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Mood and Behavior Changes During the Menstrual Cycle in Depressed and Nondepressed Women: An Unaware Study

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MOOD AND BEHAVIOR CHANGES DURING THE MENSTRUAL CYCLE IN DEPRESSED AND NONDEPRESSED WOMEN: AN UNAWARE STUDY

by

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VITA

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CHAPTER I

INTRODUCTION

The purpose of this study was to assess differences in how depressed and nondepressed women experience the menstrual cycle. Previous research has indicated that women in general can experience a range of physical and emotional symptoms concurrent with phases of the menstrual cycle. Physical discomforts recorded include headache, backache, digestive problems, salt and water retention, acne, breast swelling, tiredness, and cramping. Mood fluctuations in the areas of irritability, depression, nervousness, restlessness, and anxiety have been noted. Anywhere from 15% to 95% of sampled populations have acknowledged such symptoms (Paige, 1973).

Of particular concern in this study is how depressed women experience the menstrual cycle. Past research has suggested that increased depressive symptomatology, suicides, and attempted suicides are more prevalent during particular menstrual cycle phases. In

addition, the occurrence of depression among women is high. Not only are there from two to six women for every man clinically diagnosed as depressed (Arieti, 1979; Scarf, 1979; Weissman & Klerman, 1977), but the occurrence of depression among women appears to be on the rise (Weissman & Klerman, 1977) with suicide attempts among young females showing a trend upward (Weissman, Paykel & French, 1973).

To complicate the situation, menstrual cycle research has been fraught with methodological problems (Englander-Golden, Whitmore & Corbley, 1983, Parlee, 1974). It is clear that studies based on retrospective reports of women regarding their menstrual cycle or those based on daily data collected from women aware that the menstrual cycle is being studied are contaminated by stereotypic and cultural beliefs regarding the menstrual cycle. Other studies of the menstrual cycle have focused on the "normal" woman's experience, not taking into consideration special groups with special problems.

This study sought to rectify the above methodological problems and expand the base of knowledge in this area by studying the menstrual cycle and depressed women. Specifically, data were collected from subjects

on a daily basis for 7 to 10 weeks in an "unaware" condition. Subjects were not told that the menstrual cycle was of particular interest, rather they were told that this was a study of a variety of biosocial rhythms that might be common to both men and women.

It was hypothesized that a significant group effect would exist with depressed women experiencing the menstrual cycle significantly more negatively than nondepressed women. In addition, it was predicted that a group by phase interaction effect would exist with depressed women evidencing a greater increase in negative moods and behaviors during the premenstrual and/or menstrual phases when compared with the intermenstrual phases than would occur for nondepressed women.

CHAPTER II

REVIEW OF THE LITERATURE

Physiological Changes During the Menstrual Cycle

The menstruating woman experiences monthly, hormonally determined, physiological changes in her body. The menstrual cycle which occurs in most women between the ages of 12 and 48 is regulated by changes in hormone levels which are controlled by the hypothalamus and the pituitary gland. Although individual women vary in the lengths of their cycles from month to month, the average menstrual cycles is 28 days long (Frieze, Parsons, Johnson, Ruble & Zellman, 1978).

As Frieze et al. (1978) have summarized, the standard practice in most recent research has been to define day 1 of the menstrual cycle as the first day of menstruation. This initiates the menstrual phase of the cycle and lasts on the average five days. During these few days, the endometrium, or lining of the uterus, is shed in the usual menstrual flow. Also at this time, the key female sex hormones, estrogen and progesterone,

are at relatively low levels. In response to the low estrogen level, the hypothalamus signals the pituitary gland to release FSH (follicle stimulating hormone), which stimulates the maturation process of an ovum contained in one of the two ovaries, which in turn increases the production of estrogen by the ovary. During this two week period, the estrogen levels continue to rise, the developing ovum grows and matures, and the endometrium begins to build up in preparation to receive the ovum if fertilization occurs.

On approximately day 15, or 14 days before the onset of the next period, estrogen reaches its highest point in the cycle, and the ovary releases the mature ovum. In response to the high level of estrogen, the pituitary gland releases LH (luteinizing hormone) which stimulates the development of a glandular structure called the corpus luteum which in turn produces and continues to produce estrogen and progesterone if fertilization has taken place. If fertilization has not occurred, there is a peak in estrogen and progesterone levels around day 22, or approximately 7 days before the next period, followed by a rapid decline. The decline in these hormones signals the end of the cycle and the uterus prepares to shed the lining developed during that

cycle.

Both estrogen and progesterone reach their lowest point about three to four days before menstruation and continue at low levels during this premenstrual phase of the cycle. This drop in the estrogen level triggers the shedding of the endometrial lining and, at the same time, signals the hypothalamus to stimulate the pituitary gland to begin again its production of FSH and the next cycle (Frieze et al., 1978; Williams, 1977).

For research purposes, the menstrual cycle is generally divided into phases. Although particular phases studied and definitions of phases vary, the cycle is commonly divided into the menstrual, follicular, ovulatory, luteal, and premenstrual phases. The intermenstrual phases include the follicular, ovulatory, and luteal phases. The paramenstruum refers to the combined premenstrual and menstrual phases. The remainder of the review will discuss emotional and physical changes that have been associated with these phases of the menstrual cycle.

Physical and Emotional Changes During the Menstrual Cycle

Concurrent with changes in the sex organs and hormone levels, some women report physical discomfort,

especially while premenstrual or menstrual. These physical symptoms can include headache, backache, breast swelling and tenderness, cramping, digestive problems, and gas, salt and water retention (Frieze et al., 1978; Lahmeyer, Miller & DeLeon-Jones, 1982). In addition to these physical symptoms, there is indication that some women experience parallel mood fluctuations including variations in irritability, depression, nervousness, restlessness, and anxiety (Altman, Knowles & Bull, 1941; Coppen & Kessel, 1963; Dalton, 1971; Frank, 1931; Golub, 1976a; Ivey & Bardwick, 1968; Janowsky, Berens & Davix, 1973; May, 1976; Paige, 1971; Patkai, Johannson & Post, 1974; Wilcoxon, Schrader & Sherif, 1976).

In one of the earliest articles published on this topic, Frank (1931) identified the existence of a large group of women who were handicapped by premenstrual disturbances. These women suffered from symptoms of such severity as to require one to two days of bed rest. He described this "premenstrual tension" syndrome as developing during the second half of the menstrual cycle and as being characterized by tension, irritability, swelling of the abdomen and limbs, itching, thirst, and various tendencies to migraine headache, asthma, and epilepsy.

In another early investigation, Altman, Knowles and Bull (1941) studied the menstrual cycles of 10 college women ranging in age from 22 to 36 years old. They were observed during a total of 55 menstrual cycles covering a period of five months. Physiological data and psychological information concerning fatigue, moods, and levels of activity were collected. Their observations revealed a consistent outburst of physical and mental activity before the onset of menstruation, coupled with high tension and irritability preceded or accompanied by depression. Another time of high activity was discovered during the ovulatory phase of the cycle. In contrast to the high activity before menstruation, this activity was free of nervous tension and bore more resemblance to elation.

Since these early descriptive studies, numerous investigators have sought to identify psychological symptoms associated with the menstrual cycle. Ivey and Bardwick (1968) studied mood changes during the menstrual cycle in 26 college students (ages 19 to 22) to determine whether or not a distinct emotional cycle existed which paralleled a pattern of hormonal change. The subjects volunteered to participate in a study of the menstrual cycle and were asked to talk for five

minutes on "any memorable life experience" twice during a cycle (at ovulation and two to three days before menstruation) for two complete menstrual cycles. The verbal material was examined for thematic variations and was scored according to Gottschalk's Verbal Anxiety Scale (Gottschalk, Springer & Gleser, 1961) for death, mutilation, separation, guilt, shame, and diffuse anxiety. Analysis of their data showed that the women they studied felt the greatest sense of self-esteem and competition near ovulation, when the hormone estrogen is at its highest; and that the women became comparatively more depressed, hostile, anxious and aggressive just before menstruation, when estrogen and progesterone are at their lowest. Ivey and Bardwick stated that in spite of differences between individual subjects, their findings indicated significant and predictable affect fluctuations during the menstrual cycle in normal women which correlate with endocrine changes.

In another more recent study examining the relationship between mood changes and the menstrual cycle, May (1976) studied 30 young women who responded to an advertisement in a university newspaper. The group was limited to women who had not had children, reported regular periods, had no significant gynecological

problems, and were not using contraceptive pills. Subjects responded to a battery of mood sensitive tests given during the menstrual phase, mid-cycle, and premenstrual phase for two complete menstrual cycles. The results indicated that 50% of the subjects showed increased depression just before menstruation, while another 40% had their most positive mood premenstrually and their most depressed mood during menses. The premenstrual tension group was characterized as being less traditional in the sense of having been raised in less religious households and being more willing to accept certain impulses (e.g., admitted to liking sex, disliking forced politeness).

Wilcoxon, Schrader and Sherif (1976) studied the relationship between the menstrual cycle and the experience of both stressful events and pleasant activities. Thirty-three undergraduates (11 males, 11 females taking oral contraceptives, and 11 females not taking oral contraceptives) agreed to participate in a study on mood and body awareness. Unlike the previously described studies, subjects in this study were not informed of the true purpose of the study. They filled out daily self-reports on pleasant activities, stressful events, moods, and somatic changes for 35 consecutive

days. The males were assigned "pseudo" cycles, and the data were analyzed to compare the three samples across the three phases of the menstrual cycle. For this population of young, well-educated, and fairly healthy (both physically and psychologically) students, males reported somewhat more stable but less positive experiences than the females. While the males indicated fairly stable, low levels of pain and water retention, both female samples reported increased pain and water retention during the premenstrual and menstrual phases. There were no overall differences among the samples for the reports of negative affect, impaired concentration, and stressful events, but there were significant sample by cycle interactions. Females not taking contraceptives and females taking contraceptives peaked on measures of negative affect during the menstrual phase and premenstrual phase respectively. The experience of stressful events and impaired concentration increased for both female samples during the premenstruum, decreasing during the menstrual phase only for the females taking contraceptives. The authors noted, however, that the experience of stressful events accounted for more of the variance in symptoms of negative mood than did cycle phase, but not for pain and

water retention. This study raises some questions regarding whether changes in mood observed during the menstrual cycle are related solely to hormonal changes.

Although a number of premenstrual symptoms have been identified, the most frequent problems reported include feelings of tension, irritability, depression, headaches, and swelling of breasts and abdomen (Coppen & Kessel, 1963). These symptoms are said to be most severe in the days before menstruation, and to be relieved by the onset of menstruation. Reports vary with regard to the frequency of premenstrual symptoms in the general population. Bickers and Woods (1951) reported that 30% of the women in a factory applied for treatment of premenstrual symptoms. Pennington (1957) suggested that 95% of all American women suffer from premenstrual symptoms at one time or another. Paige (1973) indicated that anywhere from 15% to 95% of sampled populations have acknowledged premenstrual symptoms.

