1979

Variations in Mood During the Menstrual Cycle in Relation to the Personality Factors of Trait-Anxiety and Androgyny

Mary Leslie Smith O'Connor
Loyola University Chicago

VARIATIONS IN MOOD DURING THE MENSTRUAL CYCLE IN RELATION TO THE PERSONALITY FACTORS OF TRAIT-ANXIETY AND ANDROGYNY

by

Mary L. O'Connor

A Thesis Submitted to the Faculty of the Graduate School of Loyola University of Chicago in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

January

1979

ACKNOWLEDGMENTS

The author wishes to express her gratitude to Dr. Alan DeWolfe, director of this thesis, for his valuable suggestions throughout this research. She also wishes to thank Dr. Henry Lohmeyer who originally asked her to participate in this research project at West Side Veterans Administration Hospital and who has continually been of assistance. Appreciation is also expressed to Dr. Frank DeLeon-Jones for his guidance during this project. The author also is grateful to Dr. Kathleen Carlson who was most helpful with the statistical analysis of the data in this research. She also wishes to thank Dr. James Johnson for his constructive comments about the written presentation of this research.

VITA

The author, Mary Leslie Smith O'Connor, was born on October 17, 1941. She is the daughter of Robert L. Smith and Patricia Petrone Smith.

Her elementary education was obtained in parochial schools in Skokie, Illinois, and her secondary education at Marywood School for Girls, Evanston, Illinois, from which she graduated in 1959.

From September 1959 to June of 1963, she attended Mundelein College, Chicago, Illinois, where she received the degree of Bachelor of Arts, graduating cum laude with a major in English. At that time, she was inducted into Kappa Gamma Pi, a national honor society for Catholic Women's Colleges.

From September, 1963, to June, 1968, she taught English at Mather High School in Chicago, Illinois.

From 1972 to 1974, attending Loyola University, Chicago, Illinois, she took undergraduate prerequisites for graduate study in psychology. In September of 1974 she began graduate studies in clinical psychology at Loyola University.

The author completed two clerkships and a clinical internship at West Side Veterans Administration Hospital, Chicago, Illinois. She also completed a traineeship at the Counseling Center of Loyola University.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CONTENTS OF APPENDICES

CHAPTER I

INTRODUCTION

With the emergence of the women's movement in society, the psychology of women has become an area of study which is a necessary refinement of all theories of human behavior. No longer are women content to be told what their experience ought to be, but they are actively seeking knowledge about the female body and the female experience. Knowledge of the experience of the menstrual cycle is of foremost importance in the study of feminine psychology. Since antiquity, menstruation has activated the imaginations of both men and women, primarily in the form of taboo. In ancient times menstruating women were considered unclean; menstruating women were put in menstrual huts. Today although women are not segregated during the menses, the taboos linger in the form of making attempts to hide the event of menstruation or of avoiding sexual contact during menses. Also both men and women attribute irritability and depression in women to the onset of menstruation. Women can either use menstruation as an excuse for nonproductivity or can be harshly discriminated against for any signs of weakness at that "time of the month."

Within the cultural framework as women change their positions in society, it is paramount to understand the

factors of the female reproductive cycle. Do all women consistently become depressed and suffer premenstrual tension? If not, are there personality characteristics that are correlated with menstrual symptoms? Then, will this allow them to cope more effectively with stress since they have monthly practice or will it leave them debilitated each menses? The purpose of this study is to document further the affective fluctuations that occur over the menstrual cycle and to relate these changes to the personality traits of trait-anxiety and sex-role identity.

CHAPTER II

REVIEW OF THE LITERATURE

To study fluctuations of mood as a function of the menstrual cycle and of personality characteristics, the hormonal changes which produce the menstrual cycle must be documented. Recent research has shown the efficacy of dividing the cycle into five phases: follicular, periovulatory, luteal, premenstrual, and menstrual (Moghissi, Syner, & Evans, 1972). The follicular phase, lasts from the end of menses to two days prior to a peak in luteinizing hormone (LH). During this phase there is a gradual rise in estrogens, the major ones being estrone, estradiol, and estriol. At the estrogen peak, there is a surge of estradiol up to about 500 picograms per milliliter (pg/ml) which was found to occur one day before the LH peak (Abplanalp, Livingston, Rose, & Sandwisch, 1977; Ribeiro, Mischell, & Thorneycroft, 1974). This estrogen peak appears to stimulate LH from the pituitary gland which then induces ovulation. Also during the follicular phase, follicular stimulating hormone (FSH) has been stimulating the growth of follicles in the ovaries in preparation for ovulation. The pattern of FSH begins with an early rise and a decline, then a surge corresponding to the LH peak.

The periovulatory phase of the cycle includes the period from two days prior to two days after the LH peak.

Yen, Vela, Rankin, and Littell (1970) found LH peaks in plasma assays in 16 women of 91.2 $\pm$ 9.7 in International Units per milliliter (IU/ml) with an ascent of one to three days and a rapid decline of one day. Cargille, Ross and Yoshimi (1969), studying plasma samples of 21 normal women, found that LH peaked at a mean of 76.3 IU/ml. Whereas the LH peak is usually six-fold its levels during the follicular phase, FSH increases twofold at its peak, reaching levels of 19.6 in IU/ml (Cargille et al., 1969). FSH returns to baseline three days after its peak as documented by Moghissi et al. (1972) who examined basal temperature, cervical and vaginal cytology, endometrial histology, and cervical mucus. The lowest basal body temperature coincides with the first significant rise in LH levels. Within 48 hours after the LH peak, there is an elevated level of plasma progesterone (Johansson and Wild, 1969). This rise in progesterone is accompanied by a rise in basal body temperature (Yen et al., 1970).

The luteal phase begins on the third day after the LH peak and continues until three days before menses. Following ovulation, LH, FSH, and the estrogens go to their lowest levels. With the development of the corpus luteum, plasma progesterone continues to rise, peaking at about 5 micograms per milliliter from five to eight days after the LH peak. There is a secondary rise in plasma estrogens during the luteal phase (Mishell, Nakamurra, Crosignani, Stone, Kharma, Nagata & Thorneycroft, 1971).

Basal temperature usually maintains above 98. Both estrogen and progesterone reach their nadir about three days before menstruation. This three day period is the premenstrual phase of the cycle.

The menses occurs as a result of the withdrawal of stimulation by estrogen and progesterone to the endometrium. Bleeding usually occurs about 14-16 days after ovulation and lasts on an average of five days. The statistically average cycle is 28 days; yet few women have regular 28 day cycles except during a few years during the late thirties. It is normal to have cycles as short as twenty days and as long as 45 (Weidiger, 1976). Figure 1 illustrates the hormonal changes throughout the cycle.

Early studies on the variations of moods during the menstrual cycle include that of Frank (1931) who used the term "premenstrual tension" to describe the fatigability, irritability, lack of concentration, and weight gain associated with the premenstrual and menstrual phases of the female reproductive cycle. He described women who suffered such severe pain that they required bedrest. Another group he mentioned are those who show exacerbation of general disorders such as asthma prior to menstruating. He was at the time reporting methods of treatment for severe symptoms. This research is among the first to designate a "premenstrual syndrome," wherein mood swings were recognized as responses to a biological cycle.

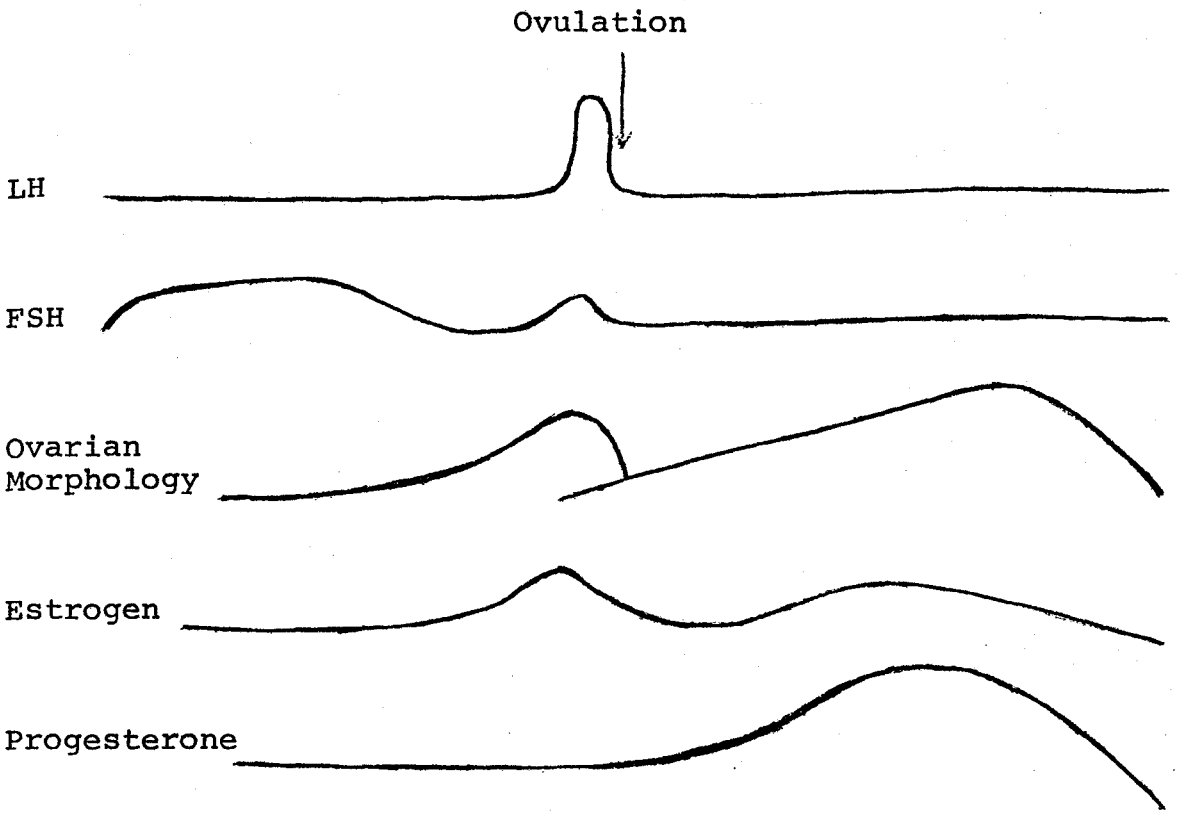

Fig. 1. Scheme relating plasma LH, FSH, estrogen, and progesterone with follicular maturation, ovulation, and development of the corpus luteum.

Note. - Reproduced from (Strott, Yoshimi, Ross, & Lipsett, 1969, p. 1166)

By 1939, the use of vaginal smears and basal body temperature to determine the hormonal cycle had been established. Therefore, Benedek and Rubenstein (1939, Part I and II) studied the correlations between the physiological factors and psychological factors. They used vaginal smears, temperature charts, and the associative material from nine analytic patients. Seventy-five cycles of which twenty-three were ovulative were studied. The authors investigated primarily the associations, the dreams, and the transference. They noted that at the follicular phase where estrogen is the predominating hormone, the psychological material of the women dealt with heterosexual tendencies; the dominant feelings were of well-being and alertness. If there was no opportunity for gratification for libidinal urges, the mood of the women was irritable and restless. The psychological content within a Freudian model was then characterized by aggression and anxiety, i.e., fear of attack, penis envy, and intense wishes to castrate. Of course, since the majority of the subjects were characterized as neurotic in this study, most of them did not attain sexual gratification. Tension or depression increased as ovulation approached. At ovulation, relaxation and an attitude of passivity along with psychic energy directed toward the self generally occurred in the women. During the early luteal phase, under the influence of progesterone, the dream content reflected mother-daughter conflicts and then concerns about impregnation and motherhood.

When there was another estrogen peak during the luteal phase, heterosexual fantasies were again present as during the follicular phase. This is a relatively quiet phase of affect. During the premenstrual phase, when there is a drop in the level of progesterone, dream content and associations of the women contained elimination tendencies illustrated on a genital level by childbirth, abortion, castration and on a pregenital level as anal or uretheral discharge. The emotions were characterized by fears of pain and mutilation and by feelings of regret and inadequacy. At the menses, with low hormone production, there is emotional relaxation; fear, apprehension, and rebellion cease. Conclusions made by Benedek and Rubenstein (1939, Part II) were as follows: 1) correlations were seen between the physiological and psychological cycle; 2) instinctual drives of adult women are related to hormone production; 3) instinctual tendencies are genital when hormone production is high and pregenital when they are low; and 4) psychic tension often increases with increase in hormone production.

