosa. *Archives of General Psychiatry, 54*, 529-534.

Joffe, H., & Cohen, L. S. (1998). Estrogen, serotonin, and mood disturbance: Where is the therapeutic bridge? *Biological Psychiatry, 44*, 798-811.

Kaye, W. H., Frank, G. F., Meltzer, C. K., Price, J. C., McConaha, C. W., Crossan, P. J., et al. (2001). Altered serotonin 2A receptor activity in women who have recovered from bulimia nervosa. *American Journal of Psychiatry, 158,* 1152-1155.

Kaye, W., Gendall, K., & Strober, M. (1998). Serotonin neuronal function and selective serotonin reuptake inhibitor treatment in anorexia and bulimia nervosa. *Biological Psychiatry, 44,* 825-838.

Kaye, W. H., Greeno, C. G., Moss, H., Fernstrom, J., Fernstrom, M., Lilenfeld, L. R., et al. (1998). Alterations in serotonin activity and psychiatric symptomatology after recovery from bulimia nervosa. *Archives of General Psychiatry, 55,* 927-935.

Kaye, W., & Strober M. (1999). The neurobiology of eating disorders. In D. Charney (Ed.). *Neurobiology of mental illness* (pp. 891-906). New York: Oxford University Press.

Kimura, D., & Hampson, E. (1994). Cognitive pattern in men and women is influenced by fluctuations in sex hormones. *Current Directions in Psychological Science, 3,* 57-64.

Klump, K., Kaye, W. H., & Strober, M. (2001). The evolving genetic foundations of eating disorders. *Psychiatric Clinics of North America, 24,* 215-225.

Kulkarni, J., Riedel, A., Castella, A. R., Fitzgerald, P. B., Rolfe, T. J., Taffe, J., et al. (2001). Estrogen—a potential treatment for schizophrenia. *Schizophrenia Research, 48,* 137-144.

Leibowitz, S. F., & Alexander, J. T. (1998). Hypothalamic serotonin in control of eating behavior, meal size, and body weight. *Biological Psychiatry, 44,* 851, 864.

Leibowitz, S. F., Lucas, D. J., Leibowitz K. L., & Jhanwar, Y. S. (1991). Developmental patterns of macronutrient intake in female and make rats from weaning to maturity. *Physiological Behavior, 50,* 1167-1174.

Leibowitz, S. F., Weiss, G. F., & Shor-Posner, G. (1988). Hypothalamic serotonin: Pharmacological, biochemical, and behavioral analyses of its feeding-suppressive action. *Clinical Neuropharmacol, 11 (supp 11),* S51-S71.

Leon, G. R., Phelan, P. W., Kelly, J. T., & Patten, S. R. (1986). The symptoms of bulimia and the menstrual cycle. *Psychosomatic Medicine, 48,* 415-422.

Macrae, C. N., Alnwick, K. A., Milne, A. B., & Schloerscheide, A. M. (2002). Person perception across the menstrual cycle: Hormonal influences on social cognitive functioning. *Psychological Science, 13,* 523-537.

Maki, P. M., Rich, J. B., & Rosenbaum, R. S. (2002). Implicit memory varies across the menstrual cycle: Estrogen effects in young women. *Neuropsycholgia, 40,* 518-529.

McKnight Investigators. (2003). Risk factors for the onset of eating disorders in adolescent girls: Results of the McKnight longitudinal risk factor study. *American Journal of Psychiatry, 162,* 248-254,

McNair, P. M., Lorr, M., & Droppleman, L. F. (1981). *POMS manual* (2$^{nd}$ ed.). San Diego, CA: Educational and Industrial Testing Service.

Mendelson, B. K., Mendelson, M. J., & White, D. R. (2001). Body-Esteem Scale for adolescents and adults. *Journal of Personality Assessment, 76,* 90-106.

Mendelson, B. K., & White, D. R. (1998). Manual for the Body-Esteem Scale for adolescents and adults. Unpublished manuscript, Center for Research in Human Development, Montreal, Quebec, Canada. In J. K. Thompson, L. J. Heinberg, M. Altabe, & S. Tantleff-Dunn (Eds.), *Exacting beauty: Theory, assessment, and treatment of body image disturbance.* Washington, DC: American Psychological Association.

MicroMetrix Corp. (1998). *AssiStat for Windows (Version 1.1).* Berkeley Height, NJ: Author.

Osterlund, M. K., & Hurd, Y. L. (2001). Estrogen receptors in the human forebrain and the relation to neuropsychiatric disorders. *Progress in Neurobiology, 63,* 251-267.