Another group of menstrual problems is characterized by painful menstruation or dysmenorrhea. Although some women suffer from both premenstrual symptoms and dysmenorrhea, this is not always the case. Coppen and Kessel (1963) studied the responses of 465

women ages 18 to 45 who were questioned retrospectively about menstrual symptoms. Their results indicate that dysmenorrhea was experienced to a severe degree by 12% of their subjects, to a moderate or severe degree by 45%, and was maximal on the day the period started. Its prevalance was unaffected by marriage but declined significantly after childbirth. In addition, they found that dysmenorrhea was the most important of all menstrual symptoms in causing a reduction of everyday activity. It was significantly correlated with menstrual irritability, depression, anxiety, nervousness, headaches, and sensations of swelling. There was no significant correlation between dysmenorrhea and neuroticism as measured on the Maudsley Personality Inventory (Eysenek, 1959). With regard to the psychological symptoms studied (irritability, depression, anxiety, nervousness), Coppen and Kessel (1963) reported that these symptoms were worse before menstruation and were significantly correlated with headaches, swelling, and reduction in activity during menstruation. All of these symptoms were in turn significantly correlated with neuroticism. In addition, there was a statistically significant correlation between high neuroticism and moderate or severe

menstrual irritability, and between high neuroticism and moderate or severe general irritability. The authors concluded that it appears that a woman who complains of premenstrual irritability is more likely to be irritable at other times as well, and, therefore, it is as though premenstrual symptoms are an exacerbation of personality traits.

The notion that emotional disturbances during the menstrual cycle may relate to underlying personality traits has received support from other investigations. Hain, Linton, Eber and Chapman (1970) gave 72 first year nursing students ages 17 to 28 an MMPI and menstrual history questionnaire in order to explore the relationships among menstrual irregularity, premenstrual and menstrual symptoms, and personality. The results of this retrospective study indicated that menstrual irregularity was associated with several psychological and physical premenstrual symptoms. In particular, premenstrual depression, abdominal swelling, irritability, and total premenstrual symptoms correlated significantly with degree of irregularity. There was also a significant relationship between irregularity and abnormal flow. From the comparison of a selected extremely regular group (reported maximum difference of

five days between longest and shortest cycle) and irregular group (minimum difference of 14 days) on the 13 standard scales of the MMPI, it was found that scales K, Hs, Pa, Sc and Ma discriminated significantly between the two groups. The authors stated that the relationships on these standard clinical scales and a number of research scales suggest that, in general personality terms, the irregular group was more immature and impulsive with numerous neurotic symptoms including somatic ones. The group also tended to have more difficulty in interpersonal relationships.

Levitt and Lubin (1967) found supporting data for the relationship between menstrual cycle problems and personality in their retrospective study of 221 student nurses. Their results suggested that menstrual complaints are related to an unwholesome menstrual attitude, to neurotic and paranoid tendencies, and to a lack of understanding of motivations and feelings. Paige (1973) in her retrospective questionnaire study of 298 unmarried university women found that women who reported many symptoms during the menses were also significantly more likely to report high psychological stress, greater use of drugs, more aches and pains, and illnesses.

In contrast to the previous studies, Golub (1976a,

1976b) did not find evidence to support the hypothesis that premenstrual mood changes are related to personal adjustment. In an attempt to explore the effects of premenstrual hormonal changes in normal women on mood, personality, and a range of intellectual activities, Golub (1976a, 1976b) studied the self report data of 50 married, middle class, Caucasian women between the ages of 30 and 45 who had had children. A battery of mood, personality, and cognitive tests was administered twice to each subject, once when she was premenstrual and once while intermenstrual. Although Golub determined that there was a significant incidence of increased negative affect, depression, and anxiety during the premenstruum, these changes were, on the average, small and less than those reported as reactions to unusual stress or found in psychiatrically ill populations. No statistically significant differences were found in the area of cognitive functioning.

Although much of the above mentioned research claims to have studied psychiatrically normal or healthy women, no specific measures were taken to screen subjects on the basis of psychiatric tests or criteria. Two specific studies have made a concerted effort to assess and then study only psychologically and

physically healthy women. Abplanalp, Donnelly and Rose (1979) studied 33 women who had been judged psychologically "healthy" on the basis of a semi-structured clinical interview and reported normal, regular cycles. This "aware" study looked into the relationship between moods and enjoyment of activities during the menstrual cycle. Some data was collected daily while other data was collected once a month. The analysis of the daily data which assessed moods and activities indicated no significant relationship between cycle phase and mood or enjoyment of activities. Daily events had a far greater impact on moods and enjoyment of daily life than did the menstrual cycle. Lahmeyer, Miller and DeLeon-Jones (1982) studied behavior fluctuations during the menstrual cycle in 11 women who had been screened for present or preexisting psychopathology. In this "aware" study, state anxiety and other psychophysiological symptoms measured by the Menstrual Distress Questionnaire (Moos, 1977) did not fluctuate significantly during the menstrual cycle. Water retention was the only variable studied that achieved significance when looked at according to menstrual cycle phase.

In summary, the literature has identified a number of physical and emotional symptoms which appear to

fluctuate during the course of the menstrual cycle. Premenstrual symptoms have included high anxiety and nervousness, irritability, depression, headaches, and swelling of the breasts and abdomen. In addition, increased pain, water retention, increased difficulty handling stressful events, and impaired concentration have been reported. Premenstrual symptoms have been acknowledged in 15% to 95% of sampled populations although for most women they are small and are less than those reported as reactions to unusual stress or found in psychiatrically ill populations. Another group of women suffer from premenstrual tension syndrome, a condition with more severe but similar symptoms affecting women during the second half of the menstrual cycle. For some women, premenstrual symptoms appear to be relieved by the onset of menstruation, for others symptoms continue or begin after menses. Depression, anxiety, nervousness, irritability, headaches, and sensations of swelling have been associated with the menstrual phase along with dysmenorrhea, the most important of all menstrual symptoms in causing a reduction in everyday activity. Some research has suggested that menstrual cycle symptomatology represents an exacerbation of already existing personality traits.

The research that has screened subjects in an effort to only look at the menstrual cycles of psychologically and physically healthy women and has collected daily data has revealed little variability in moods and behaviors on the basis of menstrual cycle phase.

Distressed Women and the Menstrual Cycle

The assumption that the menstrual cycle constitutes a source of stress for all women cannot be made. Too much individual variability exists. However, one group of women for whom the menstrual cycle does appear to present major problems is that composed of individuals suffering from physical illnesses, behavioral disturbances, and psychiatric illnesses.

Several researchers have gathered data related to the incidence of illnesses and other problems during various points in the menstrual cycle. Dalton was one of the early investigators to examine the adverse effects of the menstrual cycle on women's lives. She conducted a number of surveys investigating the effects of the eight-day paramenstruum (four days before menstruation plus the first four days of menstruation) on various facets of a woman's life. Her surveys (Dalton, 1959, 1966) indicated that during the paramenstruum, 45%

of schoolgirls' punishments were inflicted, 45% of industrial employees reported sick, 46% of acute psychiatric admissions and 49% of acute medical and surgical admissions took place, 52% of emergency accident admissions were noted, 52% of patients with acute fever presented for diagnosis, and 49% of prisoners committed their crimes. In Cooke's (1945) discussion of the "hypersensitization of the nervous system" which occurs during the premenstrual phase of the menstrual cycle, he stated that a report of a Parisian prefect of police indicated that 84% of all the crimes of violence committed by women took place during the premenstrual and early menstrual phases of the cycle.

In an early article on the "Hazards of the Menstrual Cycle," MacKinnon and MacKinnon (1956) presented the results of two-and-one-half years of postmortem examinations of 47 women of reproductive age who had died in accidents, by suicide, or because of disease. They were interested in comparing the number who had died during the follicular phase (preovulatory) with those who had died during the luteal phase (postovulatory) of the menstrual cycle. Of the 47 deaths, only two had taken place in the follicular

phase. The authors conclude that there is clear evidence that suicides, fatal accidents, and deaths from disease are more common in the luteal than in the follicular phase of the cycle. They suggest that "highly strung women" and those suffering from chronic disease be warned of these hazards and advised to "rest and take more care." In addition, they advise that planned operations, especially major ones, be carried out in the follicular phase of the menstrual cycle.

Other investigators have examined menstrual problems and symptoms in neurotic or psychotic psychiatric patients. Gregory (1957) studied a number of groups of psychiatric patients between 1948 and 1953. In a group of 219 patients, he determined that amenorrhea (cessation of menstruation) occurred with great frequency in psychotics. The incidence in neurotics and patients with affective disorders was not significantly greater than in normals. Of the 22 psychotics who were studied over a two-year period, a significantly higher proportion of behavior disturbances were found to occur during the last 10 days of the cycle with a correspondingly lower proportion occurring during the first 10 days of the cycle.

Symptoms of menstrual disturbance were also

studied by Gregory (1957) in groups of 52 neurotics and 46 psychotics. The results indicated that (1) a high incidence of previous gynecological procedures was found in the neurotic group; (2) premenstrual tension was shown to occur in a high proportion of both neurotics (88%) and psychotics (65%), with the incidence significantly greater in neurotics; (3) dysmenorrhea was shown to occur in a high proportion of both neurotics and psychotics, with a mild type more common in psychotics and a severe variety more often found in neurotics.

Jacobs and Charles (1970) investigated the relationship between the phases of the menstrual cycle and the development of psychiatric symptoms requiring professional intervention in an outpatient population. A total of 200 randomly selected patients were screened in the emergency room (100 patients) and walk-in clinic (100 patients) of a large metropolitan medical center over a six-month period. The menstrual cycle was viewed as seven four-day periods in which days 1 to 4 corresponded to menstruation, days 13 to 16 to ovulation, and days 25 to 28 to the premenstruum. The results indicated that patients sought psychiatric help most frequently during menstruation (24.5%) followed by the premenstrual phase (22.5%) and the midcycle period

(18%). A statistically significant relationship was found between phases of the cycle and the patients' requests for help. No significant differences were evident as to when in the menstrual cycle help was sought according to diagnostic entities. In both schizophrenic and depressed patients, the two largest diagnostic categories, a similar pattern emerged. No significant differences were found among married, single, separated, divorced, or widowed patients with regard to the time of the menstrual cycle in which psychiatric assistance was sought. A tendency was observed for the "more ill" emergency room patients to present more frequently menstrually than premenstrually, while the "less ill" walk-in clinic patients presented more frequently premenstrually than menstrually.

In a similar study, Glass, Heinger, Lansky and Talan (1971) assessed whether phases of the menstrual cycle related to specific types of psychiatric emergencies. Throughout a one-year period, menstrual cycle data were collected from a sample of female patients appearing in a psychiatric emergency room. Of the 166 female psychiatric emergencies evaluated, 84 women were experiencing active natural menstrual cycles and were included in the data analysis. In contrast to

Jacobs and Charles' (1970) results, their data did suggest the existence of a certain type of psychiatric emergency related to the menstrual cycle. In particular, nonpsychotic women who had a more severe history of medical and gynecologic illness and more past marital and sexual problems were likely to manifest hostility, suicidal ideation, and actual suicide attempts during the week preceding menstruation. In addition, there existed a tendency for the more disturbed patients to present themselves more frequently in the menstrual phase. These patients were characterized by more past psychiatric contacts and relatively more psychotic symptoms than the group of patients who presented in the premenstrual phase.