In contrast to the work of Benedek and Rubenstein (1939) who studied the repressed sexual drive of neurotic women as correlated with the phases of the cycle, Altman, Knowles, and Bull (1939) studied the conscious mental states of ten normal women. They took daily psychological measures and interviewed each subject daily as to pain, sleep, mood, tension, worry, physical and mental activity. They reported the following findings.

Ovulation occurred with elation in 67.5% of cases, with activity in 85.3% and with tension in 31.4%. The premenstrual phase occurred with depression in 61.5% of cases, with activity in 71.8%, and with tension in 80.0% of cases.

Many correlational studies have drawn attention to the increase of negative affect at the premenstruum and menstruum. They have attempted to correlate extraordinary events such as crime or suicide with the premenstrual or menstrual phases. Dalton (1964) summarized much of this work and has been a leading contributer of this type of research. She (Dalton, 1961) reported that in a sample of 156 newly convicted female prisoners, 49% committed their crimes during the menstruum or premenstruum. Among 51 prisoners who were reported for disorderly conduct, 54% were menstruating. In this study Dalton divided the cycle with days one to four in menstruation, 13-16 in ovulation, and 25 to 28 in premenstruum. This study corroborated Dalton's work with school girls. She found 27% of the girls' weekly grades went down during premenstruum and 17% went up; 25% went down during the menstrual week and 30% went up after menstruation. In this study she divided the cycle into four weeks. She then concentrated on the menstrual and premenstrual weeks (Dalton, 1960).

Exacerbation of psychiatric symptoms in relation to the menstrual cycle has been studied frequently. One study (Glass, Heninger, Lansky, & Tolan, 1971) evaluated 166 female psychiatric emergencies.

These patients were seen in the emergency room during the premenstruum twice the expected frequency. A certain type of woman presented herself during the premenstrual weeks. She was, in comparison to those women coming in at other cycle phases, a nonpsychotic women who had a more severe history of medical illness, more past marital and sexual problems with manifest hostility, suicidal ideation, and actual suicidal attempts. Jacobs and Charles (1970) similarly studies 200 randomly selected patients coming into an emergency room. They used Dalton's method defining midcycle as the 13-16 day and 25-28 days as premenstruum. The women sought psychiatric help most frequently during menstruation (24.5%), then during the premenstrual phase (22.5), and finally during midcycle (18%). There was no clear difference between the menstrual and premenstrual phases. Diamond, Rubenstein, Dunner, and Fieree (1976) reported on 63 women on lithium who were among groups that 1) were hospitalized for mania; 2) were hospitalized for depression and had a history of hypomania; 3) were attending outpatient facilities; and 4) had a history of depression only. Psychiatric hospitalization occurred significantly more frequently during the menstrual and the premenstrual phase. Suicide was not more frequent during these times.

Tonks, Rack, and Rose (1967) obtained information on 95 women who attempted suicide; a statistically significant excess of attempts was found at the premenstruum. The trend was found primarily in women living with a male.

Least premenstrual attempts were made by parous women who complained of premenstrual tension. Dalton's (1959) findings that more hospital admissions for suicide attempts occurred during menses than other phases have been criticized since the psychiatric admissions were actually premenstrual rather than menstrual because of the lag in hospital admissions. Mandell and Mandell (1967) wanted to corroborate the findings of Dalton. They described 87 women who menstruated who called a suicide prevention center. Highest number of calls were found the first day of menstruation, second highest were found premenstrually, and third on a mid-cycle rise. Ribeiro (1960) reported 22 cases of suicide by Hindu women, 19 of whom were menstruating.

Parlee (1973) in her review of psychological studies on the premenstrual syndrome criticizes these correlational studies. Since these studies deal with a particular group such as prisoners, the data is not generalizable to all women. Knowing that women in these groups were more likely to commit crimes at certain phases of the cycle does not lead to the inverse conclusion, that at certain phases of the cycle women will commit more crimes. Parlee suggests that studies of other groups of women such as artists might produce correlations with creative works of art. So far it is not clear whether there is an increase in negative behavior or an increase in activity at the premenstrual and menstrual phases.

Heightened arousability of hormones, other than reproductive, and neurophysiology have been the focus of some menstrual cycle research. Zuspan and Zuspan (1973) studied two normally cycling women through a complete menstrual cycle. They measured creatinine, epinephrine and norepinephrine in 24-hour urine collections. FSH, LH and plasma epinephrine and norepinephrine levels were determined from blood drawn in the basal state. Urinary norepinephrine showed a gradual increase after ovulation. Urinary epinephrine remained stable across the cycle. Plasma amines showed an increase which preceded the LH surge in one subject and corresponded to the day of the LH peak in the other. Results indicate an increase in norepinephrine levels in the early luteal phase. The authors comment that the synergistic effect of progesterone and estrogen acting upon the hypothalamus at the time of ovulation results in a pulsatile increase in plasma amine levels.

Patkai, Johannson, and Post (1974) studied six normal free-cycling women. Urinary catecholomines, adrenaline and noradrenaline, were measured from a single sample taken each morning. Four phases of the cycle, premenstrual, postmenstrual, ovulatory, and postovulatory, were compared. Basal body temperature corroborated ovulation which occurred in the designated ovulatory phase in all but one subject. Adrenaline was lowest during premenses and highest during post menses, but this difference was not significant.

Also results of comparison of noradrenaline levels were non-significant. Duration of sleep was significantly longer by one hour during the premenses in contrast to postmenses and postovulation.

Kopell, Lunde, Clayton, and Moos (1969) measured two-flash threshold, reaction time, skin potential, time estimation, and cortisol levels of eight women over the cycle. These measures were considered to reflect the state of arousal of the central nervous system. The women were measured on the 3rd, 14th, 24th, 26th, and 28th days of two successive cycles. Only time estimation varied significantly over the cycle with longer intervals during the premenstrual phase. Time estimation was, however, significantly, correlated with two-flash threshold. Correlations with cortisol levels were non-significant. Negative correlations of time estimation with concentration and with social affection from the Nowlis Adjective Checklist were significant.

As part of the same project, Moos, Kopell, Melges, Yalom, Lunde, Clayton, and Hamburg (1968) reported physical changes during the cycle. Pain and water retention and autonomic reactions rose during the luteal phase and were highest during the menstrual phase. Measurement of these symptoms was from self-reports. The women reported that sexual arousal was low during menses, rose sharply until mid-cycle, and then leveled off.

The authors concluded that the decrease in physiological activity during the luteal phase results from the increase in progesterone. Progesterone is known to have an anesthetic effect when administered to animals (Hamburg, 1969).

Zimmerman and Parlee (1973) studied arm-hand steadiness, galvanic skin response to an auditory stimulus, reaction time, time estimation, and digit-symbol substitution. Using analysis of variance for repeated measures, arm-hand steadiness was found to be significantly greater during the luteal phase than during the premenstrual phase.

A study of Janowsky, Berens, and Davis (1973) suggested a connection between the activation of the renin-angiotensin-aldosterone system during the menstrual cycle and its effect on central neurotransmitters. They studied 11 college women over 15 menstrual cycles. The subjects maintained a 2,000 calorie diet with controlled salt intake. The dependent variables were weight gain, negative affect, and urinary potassium/sodium (K/Na) ratio, which when dietary factors are controlled may reflect aldosterone effects. All three variables correlated positively with each other. Urinary K/Na ratio significantly increased, peaking three days before menses and decreasing immediately at the first day of menstruation. Negative affect and weight gain were also significantly increased premenstrually. Abdominal pain and bloatedness were seen to rise significantly during the first three days of menstruation.

The conclusions drawn in this study were speculative since measurement of K/Na ratio as a measure of aldosterone is indirect. These conclusions were that emotional upset during the menstrual cycle are the result of the interaction between the renin-angiotensin-aldosterone system and the ovarian hormones which eventually affect the neurotransmitters, norepinephrine and epinephrine. If women experience depression at premenses or menses, this would be consistent with the catecholomine hypotheses that affective disorder is a disorder of the central neurotransmitters. Gray, Strausfeld, Watanabe, Sims, and Solomon (1969) also found significantly elevated aldosterone secretion rates during the luteal phase. This was abolished when enovid was administered. This evidence also indicates an interplay between the ovaries and the adrenals during the cycle. Evidence of the interaction of the ovarian hormones and the neurotransmitters is inconclusive.

Abplanalp et al. (1977) also studied adrenocortical reactivity in relation to menstrual cycle phase. They found no significant changes in cortisol levels or human growth hormone (HGH) across menstrual phases of 21 healthy women. They gave the women a moderately stressful interview either at menstruation when estrogen is lowest or at ovulation when estrogens are highest. Women who showed higher levels of cortisol throughout the cycle showed significantly greater response after the interview. They also reported more anxiety, in a post interview test for anxiety.

Merimee, Fineberg, and Tyson (1969) found an increase in HGH at midcycle over that at menstruation after induction of a dose of l-arginine, $\frac{1}{6}$ and $\frac{1}{2}$ gm per pound body weight. Genazzi, Lemarchard-Beraud, Aubert and Felber (1975) found significant differences in cortisol levels between day seven to four before the LH peak when levels were lowest and days two to zero before the LH peak when levels were highest. Cortisol remained constant during the luteal phase. Level of HGH was significantly higher at the periovulatory phase, but there was no difference between the follicular and luteal phases. These last studies indicate ovulation may induce or require activation of the hypothalamic-pituitary-adrenal axis in addition to that of the hypothalamic-pituitary-ovarian axis.

Studies which measure the changes in cerebral neurophysiology with EEGs have been made. Lamb, Ulett, Masters, and Robinson (1953) studied ten women, five who reported premenstrual tension and five who did not. EEGs were recorded 24 hours postmenstruation, at ovulation as determined by vaginal smears, and at the premenstrual period. They found a trend for the greatest amount of alpha waves to occur at ovulation and the lowest amount premenstrually. The two groups were not significantly different. Generally, however, the authors conclude that there is no evidence of alterations on cerebral neurophysiology as a result of premenstrual tension.

Creutzfeldt, Becker, Langenstein, Tirsch, Wilhelm, and Wuttke (1976) studied 16 free-cycling women and 16 women taking oral contraceptives. They recorded EEGs, occipito-central anterior and posterior temporo-central. From blood samples, they measured hormones - estradiol, progesterone, FSH, and LH. Also they administered psychometric tests for reaction time, concentration, simple calculations, and motor performance. Under power spectrum analysis, mean alpha frequency was found to increase significantly during the luteal phase until menstruation (mean of occipital alpha acceleration = +.3 c/sec) in the free-cycling women. This time period acceleration correlated with acceleration of progesterone; but direct correlation of alpha frequency increase with the progesterone peak was not found. Reaction time and simple arithmetic performance were slightly but significantly decreased during the luteal phase.

In these cited studies on physiological changes over the menstrual cycle, some trends appear. During the periovulatory phase there is a heightened arousability corresponding to estrogen and LH peaks since norepinephrine, epinephrine, cortisol levels, and HGH tend to elevate around the time of ovulation. The luteal phase appears to be a period of increased physiological relaxation as evidenced in EEGs and some behavioral tasks. Increase in aldosterone levels premenstrually suggest some

interaction between the neurotransmitter, norepinephrine, and the lowered estrogen and progestrone levels.

Two studies which attempt a controlled design investigated intellectual performance as a function of menstrual cycle phase. If there are biochemical and affective changes of the cycle, cognitive changes can possibly be inferred. Sommer (1972) studied over 250 women, free-cycling and on the pill. She used the Watson-Glaser Critical Thinking Appraisal. She also compared scores on an in class psychology exam from phase to phase. Both measures in this study, however, are suspect since they would not be especially sensitive to changes from phase to phase. Performance did not change from phase to phase. Golub (1976) used the Kit of Reference Tests (French, Ekstrom & Price, 1963) which tests intellectual functions which might be more vulnerable to changes in affect such as memory, sensory-perceptual tasks, etc. Although her study showed significant changes in anxiety and depression between the menstrual and intermenstrual phases, no significant intellectual changes were found. In contrast to the studies of Dalton (1960) on English schoolgirls, these studies indicate that the biochemical and affective changes occurring at the premenstruum and menstruum are not sufficient to intrude on intellectual functioning.

As has been stated above, menstrual mythology and scientific research postulate the existence of the premenstrual syndrome. The classic study of Benedek and

Rubenstein (1939) created a model of affective change. They described a feeling of well-being during the follicular phase. As ovulation approaches, excitability increases. Then upon ovulation, relaxation and quiet affect ensue to be carried on during the luteal phase. At the premenstruum feelings of self-doubt, regret, and fear predominate. At the menses there is a lessening of tension but a depressive tone continues. These results have served as a model to be corroborated or refuted in more recent studies.