Patton, G. C., Selzer, R., Coffey, C., Carlin, J. B., & Wolfe, R. (1999). Onset of adolescent eating disorders: Population based cohort study over 3 years. *British Medical Journal, 318,* 765-768.

Polivy, J., & Herman, C. P. (1985). Dieting and bingeing: A causal analysis. *American Psychologist, 40,* 193-201.

Polivy, J., & Herman, C. P. (2002). Causes of eating disorders. *Annual Review of Psychology, 53,* 187-213.

Rasgon, N., Altshuler, L., & Fairbanks, L. (2001). Estrogen-replacement therapy for depression. *American Journal of Psychiatry, 158,* 1738.

Reed, D. L., Thompson, J. K., Brannick, M. K., & Sacco, W. P. (1991). Development and validation of the physical appearance state and trait anxiety scale (PASTAS). *Journal of Anxiety Disorders, 5,* 323-332.

Robert-McComb, J. J. (Ed.). (2001). *Eating disorders in women and children: Prevention, stress management, and treatment.* Boca Raton, FL: CPC Press.

Rubinow, D., Schmidt, P., & Roca, C. A. (1998). Estrogen-serotonin interactions: Implications for affective regulation. *Biological Psychiatry, 44,* 839-850.

Russell, G. F. M. (1979). Bulimia nervosa: An ominous variant of anorexia nervosa. *Psychological Medicine, 9,* 429-448.

Schneider, L. S., Small, G. W., Hamiltom, S. H., Bystritsky, A., Nemeroff, C. B., & Meyers, B. S. (1997). Estrogen replacement and response to fluoxetine in a multicenter geriatric depression trial. *American Journal of Geriatric Psychiatry, 5,* 97-106.

Seeman, M. V. (1997). Psychopathology in women and men: Focus on female hormones. *American Journal of Psychiatry, 154,* 1641-1647.

Seeman, M. V., & Lang, M. (1990). The role of estrogens in schizophrenic gender differences. *Schizophrenia Bulletin, 16,* 185-194.

Striegel-Moore, R. H., Silberstein, L. R., & Rodin, J. (1986). Toward an understanding of risk factors for bulimia. *American Psychologist, 41,* 246-263.

Sullivan, P. F. (1995). Mortality in anorexia nervosa. *American Journal of Psychiatry, 152,* 1073-1074.

Thelen, M. H., Farmer, J., Wonderlich, S., & Smith, M. (1991). The revision of the bulimia test: The BULIT-R. *Psychological Assessment, 3,* 119-124.

Thompson, J. K., Heinberg, L. J., Altabe, M., & Tantleff-Dunn, S. (Eds.). (1999). *Exacting beauty: Theory, assessment, and treatment of body image disturbance.* Washington, DC: American Psychological Association.

Thompson, K., Sergejew, A., & Kulkarni, J. (2000). Estrogen affects cognition in women with psychosis. *Psychiatry Research, 94,* 201-209.

Wade, G. N., & Schneider, J. E. (1992). Metabolic fuels and reproduction in female mammals. *Neuroscience Biobehavioral Reviews, 16,* 235-272.

Wallin, M. S., & Rissanen, A. M. (1994). Food and mood: Relationship between food, serotonin and affective disorders. *Acta Psychiatrica Scandinavica, 89 (377, Suppl),* 36-40.

Walsh, B. T. (1991). Psychopharmacologic treatment of bulimia nervosa. *Journal of Clinical Psychiatry, 52,* 34-38.

Walsh, B. T., Hadigan, C. M., Devlin, M. J., Gladis, M., & Roose, S. P. (1991). Long-term outcome of antidepressant treatment for bulimia nervosa. *American Journal of Psychiatry, 148,* 1206-1212.

Weiss, G. F., Papadakos, P., Knudson, K., & Leibowitz, S. F. (1986). Medial hypothalamic serotonin: Effects on deprivation and norepinephrine-induced eating. *Pharmacology Biochemistry & Behavior, 25,* 1223-1230.

Wentz, E., Gillberg, C., Gillberg, I. C., & Rastam, M. (2001). Ten year follow-up of adolescent onset anorexia nervosa: Psychiatric disorders and overall functioning scales. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 42,* 613-622.

Williamson, D. A., Zucker, N. L., Martin, C. K., & Smeets, A. M. (2001). Etiology and management of eating disorders. In P. B. Sutker & H. E. Adams (Eds.), *Comprehensive handbook of psychopathology* (3rd ed., pp. 641-670). New York: Kluwer Academic.

Wolfe, B. E., Metzger, E. D., & Jimerson, D. C. (1997). Research update on serotonin function in bulimia nervosa and anorexia nervosa. *Psychopharmacology Bulletin, 33,* 345-354.