Recently, Abramowitz, Baker and Fleischer (1982) studied the case records of 115 depressed and schizophrenic women who had been admitted to a psychiatric facility during an 18-month period. Their results supported the findings of Dalton (1959) and Jacobs and Charles (1970) that both depressed and schizophrenic patients had a higher rate of admission during the paramenstruum then during the nonparamenstruum. However, their findings also indicated that depressed women showed an elevation in admission

frequency on two particular paramenstrual days (the day before and the first day of flow). Forty-one per cent of the depressed women were admitted on these two days. The comparison group of schizophrenic women did not display this trend.

Considerable research has examined the relationship between affective disorders and the experience of the menstrual cycle. Wetzel, Reich, McClure and Wald (1975) tested the hypothesis that there is a relationship between the reporting of premenstrual affective symptoms and the later development of a clinically significant affective disorder. They studied a group of normal, primarily white, middle class, college women. They reasoned that women reporting premenstrual affective symptoms prior to the start of their college careers would seek psychiatric treatment more frequently during their college career than other women, and would be more likely when treated to be diagnosed as affective disorder (depression, hypomania or mania). The results of their study of 589 women confirmed the relationship between the presence of premenstrual affective symptoms of sufficient severity to interfere with a woman's life or to be recognizable to others and the later seeking of psychiatric care for an affective disorder. In

particular, women originally reporting a premenstrual affective syndrome were significantly more likely to attend a psychiatric clinic (20% vs. 14%) and more likely to present with an affective disorder. During the four-year follow-up period, 18% of the premenstrual affective syndrome group presented with an affective disorder, compared with 10% of the remainder. Kashiwagi, McClure and Wetzel (1976) also found a significant association between clinical depression and the report of a history of premenstrual affective symptoms in a group of 81 women composed primarily of black, lower socio-economic, middle aged individuals. Given the results of both studies, Wetzel et al. (1975) conclude that the relationship between premenstrual affective syndrome and clinical affective disorders appears to hold across variations in race, education, socio-economic class and age.

Along a similar line, Diamond, Rubinstein, Dunner and Fiere (1976) undertook a study to determine the extent of premenstrual and menstrual somatic and affective disturbances in a group of women with primary affective illness. They studied 63 women with primary affective illness (ages 19 to 67) who were attending a psychiatric clinic and a control group of 25 women (ages

20 to 77) who were either social workers or wives of male patients. All data collected regarding the menstrual cycle relied on retrospective report on a current basis for women still menstruating or historically for those no longer menstruating. The results indicated that the affectively ill women and control women had similar menses with regard to regularity, length of menstrual cycle, and duration of menstrual flow. In addition, the patients' reports of somatic symptoms associated with the premenstrual and menstrual phases of the cycle were found to be comparable to those of controls in type, severity, frequency of occurrence, and mean number of symptoms reported. However, the percentage of patients reporting premenstrual and menstrual affective symptoms was consistently (although not significantly) higher than that of the controls. Of the 23 (46%) who could recall the phase of their menstrual cycle for their most recent hospitalization, 70% were hospitalized during the menstrual or premenstrual phases. The authors suggested that it appears as though affectively ill women not suffering from an affective episode experience menstruation in much the same way, physically and affectively, that controls do. However, patients in the middle of an

affective episode may experience premenstrual and menstrual changes as an exacerbation of already present symptoms that then lead to hospitalization (Diamond et al., 1976). This may be a reasonable assumption given the data. However, May (1976) found that there is no correspondence between one-time retrospective reports of menstrual mood variations and the actual reports of mood at different points in the menstrual cycle. Therefore, the results of the study remain in question.

Conrad (1983) assessed variations in menstrual symptoms during three cycle phases in 24 depressed and 30 nondepressed college women who were aware the menstrual cycle was being studied. All 11 negative variables assessed (depression, state anxiety, cognitive anxiety, somatic anxiety, concentration difficulties, negative behavior change, negative affect, pain, autonomic reactions, water retention, and control symptoms) were consistently reported more often by the depressed women than by the nondepressed women throughout the menstrual cycle. However, no clear evidence was found that depressed women react differently to particular cycle phases than nondepressed women. In fact, fluctuations during the cycle were similar for measures of depression, state anxiety,

somatic anxiety, pain, autonomic reactions, and water retention with the highest endorsement of symptoms during menstruation, followed by the premenstrual phase, with fewest symptoms acknowledged intermenstrually.

The incidence of suicides or suicide attempts in conjunction with phases of the menstrual cycle is of particular concern. Gregory (1957) reported that Heller (1900) found that 36% of 70 suicides he studied occurred at the time of the woman's menses, Ollendorf (1905) found an incidence of 22% in 79 cases, and Slavic (1910) found 30% in 474 cases. Dalton (1959) studied the admissions records of British hospitals. Of the 276 female psychiatric patients admitted an an acute basis, 46% of the admissions occurred during the paramenstruum. This percentage included 53% of the attempted suicides and 47% of the patients with depression. Ribeiro (1962) reported that 23 of the 26 women who committed suicide that he studied had been menstruating at the time of their deaths.

Two particular studies (Mandell & Mandell, 1967; Wetzel, Reich & McClure, 1971) utilized data collected from women calling a suicide prevention center. Mandell and Mandell (1967) were interested in determining during which phases of the menstrual cycle the maximum

psychological disturbance was experienced. Their findings for the relationship between the incidence of suicide calls and phases of the menstrual cycle are similar to those reported by Dalton (1959) for acute psychiatric hospital admissions. Of the 87 documented calls, 52% took place either while the women were menstrual or premenstrual. The highest number of calls occurred during the first four days of menstruation (30%), the second highest took place premenstrually (22%), and the third highest during the midcycle (17%). Their analysis allowed for the rejection of the hypothesis of a uniform distribution over the seven phases into which the cycle had been divided.

In an attempt to access the relationship between phases of the menstrual cycle at the time of a call to a suicide prevention center and self-judged lethality, Wetzel, Reich and McClure (1971) studied the responses of 56 women who called a suicide prevention center. These 56 women represented 30% of the 181 women who called the center. Women were excluded from the study either due to lack of an interview (some were referred for help immediately) or inability to assign the women to some phase of the menstrual cycle (e.g., lack of information, pregnant, menopausal, hysterectomized).

Their results indicated that the number of women calling during the menstrual phase was almost twice the expected frequency. In addition, 57% of the callers in the luteal or menstrual phase of their cycle reported they had considered suicide seriously on the day of the call, while only 23% of the callers in the follicular phase felt they had serious suicidal thoughts on the day of the call. Of those with previous attempts calling in the luteal or menstrual phase, 77% said they had serious suicidal thoughts on the day of the call. The authors point out that the results may be biased due to the small percentage of possible subjects interviewed often because callers were referred for immediate help due to the seriousness of their situation. They mention that this may explain why they did not find the increased frequency of calls in the late luteal phase of the cycle as Mandell and Mandell (1967) did.

In summary, evidence exists which suggests that fluctuations from one menstrual cycle phase to another can present major problems for women suffering from physical illnesses, behavior disturbances, or psychiatric disorders. Surveys demonstrate that the largest proportion of working women reporting sick as well as psychiatric admissions, acute medical and

surgical admissions, and emergency accident admissions are noted during the 8-day paramenstruum. Available evidence also appears to support the conclusion that the probability of observing menstrual cycle-related problems may be greater in women who are suffering from affective disorders than in women who are not. In addition, it does seem probable that there are some women who have a greater risk of a suicide threat, attempt, or even a successful act in particular phases of the menstrual cycle.

Methodological Issues Involved in Menstrual Cycle Research

Based on the research described in the above review, there appears to be a direct relationship between menstruation and monthly mood swings. However, a body of literature has developed addressing a number of methodological issues involved in menstrual cycle research which questions the validity of some of the previously reported results. Parlee (1973) and Sommer (1973) mention a number of these methodological issues. For example, much of the research in this area has been descriptive and has not provided statistical analyses of the data. Furthermore, studies have often employed very

small sample sizes. Of particular concern in studies examining menstrually related changes in behaviors, performance, and/or symptomatology has been the use of retrospective reports and the subjects' awareness of the purpose of the research. In addition, the symptoms and moods listed on questionnaires are usually negative ones, and the subjects are usually questioned about their experiences just before or during menstruation.

Evidence has been found for the strong influence of social and cultural factors in individual attitudes and experiences surrounding menstruation. Abplanalp, Donnelly and Rose (1979) studied 33 women who were aware the menstrual cycle was being investigated. The women responded to two questionnaires inquiring about moods and activities on a daily basis and filled out the Menstrual Distress Questionnaire (MDQ, Moos, 1977) retrospectively one time per month. The instructions for the MDQ requested the subject to answer the 47-item questionnaire three times for the most recent premenstrual, menstrual and intermenstrual phases. The responses to the daily questionnaire were then compared to the MDQ retrospective report. For this group of physically and psychologically healthy women, there were no changes in either moods or enjoyment of activities

(the daily measures) based on cycle phase. However, scores on the MDQ showed the usual cycle-related differences with negative moods and behaviors reported most often premenstrually or menstrually. The validity of the retrospective method is clearly in question.

In another study of concurrent and retrospective methods of mood assessment, Vila and Beech (1980) questioned phobic patients premenstrually and intermenstrually. When the subjects were unaware of the purpose of the study and concurrent data were collected, no significant mood changes were found. However, significant negative mood changes were reported retrospectively for the identical cycle phases.

Ruble (1977) designed a study in which subjects were led to believe that they were premenstrual when they were not and intermenstrual when they were not. Subjects then filled out a MDQ with instructions to indicate which if any of the symptoms they had experienced in the last day or two. The women who were led to believe they were premenstrual reported experiencing a significantly higher degree of several physical symptoms (e.g., water retention, pain) than did women who were led to believe they were intermenstrual.

Englander-Golden, Sonleitner, Whitmore and Corbley

(1983) studied self-reports of moods and behaviors of women not taking oral contraceptives. They were investigating whether awareness of the purpose of the study or type of recall produced the observed results in previous menstrual cycle reports. The study was designed to allow a comparison of daily "aware" (the subjects knew the menstrual cycle was being studied), daily "unaware" (the subjects knew only that they were participating in a study of biological rhythms that might be common to both men and women), and retrospective self-reports. In the retrospective condition, all 14 factors studied had significant variability as a function of menstrual cycle phase. All 11 of the negative variables (pain, fatigue, water retention, autonomic reaction, prostaglandin, tension, depression, anxiety-irritability, behavioral change, anger, and concentration) were highest either just before or during the first two days of menstruation. The peaks in vigor, sexual arousal, and well-being were remembered as occurring in the ovulatory or follicular phase. In the daily "unaware" condition only four factors (pain, water retention, autonomic reaction, and prostaglandin) showed significant variability as a function of menstrual cycle phase. In the daily "aware" condition, 10 of the 14

factors showed significant variability. As in the retrospective condition, negative events were reported in the paramenstruum and positive events were reported at a minimum. As a result of this investigation, it appears quite reasonable to assume that retrospective self-reports of moods and behaviors are most contaminated by stereotypic beliefs about menstruation. Subjects aware the menstrual cycle is being studied also appear to be influenced by cultural attitudes about menstruation and the menstrual cycle. Yet of the previously reviewed studies, only two (Wilcoxon et al., 1976; Englander-Golden et al., 1983) gathered daily data on an unaware basis. "Unaware" collection of menstrual cycle data when using a current, nonretrospective, self-report method would seem to be essential if stereotypic and cultural beliefs are to be avoided.