These more current studies can be divided according to the methodology employed: 1) those studies using retrospective reports; 2) those studies using single measures from various phases of the cycle; and 3) those studies using daily self-reports of affect. In the first category of retrospective reports, Coppen and Kessel (1963) sent out a menstrual questionnaire to 500 women, ranging in age from 18 to 25. Twenty-two percent were menstruating at the time of completing the form. This group did not differ from the non-menstruating group in severity of symptoms. The form asked the women whether they became depressed, anxious or nervous around the time of their period. Irritability, depression, tension, headache, body swelling, occured most frequently in the women one or more days before menses.

One woman in nine reported severe pain, irritability or headaches associated with her period. One woman in sixteen reported that she gets depressed or tense. Statistical analyses, however, were not employed to substantiate these findings. These findings add to previous research and popular opinion of the existence of a premenstrual syndrome.

Lamb et al., (1953) conducted a survey of 127 nurses with a mean age of 20.3. Of these, 78% reported some dysmenorrhea sometimes; 50% had it always. Depression, irritability, temper outbursts occured singly or together in 85% of the subjects. This type of survey is suspect, however, because of possible faulty memory, the mood when taking the test, and the popular belief that poor mood results from "getting your period."

The second category of studies, those taking a single measure of affect at a different phase of the cycle further corroborated the existence of heightened negative affect during the premenses and menses. Lamb et al., (1953) compared five women who complained of the premenstrual syndrome and five who did not. The authors conducted interviews at the time of ovulation, premenstrually, and on the day of bleeding. Then each subject was rated on mood, activity level, and assertiveness. They found that at the premenstrum those who complained of premenstrual tension became depressed and were either hypo or hyperactive, whereas controls were not.

Premenstrual complainers also tended to be more hostile and aggressive than the controls whereas at other times of the cycle they were more submissive.

Ivey and Bardwick (1968) tested anxiety levels of 26 college women ages 19 to 22. The women were told they were cooperating in a study on the menstrual cycle and that they would be tested at ovulation and premenses. They were asked to talk for five minutes about any event in their lives. This verbal sample was then scored according to Gottschalk's (1961) Verbal Anxiety scale for death, multilation, separation, guilt, shame, and diffuse anxiety. Anxiety levels were significantly higher ($p < .005$) premenstrually than at ovulation for all subjects for two complete cycles. These feelings are similar to the findings of Benedek and Rubenstein (1939, Part II) of fear of mutilation and inadequacy experienced at the premenstruum. Also authors found consistent themes of hostility and depression and inability to cope. Attention must be paid to the fact that the subjects knew the times of the cycle at which they were being tested. To test this confound, the authors asked the women what they guessed was the purpose of the study. The authors claim none of the women suspected their moods were being measured.

Luschen and Pierce (1972) studied 48 women from ages 18 to 22, having 24 subjects in a premenstrual group and 34 in an ovulatory group. Ovulation was defined as 15 days prior to the next expected menses. Despite the fact that the 15th day prior to menses is not always the day of ovulation, significance was found. The ovulatory group were significantly more other-directed than the premenstrual group. Also women at ovulation had a higher sexual arousability score than those at premenses. One possible confound in this study was that pill takers were in the groups. The authors claim that their scores did not differ from those of the free-cycling women.

To investigate the changes in symptoms and affect over two consecutive cycles with a group of 15 women, Moos et al., (1969) tested on the 2nd 7th, 14th, 19th, 24th, 25th, 26th, 27th, and 28th day. Mood was measured by the Nowlis Mood Adjective Checklist (1965). Results show pain and water retention highest at menses, dropping to the lowest point during the follicular phase, and rising again after the 16th day. Anxiety was highest during the menstrual phase and dropped at midcycle, then began to rise during the luteal phase. Pleasant affect and activation peaked at mid-cycle and were lowest at menstruation. Sexual arousal also peaked at midcycle. Surprisingly, depression showed no noticeable changes over the cycle. Correlations between the two cycles were generally high at the menstrual, intermenstrual and premenstrual phases.

Women who were high on premenstrual tension in contrast to those low in premenstrual tension were high on negative affect, pain, and autonomic reactions. Although phase changes were not analyzed statistically, this study does show fluctuations in mood over a cycle which seems to be fairly consistent from cycle to cycle.

The work of Paige (1971) showed increase in negative affect at the time of premenses and menses. In this study, 38 free-cycling women were compared to 26 women on combination contraceptives and 12 women on sequential contraceptives. They measured on the 4th, 10th, 16th, and 26th days with the Gottshalk Verbal Anxiety Scale (1961). Total negative affect for all the groups across the cycle was not different. Cycle day for the normal group had a significant effect on the magnitude of negative affect, anxiety and hostility. Self-selection into the groups was ruled out as an explanation after analyses of demographic data. Normals showed the usual U-shaped curve of high negative affect at menses, low at midcycle and high at premenses.

Golub (1976) assessed the magnitude of depression and anxiety in 50 women between the ages of 30 and 45 who were described as "active women leading productive lives" (p. 10). She formed a counterbalanced design with Group 1 first tested premenstrually and then tested intermenstrually; Group 2 was tested in the opposite order.

She used the Depression Adjective Checklist (DACL) (Lubin, 1967) and the STAI (Spielberger, Gorsuch, & Lushene, 1970). About 75% had higher premenstrual depression and about 65% had higher premenstrual anxiety than intermenstrually. The mean scores were significantly higher at premenses than intermenses. Golub compared these scores to the normative data of the DACL for normal women whose scores fall between the mean intermenstrual and the mean premenstrual scores in her study. The depression levels in this study, 9.4 and 9.2, were much less than the normative data from psychiatric patients which were 14.95 and 16.03. The merit of this study is in the use of standardized measure of depression and anxiety which supports other studies reporting the fluctuation of mood during the cycle. In only comparing premenstrual to intermenstrual, however, the information culled is unspecific since "intermenstrual" could refer to follicular, periovulatory or luteal phase, all of which have different hormone balances.

Abplanalp et al., (1977) administered the state-anxiety form of the STAI (Spielberger et al., 1970) before and after a mildly stressful interview. Half the subjects were interviewed during their menses and the other half during the periovulatory phase. The time of ovulation, however, was correctly estimated only in about 59% of the cases when compared with the results of the biochemical analyses.

State-anxiety differences between pre and post interview were not significant despite phase of the menstrual cycle at which the subject was interviewed. Where Golub (1976) found significant changes in anxiety between the pre-menstruum and intermenstruum, Abplanalp et al., (1977) found no variation in state-anxiety between the menstrual and intermenstrual phases. In general, the research cited above, using single times of measuring per phase, indicate that there is a fluctuation in mood with negative affect high at menses, low at ovulation, and high again at premenses. Only in Ivey and Bardwick (1968) was there an attempt to establish ovulation by basal body temperature. Therefore although changes in mood are found, the precise nature of the changes as related to hormonal changes is not evident in these studies.

Other studies collected daily self-reports. Silbergeld, Brast, and Noble (1971) had eight subjects, four who were first on Enovid for two cycles, then free-cycling for two cycles, and four subjects who were reversed. Each night subjects rated their feelings on the Nowlis Adjective Checklist (1965) and the Menstrual Distress Questionnaire (MDQ) (Moos, 1977). On nine days throughout the cycle, they were given the Gottschalk Verbal Anxiety Scale (1961) where they talked freely for five minutes. The data divided into six phases: menstrual, midfollicular, early ovulatory, late ovulatory, midluteal and premenstrual.

Only for anxiety rated by an unaware experimenter was there a significant treatment by phase interaction. Analysis for phase effects showed an increase in physical symptoms at the menstrual and premenstrual phases. The women reported more crying, irritability, and tension and were rated more tense and aggressive during the premenstrual phase than during the other phases. The authors conclude that the pattern of affective changes found in the free-cycling group is consistent with the model of Benedek and Rubenstein (1939).

Wilcoxon, Schrader, and Sherif (1976) took daily self-reports. Their subjects from an introductory psychology course were 11 males, 11 females-no pill, and 11 females on contraceptives. They divided the cycle into three phases: intermenstrual, premenstrual and menstrual. Yet sample by phase interactions were significant. Females-no pill peaked on negative affect at menses while females-pill peaked premenstrually. Impairment of concentration and report of stressful events increased premenstrually for both groups and decreased menstrually for females-pill. Stressful events, however, accounted for more of the variance for negative affect than cycle phase. The authors also noted that caution be used in interpreting the data because on all thirteen factors they measured, subject's variance, amount of individual difference, contributed more to the variance than sample, cycle phase, or interaction effect.

One purpose of this present study was to replicate earlier findings that negative affect appears to fluctuate in a U-shaped curve. Negative affect is high at menses, low at mid-cycle, and high at premenses. Also heightened pleasant affect is found at the periovulatory phase. The most precise methodology was decided to be daily self-reports. Five phases of the menstrual cycle were compared for fluctuations. Standardized measures of anxiety, negative affect, and pleasant affect were employed to increase generalizability.

Although general trends of affective change during the menstrual cycle have been found, research shows great individual variation. This has lead many authors to search for personality components to explain different patterns of menstrual symptoms. Some theories come from psychoanalysis. Benedek (1959) suggests that women who suffer from dysmenorrhea have a relatively low pain threshold perhaps due to an infantile personality organization. Shainess (1961) found that premenstrual symptoms are associated with helplessness, need for love, or defensiveness against attack. The symptoms are a "compulsive recapitulation" of self-devaluation for being a woman. Lamb et al. (1953) found that women who complained of premenstrual tension were more emotionally labile and generally more submissive than women who do not have premenstrual symptoms.

Coppen and Kessel (1963) measured neuroticism in 465 women. Neuroticism was defined as general emotional lability, overresponsiveness, and liability to breakdown under stress (Eysenck, 1959). They found significant correlation between neuroticism and retrospective reports of premenstrual irritability, depression, tension, headaches, and sensations of swelling. Dysmenorrhea did not correlate with neuroticism. The authors conclude that dysmenorrhea cannot be considered a psychosomatic condition. Moos et al. (1969) also found that women who reported high premenstrual tension when measured during the cycle were also found to have more anxiety, depression, and aggression, more pain and autonomic responsiveness, and less sexual arousability than women with low premenstrual tension. Leavitt and Lubin (1967) studied 221 women, using retrospective reports of their menstrual symptoms. They found significant positive correlations between the severity of menstrual complaints and unwholesome attitudes toward menstruation. Also as complaints increased, so did superficial understanding of self and human relationships, hypersensitivity and suspiciousness, and emotional instability. Haim, Linton, Eber, and Chapman (1970), also using a retrospective questionnaire, found that women who had the most irregular cycles could be discriminated significantly on the MMPI scales K, Hs, Pa, Sc, and Ma. These women scored higher than the women with regular cycles except on K where they scored lower. Moos (1969) when

developing his MDQ found that women who scored high menstrually on a scale would also score high at other phases of the cycle. This suggests that premenstrual symptoms are exacerbations of personality traits. For example, women who complain of pain when under stress would do so premenstrually or intermenstrually. Also this study indicated a number of subgroups of symptoms. Some women were: a) high on negative affect premenstrually and pain menstrually; b) some had both at both phases; c) or neither. The women illustrated various combinations of the eight factors on the MDQ. May (1976) compared a group of women whose lowest mood was at premenses with a group whose lowest mood was at menses. The premenstrual group had a less devout religious upbringing, more positive attitudes toward sex, and viewed menstruation as an unnecessary burden as compared to the menstrual group.

This present study investigated trait-anxiety as measured by the STAI (Spielberger et al., 1967). Golub (1976) found that trait-anxiety scores on her groups of normal women above the age of 30 were lower than the normative data. These women showed incidence of high scores on depression and state-anxiety during the premenstrual phase. No significant correlation was found between trait-anxiety and premenstrual state-anxiety or depression. Abplanalp et al. (1977)

reported there was no significant difference in trait-anxiety between subjects who were menstruating and subjects who were not when they took the inventory. Both these studies question the idea that premenstrual symptoms are exacerbations of personality traits, specifically trait-anxiety. Taking daily self-reports, this present study hypothesized that those women high in trait-anxiety would score higher in state-anxiety and negative affect at the premenses and menses than those low in trait-anxiety.