Wolfe, B. E., Metzger, E. D., Levine, J. M., Finkelstein, D. M., Cooper, T. B., & Jimerson, D. C. (2000). Serotonin function following remission from bulimia nervosa. *Neuropsychopharmacology, 22,* 257-263.

Wurtman, R. J., & Wurtman, J. J. (1989). Brain serotonin, carbohydratecraving, obesity and depression. *Obesity Research, 3,* 477S-480S.

Young J. K. (1991). Estrogen and the etiology of anorexia nervosa. *Neuroscience & Biobehavioral Reviews, 15,* 327-331.

# APPENDIX A

## THE BACKGROUND INFORMATION QUESTIONNAIRE

# Eating Study

In this survey you will be given a series of questionnaires on various aspects of your eating behaviors. It will take approximately 30 minutes to complete the questionnaires. It is important that you answer as accurately and honestly as possible to all of the questions. All the information that you provide will be kept strictly confidential.

*Do not put your name anywhere on these questionnaires.*

1. How old are you? _____
2. What is your ethnic/racial group?

   **1**. African American      **4**. Caucasian
   **2**. American Indian        **5**. Hispanic
   **3**. Asian American         **6**. Other


3. How much do you weigh? If uncertain, please give your best estimate. _____lbs.
4. How tall are you? _____ft. _____in.
5. Are you taking birth control pills or using any hormone based method of birth control (norplant)?   **1**. Yes.   **2**. NO.
6. How regular are your cycles?

   **1.**   My cycles are exactly the same length each cycle.
   **2.**   My cycles are very regular, within one or two days each cycle.
   **3.**   My cycles are somewhat regular, within 3 or 4 days.
   **4.**   My cycles are somewhat irregular, varying by as much as a week in length.
   **5.**   My cycles are quite irregular, varying by more than a week in length.

7. Over the past 6 months, how many menstrual periods have you missed?

   **1.** zero  **2.** once  **3.** twice  **4.** three  **5.** four or more.

8. About how many days is your average menstrual cycle (that is, the start of your period one month to the start of your period the next month. e.g. 28 days)? _____ days
9. Indicate the date your last period began: Month_____Day_____

*Use this calendar if it will help you count the days….*

| December 2002 | | | | | | | | January 2003 | | | | | | | | February 2003 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | M | T | W | T | F | S | | S | M | T | W | T | F | S | | S | M | T | W | T | F | S |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | | | | 1 | 2 | 3 | 4 | | | | | | | | 1 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 29 | 30 | 31 | | | | | | 26 | 27 | 28 | 29 | 30 | 31 | | | 23 | 24 | 25 | 26 | 27 | 28 |

# APPENDIX B

# THE EATING ATTITUDES TEST-26 (EAT-26)

# EAT

Please circle a response for each of the following questions. All of the responses will be confidential. Please answer each question carefully. Thank you.

**A** = *Always*; **U** = *Usually*; **O** = *Often*; **S** = *Sometimes*; **R** = *Rarely*; **N** = *Never*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Am terrified about being overweight | A | U | O | S | R | N |
| 2 | Avoid eating when I am hungry | A | U | O | S | R | N |
| 3 | Find myself preoccupied with food | A | U | O | S | R | N |
| 4 | Have gone on eating binges where I feel that I may not be able to stop | A | U | O | S | R | N |
| 5 | Cut my food into small pieces | A | U | O | S | R | N |
| 6 | Aware of the calorie content of foods that I eat | A | U | O | S | R | N |
| 7 | Particularly avoid food with a high carbohydrate content (i.e., bread, rice, potatoes, etc.) | A | U | O | S | R | N |
| 8 | Feel that others would prefer if I ate more | A | U | O | S | R | N |
| 9 | Vomit after I have eaten | A | U | O | S | R | N |
| 10 | Feel extremely guilty after eating | A | U | O | S | R | N |
| 11 | Am preoccupied with a desire to be thinner | A | U | O | S | R | N |
| 12 | Think about burning up calories when I exercise | A | U | O | S | R | N |
| 13 | Other people think that I am too thin | A | U | O | S | R | N |
| 14 | Am preoccupied with the thought of having fat on my body | A | U | O | S | R | N |
| 15 | Take longer than others to eat my meals | A | U | O | S | R | N |
| 16 | Avoid foods with sugar in them | A | U | O | S | R | N |
| 17 | Eat diet foods | A | U | O | S | R | N |
| 18 | Feel that food controls my life | A | U | O | S | R | N |
| 19 | Display self-control around food | A | U | O | S | R | N |
| 20 | Feel that others pressure me to eat | A | U | O | S | R | N |
| 21 | Give too much time and thought to food | A | U | O | S | R | N |
| 22 | Feel uncomfortable after eating sweets | A | U | O | S | R | N |
| 23 | Engage in dieting behavior | A | U | O | S | R | N |
| 24 | Like my stomach to be empty | A | U | O | S | R | N |
| 25 | Enjoy trying new rich foods | A | U | O | S | R | N |
| 26 | Have the impulse to vomit after meals | A | U | O | S | R | N |