Clearly, issues related to statistical analysis, sample size, and data collection procedures need to be addressed in any menstrual cycle research.

Summary and Hypotheses

The assumption of a relationship between menstruation and monthly mood changes appears reasonable. However, the experience seems quite pronounced for some

women and minimal for others. It does appear that women suffering from physical illnesses, behavior disturbances, and psychiatric disorders are at some greater risk during particular menstrual cycle phases. Of particular concern in this investigation is how depressed women experience and cope with the effects of this cycle in their lives. Not only are there from two to six women for every man clinically diagnosed as depressed (Arieti, 1979; Scarf, 1979; Weissman & Klerman, 1977), but the occurrence of depression among women appears to be on the rise (Weissman & Klerman, 1977). In addition, research on suicide attempts among females has shown a trend upward, primarily among younger women (Weissman, Paykel & French, 1973). These data combined with the research suggesting that increased depressive symptomatology, suicides, and suicide attempts are more prevalent during particular menstrual cycle phases (Altman et al., 1941; Coppen & Kessel, 1963; Dalton, 1959; Diamond et al., 1976; Glass et al., 1971; Golub, 1976a; Gregory, 1957; Jacobs & Charles, 1970; Kashiwagi et al., 1976; MacKinnon & MacKinnon, 1956; Mandell & Mandell, 1967; May, 1976; Ribeiro, 1962; Wetzel et al., 1971; Wetzel et al., 1975) constitute the rationale for studying depressed women.

This study investigated the degree of mood and behavior variation during the menstrual cycle in depressed women as compared with nondepressed women. Daily reports of mood and behavior were gathered for a 7 to 10 week period with subjects uninformed regarding the true purpose of the study. In addition, males were included in the data collection to further disguise the purpose of the investigation.

The following hypotheses were tested:

1. Depressed women experience the entire menstrual cycle more negatively than do nondepressed women.

2. Depressed women evidence a greater increase in negative moods and behaviors during the premenstrual phase when compared with the intermenstrual phases than occurs for nondepressed women.

3. Depressed women evidence a greater increase in negative moods and behaviors during the menstrual phase when compared with intermenstrual phases than occurs for nondepressed women.

CHAPTER III

METHOD

Subjects

The subjects studied in this investigation were women who were not taking oral contraceptives or other hormonal medications, who were not pregnant or lactating, and who menstruated at least twice during the 7 to 10 week data collection period. The subjects were also unaware that the menstrual cycle was being studied.

Approximately 190 female and 40 male subjects were recruited from undergraduate psychology courses during the winter of 1984. Subjects consented to participation in a 10 week study of biosocial rhythms. Of the 190 female subjects, 79 women completed from 7 to 10 weeks of daily questionnaires. Of these 79 females, 21 were eliminated from the data analysis due to the use of birth control pills, diet pills, or insulin and 10 more were excluded because they indicated in a post-data-collection questionnaire that they thought the project might have been looking at the menstrual cycle in some

way. Of the remaining 48 subjects, 5 more were eliminated because they either did not menstruate or did not menstruate twice so the calculation of one complete menstrual cycle could not be made.

The data from 43 female subjects provided the data base for the experimental study sample. Based on responses to the Beck Depression Inventory, BDI (Beck, 1970), 23 of these women were classified as nondepressed (BDI<5), 9 were grouped as depressed (BDI>11), and 11 were in a middle group not considered clearly depressed or nondepressed (4<BDI<12).

Ninety-two per cent of these women were between the ages of 18 and 21, 70% were Caucasian with 30% from other racial groups, and 72% of the women were Roman Catholic. Two of the subjects were married and none had children, were pregnant or lactating. Characteristics of the subject sample are described in more detail in Table 1.

To further describe the population, each of the subjects also completed additional questionnaires related to locus of control (Locus of Control Scale; Rotter, 1966), trait anxiety (trait measure of the State-Trait Anxiety Inventory; Spielberger, Gorsuch & Lushene, 1970), and negative and positive life stress

TABLE 1

Description of the Subject Sample

	N	%
A. AGE		
18	5	12
19	18	42
20	11	26
21	5	12
22	1	2
23	1	2
27	1	2
40	1	2
B. RACE		
Caucasian	30	70
Afro-American	5	12
Hispanic	4	9
Oriental	4	9
C. RELIGION		
Roman Catholic	31	72
Protestant	7	16
Jewish	2	5
Moslem	1	2
None Indicated	2	5
D. MARITAL STATUS		
Married	2	5
Not Married	41	95
E. CHILDREN		
None	43	100

(Life Experiences Survey; Sarason, Johnson & Siegel, 1978). Based on the three depression groups (nondepressed, middle, and depressed), the depressed group scored significantly higher in the area of negative life stress than did the nondepressed group. The middle group was not significantly different from either the depressed or nondepressed group in the area of negative life stress. Significant group differences also existed in the area of trait anxiety with the depressed group indicating significantly greater trait anxiety than both the middle-and nondepressed groups. The middle and nondepressed groups did not differ significantly in the area of trait anxiety. No significant differences existed between depression groups for locus of control or positive life stress. Means and standard deviations for the three depression groups are presented in Table 2.

Materials

The tests used in this study were the Beck Depression Inventory (Beck, 1970), the Life Experiences Survey (Sarason et al., 1978) the trait measure of the State-Trait Anxiety Inventory (Spielberger et al., 1970), the Locus of Control Scale (Rotter, 1966), and the Moods and

TABLE 2

Description of Subjects in Different Groups Based on Test Data
Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Total Group n=43
BDI	2.0 (1.5)	8.2 (1.7)	18.1 (4.1)	7.0 (6.7)
LCS	8.1 (3.6)	10.5 (4.0)	11.2 (3.5)	9.3 (3.8)
LES-Negative	5.2 (5.3)	9.7 (8.5)	13.8 (7.5)	8.2 (7.4)
LES-Positive	8.0 (6.0)	11.2 (6.3)	5.1 (4.4)	8.2 (6.0)
TAI	34.5 (7.2)	38.3 (6.6)	51.1 (3.0)	39.0 (9.0)

Behaviors Questionnaire (Englander-Golden et al., 1983). In addition, a General Information Questionnaire was administered at the conclusion of the study.

Beck Depression Inventory (BDI). The BDI (Beck, 1970) is a widely used, self-report measure of depression consisting of 21 categories of symptoms and attitudes clinically related to depression. The scale was clinically derived and designed for use with psychiatric populations for assessing the current depth of depression. The inventory provides a numerical score which represents a combination of the number of symptoms the subjects has and the severity of those particular symptoms.

Validity and reliability are reported for the BDI. Based on a psychiatric sample of 409 patients, a corrected split-half reliability coefficient of .93 is reported (Beck, Ward, Mendelson, Mock & Erbauch, 1961). Miller and Seligman (1973) report a test-retest reliabilty coefficient of .74. Concurrent validity of the inventory was shown by studies which employed clinical ratings of the depth of depression and/or other psychometric measures (Bumberry, Oliver & McClure, 1978; Byerly & Carlson, 1982). Beck (1970) presents his evidence for the construct validity of the measure

citing a number of his own studies as well as those of other researchers. Beck and Beck (1972) reported that the BDI had been used as a criterion measure in over 100 studies, with much of the literature supporting the validity of the inventory.

The BDI is a useful, reliable, and fairly well validiated state measure of depression. It is helpful in assessing severity and reflecting change over time. It has been shown to be useful in treatment studies and in detecting depression in normal populations. In particular, Bumberry et al. (1978) validated the use of the BDI in university populations and determined that the cutoff score of 12 (mean of 14) accurately classified mildly depressed college students. The BDI has also been found to be relatively free of anxiety confounds (Beck, 1970; Becker, 1974) yet does confound state and trait depression. The BDI tends to emphasize cognitive aspects of depression with a de-emphasis on the somatic symptoms (Mayer, 1977). The inventory correlated well with other depression scales such as the Depression Adjective Checklists and the Generalized Contentment Scale (Byerly & Carlson, 1982).

The classification of subjects in depression groups was done on the basis of scores on the BDI.

Women were classified as nondepressed if they had BDI scores less than 5. Depressed women obtained BDI scores greater than 11. Those women with scores from 5 through 11 were placed in a middle group.

Life Experiences Survey (LES). The LES (Sarason et al., 1978) is an instrument designed to measure life stress. Specifically, the survey measures life changes with the assumption that life changes require adaptation on the part of the individual and are, therefore, stressful. The LES is a 57-item scale requiring respondents to indicate events experienced during the previous year, whether they consider these events desirable or undesirable, and the degree of impact the events had on their lives. The scale yields both positive and negative life change scores. Sarason et al. report the results of a number of studies using the LES. Negative and total change scores (negative + positive change scores) were found to be reasonably reliable over a 5- to 6-week period of time. Test-retest correlations for the positive change score were significant in one study but not in another. The authors point out that test-retest reliability studies are complicated by the fact that subjects may actually experience a variety of both positive and negative events during the time interval

before the retesting. Therefore, scoring changes can reflect actual life change occurrences rather than inconsistencies in reporting. The LES is relatively free from social desirability biases and is capable of differentiating college students who have sought help for adjustment problems from those who have not. Total and negative change scores correlate significantly and in a positive direction with state and trait anxiety. These same scores are also significantly but negatively correlated with grade point average.

The LES was used in this study to assess the occurrence of positive and negative stress in the three depression groups studied.

Trait Anxiety Inventory (TAI). The TAI is the trait anxiety measure of the State-Trait Anxiety Inventory, STAI (Spielberger et al., 1970). The STAI is based on the state-trait conceptualization of anxiety as originally outlined by Cattell and Scheier (1958). Anxiety is veiwed as consisting of two distinct components: state anxiety and trait anxiety. State anxiety fluctuates over time and refers to an individual's emotional response to perceived dangerous stimuli. Trait anxiety is relatively stable and refers to an individual's tendency to perceive threatening

elements across a broad spectrum of stimulus conditions. The STAI was constructed to provide a brief and reliable self-report measure of the two anxiety constructs. The trait anxiety scale consists of 20 items with instructions to indicate general feelings on a scale of one to four from "not at all" to "very much so." Seven of the 20 trait anxiety items are stated in reverse so as to minimize an acquiescence set. Trait anxiety test-retest reliability coefficients for males and females very between .86 and .73 for retest periods of 20 days and 104 days, respectively (Hedberg, 1972). Internal consistency, as measured by formula K-R 20, yields coefficients between .86 and .92 for trait anxiety (Hedberg, 1972). Studies of concurrent validity for trait scores estimated by correlating the scores with the IPAT Anxiety Scale, Manifest Anxiety Scale, and Affect Adjective Check List were .75, .80, and .52, respectively, for 126 college women (Dreger, 1978). The trait anxiety inventory is considered a reliable and valid index of individual differences in proneness to anxiety (Katkin, 1978).

The TAI was included in this study as a descriptive measure of the depression groups used in this study.