Another personality factor which this study investigated was sex-role identification and its relationship to menstrual cycle mood changes. In the literature on the menstrual cycle it is frequently suggested that women who suffer more severe symptoms related to their menstrual cycle have conflicts about their identification as women (Benedek, 1959; Shainess, 1961; May, 1976). Janowsky, Gorney, and Mandell (1967) studied one woman who attempted suicide 12 times during the premenstrual phase. Her behavioral and psychological data suggested intense conflicts about her womanly role. Also she had relapses of her symptoms, especially at ovulatory and midluteal peaks of her estrogen excretion. Paulson (1961) reported that premenstrual tension was shown in women who have difficulty accepting the expected psycho-social feminine role.

The question appears to be whether psychological and physiological health can be determined by a woman's conforming to the socially desirable and expected behavior of a woman. In the literature on sex-role stereotyping, neurotic, or less healthy behavior, is more frequently associated with feminine characteristics. Broverman, Broverman, and Clarkson (1970) asked clinicians to describe their concept of the healthy male, healthy female, and healthy adult. Their concept of a mature man did not differ significantly from their concept of a mature adult but differed significantly from the concept of a mature woman. Individuals with feminine identifications have been found to report anxiety. Cosentino and Heilbrun (1964) using the M-F scale of the Adjective Checklist (Gough & Heilbrun, 1963) found correlations indicating that persons with a feminine identity in either sex respond with anxiety at the threat of aggression from without or within. Gall (1969) corroborated these results.

Some studies indicate that women with more masculine identities also experience conflict. Heilbrun (1968) in assessing the instrumental-expressive behavior and related psychopathology in females, found that problem masculine girls seemed to have high succorance needs based on social isolation which frequently appeared as independence. Neurotic tendencies, guilt-proneness, and anxiety were associated with high masculine scores in a study by Harford, Willis and Deabler (1967).

They concluded that these results suggest conflict over sex-role identity manifested in a masculine over-compensation. Hence an extreme sex-role identity, either feminine or masculine, would indicate some maladjustment.

Bem (1975) hypothesized that androgynous individuals might be more likely than masculine or feminine types to display adaptibility to various situations. Androgyny is defined as an equal and high possession of both masculine and feminine traits, as internalized from society's sex-typed standards of behavior for men and women. Bem (1975) conducted two experiments of relevance here. One was a conformity paradigm where masculine and androgynous individuals were found to be less conforming. The other was a task where nurturing behaviors toward a kitten were the measure of femininity. Feminine males and androgynous males and females were active with the kitten. Both extreme sex-typed groups were not active suggesting that both avoid behavior contradictory to their role. She proposed that the ultra-feminine women, not acting in a feminine manner, would have to be explained by low self-esteem, low self-confidence, and timidity since femininity is also associated with high anxiety and poor social adjustment. In both studies androgynous individuals acted in a sex-role behavior which was adaptable to the situation.

Spence, Helmreich, and Stapp (1975) also found correlations which substantiate the idea that greater psychological health would be correlated with androgyny. Their male and female sample were divided into four groups: 1) low masculine-low feminine; 2) low masculine, high feminine; 3) high masculine, low feminine; and 4) high masculine, high feminine. Using means from a self-esteem measure, those high on both masculinity and femininity, hence androgynous, were highest on self-esteem, followed by those high in masculinity and low in femininity. Those lowest in both were lowest in self-esteem. Bem (1977) found similar results. She found subjects high on masculinity and femininity significantly highest in self-esteem. She designated an undifferentiated group who were low in masculinity and femininity and low in self esteem. Jones, Chernovitz, and Hanssen (1978) found that increased self-esteem, heterosexual involvement and adaptibility were related to masculine qualities on the Bem Sex-Role Inventory (BSRI). Masculine men and women were most effective. When asked how they would like to change, all subjects wanted to change in the direction of more masculine behaviors. These authors conclude that high self-esteem is related to masculine behaviors since society positively reinforces these behaviors.

From the literature, it is concluded that the additive method of scoring advocated by Bem (1977) where androgynous individuals have high scores on masculine and feminine characterics, may be a measure of self-esteem rather than an indicator of sex-role. Androgynous women rate themselves high in both instrumental and expressive behaviors indicating their generally high opinion of themselves.

This present study assessed the relationship between menstrual distress and sex-role identity. Previously two studies have correlated the MDQ with sex-role identity. Gough (1975) found that women reporting the greatest amount of distress were those low on Modernity (a measurement of norm questioning), low on socialization, and high on femininity. They were shy, given to self-doubt, eager to seek help and behaved in self-defeating ways. Those reporting the least distress were appreciative, cautious, conventional, stable, and unemotional. Berry and McGuire (1972) using 100 inpatients who were in contact with reality and of childbearing age, correlated MDQ factors with a role-acceptance scale. They found significant negative correlations between role-acceptance and pain, concentration, and autonomic reactions at the premenses and menses. Negative affect, a measure of premenstrual tension, as they used it, did not correlate with role-acceptance. In this present study it was hypothesized that women who were androgynous, hence more adaptable to life situations and higher in

self-esteem would show fewer and less severe premenstrual and menstrual symptoms than women who were non-androgynous. The non-androgynous group was composed of masculine, feminine, and undifferentiated types, all of whom would be expected to cope less effectively to stress related to menstruation.

Therefore the following hypotheses were tested in the present study concerning the affective changes during the menstrual cycle and the personality factors of trait-anxiety and androgyny as they relate to phase changes in the menstrual cycle.

Hypotheses:

1. State-anxiety is greater during the premenstruum than the follicular, periovulatory, or luteal phases.

2. State-anxiety is greater during the menstruum than during the follicular, periovulatory or luteal phases.

3. The negative affect factor of the MDQ is greater during the premenstruum than the follicular, periovulatory or luteal phases.

4. The negative affect factor on the MDQ is greater during the menstruum than the follicular, periovulatory, or luteal phases.

5. The arousal factor on the MDQ will be greater during the periovulatory phase than during the menstrual follicular, luteal, and premenstrual phases.

6. Women with high trait-anxiety score higher in state-anxiety during the premenstruum than women with low trait-anxiety.

7. Women with high trait-anxiety score higher in state-anxiety during the menses than women with low trait-anxiety.

8. Women with high trait-anxiety have higher MDQ negative affect at the premenstruum than women with low trait-anxiety.

9. Women with high trait-anxiety have higher MDQ negative affect at the menstruum than women with low trait-anxiety.

10. Androgynous women have lower state-anxiety scores than non-androgynous women during the premenstruum.

11. Androgynous women have lower state-anxiety scores than non-androgynous women during the menses.

12. Androgynous women have lower negative affect scores than non-androgynous women at the premenstruum.

13. Androgynous women have lower negative affect scores than non-androgynous women during the menses.

CHAPTER III

METHODS

Subjects

The 15 women were selected from volunteers from the student body and staff of the University of Illinois Medical Center. Of these 15 women who participated in the study, only 13 were included in the analysis of the data. One woman was excluded because her temperature chart was uninterpretable. Another woman was excluded since in a post experimental interview, she revealed herself as having a history of manic-depressive illness.

The prerequisites for inclusion in the study were that the women were free-cycling, that they had not been taking any form of oral contraceptives within the last six months nor were they less than 12 months post-lactation. By questionnaire of medical history, the women were screeened to exclude any known endocrine, renal, cardiovascular, gasteroentric dysfunction, or urogenital infections. Also women with any gynecological disturbances such as amenorrhea, hypomenorrhea, or hypermenorrhea were excluded. Women on any form of continuing medication were excluded. Each volunteer had a brief psychiatric interview to determine whether she had a prior or current psychiatric disturbance.

Women with a current or previous diagnosis of depression, schizophrenia, or severe anxiety disturbance were excluded since the purpose of the study was to examine mood fluctuations in normal women.

The following demographic information was obtained. The mean age of the subjects was 26 $\pm$ 4.6, the standard deviation; the range was from 19 to 36. Nine women were single and four married. Two women were parous. All the women reported that their cycles were regular.

Materials

State-Trait Anxiety Index (Spielberger, Gorsuch, & Lushene, 1970). The Anxiety-State (x-1) scale consists of twenty statements about emotional states with instructions to subjects to describe how they feel at that particular moment. They are to evaluate their feelings from one to four, from "Not at All" to "Very Much So." The concept of anxiety measured is "the transitory emotional condition... of consciously perceived feelings of tension and apprehension and heightened autonomic nervous system activity" (Spielberger et al., 1970, p.3). The Anxiety-Trait (x-2) scale consists of twenty items by which people report how they generally feel. Trait-anxiety refers to individual differences in disposition to respond to stressful events with varying amounts of state-anxiety. For state-anxiety, test-retest correlations range from .16 to .54, reflecting the sensitivity of the test to the situational factors at the time of the testing.

For trait-anxiety, test-retest correlations are .73 to .86. Using the alpha coefficient as a measure of internal consistency, results for state-anxiety range from .83 to .92 and for trait-anxiety from .36 to .96. Studies of concurrent validity of the Anxiety-Trait scale show correlations of .75 to .77 with IPAT Anxiety scale (Cattell & Scherer, 1963); .80 to .83 with the Taylor Manifest Anxiety scale (1953) and .52 to .58 with the Zuckerman Affective Adjective Checklist (1960).

Menstrual Distress Questionnaire (Moos, 1968) Form T. This is a list of 47 symptoms related to the menstrual cycle. Women are asked to rate the symptoms as they are experiencing them that day. Subjects rank each symptom from one to six, from "no experience of the symptom" to "acute or partially disabling." The 47 items were factor analyzed and intercorrelated with a sample of 839 women who were asked to describe their menstrual cycle at three phases and their worst menstrual cycle. Eight factors were differentiated: pain, concentration, behavior change, autonomic reactions, water retention, negative affect, arousal, and control. Intercorrelations between the eight scales are all positive ranging from .59 between pain and negative affect to .18 between arousal and autonomic reactions. Split-half reliabilities, which varied from .74 to .98 were all statistically significant (Markum, 1976). The manual gives normative

data for Form A which is based on a report of how a woman feels in retrospect about three different phases of her cycle. The manual then states that the means and standard deviations for Form T, which has instructions to report symptoms for that day, are similar to Form A.

Bem Sex-Role Inventory (Bem, 1974). The scale is composed of 20 feminine characteristics, 20 masculine characteristics, and twenty neutral ones which the subject is to evaluate as characteristic of herself. The subject is to evaluate on a scale from one to seven, from "Never true" to "Always true." These items were chosen out of 200 possibilities as those qualities which are most often seen as appropriate for males or females. Neutral items did not seem more desirable for one or the other sex. The internal consistency of the BSRI is masculinity alpha = .86; femininity alpha = .80. Test-retest reliability indicates that for masculinity r = .90; for femininity, r = .93. This scale is not highly correlated with the M-F scales of the Guilford-Zimmerman Temperment Survey nor the California Psychological Inventory. Normative data is given for college age females and males (Bem, 1974).

When the scale was originated, scoring was based on a masculine score and a feminine score and an androgyny score which was determined by the difference between the masculinity and femininity scores, normalized for the standard deviations of the masculinity or femininity scores. The androgynous

sex-role reflected the equal endorsement of masculine and feminine qualities. Bem (1977), however, concurred with Spence et al., (1975) that the term androgynous should be used to designate individuals who score high in both masculinity and femininity. Therefore she devised a scoring method based on a median split. The median masculinity and femininity scores for her sample were 4.89 and 4.76, respectively. Those who score above these scores on both masculinity and femininity are androgynous. Those who score above on either scale are correspondingly masculine or feminine. Those who score below on both scales are classified as undifferentiated.

Procedure

When each woman volunteered, an interview appointment was set up for her. During this interview, it was determined whether she could participate on the basis of her medical and psychological history. The few necessary questions about contraceptives, length and regularity of menstrual cycle were also interwoven into this interview. At this time the subjects were notified that they would collect urines and record their feelings daily. They were asked not to take any medication unless directed by a physician and then to notify the experimenters so that they could be dropped from the experiment. To agree to this, all subjects signed a consent form.

If accepted, according to the criteria mentioned above, the subject began the procedures the following day. By starting at a random point in each women's cycle, there was some attempt to control for stereotypic responses on the daily self-reports. Each woman collected urines for a 24-hour period for each day of her cycle. These urine samples were used for another phase of this study which will be reported elsewhere.