# APPENDIX C

# THE BULIMIA TEST-REVISED (BULIT-R)

# BULIT-R

Answer each question by circling the appropriate number. Please respond to each item as honestly as possible. All of the information you provide will be kept confidential.

1    I am satisfied with my eating patterns
   1. Agree                          4. Disagree
   2. Neutral                        5. Disagree strongly
   3. Disagree a little

2    Would you presently call yourself a "binge eater"?
   1. Yes, absolutely               4. Yes, possibly
   2. Yes                           5. No, probably not
   3. Yes, probably

3    Do you feel you have control over the amount of food you consume?
   1. Most or all of the time       4. Rarely
   2. A lot of the time             5. Never
   3. Occasionally

4    I am satisfied with the shape and size of my body.
   1. Frequently or always          4. Rarely
   2. Sometimes                     5. Seldom or never
   3. Occasionally

5    When I feel that my eating behavior is out of control, I try to take rather extreme measures to get back on course (strict dieting, fasting, laxatives, diuretics, self-induced vomiting, or vigorous exercise).
   1. Always                        4. Sometimes
   2. Almost always                 5. Never or my eating behavior is
   3. Frequently                       never out of control

6    I use laxatives or suppositories to help control my weight.
   1. Once a day or more            4. 2-3 times a month
   2. 3-6 times a week              5. Once a month or less (or never)
   3. Once or twice a week

7    I am obsessed about the size and shape of my body.
   1. Always                        4. Sometimes
   2. Almost always                 5. Seldom or never
   3. Frequently

8    There are times when I rapidly eat a very large amount of food.
   1. More than twice a week        4. 2-3 times a month
   2. Twice a week                  5. Once a month or less (or never)
   3. Once a week

9    How long have you been binge eating (eating uncontrollably to the point of stuffing yourself)?
   1. Not applicable; I don't binge eat    4. 1-3 years
   2. Less than 3 months                   5. 3 or more years
   3. 3 months to 1 year

10  Most people I know would be amazed if they knew how much food I can consume at one sitting.
1. Without a doubt          4. Possibly
2. Very probably            5. No
3. Probably

11  I exercise in order to burn calories.
1. More than 2 hours per day
2. About 2 hours per day
3. More than 1 but less than 2 hours per day
4. One hour or less per day
5. I exercise but not to burn calories or I don't exercise

12  Compared with women your age, how preoccupied are you about your weight and body shape?
1. A great deal more than average    4. A little more than average
2. Much more than average            5. Average or less than average
3. More than average

13  I am afraid to eat anything for fear that I won't be able to stop.
1. Always          4. Sometimes
2. Almost always   5. Seldom or never
3. Frequently

14  I feel tormented by the idea that I am fat or might gain weight.
1. Always          4. Sometimes
2. Almost always   5. Seldom or never
3. Frequently

15  How often do you intentionally vomit after eating?
1. 2 or more times a week    4. Once a month
2. Once a week               5. Less than once a month or never
3. 2-3 times a month

16  I eat a lot of food when I'm not even hungry.
1. Very frequently   4. Sometimes
2. Frequently        5. Seldom or never
3. Occasionally

17  My eating patterns are different from the eating patterns of most people.
1. Always          4. Sometimes
2. Almost always   5. Seldom or never
3. Frequently

18  After I binge eat I turn to one of several strict methods to try to keep from gaining weight (vigorous exercise, strict dieting, fasting, self-induced vomiting, laxatives, or diuretics.)
1. Never or I don't binge eat   4. A lot of the time
2. Rarely                       5. Most or all of the time
3. Occasionally

19  I have tried to lose weight by fasting or going on strict diets.
    1.  Not in the past year          4.  4-5 times in the past year
    2.  Once in the past year         5.  More than 5 times in the past year
    3.  2-3 times in the past year

20  I exercise vigorously and for long periods of time in order to burn calories.
    1.  Average or less than average  4.  Much more than average
    2.  A little more than average    5.  A great deal more than average
    3.  More than average