Locus of Control Scale (LCS). The LCS was developed by Rotter (1966) and is based on the construct "locus of control" which is a part of Rotter's theory of social learning (Rotter, 1954). According to this theory, individuals who perceive that the rewards of life are contingent on their own behavior (called "internals") may be different from those who feel that these rewards are controlled by forces outside themselves (called "externals"). The LCS is a 29-item, two option, forced-choice scale including 6 filler items intended to make somewhat more ambiguous the purpose of the questionnaire. The items deal with beliefs about the nature of the world and are concerned with the subject's expectations about how reinforcement is controlled. Low scores imply an internal locus of control, and high scores an external locus of control. Rotter (1966) presents evidence for construct validity. Internal consistency estimates are relatively stable ranging from .70 to .79 for undergraduate females. Test-retest reliability is considered satisfactory with .83 and .61 reliability coeficients for 1- and 2-month periods respectively for an undergraduate female population. The scale also correlates satisfactorily, with other methods of assessing the same variable

including questionnaire, Likert scale, interview assessments, and ratings from a story-completion technique. In addition, relationships with such test variables as intelligence, social desirability, and political liberalness are low for the samples studied and indicate good discriminant validity.

The extent to which each depression group believed perceived events were controlled by their own action (lower scores) or viewed such events as being influenced by factors other than themselves (higher scores) was assessed.

Moods and Behaviors Questionnaire (MBQ). The MBQ (Englander-Golden et al., 1983) consists of 70 items which are rated from "not at all" to "very" on a six-point scale (see Appendix I). The questionnaire includes 36 items from the Moos Menstrual Distress Questionnaire (Moos, 1977) plus 34 additional items and is based on factor analysis of self-reports obtained in a daily "unaware" condition. Englander-Golden et al. identified 14 factors--pain, fatigue, water retention, autonomic reactions, prostaglandin effects, tension, depression, anxiety/ irritability, vigor, well-being, sexual arousal, negative behavior change, concentration decrements, and anger. A delineation of the 14 factors

according to individual items can be found in Table 3. Four additional items on this questionnaire relate to the health of the individual, what drugs had been taken that day, whether female subjects were menstruating, and how stressful the subject considered that particular day.

The MBQ was used as the daily measure of mood and behavior changes in the study. Subjects were instructed to fill one out each evening of the study.

General Information Questionnaire (GIQ). The GIQ (see Appendix II) was constructed to collect basic information about the subject to aid in describing the population studied. This information included items related to age, religious background, race, marital status, number of children, sex of the subject, and whether female subjects were pregnant or lactating during the data collection. A key question was also asked related to whether the subject had any ideas what the study might have been specifically investigating other than biosocial rhythms as explained to all subjects at the beginning of the investigation. Subjects were excluded if they thought the project was related to the menstrual cycle in any way.

TABLE 3

Moods and Behavior Questionnaire
Individual Items Grouped According to 14 Factors
(Englander-Golden, Sonleitner, Whitmore & Corbley, 1983)

(1) PAIN
- muscle stiffness
- headache
- cramps
- backache
- general aches & pains

(2) FATIGUE
- fatigue
- worn-out
- weary
- sleepy
- tired

(3) WATER RETENTION
- weight gain
- skin disorders
- painful breasts or chest swelling

(4) AUTONOMIC REACTIONS
- cold sweats
- hot flashes
- flushing
- clammy

(5) PROSTAGLANDIN EFFECTS
- nausea
- vomiting
- diarrhea or loose bowel

(6) TENSION
- tension
- nervous
- on edge

(7) DEPRESSION
- crying
- depression
- unhappy
- gloomy
- worthless
- blue
- discouraged
- helpless

(8) ANXIETY/IRRITABILITY
- loneliness
- anxiety
- easily upset
- irritability
- grouchy

(9) VIGOR
- excitement
- bursts of energy/activity
- active
- full of pep
- lively
- vigorous

(10) WELL-BEING
- affectionate
- feelings of well-being
- friendly
- good-natured
- cooperative
- understanding

(11) SEXUAL AROUSAL
- sexy
- passionate
- lustful

(12) NEGATIVE BEHAVIOR CHANGE
- lowered school or work performance
- stay at home
- avoid social activities

(13) CONCENTRATION DECREMENTS
- forgetfulness
- confusion
- lowered judgement
- diffculty concentrating
- decreased efficiency
- lowered motor coordination

(14) ANGER
- annoyed
- angry
- ready to fight

Procedure

Subject Recruitment. Undergraduate subjects were recruited from two sources. Indroductory psychology students earning experimental credit completed information and consent forms and filled out the BDI, LES, TAI, and the LCS in a pretest condition. Women with BDI scores falling into either the depressed or nondepressed groups were further recruited by telephone to participate in a study of biosocial rhythms common to both men and women. Arrangements were made to meet with the investigator, sign additional consent forms, and receive packets of materials.

Additional subjects (males and females) were recruited from advanced undergraduate psychology classes and asked to participate in a study of biosocial rhythms common to men and women. Interested subjects completed information and consent forms and filled out the BDI, LES, TAI, and the LCS. These subjects participated irrespective of BDI scores and received extra credit for their involvement. Packets of materials were distributed to subjects at this first meeting.

Instructions. Subjects were given packets of MBQs with instructions to fill them out every evening for the next 10 weeks. Packets of MBQs were collected

and distributed by the researcher on an every two-week basis. At the conclusion of the data collection, subjects were asked to fill out the General Information Questionnaire. Subjects were debriefed regarding the specific purpose of the study following the final data collection. They were told the female data would be analyzed for mood and behavior changes based on menstrual cycle phases, and that male and female data would be analyzed for similar changes based on day-of-the-week (a separate study).

Data Reduction. Menstrual cycles were divided into seven phases based on the following criteria: early menstrual--day 1 and day 2 of menstrual flow; late menstrual--day 3 and day 4 of menstrual flow; late premenstrual--days 1 and 2 before the onset of menstruation; early premenstrual--days 3 and 4 before menstrual flow; luteal--days 5 through 12 before the onset of menstruation; ovulatory--days 13 through 17 before menstruation; follicular--days between the 18th day before menstrual flow all the way to and including the 5th day after the onset of the previous menstrual cycle. This model was used by Englander-Golden et al. (1983) in their menstrual cycle study. The division of the cycle into seven phases as opposed to fewer phases is

considered advantageous in that differences among intermenstrual phases and among paramenstrual phases can more easily be detected. Subjects who did not menstruate twice during the 10-week data collection period were excluded from the analysis as it was not possible to assign them a complete 7-phase cycle. Phase calculations were averaged for subjects with more than one score for a particular menstrual cycle phase.

CHAPTER IV

RESULTS

Overview of the Design

A total of 43 women contributed data to the final data analyses. These women experienced at least one complete and documented menstrual cycle, were not taking oral contraceptives or other hormone medications, and were not pregnant or lactating. The subjects filled out the 74-item MBQs for 7 to 10 weeks. Based on the 14 factors identified by Englander-Golden et al. (1983), average daily factor scores were calculated. Average factor scores for each of the 7 menstrual cycle phases were then computed based on the model as outlined previously. When subjects experienced more than one complete cycle and extra phase data were available, factor scores for the same phases were averaged. Subjects' data were then grouped according to depression group classification and factor scores were averaged. The resulting means and standard deviations for each of the 3 depression groups for each of the 14 factors were

used in the data analysis. A 3 (depression group) X 7 (cycle phase) analysis of variance with repeated measures was computed for each of the 14 factors. A complete summary of these analyses is presented in Appendixes III - XVI. Significant effects as related to the hypotheses tested are described in the sections to follow.

General Phase Effects

This study did not test specific hypotheses related to overall changes in physiological or psychological functioning during the menstrual cycle. Because such changes have been described in the literature, however, it seemed worthwhile to first examine general fluctuations as they occurred in the present sample. Such cycle fluctuations were reflected in the phase main effects from the previously described analyses of variance. When data from all 43 subjects were grouped together, significant phase main effects were observed for five factors: Pain, $F(6, 240) = 12.55$, $p < .001$; Fatigue, $F(6, 240) = 2.14$, $p < .05$; Water Retention, $F(6, 240) = 14.90$, $p < .001$; Prostaglandin Effects, $F(6, 240) = 3.64$, $p < .01$; and Well-Being, $F(6, 240) = 3.38$, $p < .01$. The analyses, means, and standard deviations

are presented in Appendixes III, IV, V, VII, and XII, respectively. The factor means for each group and the results of the Newman-Kuels analyses are presented in Table 4. Newman-Kuels analyses indicated that pain was significantly higher during the early menstrual phase than during any other phases of the cycle. This is most likely accounted for by dysmenorrhea experienced by some of the subjects. Fatigue was reported significantly more during the follicular phase than during the ovulatory phase. However, other cycle phases did not differ significantly from either of these phases.

Water retention results are more complicated. The highest report of water retention was during the early menstrual phase which differed significantly from all other phases. Generally, the results indicate that water retention is highest during the early menstrual, late premenstrual, and early premenstrual phases which differ significantly from the luteal, follicular and ovulatory phases when water retention is reported at its lowest.

Prostaglandin effects indicate that such things as nausea, vomiting, diarrhea or loose stools are experienced significantly more during the 2-day early menstrual phase than during any other time in the cycle.

TABLE 4

Phase Differences Based on the Newman-Kuels Procedure for 5 Factors

Phases with Common Underscores Have Homogeneous Means (Means in Parentheses)

FACTOR	PHASES						
	low scores						high scores
Pain	4 (.68)	3 (.75)	5 (.76)	6 (.77)	7 (.84)	2 (.90)	1 (1.43)
Fatigue	4 (1.34)	6 (1.40)	2 (1.45)	7 (1.49)	5 (1.53)	1 (1.64)	3 (1.70)
Water Retention	4 (.58)	3 (.60)	5 (.68)	2 (.77)	6 (.85)	7 (.96)	1 (1.12)
Prostaglandin Effects	3 (.23)	5 (.24)	4 (.25)	2 (.25)	6 (.28)	7 (.31)	1 (.48)
Well-Being	1 (2.61)	7 (2.74)	6 (2.79)	3 (2.87)	2 (2.91)	5 (2.92)	4 (3.01)

1 = early menstrual
2 = late menstrual
3 = follicular
4 = ovulatory
5 = luteal
6 = early premenstrual
7 = late premenstrual

This conforms with the observations of Halbert, Demers and Jones (1956) that prostaglandin effects are more prevalent during the menses.

Well-being, the only positive factor assessed showing any significant fluctuations, was experienced most during the ovulatory, then the luteal, late menstrual, and follicular phases which differed significantly from the low in well-being experienced during the early menstrual phase. The early and late premenstrual phases did not differ significantly from any of the other menstrual cycle phases.

Depressed vs. Nondepressed Women: Group Differences

The first hypothesis tested whether or not depressed women would experience the entire menstrual cycle more negatively than would the nondepressed group. To test this hypothesis, main effects for group in each of the analyses of variance conducted on the 14 factors were examined. Of the 14 factors measured over the 7 cycle phases, 11 factors assessed negative moods, behaviors, or experiences. Significant main effects for group were observed in the case of 10 of the 11 factors: Pain, $F(2, 40) = 4.76$, $p < .05$; Water Retention, $F(2, 40) = 6.51$, $p < .01$; Autonomic Reactions, $F(2, 40) =$

6.68, $p < .01$; Prostaglandin Effects, $F(2, 40) = 3.71$, $p < .05$; Tension, $F(2, 40) = 4.20$, $p < .05$; Depression, $F(2, 40) = 12.15$, $p < .001$; Anxiety/Irritability, $F(2, 40) = 7.42$. $p < .01$; Negative Behavior Change, $F(2, 40) = 5.12$, $p < .05$; Concentration Decrements, $F(2, 40) = 8.31$, $p < .001$; and Anger, $F(2, 40) = 11.01$, $p < .001$. The analyses with means and standard deviations are found in Appendixes III, V - X, XIV - XVI. The factor means for each group and the results of the Newman-Keuls test are presented in Table 5. As can be seen, the depressed group experienced all of these variables significantly more negatively than did the nondepressed group. The four remaining factors (fatigue, vigor, well-being, and sexual arousal) showed no significant group effects.