At the time of the interview each subject was tested for trait-anxiety with the STAI. She was also given a supply of STAI forms for state-anxiety and a supply of MDQ Form T. She was instructed to fill out a state-anxiety form and an MDQ form each evening before retiring. Each day she took her basal body temperature before rising from bed. She also recorded the most significant event of the day and noted the days on which she menstruated. This notation about menstruation, she was told, was to assist the laboratory in analyzing the urine. Since she had to bring in her urines every other day, she also brought in her daily self-reports at this time. Each week the experimenter called each subject to troubleshoot any difficulties. At the end of the approximated length of her cycle, each subject came in for another interview. At this time she was told she could continue in the study if she wished. If she did continue, she followed the same instructions. If she did not, she filled out the BSRI and also a detailed

questionnaire on her menstrual history and attitudes and on her family medical and psychiatric history. Subjects were also asked what they thought the study was about and what their reactions were to the procedures. Out of the 13 women who participated, two women went for three cycles and one woman for two cycles. The data from their first cycles in the experiment were included in this study.

Partitioning of the Cycle into Five Phases

In order to analyze data for affective variation during the cycle, each cycle was divided into five phases: menstrual, follicular, ovulatory, luteal, and premenstrual. These phases were determined from two points during the cycle, the onset of menstruation and the time of ovulation as determined by the basal body temperature. Ovulation was said to have occurred after a low temperature then a shift to a steady higher temperature. The mean post ovulation temperature was higher than pre-ovulation. For each variable, daily scores within a phase were averaged to produce a single score for each phase; therefore there were five scores per cycle per subject.

CHAPTER IV

RESULTS

Overview of Design

Altogether 13 cycles were studied; all cycles were considered ovulatory. The mean cycle length of all the women was 29.23 $\pm$ 3.85, the standard deviation.

A 2 X 2 X 5 (Trait-anxiety X Androgyny X Phase) analysis of variance with repeated measures using the method of unweighted means was computed for the eight MDQ variables, the total MDQ score, and the STAI state-anxiety score. The repeated measure factor, phase of cycle, was comprised of the mean scores from each of the five phases of the cycle. A variable number of scores went into each mean. Both the ovulatory and premenstrual phases were fixed at four days and the other phases had varying lengths. Means of phase lengths are found in Table 1.

Another independent variable, trait-anxiety was formed from a median split of the scores from the STAI trait-anxiety inventory. The median score was 32. The six high anxious women had a mean of 39.33 $\pm$ 4.42. The seven low anxious women had a mean of 27.43 $\pm$ 3.29. These scores correspond to the 52nd and 36th percentile of the

TABLE 1

Partitioning of the Menstrual Cycle into Phases

Phase	Definition	Mean Length of Days
1) Menstrual	Period of menstrual flow	6.30 $\pm$ 2.05*
2) Follicular	Period between phase 1 and 3	7.54 $\pm$ 3.57
3) Ovulatory	2 days before and 2 days after ovulation	4
4) Luteal	Period between phase 3 and 5	6.77 $\pm$ 2.94
5) Premenstrual	4 days preceding menses	4

* The standard deviation.

normative data for undergraduate females who had a mean of 38.25 (Spielberger et al., 1970). Golub's (1976) mean for women in their 30's was 34.12.

The last independent variable was androgyny. The four androgynous women had mean scores on the BSRI of 5.03 $\pm$ .25 and 5.40 $\pm$ .39 on the masculine and feminine scales, respectively. Since these women scored above Bem's (1977) median scores, they were considered androgynous. The nine non-androgynous women had mean scores of 4.9 $\pm$ .52 and 4.54 $\pm$ .64 on the respective masculine and feminine scales. This group scored below Bem's median scores on one or both the masculine and feminine scales. Although not considered statistically, in a further breakdown of the non-androgynous group there were two masculine, three feminine and two undifferentiated subjects.

Phase Effects

The following hypotheses related to phase changes did not find support in this study: 1) State-anxiety is greater during the premenstruum than the follicular, periovulatory, or luteal phases; 2) State-anxiety is greater during the menstruum than during the follicular, periovulatory, or luteal phase; 3) The negative affect factor of the MDQ is greater during the premenstruum than the follicular, perovulatory, or luteal phases; 4) The negative affect factor is greater during the menstruum than during the follicular, periovulatory, or luteal phases; and 5) The arousal factor

on the MDQ is greater during the periovulatory phase than during the menstrual, follicular, luteal and premenstrual phases.

MDQ water retention was the only variable to demonstrate significant changes through the five phases (F (4, 36) = 5.719, $p < .001$). Analysis of variance is found in Table 2. Figure 2 presents the means for the five phases. As seen in Table 3, the Newman-Keuls test for ordered differences substantiated that the women reported the most water retention during the premenstrual phase; the premenstrual phase differed significantly from the menstrual, follicular, and ovulatory phases.

The following hypotheses indicating an interaction between trait-anxiety and phase of cycle were not supported: 1) Women with high trait-anxiety score higher in state-anxiety during the premenstruum than women with low trait-anxiety; 2) Women with high trait-anxiety score higher in state-anxiety during the menses than women with low trait-anxiety. 3) Women with high trait-anxiety have higher MDQ negative affect at the premenstruum than women with low trait-anxiety; and 4) Women with high trait-anxiety have higher MDQ negative affect at the menstruum than women with low trait-anxiety.

There was, however, a marginally significant interaction (trait-anxiety X phase) for the dependent variable STAI state-anxiety (F (4, 36) = 2.0534), $p < .10$). Figure 3 presents this interaction. Table 2 presents the analysis of variance and the simple effects analysis which revealed

that high anxious women accounted for most of the phase change (F (1, 36) = 10.672, $p < .05$). The Newman-Keuls test for ordered differences (Table 4) indicated that for high anxious women, the luteal phase was significantly lower in state-anxiety than the follicular; ovulatory, and premenstrual phases. Also the ovulatory phase was significantly higher than the menstrual phase. The following hypotheses indicating an interaction between androgyny and phase of cycle were not supported: 1) Androgynous women have lower state-anxiety scores than non-androgynous women during the premenstruum; 2) Androgynous women have lower state-anxiety scores than non-androgynous women during the menses; 3) Androgynous women have lower negative affect scores than non-androgynous women at the premenstruum; and 4) Androgynous women have lower negative affect scores than non-androgynous women during the menses.

Another trend was seen in the interaction of androgyny and phase for MDQ concentration (F (4.36) = 2.564, $p < .055$). Further analysis of this interaction was not done since investigation of the raw data indicated that the effect was limited to this sample. One woman with extreme scores accounted for most of the variance. Refer to Table 2.

TABLE 2

Analyses of Variance for MDQ Variables and STAI State-Anxiety by Trait-Anxiety, Androgyny, and Cycle Phase

Source	df	MS	F	P
		Pain		
Anxiety (A)	1	7.618	.190	NS
Androgyny (C)	1	77.956	1.942	NS
A X C	1	3.853	.001	NS
Error Between	9	40.149		
Phase (B)	4	5.158	1.164	NS
A X B	4	5.529	1.247	NS
B X C	4	2.746	.620	NS
A X B X C	4	.511	.115	NS
Error Within	36	4.432		
		Concentration		
Anxiety (A)	1	45.430	3.3602	.100
Androgyny (C)	1	3.017	.223	NS
A X C	1	2.067	.153	NS
Error Between	9	13.520		
Phase (B)	4	1.123	.486	NS
A X B	4	1.988	.860	NS
B X C	4	5.930	2.564	.055
A X B X C	4	1.557	.673	NS
Error Within	36	2.312		

TABLE 2-Continued

Source	df	MS	F	P
Behavior Change				
Anxiety (A)	1	11.088	1.080	NS
Androgyny (C)	1	.464	.045	NS
A X C	1	.469	.045	NS
Error Between	9	10.263		
Phase (B)	4	1.830	.913	NS
A X B	4	.186	.093	NS
B X C	4	1.476	.736	NS
A X B X C	4	.965	.481	NS
Autonomic Reactions				
Anxiety (A)	1	5.703	.062	NS
Androgyny (C)	1	.553	.598	NS
A X C	1	.175	.189	NS
Error Between	9	.926		
Phase (B)	4	.808	1.762	NS
A X B	4	.166	.362	NS
B X C	4	6.207	.362	NS
A X B X C	4	.840	1.831	NS
Error Within	36	1.831		
Water Retention				
Anxiety (A)	1	4.568	.440	NS
Androgyny (C)	1	1.148	.111	NS
A X C	1	23.363	2.539	NS
Error Between	9	10.380		
Phase (B)	4	9.619	5.719	.002
A X B	4	2.371	1.410	NS
B X C	4	1.078	.641	NS
A X B X C	4	3.567	2.121	NS
Error Within	36	1.681		

TABLE 2-Continued

Source	df	MS	F	P
		Negative Affect		
Anxiety (A)	1	12.599	.361	NS
Androgyny (C)	1	20.220	.579	NS
A X C	1	14.998	.430	NS
Error Between	9	34.912		
Phase (B)	4	1.834	.295	NS
A X B	4	7.585	1.220	NS
B X C	4	3.306	.532	NS
A X B X C	4	3.098	.498	NS
Error Within	36	6.219		
		Arousal		
Anxiety (A)	1	.812	.015	NS
Androgyny (C)	1	32.126	.576	NS
A X C	1	21.357	.383	NS
Error Between	9	55.753		
Phase (B)	4	2.598	.442	NS
A X B	4	1.915	.326	NS
B X C	4	6.209	1.056	NS
A X B X C	4	4.378	.745	NS
Error Within	36	5.876		
		Control		
Anxiety (A)	1	1.819	.109	NS
Androgyny (C)	1	11.445	.686	NS
A X C	1	3.325	.002	NS
Error Between	9	16.693		
Phase (B)	4	.475	.736	NS
A X B	4	.230	.357	NS
B X C	4	.690	1.070	NS
A X B X C	36	.370	.574	NS

TABLE 2-Continued

Source	df	MS	F	P
		MDQ Total		
Anxiety (A)	1	358.737	.468	NS
Androgyny (C)	1	488.909	.638	NS
A X C	1	84.823	.111	NS
Error Between	9	766.490		
Phase (B)	4	75.67	.397	NS
A X B	4	45.308	.952	NS
B X C	4	52.198	1.096	NS
A X B X C	4	11.932	.251	NS
Error Within	36	47.612		
		STAI State-Anxiety		
Anxiety (A)	1	75.76	.740	NS
Androgyny (C)	1	.386	.004	NS
A X C	1	4.169	.041	NS
Error Between	9	102.287		
Phase (B)	4	22.029	.851	NS
A X B	4	53.159	2.054	.107
B X C	4	27.624	1.067	NS
A X B X C	4	41.392	1.599	NS
Error Within	36	25.884		
b at a_1	1	55.999	2.163	NS
b at a_2	1	276.231	10.672	.05