21  When engaged in an eating binge, I tend to eat foods that are high in carbohydrates (sweets and starches).
    1.  Always                        4.  Sometimes
    2.  Almost always                 5.  Seldom or never
    3.  Frequently

22  Compared to most people, my ability to control my eating behavior seems to be
    1.  Greater than others' ability  4.  Much less
    2.  About the same                5.  I have absolutely no control
    3.  Less

23  I would presently label myself a "compulsive eater" (one who engages in episodes of uncontrolled eating).
    1.  Absolutely                    4.  Yes, possibly
    2.  Yes.                          5.  No, probably not
    3.  Yes, probably

24  I hate the way my body looks after I eat too much.
    1.  Seldom or never               4.  Almost always
    2.  Sometimes                     5.  Always
    3.  Frequently

25  When I am trying to keep from gaining weight, I feel that I have to resort to vigorous exercise, strict dieting, fasting, self-induced vomiting, laxatives, or diuretics.
    1.  Never                         4.  A lot of the time
    2.  Rarely                        5.  Most of all of the time
    3.  Occasionally

26  Do you believe that it is easier for you to vomit than it is for most people?
    1.  Yes, it's no problem at all for me   4.  About the same
    2.  Yes, it's easier              5.  No, it's less easy
    3.  Yes, it's a little easier

27  I use diuretics (water pills) to help control my weight.
    1.  Never                         4.  Frequently
    2.  Seldom                        5.  Very frequently
    3.  Sometimes

28  I feel that food controls my life.
    1.  Always                        4.  Sometimes
    2.  Almost always                 5.  Seldom or never
    3.  Frequently

29  I try to control my weight by eating little or no food for a day or longer.
    1.  Never                       4.  Frequently
    2.  Seldom                   5.  Very frequently
    3.  Sometimes

30  When consuming a large quantity of food, at what rate of speed do you usually eat?
    1.  More rapidly than most people have ever eaten in their lives
    2.  A lot more rapidly than most people
    3.  A little more rapidly than most people
    4.  About the same rate as most people
    5.  Most slowly than most people (or not applicable)

31  I use laxatives or suppositories to help control my weight.
    1.  Never                       4.  Frequently
    2.  Seldom                   5.  Very frequently
    3.  Sometimes

32  Right after I binge eat I feel:
    1.  So fat and bloated I can't stand it
    2.  Extremely fat
    3.  Fat
    4.  A little fat
    5.  OK about how my body looks or I never binge eat

33  Compared to other people of my sex, my ability to always feel in control of how much I eat is:
    1.  About the same or greater        4.  Much less
    2.  A little less                  5.  A great deal less
    3.  Less

34  In the last 3 months, on the average how often did you binge eat (eat controllably to the point of stuffing yourself).
    1.  Once a month or less (or never)    4.  Twice a week
    2.  2-3 times a month            5.  More than twice a week
    3.  Once a week

35  Most people I now would be surprised at how fat I look after I eat a lot of food.
    1.  Yes, definitely.              4.  Yes, possibly.
    2.  Yes.                     5.  No, probably not or I never eat a
    3.  Yes, probably.               lot of food

36  I use diuretics (water pills) to help control my weight.
    1.  3 times a week or more       4.  Once a month
    2.  Once or twice a week         5.  Never
    3.  2-3 times a month

# APPENDIX D

## THE BODY ESTEEM SCALE FOR ADOLESCENTS AND ADULTS (BESAA)

# BESAA

Indicate whether you agree with the following statements. Please Circle a response for each of the following questions. All of the responses will be confidential. Please answer each question carefully. Thank you.