The evidence from these analyses do support the hypothesis that the menstrual cycle as assessed by the MBQ is experienced more negatively by depressed women than by nondepressed women.

Depressed Women and the Premenstrual and Menstrual Phases

Hypotheses 2 and 3 stated that depressed women evidence a greater increase in negative moods and behaviors during the premenstrual or menstrual phases

TABLE 5

Group Differences Based on the Newman-Kuels Procedure for 10 Factors

Groups with Common Underscores Have Homogeneous Means (Means in Parentheses)

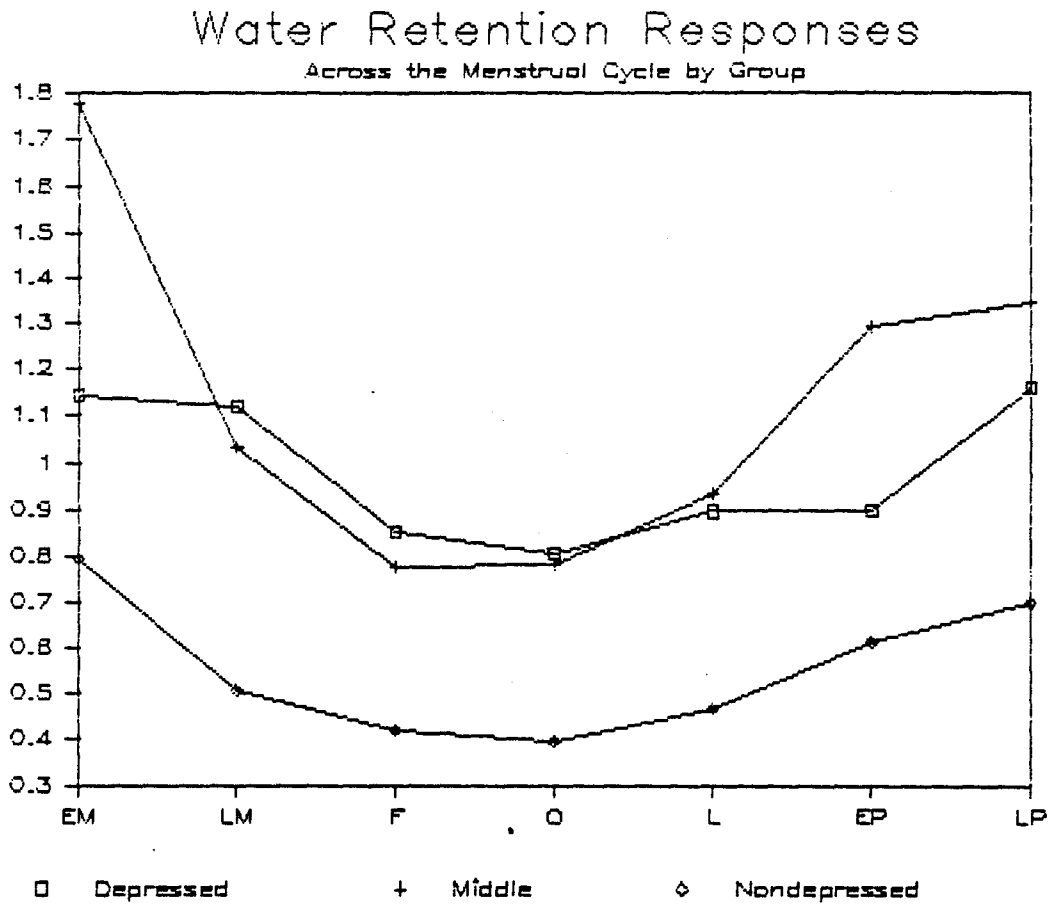
FACTOR	GROUPS		
	low scores Nondepressed	Middle	high scores Depressed
Pain	(.68)	(.96)	(1.27)
Water Retention	(.56)	(1.13)	(.98) *
Autonomic Reactions	(.10)	(.26)	(.54)
Prostaglandin Effects	(.20)	(.33)	(.48)
Tension	(.92)	(1.53)	(1.70)
Depression	(.52)	(1.06)	(1.46)
Anxiety/Irritability	(.79)	(1.51)	(1.56)
Negative Behavior Change	(1.06)	(1.47)	(1.71)
Concentration Decrements	(.50)	(1.00)	(1.31)
Anger	(.58)	(1.29)	(1.44)

*The middle group scored higher in water retention than did the depressed group for water retention only.

when compared with the intermenstrual phases than do the nondepressed women. Both hypotheses were addressed by examining the interaction effects generated by previously described analyses of variance. These hypotheses were not supported by the results of these analyses. The only significant interaction effect was noted for the water retention factor, $F(12, 240) = 2.29$, $p < .01$ (see Appendix V). A graphic representation of the means for each of the three depression groups is shown in Figure 1. The results of the Newman-Keuls test for ordered differences indicate that both the depressed and middle group differ significantly from the nondepressed group as a whole with the nondepressed group scoring lower. However, separate analyses for each of the depresssion groups indicate that the depressed group showed high but stable scores on water retention across the menstrual cycle phases, the middle group was also high but quite variable, and the nondepressed group indicated low and stable scores for water retention across the seven menstrual cycle phases. The interaction effect noted appears to be a result of the high variability of the middle group data which at times was higher than the depressed group data.

There were no significant interactions for any of

FIGURE 1



EM = early menstrual
LM = late menstrual
F = follicular
O = ovulatory
L = luteal
EP = early premenstrual
LP = late premenstrual

the remaining factors. As a result, the analyses, means and standard deviations for these factors are presented in Appendixes I -IV, VI - XVI.

Summary

The results of this investigation found evidence to support previous research indicating variations in moods and behaviors based on menstrual cycle phases. When data from all 43 subjects were analyzed together, significant variations in cycle phases were noted for five factors: pain, fatigue, water retention, prostaglandin effects, and well-being. Evidence was found to support the hypothesis that depressed women experience the menstrual cycle more negatively than nondepressed women. The depressed women in this study reported more pain, water retention, autonomic reactions, prostaglandin effects, tension, depression, anxiety/irritability, anger, difficulty concentrating, and negative behavior changes than did the nondepressed women. Evidence was not found to support the hypothesis that depressed women experience the menstrual or premenstrual phases significantly more negatively than the intermenstrual phases when compared with nondepressed women.

CHAPTER V

DISCUSSION

The major finding of this study comparing the experiences of depressed and nondepressed women across the menstrual cycle on a variety of menstrual cycle related factors is that depressed women experience the entire cycle significantly more negatively than do nondepressed women. The depressed women experienced more pain, water retention, autonomic reactions, and prostaglandin effects, reported more feelings of tension, depression, anxiety/irritability, and anger, had greater difficulty concentrating, and reported more negative behavior changes than did the nondepressed women. This finding is similar to that found by Conrad (1983) in her investigation of menstrual cycle related differences in depressed and nondepressed women.

Significant phase effects were present for the five variables of pain, fatigue, water retention, prostaglandin effects, and well-being. For pain, water retention, and prostaglandin effects, negative

experiences were highest during the 2-day early menstrual phase of the cycle. Well-being was noted most during the ovulatory phase. These findings are similar to those reported by Englander-Golden et al. (1983), Conrad (1983), and Rossi & Rossi (1977).

Using the identical MBQ questionnaire, Englander-Golden et al. (1983) found significant phase differences for pain, water retention, prostaglandin effects, and autonomic reactions in their similarly designed daily unaware investigation of 37 women not using oral contraceptives. Three of these factors (pain, water retention, and prostaglandin) are the same as those found in this study.

Conrad (1983) found significant phase fluctuations for the combined depressed and nondepressed groups of aware women she studied. The highest endorsement of negative symptoms (pain, water retention, autonomic reactions, and somatic anxiety) was during menstruation. The positive measures (arousal and resting) were reported most often intermenstrually.

Rossi & Rossi (1977) traced the effects of the menstrual cycle on moods in a daily aware study of 67 undergraduate women. Their results indicated an elevation of positive moods and a slight decrease in

negative mood during the ovulatory phase. In addition, the first two days of menstruation were characterized by a significant elevation in negative mood largely due to somatic complaints. They also found an elevation in negative mood and a decrease in positive mood during the luteal phase. This negative mood, however, was more psychological than somatic in nature.

Although the results of this investigation did find the seemingly characteristic variability in moods and behaviors during different menstrual cycle phases, it is noted that actual mean values varied within a very narrow range. Subjects indicated experiences related to items on the MBQ on a 6-point scale with responses coded according to the following numeric values: Not at all--0, Almost not at all--1, Slightly--2, Somewhat--3, Moderately--4, and Very--5. Marginal mean phase values for the five factors that showed significant phase effects ranged as follows: Pain--.68 to 1.43, Fatigue--1.34 to 1.70, Water Retention--.58 to 1.12, Prostaglandin Effects--.23 to .48, and Well-Being--2.61 to 3.01. Golub (1976a) also found significant increases in negative affect, depression, and anxiety during particular menstrual phases. However, she also notes that the changes were small and less than those reported

as reactions to unusual stress or found in psychiatrically ill populations.

The investigation did not find the interaction effects deemed necessary to support the hypothesis that depressed women experience the menstrual or premenstrual phases significantly more negatively than the intermenstrual phases when compared with nondepressed women. At first glance, this may seem to contradict previous research indicating higher rates of psychiatric hospital admissions for depressed women during the paramenstruum (Abramowitz et al., 1982; Dalton, 1959; Jacobs & Charles, 1970) and the greater incidence of suicides during the menses (Gregory, 1957; Ribeiro, 1962). However, this is not necessarily the case. Both significant phase and group effects occurred suggesting the existence of parallel but significantly different responses to mood and behavior questions. That is, depressed women responded more negatively than nondepressed women at all phases of the cycle. Of concern with depressed women are those times in the cycle when negative symptoms increase and critical symptom levels may be reached. If vulnerable levels are reached, depressed women may be more prone to emergency hospitalizations or self-distructive behavior.

Beck (1963) reported that suicidal ideation was related to the subject's conceptualization of his/her situation as hopeless. A key issue in working with depressed clients, whether they have suicidal tendencies or not, is anticipating and understanding those times when negative experiences and hopelessness increase. If it is considered important to anticipate and help the depressed woman understand her own affect fluctuations in hopes of reducing the occurrence of feelings of hopelessness, then discussion and understanding of mood fluctuations as related to the menstrual cycle appear important. If the depressed woman can anticipate and understand her varying moods with the knowledge that she may feel more vulnerable during particular phases of her menstrual cycle and less vulnerable during others, then some of the helplessness, hopelessness, and fear associated with increased negative symptoms may be better understood and hopefully brought better under control.