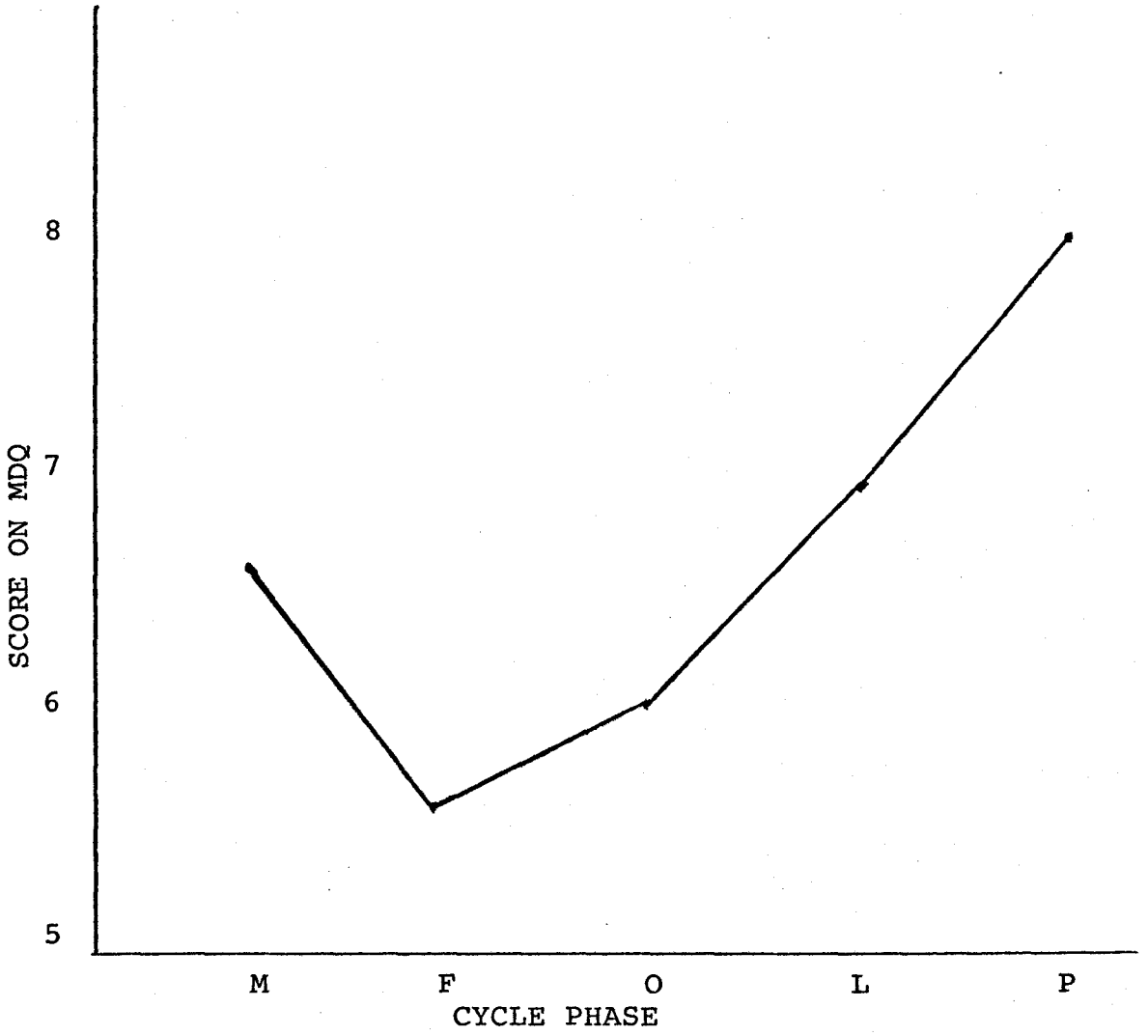

Fig. 2. Mean scores for water retention for the five phases-menstrual, follicular, ovulatory, luteal, and premenstrual

Note: - Abbreviated M= menstrual, F= follicular; O= ovulatory; L= luteal; P= premenstrual

TABLE 3

Tests on Water Retention Means Using the Newman-Keuls Procedure

	b_2	b_3	b_1	b_4	b_5	r	$q_{.95}$ (r,36)
b_2		.504	1.002	1.493	2.426	5	4.10
b_3			.497	.988	1.922	4	3.84
b_1				.490	1.425	3	3.49
b_4					.934	2	2.89

$S_{\bar{B}}$ = .3597

	R =	2	3	4	5
$S_{\bar{B}}$	$q_{.95}$ (r, 36) =	1.039	1.255	1.381	1.474

	b_2	b_3	b_1	b_4	b_5
b_2				*	*
b_3					*
b_1					*
b_4					

* p .05

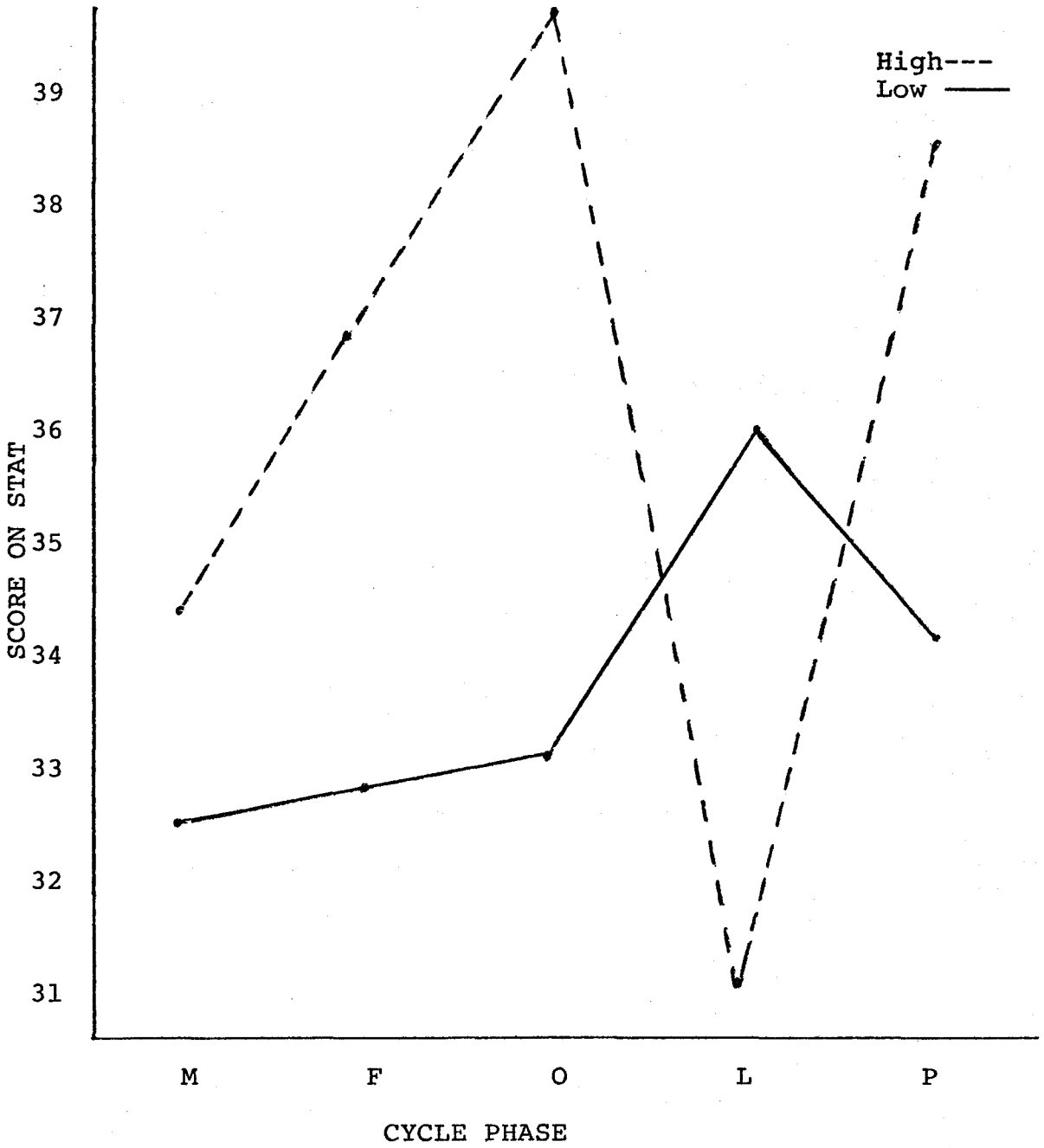

Fig. 3. Mean scores of state-anxiety for the five phases- menstrual, follicular, ovulatory, luteal, and premenstrual- for high and low anxiety subjects.

Note: - Abbreviated M= menstrual; F= follicular; O= ovulatory; L= luteal; P=premenstrual.

TABLE 4

Tests on State-Anxiety Means of High Trait-Anxiety Subjects Using the Newman-Keuls Procedure

b_4	b_1	b_2	b_5	b_3	r	q (r, 36)
b_4	3.195	5.777	6.985	8.647	5	4.10
b_1		2.582	3.790	5.455	4	3.84
b_2			1.208	2.870	3	3.49
b_5				1.662	2	2.89

$S_{\bar{B}} = 1.411$

r =	2	3	4	5
$S_{\bar{B}}$ q (r, 36) =	5.785	5.418	4.920	4.078

b_4	b_1	b_2	b_5	b_3
b_4		*	*	*
b_1				*
b_2				
b_5				

* p .05

Trait-Anxiety

For all variables except MDQ concentration, there were no main effects for trait-anxiety. Refer to Table 2. For MDQ concentration, low trait-anxiety women reported less difficulty concentrating during the cycle than high trait-anxiety women with respective means of 9.2 and 11.0. This difference was marginally significant at $F\ (1,9) = 3.3602$, $p < .10$. Table 5 presents the means on all variables for high and low trait-anxious subjects. As suggested from this table, high trait-anxious subjects tend to score higher than low trait-anxious subjects.

Androgyny

For all variables no significant differences were found between androgynous and non-androgynous women, (Table 2). For MDQ pain a trend is suggested with androgynous women reporting less pain than non-androgynous women with respective means of 8.6 and 10.99 ($F\ (1,9) = 1.942$, $p < .2$). As suggested in Table 6, androgynous women generally scored lower than non-androgynous women.

As can be seen in Table 7, androgynous and non-androgynous women seem to experience their greatest amount of symptoms at different times of the cycle. Using the Friedman test for three or more related samples, this pattern was tested for significance. It was found that androgynous women reported most behavior change at menses

TABLE 5

Mean Total Scores for High and Low Trait-Anxiety Subjects for All Variables

Variables	High	Low
MDQ Total (47)*	71.20	66.10
Pain (6)	10.17	9.42
Concentration (8)	11.06	9.42
Behavior Change (5)	7.11	6.22
Autonomic Reactions (4)	4.40	4.47
Water Retention (4)	6.73	6.16
Negative Affect (8)	12.40	11.44
Arousal (5)	11.13	11.37
Control (6)	7.02	6.66
STAI State-Anxiety (20)	36.12	33.77

* Number of items in a scale

TABLE 6

Mean Total Scores for Androgyny and Non-Androgyny for All Variables

Variables	Androgyny	Non-Androgyny
MDQ Total (47)*	65.68	71.63
Pain (6)	8.61	10.95
Concentration (8)	9.92	10.39
Behavior Change (5)	6.57	6.76
Autonomic Reactions (4)	4.34	4.54
Water Retention (4)	6.59	6.30
Negative Affect (8)	11.32	12.53
Arousal (5)	10.49	12.02
Control (6)	6.38	7.29
STAI State-Anxiety (20)	34.80	35.03

* Number of items in a scale

TABLE 7

Phase Means* for Androgyny and Non-Androgyny

Variables	M	F	O	L	P
			Androgyny		
Pain	1.65	1.49	1.47	1.35	1.22
Concentration	1.22	1.41	1.34	1.28	1.11
Behavior Change	1.51	1.28	1.33	1.25	1.22
Autonomic Reactions	1.19	1.08	1.13	1.03	1.00
Water Retention	1.21	1.13	1.21	1.48	1.56
Negative Affect	1.55	1.32	1.39	1.36	1.45
Arousal	2.15	2.10	2.15	1.99	2.10
Control	1.47	1.39	1.39	1.38	1.38
STAI State-Anxiety	33.35	37.00	34.98	34.46	34.54
			Non-Androgyny		
Pain	1.84	1.74	2.03	1.79	1.75
Concentration	1.21	1.21	1.37	1.32	1.37
Behavior Change	1.33	1.25	1.53	1.34	1.31
Autonomic Reactions	1.20	1.08	1.21	1.10	1.08
Water Retention	1.33	1.02	1.14	1.26	1.55
Negative Affect	1.54	1.57	1.70	1.53	1.48
Arousal	2.21	2.32	2.42	2.82	2.24
Control	1.36	1.39	1.47	1.49	1.59
STAI State-Anxiety	33.51	32.84	38.16	32.89	37.75

* Means for MDQ variables have been divided by the number of items in each scale so that the scales are comparable.

Note. - Abbreviated: M= menstrual; F= follicular; O= ovulatory; L= luteal; P= premenstraul.

($\chi^2_r = 10.46$, df 4, $p < .05$), compared to other phases of their cycle. By inspection of Table 7, it was noted that androgynous women generally reported their highest scores at menses. Non-androgynous women generally reported their greatest symptoms at ovulation.

Other Post Hoc Tests

Upon completing the analyses of variance, a series of Pearson Product Moment Correlations were conducted to assess the overall consistency of the data. The range and average correlations between phases for each dependent variables are found in Table 8. These positive correlations indicate the amount of variable accounted for by the test-retest procedure.

This consistency of response is also revealed in Table 9. Women scored highest on the MDQ arousal scale, followed by pain across all phases. Women scored lowest on MDQ autonomic reactions in all phases.