*0 = Never; 1 = Seldom; 2 = Sometimes; 3 = Often; 4 = Always*

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | I like what I look like in pictures | 0 | 1 | 2 | 3 | 4 |
| 2. | Other people consider me good looking. | 0 | 1 | 2 | 3 | 4 |
| 3. | I'm proud of my body. | 0 | 1 | 2 | 3 | 4 |
| 4. | I am preoccupied with trying to change my body weight. | 0 | 1 | 2 | 3 | 4 |
| 5. | I think my appearance would help me get a job. | 0 | 1 | 2 | 3 | 4 |
| 6. | I like what I see when I look in the mirror. | 0 | 1 | 2 | 3 | 4 |
| 7. | There are lots of things I'd change about my looks if I could. | 0 | 1 | 2 | 3 | 4 |
| 8. | I am satisfied with my weight. | 0 | 1 | 2 | 3 | 4 |
| 9. | I wish I looked better. | 0 | 1 | 2 | 3 | 4 |
| 10. | I really like what I weigh. | 0 | 1 | 2 | 3 | 4 |
| 11. | I wish I looked like someone else. | 0 | 1 | 2 | 3 | 4 |
| 12. | People my own age like my looks. | 0 | 1 | 2 | 3 | 4 |
| 13. | My looks upset me. | 0 | 1 | 2 | 3 | 4 |
| 14. | I'm as nice looking as most people. | 0 | 1 | 2 | 3 | 4 |
| 15. | I'm pretty happy about the way I look. | 0 | 1 | 2 | 3 | 4 |
| 16. | I feel I weigh the right amount for my height. | 0 | 1 | 2 | 3 | 4 |
| 17. | I feel ashamed of how I look. | 0 | 1 | 2 | 3 | 4 |
| 18. | Weighing myself depresses me. | 0 | 1 | 2 | 3 | 4 |
| 19. | My weight makes me unhappy. | 0 | 1 | 2 | 3 | 4 |
| 20. | My looks help me to get dates. | 0 | 1 | 2 | 3 | 4 |
| 21. | I worry about the way I look. | 0 | 1 | 2 | 3 | 4 |
| 22. | I think I have a good body. | 0 | 1 | 2 | 3 | 4 |
| 23. | I'm looking as nice as I'd like to. | 0 | 1 | 2 | 3 | 4 |

# APPENDIX E

# THE BODY IMAGE SILHOUETTES (BIS)

1  2  3  4  5  6  7  8  9  10  11

12  13  14  15  16  17  18  19  20  21
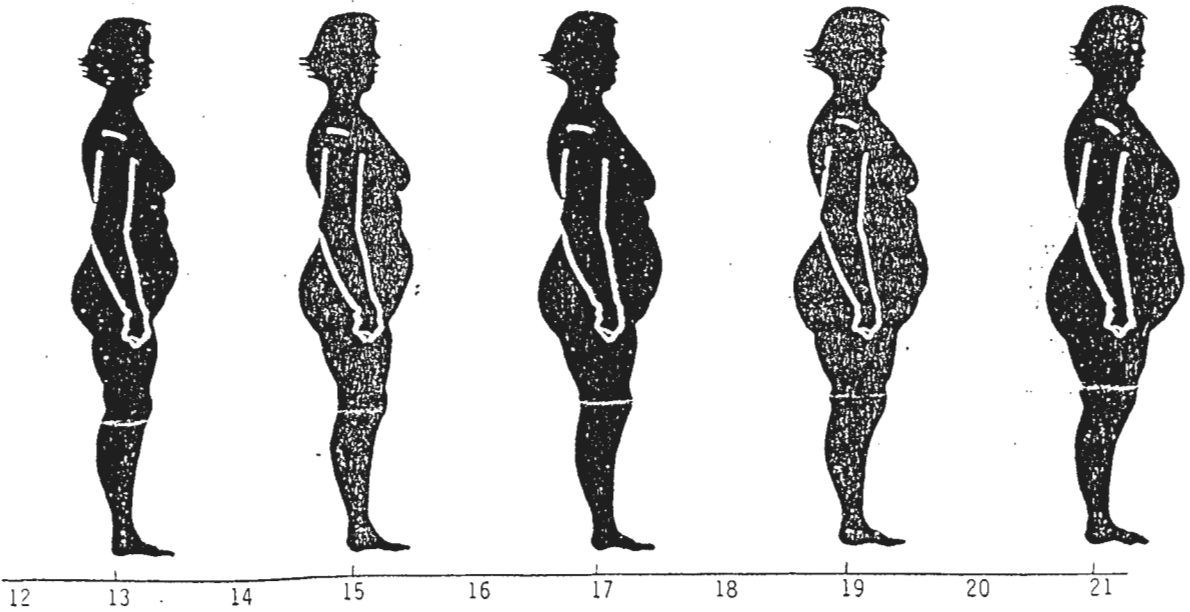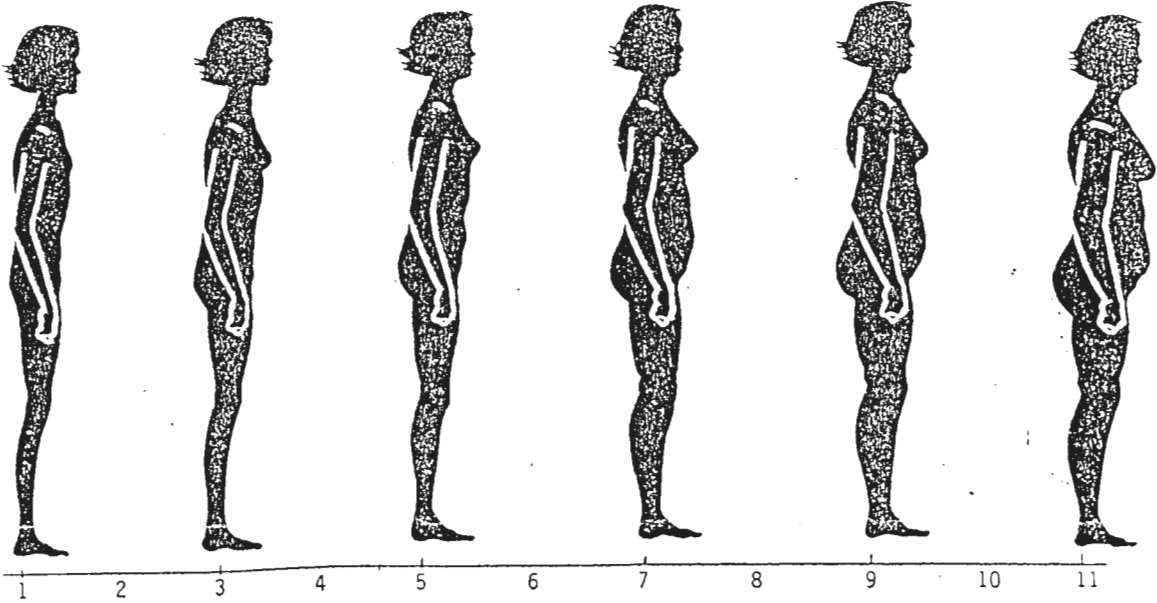
_____ Which figure is closest to the way you look?