Considerable time and effort was involved in collecting daily data for this investigation. In addition, a number of subjects were eliminated in order that the criteria of subject unawareness be maintained. However, when the results of this study are compared

with those of Conrad (1983) who investigated the same topic but collected data only three times during one cycle with subjects fully aware that the menstrual cycle was being studied, the results appear quite similar. Of the 14 factors investigated in this study, 10 factors significantly differentiated the depressed and nondepressed groups. In the Conrad study, 11 factors of the 13 investigated significantly differentiated the two depression groups. With regard to phase fluctuations, 5 factors showed significant variability in the present study while 6 varied significantly in the earlier Conrad investigation. It is noted that a different questionnaire was used in this study than in the Conrad study, and, therefore, comparison of exact variables cannot be made. The issue of awareness in menstrual data collected contemporaneously in a population of young, primarily Roman Catholic, college women is not clearly resolved.

Limitations do exist in studies of this type, and those related to this investigation need consideration. First of all, the number of subjects in each of the depression groups was small. Not surprisingly, the greatest drop out rate and the resulting lowest number of subjects were in the depressed group. Filling out a

daily questionnaire for 10 weeks was probably difficult for these women who already acknowledged a number of depressive symptoms.

Another limitation of this study was the assessment technique used to classify the subjects as depressed or nondepressed. Classification of subjects into depression groups was based on responses to the BDI given one time prior to the study. No clinical interview took place, no follow up assessment of depression or any other possible problems took place. Nor was it determined when during the subjects' cycles BDIs were completed in case premenstrual or menstrual symptoms were present during the evaluation. In addition, a BDI cut-off score of 12 was used which resulted in a depressed group which was only mildly to moderately depressed. If a clinically depressed group of women were studied, the effects might be stronger, and certainly the clinically depressed woman is the one for whom concern is greatest.

A general problem with the investigation which may have influenced the results obtained relates to the fact that no physiological measurements were taken to more accurately partition the menstrual cycle into phases. In addition, the actual occurence of ovulation was not

determined, and anovulatory cycles may have been included in the data analysis which may have lowered some cyclical variability across the menstrual cycle.

Koeske (1980) raises a number of points regarding the complexity of menstrual cycle studies. One of her key concerns regards the events subjects experience while involved in menstrual cycle data collection. She questions whether these events might be more influential in terms of mood variations than biological explanations. As part of another study, the daily data collected for this project were analyzed on the basis of a social cycle, day-of-the-week. In contrast to the five variables for which significant phase fluctuations were found in this study, eight variables (prostaglandin effects, tension, anxiety/irritability, vigor, well-being, sexual arousal, negative behavior change, and concentration decrements) were found to vary significantly on the basis of day-of-the-week. (Note: Prostaglandin effects and well-being varied significantly when analyzed by both cycle phase and day-of-the-week.) Although analyses based on day-of-the-week do not take into consideration isolated stressful events such as exams or personal problems or triumphs, this does illustrate the influence of yet another factor in any

study assessing mood changes on a daily basis.

The present research does highlight a number of issues of which health and mental health professionals should be aware when working with depressed or potentially depressed women. First, depressed women do appear to experience the entire menstrual cycle more negatively than do nondepressed women. Negative physiological and psychological symptoms are reported more often by depressed women. Second, there appear to be groups of symptoms that vary significantly on the basis of menstrual cycle phase suggesting that although depressed and nondepressed women differ with regard to the extent of negative experiences, a parallel variation in feelings across cycle phases exists. This leads to the final point. The concern with the depressed woman is that there may be particular times during her cycle when she is more prone to critical symptom levels. It would seem important that the depressed woman and the people working with her be cognizant of particularly the late premenstrual and early menstrual phases in order that special help be available if needed.

Further research in this area should consider a number of issues. First, data needs to be collected from a more representative sample of adult women taking

into consideration such variables as age, marital status, parity, religious affiliation, and level of depression. Larger sample sizes are needed although follow through is difficult to obtain from depressed subjects when daily reporting is required. Second, classification of subjects as depressed or not should be based on both test taking and interviews conducted preferably during the luteal phase of the cycle. Third, validity of menstrual cycle research is enhanced by the use of physiological measurements to more accurately partition the menstrual cycle and assure the occurrence of ovulation. Finally, data assessing the occurrence of daily stressors (positive and negative) could lead to better understanding of stressful events and their influence on the experience of the menstrual cycle.

SUMMARY

Variations in menstrual symptoms were assessed during 7 cycle phases in 9 depressed, 11 neither clearly depressed or nondepressed, and 23 nondepressed college women on a daily basis for from 7 to 10 weeks. Subjects were not taking oral contraceptives or other hormone medications, were not pregnant or lactating, and menstruated at least two times during the data collection period. Participants were told they were involved in a study of biosocial rhythms and did not suspect the menstrual cycle was being investigated.

Negative moods and behaviors including pain, water retention, autonomic reactions, prostaglandin effects, tension, depression, anxiety/irritability, anger, concentration difficulty, and negative behavior changes were all reported significantly more often by the depressed group than by the nondepressed group of women. However, no clear evidence was found that depressed women react differently to particular cycle phases than nondepressed women.

Significant phase effects existed for the combined

groups of women for the variables of pain, water retention, prostaglandin effects, fatigue, and well-being. The first three variables were reported most often during the 2-day early menstrual phase. Fatigue related items were endorced least often during the ovulatory phase and most often during the follicular phase. Well-being was noted most during the ovulatory phase.

Methodological issues involved in this and similar research projects investigating the menstrual cycle are complicated. These include: (a) psychological assessment of populations studied; (b) the difficulty of obtaining daily measures of moods and behaviors over extended periods of time from depressed subjects; (c) the necessity and difficulty of obtaining physiological measures to more accurately partition the menstrual cycle into phases and assure the occurrence of ovulation while still maintaining the "unaware" status of the subject with regard to the purpose of the investigation; and (d) evaluation of exogenous factors which cause stress (positive or negative) and influence menstrual cycle data.

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APPENDIX I

APPENDIX I

Moods and Behaviors Questionnaire

On this page and the next, you will find a copy of a questionnaire followed by 7 General Purpose-NCS-Answer Sheets. Each evening during this investigation take an answer sheet and fill in your identification number and the actual date. No other information is needed. Then read through the items listed below. If the word(s) definitely describes how you felt today, fill in the circle under F for the corresponding item number on the answer sheet. If the word(s) describes less well how you felt, you can choose a milder response all the way to "not at all". Work rapidly. Your first selection is best. Fill in all words.

A	B	C	D	E	F
Not at all	Almost not at all	Slightly	Some-what	Moderately	Very

1. weight gain
2. unusually cold
3. crying
4. lowered school or work performance
5. muscle stiffness
6. forgetfulness
7. confusion
8. take naps; stay in bed
9. headache
10. skin disorders
11. loneliness
12. feeling of suffocation
13. affectionate
14. orderliness
15. stay at home
16. cramps
17. excitement
18. avoid social activities
19. anxiety
20. backache
21. cold sweats
22. lowered judgment
23. fatigue
25. hot flashes
26. difficulty concentrating
27. painful breasts or chest
28. feelings of well-being
29. distractible
30. swelling
31. easily upset
32. irritability
33. general aches and pains
34. depression
35. decreased efficiency
36. lowered motor coordination
37. tension
38. vomiting
40. flushing
41. bursts of energy or activity
42. unhappy
43. annoyed
44. sexy
45. friendly
46. active
47. angry
48. gloomy
49. full of pep
50. worthless

A Not at all	B Almost not at all	C Slightly	D Some-what	E Moderately	E Very

51. passionate	61. on edge
52. good-natured	62. sleepy
53. nervous	63. discouraged
54. worn out	64. grouchy
55. ready to fight	65. understanding
56. lustful	66. tired
57. cooperative	67. lively
58. blue	68. vigorous
59. unusually warm	69. helpless
60. weary	70. clammy

71. Were you sick today? A) yes; B) no

72. What medications did you take today?
A) none
B) pain reliever
C) cold medication
D) allergy medication
E) insulin
F) diet pill
G) birth control pill
H) other

73. Did you have your period (menstruate) today?
A) not applicable (males)
B) no (females)
C) yes (females)

74. How stressful was your day today?
A) not at all
B) almost not at all
C) slightly
D) somewhat
E) moderately
F) very

Note. From "Self-Reports Across the Menstrual Cycle: Methodological and Substantive Findings" by P. Englander-Golden, F. J. Sonleitner, M. R. Whitmore & G. L. M. Corbley, 1983, University of Oklahoma. Reprinted by permission.

APPENDIX II

APPENDIX II

GENERAL INFORMATION QUESTIONNAIRE

Please answer the following questions to the best of your ability.

1. How old are you? _____

2. What is your religious background? _____

3. What is your race? _____

4. Are you married? _____

5. Have you had any children? _____
   If yes, how many? _____

6. Are you a male or female? _____
   If female, were you pregnant or lactating (nursing) any time during this study? _____

7. You have recently completed the Biosocial Rhythm Investigation. Other than what was explained to you, do you have any further ideas what this study might have been investigating? Please explain.
   _____
   _____
   _____

8. This space is reserved for any additional comments you would like to make.
   _____
   _____
   _____
   _____

APPENDIX III

APPENDIX III

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable PAIN

Source	df	MS	F
Group	2	8.09	4.76*
Error	40	1.70	
Phase	6	2.36	12.55***
Group x Phase	12	.21	1.11
Error	240	.19	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	1.24 (.77)	1.71 (.88)	1.59 (.84)	1.43
Late Menstrual	.71 (.44)	.78 (.67)	1.55 (.46)	.90
Follicular	.56 (.47)	.84 (.69)	1.14 (.70)	.75
Ovulatory	.49 (.48)	.81 (.78)	1.00 (.62)	.68
Luteal	.61 (.65)	.79 (.79)	1.10 (.56)	.76
Early Premenstrual	.59 (.36)	.89 (.70)	1.09 (.62)	.77
Late Premenstrual	.60 (.45)	.91 (.89)	1.40 (.94)	.84
Marginal Means	.68	.96	1.27	.88

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

APPENDIX IV

APPENDIX IV

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable FATIGUE

Source	df	MS	F
Group	2	2.48	.50
Error	40	4.95	
Phase	6	.61	2.14*
Group x Phase	12	.21	.75
Error	240	.29	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	1.53 (1.19)	1.73 (1.17)	1.83 (.64)	1.64
Late Menstrual	1.35 (.89)	1.43 (.83)	1.71 (.90)	1.45
Follicular	1.59 (.99)	1.77 (.94)	1.90 (1.23)	1.70
Ovulatory	1.16 (.78)	1.52 (1.01)	1.61 (1.02)	1.34
Luteal	1.48 (.97)	1.39 (.88)	1.79 (.97)	1.53
Early Premenstrual	1.40 (1.03)	1.40 (1.07)	1.42 (1.02)	1.40
Late Premenstrual	1.40 (.93)	1.29 (1.01)	1.96 (.76)	1.49
Marginal Means	1.41	1.50	1.75	1.51

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

APPENDIX V.