TABLE 8

Correlations Between Phases Compared to Test-Retest Correlations of Markum (1976)

Variable	Range of r	Average r	Markum's Average r
Pain	.80-.47	.65	.66
Concentration	.18-.81	.54	.75
Behavior Change	.07-.83	.46	.61
Autonomic Reactions	.006-.51	.14	.47
Water Retention	.14-.87	.55	.54
Negative Affect	.24-.80	.47	.71
Arousal	.35-.81	.66	.42
MDQ Total	.59-.89	.74	.77

TABLE 9

Means for Phases for all Variables

Variables	M	F	O	L	P
Pain	1.74	1.62	1.75	1.57	1.49
Concentration	1.22	1.31	1.27	1.30	1.24
Behavior Change	1.42	1.27	1.42	1.29	1.26
Autonomic Reactions	1.20	1.08	1.17	1.06	1.04
Water Retention	1.59	1.34	1.47	1.71	1.95
Negative Affect	1.55	1.45	1.55	1.45	1.46
Arousal	2.18	2.21	2.29	2.40	2.17
Control	1.09	1.12	1.15	1.15	1.18

Note.- Abbreviated: M= menstrual; F= follicular; O= ovulatory; L= Luteal; P= premenstrual

CHAPTER V

DISCUSSION

Women did not report higher negative affect or state-anxiety at the premenses or menses in comparison to the follicular, ovulatory, and luteal phases. Nor did pain, autonomic reactions, behavior change, or arousal vary in relation to cycle phase. Water retention, however, was found to increase significantly at the premenses. Also high anxious women experienced significantly more state-anxiety during the ovulatory phase and significantly less anxiety at the luteal phase when compared to other phases of their cycle. The evidence from this study would indicate that women do not suffer from a negative mood state labelled "premenstrual tension; nor do they experience an increase in negative mood during menses."

These findings of no affective changes at menses and premenses can be evaluated in light of the nature of this sample, the instruments used, and the procedure followed as compared to other studies.

This study had an N of 13 because of the difficulty in finding volunteers who would collect urines for approximately 30 days and also because of the laboratory work involved in another part of this study. Therefore the power of the F test was reduced and the possibility of making a type II error was increased. Generally, however, in research on

the menstrual cycle, studies other than surveys have relatively few subjects. Those studies that have found significant phase effects for negative affect have more subjects than this present study. Golub (1976) had 50 women; and Paige (1971) had 38 subjects which may have increased their chances of finding significance.

Another factor that might have made it more difficult to find fluctuations in negative affect during the cycle was that these women were selected for the study because they were free from depressive symptoms. Also they had a low mean for trait-anxiety of 32.92 $\pm$ 7.08 in comparison to 38.25 for college undergraduates (Spielberger et al., 1970); 37.75 for a comparable age group of paid volunteers (Abplanalp et al., 1977); and 34.12 for women over 30 (Golub, 1976). It is deduced therefore that our subjects were probably not of depressive character and would be unlikely to express the stress of bodily changes by means of negative affect. In fact, this group scored their highest scores on MDQ arousal, a variable reflecting pleasant affect, across all phases of the cycle. This would indicate that they were generally not prone to dysphoria throughout the study. They expressed the oncoming of menstruation by reporting increased water retention, a physiological rather than a psychological phenomenon. This finding would suggest the possibility of two types of women, non-depressive individuals who would not react to the bodily changes of the menstrual cycle with emotional tension and depression

and depressive women who would be prone to express their menstrual changes by means of negative affect. The comparison of these two groups is suggested for further study.

Another methodological question, regarding the MDQ arose which may explain the failure to obtain significant phase effects. As noted in Table 8 the average inter-correlation for MDQ total scores when correlations were calculated between phases was .74 with a range of .59 to .89. Markum (1976) computed split-half reliabilities separately for the menstrual, premenstrual and intermenstrual phases. These split-half reliabilites ranged from .74 to .98 with a mean of .88. The average correlations between phases in this study approach the test-retest correlations reported by Markum on Total MDQ, pain, and water retention. The present correlation for arousal is higher than that previously reported (Table 8). This suggests that the variability accounted for by these correlations is greater than the level compensated for in a repeated measure analysis. As a result the likelihood of finding phase effects was restricted.

The procedure of daily self-reports on the MDQ and the state-anxiety scale may also have confounded results. However, although subjects were in the study from 28 to 38 days, there was no deterioration of responses over time.

The premenstrual scores of those starting the study early in their cycle and those starting late in their cycle were equivalent. Consequently, this possible confound seems improbable.

Daily self-reports over an entire cycle should reduce cultural stereotypy as discussed by Parlee (1974) as a possible confound on menstrual research. This is especially true if the subjects are ignorant of the purpose of the study and are started at random points in their cycles as in this study. Daily reports, however, might be conducive to another form of stereotypy, that is, each individual's self-perception. Subjects, responding to the tedium of filling out forms everyday, may rely on preconceived notions of how irritable or fatigued they generally are. Fewer measures throughout the cycle might be a remedy.

Although the above discussion indicates the methodological confounds of this particular study which possibly negated expected results, careful perusal of the current literature indicates that there is little definitive evidence that affective changes occur as a function of the menstrual cycle. Most studies are suspect because of methodological problems. Ivey and Bardwick (1968) studying 17 women found differences in anxiety between the ovulatory and premenstrual phases when two measures were taken. The subjects, however, were aware of the purpose of the study. Golub (1976), taking measures of both depression and

anxiety at premenses and intermenses found significant differences. This study too may be confounded by demand characteristics since the women were carefully questioned about their menstrual cycles so that they could be tested at a particular phase. Abplanalp et al. (1977) found no differences in state-anxiety between the menstrual and intermenstrual phases. Their subjects were measured prior to and following a stressful interview at the two phases.

Moos et al. (1969) who took nine measures across the cycle reported that pain, water retention, and anxiety were highest at the menses, decreased and then showed a gradual rise after mid-cycle. Arousal peaked at ovulation. Depression showed no changes across the cycle. These results concur with the hypotheses that this present study hoped to validate. Moos et al. (1969), however, published no statistical analysis of their data which makes their results suspect.

Silbergeld et al. (1971) using daily self-reports, reported significant ($p < .05$) changes in pain at menses, painful breasts, irritability and aggression at premenses, and hostility at ovulation. They studied eight subjects over four cycles each; then they did an analysis of variance on 31 cycles. Evidently, they interspersed ipsative with normative data which makes their results inconclusive.

Wilcoxon et al. (1976) using daily self-reports, found that free-cycling women peaked on a measure of negative mood during the menstrual period while women taking contraceptives peaked at the premenstrual phase. Both samples had increased impairment of concentration and experience of stressful events at the premenses. These results were statistically significant; however, further analysis indicated that experience of stressful events accounted for more of the variance than did cycle phase for negative affect.

One study which was well controlled found significant changes in affect over the cycle. Paige (1971) when comparing 38 free-cycling women to 64 pill-taking women. found that the free-cycling women showed significant increase in negative affect, anxiety, and hostility at menses and premenses as compared to mid-cycle. The study was disguised as a study of sex differences. The Gottschalk Verbal Anxiety Scales (1961), for which the subject speaks for five minutes on any topic and then is scored for anxiety, hostility, and aggression, further eliminated the effects of demand characteristics.

On account of the contradictory results between studies and methodological problems within studies, including in particular this one, the relationship of affect and the menstrual cycle, if any, is incompletely understood.

Nevertheless, one significant phase effect found in this study was the increase in the experience of water retention at the premenses. The women reported an increase in all symptoms within the factor, water retention - weight gain, skin disorders, painful breasts, and swelling. Janowsky et al., (1973) reported significant weight gain at the premenstruum. Furthermore, Wilcoxon et al., (1976) in a well-controlled and statistically well analyzed study found a significant increase in the physiological symptoms of pain and water retention at the premenses. These results suggest that normal, free-cycling women are aware of the bodily changes associated with menses and premenses. These changes, however, are not accompanied by emotional tension, as expected if the premenstrual tension syndrome is accepted.

In addition to the changes in affect over the phases of the cycle, this study investigated two personality variables, trait-anxiety and androgyny, as related to the menstrual experience. The literature has suggested that different types of women might experience different menstrual symptoms or different patterns of symptoms, (Moos et al., 1969, Coppen & Kessel, 1963; Lamb et al., 1966). For the factor trait-anxiety, it was noted in Table 5 that high anxious women generally scored higher on all variables than low anxious women. For MDQ concentration, there was marginal significance with high anxious women having more difficulty concentrating throughout the cycle.

This would be expected since anxiety would be expected to intrude on concentration.

The interaction between phase and trait-anxiety indicated a trend. Low trait-anxiety women did not vary significantly from phase to phase although they were somewhat elevated at the premenstruum. High trait-anxiety women, however, peaked at ovulation and experienced their lowest state-anxiety during the luteal phase.

The low point in state-anxiety for high trait-anxiety subjects might be correlated to the increase in progesterone during the luteal phase. Hamburg (1966) found progesterone to act as an anesthetic in animals. Benedek and Rubenstein (1939, I and II) describe the luteal phase as one of relaxation. Creutzbeldt et al., (1976) in studying women's EEGs during the cycle found that mean alpha frequency increased significantly during the luteal phase. Also in their study, reaction time, speed of performance, and correctness of response on psychometric measures increased during the luteal phase in comparison to the follicular phase. Since progesterone also increased during the luteal phase, they correlated alpha frequency to progesterone and did not find a direct correlation; that is, progesterone did not peak at the same point as the increased alpha frequencies. As a result, these authors hypothesize other intermediary links such as basal temperature increase or increased

water retention which are caused by progesterone increase. Zimmerman and Parlee (1973) found increased arm-steadiness at the luteal phase. Patkai (1974) also found a decrease in restlessness and apprehension at the luteal phase. These findings indicate a lessening of performance inhibitions, perhaps a lessening of anxiety which facilitates performance at the luteal phase. Whether these hormonal changes of estrogen and progesterone exert effects on emotions and behavior is in need of more extensive research. Yet the suggestion is there from this study and others that women prone to anxiety may experience a respite during the luteal phase during which their performance effectiveness may be enhanced.

The other personality variable investigated in this study as a function of the menstrual cycle was androgyny. Androgynous women are described as more flexible, socially competent, situationally adaptive, more complete and self-actualized than non-androgynous women. They are generally less traditional, less restrained about occupation and education, sexual behaviors, marital and childbearing preferences (Jones et al., 1978). According to Bem's (1977) additive scoring, they are high on both masculine and feminine attributes. This method of scoring has also been suggested as a measure of self-esteem (Spence et al., 1975; Bem, 1977 Jones et al., 1978).

The results of this present study indicated that androgynous women did not differ significantly from non-androgynous women in their experience of menstrual symptoms, in particular negative affect and state-anxiety, at the premenses and menses as was hypothesized. A marginally significant main effect for MDQ pain was found where androgynous women scored lower than non-androgynous women. There is some corroboration of this finding in Gough (1975) who found the highest report of MDQ distress from women who were low on modernity and socialization and high on femininity. This group seems comparable to the non-androgynous group of this study who could be considered less adaptive and who included those high on the feminine scale.

Since the sample of this study was so small, feminine (N = 3), masculine (N = 2), undifferentiated (N = 2) were included in the non-androgynous group. All these groups have been shown to be less flexible in sex-role behaviors and to have less self-esteem than androgynous subjects (Bem, 1977; Spence et al., 1975; and Jones et al., 1978). In investigating avenues for further research, it was noted that within the non-androgynous group the undifferentiated subjects scored higher on MDQ total, pain, behavior change, negative affect, control, and STAI state-anxiety than either the feminine or masculine subjects. Masculine subjects,

then feminine, follow in intensity of symptoms but together are closer to the androgynous scores than the undifferentiated. These observations suggest for further investigation with a large sample a correlation between amount of menstrual distress and sex-role identification as ranked from undifferentiated to androgynous.

Moos et al., (1969) submitted that there are variations in patterns of menstrual symptoms among women and that there might be underlying personality traits related to these patterns. This present study found that androgynous women reported their highest scores at menses for behavior change. An item analysis of the behavior change variable indicated that these women increased mostly in their nap taking and staying home. One interpretation of the increase in behavior change at menses is that androgynous women, used to independent, active lives, react to the physical inconvenience of the menstrual flow. Also Paige (1973) suggests the amount of menstrual flow in these androgynous women might be the factor related to decreased actitity at menses. She found a positive correlation between anxiety and amount of flow and decreased sexual activity and amount of flow.

A final point to consider in the overall failure to find differences between androgynous and non-androgynous

group is that the entire sample was a homogenous group in that all were out of the home, working or in college or graduate school. Looking at this behavioral dimension of their sex-role identity, it could be said that none of these women totally reflect traditional women's roles. Paige (1973) found that women with attitudes that women belong in the home and who had no career plans complained most of severe menstrual symptoms.