_____ Which figure is closest to how you would ideally like to look?

_____ Which figure do you think men would find most attractive?

APPENDIX F

THE PHYSICAL APPEARANCE STATE AND TRAIT ANXIETY SCALE (PASTAS)

# PASTAS

The statements listed below are used to describe how anxious, tense, or nervous you feel right now about your body. Please circle a response for each of the following questions. All of the responses will be confidential. Please answer each question carefully. Thank you.

**0 = Not at all; 1 = Slightly; 2 = Moderately; 3 = Very much so; 4 = Exceptionally so**

Right now, I feel anxious, tense, or nervous about

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | The extent to which I look overweight. | 0 | 1 | 2 | 3 | 4 |
| 2. | My thighs. | 0 | 1 | 2 | 3 | 4 |
| 3. | My buttocks. | 0 | 1 | 2 | 3 | 4 |
| 4. | My hips. | 0 | 1 | 2 | 3 | 4 |
| 5. | My stomach (abdomen). | 0 | 1 | 2 | 3 | 4 |
| 6. | My legs. | 0 | 1 | 2 | 3 | 4 |
| 7. | My waist. | 0 | 1 | 2 | 3 | 4 |
| 8. | My muscle tone. | 0 | 1 | 2 | 3 | 4 |

APPENDIX G

THE EATING DISORDER INVENTORY-23 (EDI-23)

# EDI

Please circle a response for each of the following questions. All of the responses will be confidential. Please answer each question carefully. Thank you.

**A** = *Always*; **U** = *Usually*; **O** = *Often*; **S** = *Sometimes*; **R** = *Rarely*; **N** = *Never*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | I eat sweets and carbohydrates without feeling nervous | A | U | O | S | R | N |
| 2. | I think about dieting | A | U | O | S | R | N |
| 3. | I feel extremely guilty after overeating | A | U | O | S | R | N |
| 4. | I am terrified of gaining weight | A | U | O | S | R | N |
| 5. | I exaggerate or magnify the importance of weight | A | U | O | S | R | N |
| 6. | I am preoccupied with the desire to be thinner | A | U | O | S | R | N |
| 7. | If I gain a pound, I worry that I will keep gaining | A | U | O | S | R | N |
| 8. | I eat when I am upset | A | U | O | S | R | N |
| 9. | I stuff myself with food | A | U | O | S | R | N |
| 10. | I have gone on eating binges where I have felt that I could not stop | A | U | O | S | R | N |
| 11. | I think about bingeing (overeating) | A | U | O | S | R | N |
| 12. | I eat moderately in front of others and stuff myself when they are gone | A | U | O | S | R | N |
| 13. | I have the thought of trying to vomit in order to lose weight | A | U | O | S | R | N |
| 14. | I eat or drink in secrecy | A | U | O | S | R | N |
| 15. | I think that my stomach is too big | A | U | O | S | R | N |
| 16. | I think that my thighs are too large | A | U | O | S | R | N |
| 17. | I think that my stomach is just the right size | A | U | O | S | R | N |
| 18. | I feel satisfied with the shape of my body | A | U | O | S | R | N |
| 19. | I like the shape of my buttocks | A | U | O | S | R | N |
| 20. | I think my hips are too big | A | U | O | S | R | N |
| 21. | I think that my thighs are just the right size | A | U | O | S | R | N |
| 22. | I think by buttocks are too large | A | U | O | S | R | N |
| 23. | I think that my hips are just the right size | A | U | O | S | R | N |