APPENDIX V

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable WATER RETENTION

Source	df	MS	F
Group	2	10.12	6.51**
Error	40	1.56	
Phase	6	1.62	14.90***
Group x Phase	12	.25	2.29**
Error	240	.12	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.79 (.56)	1.78 (.69)	1.14 (.82)	1.12
Late Menstrual	.51 (.42)	1.03 (.60)	1.12 (.63)	.77
Follicular	.42 (.38)	.78 (.48)	.85 (.50)	.60
Ovulatory	.40 (.41)	.78 (.55)	.81 (.44)	.58
Luteal	.47 (.50)	.93 (.58)	.90 (.57)	.68
Early Premenstrual	.61 (.60)	1.30 (.73)	.90 (.68)	.85
Late Premenstrual	.70 (.62)	1.34 (.71)	1.16 (.63)	.96
Marginal Means	.56	1.13	.98	.79

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

APPENDIX VI

APPENDIX VI

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable AUTONOMIC REACTIONS

Source	df	MS	F
Group	2	4.47	6.68**
Error	40	.67	
Phase	6	.04	1.38
Group x Phase	12	.03	.95
Error	240	.03	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.15 (.22)	.35 (.43)	.60 (.52)	.30
Late Menstrual	.12 (.21)	.23 (.28)	.58 (.60)	.24
Follicular	.09 (.14)	.22 (.41)	.47 (.46)	.20
Ovulatory	.12 (.21)	.28 (.58)	.42 (.37)	.22
Luteal	.10 (.14)	.22 (.37)	.55 (.61)	.22
Early Premenstrual	.03 (.07)	.22 (.33)	.62 (.75)	.21
Late Premenstrual	.07 (.16)	.28 (.45)	.53 (.58)	.22
Marginal Means	.10	.26	.54	.23

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

APPENDIX VII

APPENDIX VII

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable PROSTAGLANDIN EFFECTS

Source	df	MS	F
Group	2	1.76	3.71*
Error	40	.47	
Phase	6	.26	3.64**
Group x Phase	12	.04	.61
Error	240	.07	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.42 (.51)	.49 (.56)	.61 (.47)	.48
Late Menstrual	.20 (.29)	.26 (.35)	.40 (.36)	.25
Follicular	.14 (.18)	.34 (.42)	.34 (.36)	.23
Ovulatory	.16 (.21)	.34 (.46)	.39 (.36)	.25
Luteal	.15 (.18)	.26 (.27)	.45 (.44)	.24
Early Premenstrual	.15 (.26)	.32 (.34)	.58 (.55)	.28
Late Premenstrual	.21 (.30)	.31 (.38)	.57 (.48)	.31
Marginal Means	.20	.33	.48	.29

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

APPENDIX VIII

APPENDIX VIII

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable TENSION

Source	df	MS	F
Group	2	18.05	4.20*
Error	40	4.30	
Phase	6	.36	1.22
Group x Phase	12	.22	.74
Error	240	.29	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.99 (.87)	1.67 (1.17)	1.71 (1.14)	1.31
Late Menstrual	.97 (.94)	1.58 (.99)	1.80 (1.02)	1.30
Follicular	.97 (.72)	1.44 (.99)	1.79 (1.23)	1.26
Ovulatory	.85 (.72)	1.19 (1.01)	1.55 (.87)	1.09
Luteal	.87 (.78)	1.46 (.92)	1.64 (.86)	1.18
Early Premenstrual	.77 (.73)	1.81 (1.23)	1.49 (.93)	1.19
Late Premenstrual	1.01 (.88)	1.55 (1.20)	1.90 (1.15)	1.33
Marginal Means	.92	1.53	1.70	1.24

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

APPENDIX IX

APPENDIX IX

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable DEPRESSION

Source	df	MS	F
Group	2	22.23	12.15***
Error	40	1.83	
Phase	6	.26	1.10
Group x Phase	12	.11	.49
Error	240	.23	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.56 (.55)	1.12 (.60)	1.55 (.87)	.91
Late Menstrual	.64 (.74)	1.06 (.79)	1.45 (1.04)	.92
Follicular	.51 (.33)	1.09 (.62)	1.50 (1.09)	.86
Ovulatory	.39 (.35)	1.01 (.65)	1.23 (.97)	.72
Luteal	.47 (.35)	.87 (.57)	1.45 (.89)	.78
Early Premenstrual	.53 (.47)	1.21 (1.01)	1.31 (1.01)	.87
Late Premenstrual	.54 (.55)	1.09 (.81)	1.71 (.91)	.93
Marginal Means	.52	1.06	1.46	.85

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

APPENDIX X

APPENDIX X

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable ANXIETY/IRRITABILITY

Source	df	MS	F
Group	2	20.51	7.42**
Error	40	2.76	
Phase	6	.34	1.50
Group x Phase	12	.24	1.06
Error	240	.22	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.92 (.74)	1.78 (.79)	1.52 (.85)	1.27
Late Menstrual	.83 (.78)	1.55 (.82)	1.44 (.97)	1.14
Follicular	.72 (.43)	1.44 (.74)	1.60 (1.03)	1.09
Ovulatory	.63 (.48)	1.45 (.89)	1.46 (.91)	1.01
Luteal	.76 (.52)	1.32 (.77)	1.47 (.85)	1.05
Early Premenstrual	.81 (.66)	1.66 (.86)	1.44 (.88)	1.16
Late Premenstrual	.86 (.80)	1.39 (.90)	1.98 (1.19)	1.23
Marginal Means	.79	1.51	1.56	1.14

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

APPENDIX XI

APPENDIX XI

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable VIGOR

Source	df	MS	F
Group	2	4.49	.97
Error	40	4.62	
Phase	6	.34	1.34
Group x Phase	12	.19	.74
Error	240	.25	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	1.74 (1.02)	1.71 (.83)	1.68 (.83)	1.72
Late Menstrual	2.04 (1.09)	2.03 (.69)	1.52 (1.22)	1.93
Follicular	1.98 (.81)	1.90 (.54)	1.50 (1.15)	1.86
Ovulatory	2.13 (.77)	2.24 (.85)	1.70 (.97)	2.07
Luteal	2.08 (.89)	2.06 (.77)	1.54 (1.02)	1.96
Early Premenstrual	1.89 (1.08)	2.12 (.96)	1.57 (.98)	1.88
Late Premenstrual	1.90 (.96)	2.23 (1.00)	1.50 (.95)	1.90
Marginal Means	1.97	2.04	1.57	1.90

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

APPENDIX XII

APPENDIX XII

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable WELL-BEING

Source	df	MS	F
Group	2	12.83	2.22
Error	40	5.78	
Phase	6	.69	3.38**
Group x Phase	12	.11	.54
Error	240	.20	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	2.85 (1.11)	2.46 (.65)	2.19 (1.17)	2.61
Late Menstrual	3.12 (1.06)	2.96 (.53)	2.32 (1.21)	2.91
Follicular	3.04 (.89)	2.99 (.47)	2.27 (1.31)	2.87
Ovulatory	3.19 (.86)	2.98 (.67)	2.58 (1.23)	3.01
Luteal	3.09 (.89)	3.04 (.63)	2.33 (1.28)	2.92
Early Premenstrual	3.03 (1.01)	2.85 (.83)	2.11 (1.29)	2.79
Late Premenstrual	2.91 (1.16)	2.88 (1.07)	2.16 (1.34)	2.74
Marginal Means	3.03	2.88	2.28	2.84

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

APPENDIX XIII

APPENDIX XIII

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable SEXUAL AROUSAL

Source	df	MS	F
Group	2	2.29	.45
Error	40	5.09	
Phase	6	.30	1.66
Group x Phase	12	.10	.57
Error	240	.18	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.99 (.81)	1.12 (.89)	1.30 (1.13)	1.08
Late Menstrual	1.21 (.83)	1.23 (.91)	1.58 (1.20)	1.29
Follicular	1.29 (.73)	.98 (.74)	1.49 (1.46)	1.25
Ovulatory	1.18 (.83)	1.27 (.68)	1.58 (1.34)	1.29
Luteal	1.20 (.78)	1.28 (.85)	1.44 (1.32)	1.27
Early Premenstrual	1.08 (.88)	1.16 (.90)	1.40 (1.20)	1.17
Late Premenstrual	.97 (.87)	1.13 (.98)	1.31 (1.30)	1.08
Marginal Means	1.13	1.17	1.44	1.21

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

APPENDIX XIV

APPENDIX XIV

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable NEGATIVE BEHAVIOR CHANGE

Source	df	MS	F
Group	2	11.17	5.12*
Error	40	2.18	
Phase	6	.10	.49
Group x Phase	12	.25	1.31
Error	240	.19	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	1.19 (.73)	1.41 (.76)	1.80 (.70)	1.38
Late Menstrual	1.13 (.82)	1.39 (.62)	1.73 (.69)	1.32
Follicular	1.00 (.63)	1.44 (.60)	1.84 (.71)	1.29
Ovulatory	.91 (.56)	1.63 (.61)	1.51 (.65)	1.22
Luteal	1.05 (.62)	1.41 (.52)	1.64 (.74)	1.27
Early Premenstrual	1.09 (.68)	1.77 (.61)	1.61 (.94)	1.37
Late Premenstrual	1.03 (.59)	1.26 (.65)	1.85 (1.16)	1.26
Marginal Means	1.06	1.47	1.71	1.30

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

APPENDIX XV

APPENDIX XV

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable CONCENTRATION DECREMENTS

Source	df	MS	F
Group	2	16.84	8.31***
Error	40	2.03	
Phase	6	.10	.91
Group x Phase	12	.14	1.23
Error	240	.12	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.53 (.46)	.91 (.51)	1.26 (.86)	.78
Late Menstrual	.47 (.46)	.94 (.67)	1.29 (.98)	.76
Follicular	.55 (.45)	1.06 (.59)	1.46 (.76)	.87
Ovulatory	.45 (.43)	.92 (.72)	1.26 (.73)	.74
Luteal	.50 (.39)	.90 (.62)	1.36 (.87)	.78
Early Premenstrual	.45 (.39)	1.27 (.89)	1.10 (.78)	.80
Late Premenstrual	.56 (.54)	1.00 (.76)	1.43 (1.18)	.85
Marginal Means	.50	1.00	1.31	.80

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

APPENDIX XVI

APPENDIX XVI

Two-Way ANOVA with Repeated Measures with Depression Group the Between Subjects Variable and Phase of the Menstrual Cycle the Within Subjects Variable for the Dependent Variable ANGER

Source	df	MS	F
Group	2	23.12	11.01***
Error	40	2.10	
Phase	6	.24	1.33
Group x Phase	12	.28	1.58
Error	240	.18	

Means with Standard Deviations in Parentheses

	Nondepressed n=23	Middle n=11	Depressed n=9	Marginal Means n=43
Early Menstrual	.68 (.62)	1.35 (.60)	1.35 (.88)	.99
Late Menstrual	.54 (.53)	1.22 (.73)	1.40 (.98)	.89
Follicular	.50 (.38)	1.16 (.65)	1.57 (1.06)	.89
Ovulatory	.47 (.40)	1.24 (.71)	1.37 (.81)	.86
Luteal	.54 (.46)	1.27 (.80)	1.36 (.72)	.90
Early Premenstrual	.63 (.51)	1.56 (.77)	1.16 (.74)	.98
Late Premenstrual	.70 (.79)	1.23 (.80)	1.88 (1.01)	1.08
Marginal Means	.58	1.29	1.44	.94

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

APPROVAL SHEET

The dissertation submitted by Marlys A. Conrad has been read and approved by the following committee:

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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval by the Committee with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

April 15, 1985
Date

Patricia A. Rupert
Director's Signature