# APPENDIX H

## THE PROFILE OF MOOD STATE—SHORT FORM (POMS-SF)

(Protected by Copyright)

# APPENDIX I

# THE INFORMED CONSENT FORM

# UNIVERSITY OF NORTHERN IOWA
## HUMAN PARTICIPANTS REVIEW -- INFORMED CONSENT

Project Title: **Eating disturbance, estrogen and menstrual cycle**
Name of Investigator(s):     Mei-Chuan Wang and M. Catherine DeSoto

**Invitation to Participate**: You are invited to participate in a research project conducted through the University of Northern Iowa. The University requires that you give your signed agreement to participate in this project. The following information is provided to help you made an informed decision whether or not to participate.

**Nature and Purpose**: This study is designed to determine how appetite, body image and eating behavior vary among college-aged women.

**Explanation of Procedures**: For this study, you will complete a series of paper and pencil questionnaires. Participation is expected to take less than 60 minutes.  As a participant, you may choose to stop participation at any time you wish without penalty.

**Discomfort and Risks**:  Participation in this research is not expected to involve any risks beyond those normally associated with everyday living.

**Benefits**:   You will receive one course credit for participating in this study session.  The course credit will be assigned automatically based on the name on this signed consent form; but it is recommended that you keep your copy of the informed consent as proof of participation. You may be invited to participate in two additional follow-up sessions via e-mail within three weeks.  If you are invited and if you do completely participate in both follow-up sessions, you will receive additional two course credits for these sessions and a $7 gift certificate at the university book store as a thank-you gift for your continued participation and be entered into a drawing for a $30 gift certificate.

**Confidentiality**:  You may be assured that your name (nor any other identifying information) will never be attached to the data.  The results of this research may be published in a scholarly journal, but your name as a participant would not be identified.

**Right to Refuse or Withdraw**: I understand the investigator will answer any questions I have about my participation. I also understand that if I desire information in the future regarding my participation or the study generally, I can contact Mei- Chuan Wang (meichuan@uni.edu) or Dr. Catherine DeSoto at 319-273-7475 at the Department of Psychology, University of Northern Iowa. I can also contact the office of the Human Participants Coordinator, University of Northern Iowa, at 319-273-2748, for answers to questions about rights of research participants and the participant review process.

I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. 1 am 18 years of age or older.

_____

**(Signature of participant)    (Date)**

_____

**(Signature of investigator)   (Date)**

_____

**(Printed name of participant)**

_____

**(Signature of advisor)    (Date)**

APPENDIX J

THE DEBRIEFING FORM

# Debriefing

This was a study designed to determine if estrogen levels might influence symptoms of eating disturbance. More than 90% of individuals with eating disorders are female (American Psychiatric Association, 1994) and symptoms are generally most sever during the teens and early twenties. When a pronounced sex difference emerges around the time of adolescence, the possibility that hormonal factors are playing some role is a possibility. Although socialization is still likely to play a large role in the sex difference, it is also possible hormones play some role in development of eating disorders. Previous research has shown that there are links between eating disorders and a brain chemical called serotonin; and that there are links between estrogen levels and serotonin. Thus the study you just participated in tests the idea that estrogen levels could have some effect on the symptoms of eating disorders. One way to investigate this hypothesis is to check for changes across the menstrual cycle. Levels of estrogen are rising between 7-14 days after the onset of bleeding, and are low near the time of menstruation. This is why you came in to fill out the questions near the time of your period and also between 7-14 days after your period began. We hypothesized that a cross section of normally menstruating women measured during times of low estrogen levels will show more maladapted eating behaviors and body images compared to women measured during times of high estrogen levels. If the hypothesis is supported, the results could eventually lead to improved treatment via tailoring of commonly used medications for eating disorders.

*If you feel that your eating behavior is causing you discomfort or concern, the UNI student counseling center has trained counselors to help you determine if you might benefit from assistance. You may schedule an appointment with them by calling 273-2676.*

Thank you for participating in this psychology research and feel free to e-mail Mei-Chuan Wang (meichuan@uni.edu) or Dr. Catherine DeSoto (cathy.desoto@uni.edu) with any additional questions you may have about the study.

Thank you again,

Mei-Chuan Wang