In this study the women were non-traditional in their pursuit of a career and also apparently had little premenstrual and menstrual distress, in comparison to other groups of women. Table 10 compares the means of this group to the means presented by Moos (1977) in his normative data and to those of Gough (1975). As can be seen the means are generally lower in this study. Again as was discussed earlier in relation to phase effects, this sample was selected for their relative freedom from psychiatric symptoms, especially depression. Also they are all active in independent pursuits such as a job or school. Therefore the level of functioning is fairly high for the group and would lessen the possibility of findings significant increases in symptoms across phases or groups.

In conclusion, it can be seen that evidence of mood changes over the menstrual cycle as a phenomenon experience by normal, non-depressed women is inconclusive.

TABLE 10

Comparison of MDQ Total Means with Normative Data

	Moos (1977)	Gough (1975)
M	76.2	78.3
P	73.4	75.6
I	68.6	59.9

	Total Sample	Androgynous	Non-Androgynous
M	69.17	69.21	69.30
P	67.90	63.80	72.00
I	68.73	65.12	75.35

Note. - Abbreviated: M= menstrual; P= premenstrual; I= intermenstrual.

To further investigate these results the following suggestions are made: 1) to compare non-depressive women with women who tend to get depressed as a reaction to stress; 2) to use measures of mood that might be more sensitive to mood swings than the measures used in this study 3) to apply statistical analyses that might be more sensitive to individual differences; and 4) to maintain the method of daily self-reports to avoid the demand characteristics of cultural attitudes toward menstruation.

In regard to the personality traits, trait-anxiety and androgyny, that were studied in relation to menstrual variations, the following suggestions are made: 1) to further investigate the effects of ovarian hormonal changes during the cycle as they affect women prone to anxiety; and 2) to test with a larger sample the hypotheses that androgynous women would have least distress and undifferentiated women the most menstrual distress during the cycle.

SUMMARY

This study assessed variations in menstrual symptoms over five phases of the cycle in thirteen women. These subjects filled out the MDQ and the STAI state-anxiety scale daily for one menstrual cycle. Mean scores from the menstrual, follicular, ovulatory, luteal, and premenstrual phases were compared. No phase effects were found for the psychological variables, mainly MDQ negative affect or MDQ arousal. MDQ water retention, a physiological variable, was significantly higher at premenses than the other phases.

Two personality variables, trait-anxiety and androgyny, were also assessed as functions of the menstrual cycle. High and low trait-anxiety were determined by a median split of this group. High trait-anxious women were found to peak at ovulation and have a low point at the luteal phase for state-anxiety. Low anxious women did not change in state-anxiety throughout the cycle. A marginally significant difference between high and low trait-anxiety subjects was found for MDQ concentration with high trait-anxiety women reporting more difficulty concentrating.

Androgynous women scored above the median scores of Bem (1977). A marginally significant finding was that androgynous women reported less MDQ pain across the cycle.

Also androgynous women reported most MDQ behavior change during the menses.

The hypotheses for increase in negative affect and state-anxiety at premenses and menses, especially for high-anxious and non-androgynous women, were not supported.

References

Alplanalp, J., Livingston, L., Rose, R., & Sandwisch, B. Cortisol and growth hormone responses to psychological stress during the menstrual cycle. Psychosomatic Medicine, 1977, 39, 158-176.

Altman, M., Knowles, E., & Bull, H. A psychosmatic study of the sex cycle in women. Psychosomatic Medicine, 1941, 3, 199-224.

Bem, S. The measurement of psychological androgyny. Journal of Consulting and Clinical Psychology, 1974, 42, 155-162.

Bem, S. Sex-role adaptability: one consequence of psychological androgyny. Journal of Personality and Social Psychology, 1975, 31, 634-643.

Bem, S. On the utility of alternative procedures for assessing psychological androgyny. Journal of Consulting and Clinical Psychology, 1977, 45, 196-205.

Benedek, T. & Rubenstein, B. The correlations between ovarian activity and psychodynamic processes. Psychosomatic Medicine, 1931, 1, Part I, 245-270, Part II, 461-485.

Benedek, T. Sexual function in women and their disturbance. In Arieti, S. American Handbook of Psychiatry, Vol. I. New York: Basic Books, 1959, 727-748.

Berry, C., & MCGuire, F. Menstrual distress and acceptance of sexual role. American Journal of Obstetrics and Gynecology, 1972, 114, 83-87.

Broverman, D., Clarkson, F., Rosenkrantz, P., & Vogel, S. Sex-role sterotypes and clinical judgements of mental health. Journal of Consulting and Clinical Psychology, 1970, 34, 1-7.

Cargille, C., Ross, G., & Yoshimi, T. Daily variations in plasma follicle stimulating hormone, luteinizing hormone and progesterone during the menstrual cycles. Journal of Clinical Endocrinology and Metabolism, 1969, 29, 12-19.

Coppen, A., & Kessel, N. Menstruation and personality. British Journal of Psychiatry, 1963, 109, 711-721.

Cosentino, F., & Heilbrun, A. Anxiety, correlates of sex-role identity in college students. Psychological Reports, 1964, 14, 729-730.

Creutzfeldt, O., Arnold, P., Becker, S., Langenstein, W., Tirsch, W., Wilhelm, H., & Wuttke, W. EEG changes during spontaneous and controlled menstrual cycles and their correlation with psychological performance. Electroencephalography and Clinical Neurophysiology, 1976, 40, 113-131.

Dalton, K. Menstruation and acute psychiatric symptoms. British Medical Journal, 1959, 1, 148-149.

Dalton, K. Effect of menstruation on schoolgirls' weekly work. British Medical Journal, 1960, 326-327.

Dalton, K. Menstruation and crime. British Medical Journal, 1961, 2, 1752-1753.

Dalton, K. The premenstrual syndrome. Springfield, Illinois: Charles C. Thomas, 1964.

Diamond, S., Rubenstein, A., Dunnes, D., & Fieree, R. Menstrual problems in women with primary affective illness. Comprehensive Psychiatry, 1976, 17, 224-228.

Eysenck, H., & Eysenck, S. Manual for the Eysenck Personality Inventory. San Diego: Educational and Industrial Testing Service, 1963.

Frank, R. The hormonal causes of premenstrual tension. Archives of Neurology and Psychiatry, 1931, 26, 1053-1057.

French, J., Ekstrom R., & Price, L. Manual for kit of reference tests for cognitive factors. Princeton, New Jersey: Educational Testing Service, 1963.

Gall, M. The relationship between masculinity-femininity and manifest anxiety. Journal of Clinical Psychology, 1969, 25, 294-295.

Genazzi, A., Lemarchand-Beraud, T., & Aubert, M. Patterns of plasma ACT, HGH, and cortisol during the menstrual cycle. Journal of Clinical Endocrinological Metabolism, 1975, 431, 431-437.

Glass, G., Heninger, G., Lansky, M., & Tolan, K. Pyschiatric emergency related to the menstrual cycle. American Journal of Psychiatry, 1970, 126, 1504-1506.

Golub, S. The magnitude of premenstrual anxiety and depression. Psychosmatic Medicine, 1976, 38, 4-12.

Golub, S. The effect of premenstrual anxiety and depression on cognitive functioning. Journal of Personality and Social Psychology, 1976a, 34, 99-104.

Gottschalk, L., Springer, K., & Gleser, G. Experiments with a method of assessing the variations in intensity of certain psychological states occurring during psychotherapeutic interviews. In Gottschalk, L., Ed. Comparative Psycholinguistic Analysis of Two Psychotherapeutic Interviews. New York: International University Press, 1961.

Gough, H. Personality factors related to reported severity menstrual distress. Journal of Abnormal Psychology, 1975, 84, 59-65.

Gough, H., & Heilbrun, A. Joint Manual for the Adjective and the Need Scales for the ACL. Palo Alto: Consulting Psychologist Press, 1965.

Gray, M., Strausfeld, K., Watanabe, M., Sims, A., & Solomon, S. Aldosterone secretory rates in the normal menstrual cycle. Journal of Clinical Endocrinology and Metabolism, 1968, 28, 1269-1275.

Hain, J., Linton, P., Eber, H., & Chapman, M. Menstrual irregularity, symptoms and personality. Journal of Psychosomatic Research, 1970, 14, 81-87.

Hamburg, D. Effects of progesterone on behavior. Research Publication of the Association for Research in Nervous and Mental Disease, 1966, 43, 251-265.

Harford, T., Willis, C., & Deabler, H. Personality correlates of masculinity-femininity. Psychological Reports, 1967, 21, 881-884.

Heilbrun, A. Sex-role instrumental-expressive behavior and psychopathology in females. Journal of Abnormal Psychology, 1968, 73, 131-136.

Israel, R., Mishell, D., Stone, S., Thorneycroft, I., & Moyer, D. Single luteal phase serum progesterone assay as indicators of ovulation. American Journal of Obstetrics and Gynecology, 1972, 112, 1043-1046.

Ivey, M., & Bardwick, J. Patterns of affective fluctuation in the menstrual cycle. Psychosomatic Medicine, 1968, 3, 336-345.

Jacobs, T., & Charles, E. Correlation of psychiatric symptomology in an outpatient population. American Journal of Psychiatry, 1970, 126, 1504-1508.

Janowsky, D., Gorney, R., & Mandel, A. The menstrual cycle. Archieves of General Psychiatry, 1967, 17, 459-469.

Janowsky, D., Berens, S., & Davis, J. Correlations between mood, weight, and electrolytes during the menstrual cycle: a renin-angiotensin-aldosterone hypothesis of premenstrual tension. Psychosomatic Medicine, 1973, 2, 143-154.

Jones, W., Chernovetz, M., & Hansson, R. The enigma of androgyny: differential implications for males and females. Journal of Counsulting and Clinical Psychology, Volume 1978, 46, 298-313.

Kopell, B., Lunde, D., Clayton, B., & Moos, R. Variations in some measures of arousal during the menstrual cycle. The Journal of Nervous and Mental Disease, 1969, 148, 180-187.

Lamb, W., Ulett, G., Masters, W., & Robinson, D. Pre-menstrual tension: EEG, hormonal, and psychiatric evaluation. American Journal of Psychiatry, 1953, 109, 840-848.

Levitt, E., & Lubin, B. Some personality factors associated with menstrual complaints and menstrual attitudes. Journal of Psychosomatic Research, 1967, 11, 267-270.

Lubin, B. Manual for the Depression Adjective Check Lists. California: Educational and Industrial Testing Service, 1967.

Luschen, M., & Pierce, D. Effects on the menstrual cycle on mood and sexual arousal. Journal of Sex Research, 1972, 1, 41-47.

MacKinnon, I., Mackinnon, P., & Thompson, A. Lethal hazards of the luteal phase of the menstrual cycle. British Medical Journal, 1959, 1015-1017.

Mandell, A., & Mandell, M. Suicide and the menstrual cycle. Journal of the American Medical Association, 1967, 200, 792-793.

Markum, R. Assessment of the reliability of and the effect of neutral instructions on the symptom ratings on the Moos Menstrual Distress Questionnaire. Psychosomatic Medicine, 1976, 38, 163-172.

May, R. Mood shifts and the menstrual cycle. Journal of Psychosomatic Research, 1976, 20, 125-130.

Merimee, T., Fineberg, S., & Tyson, J. Fluctuations of human growth hormone secretion during menstrual cycle: A response to arginine. Metabolism, 1969, 18. 606-608.

Mishell, S., Nakamura, R., Crosignani, P., Stone, S., Kharma, K., Nagata, U., & Thorneycroft, I. Serum gonadtropin and steroid patterns during the normal menstrual cycle. American Journal of Obstetrics and Gynecology, 1971, 110, 60-65.

Moghissi, K., Syner, F., & Evans, T. A composite picture of the menstrual cycle. American Journal of Obstetrics and Gynecology, 1972, 114, 405-418.

Moos, R. Typology of menstrual cycle symptoms. American Journal of Obstetrics and Gynecology, 1969, 103, 390-402.

Moos, R. Menstrual Distress Questionnaire Manual. Sanford University, 1977.

Moos, R., Kopell, B., Melges, F., Yalom, I., Lunde, D., Clayton, R., & Hamburg, D. Fluctuations in symptoms and mood during the menstrual cycle. Journal of Psychosomatic Research, 1969, 13, 37-44.

Nowlis, V. Research with the mood adjective checklist. In Tomkin, T., & Isard, C., Ed. Affect cognition, and personality. New York: Springer, 1963.

Paige, K. Effects of oral contraceptives on affective fluctuations associated with the menstrual cycle. Psychosomatic Medicine, 1971, 33, 515-537.

Paige, K. Women learn to sing the menstrual blues. Psychology Today, 1973, 7, 41-46

Parlee, M. The Premenstrual Syndrome. Psychological Bulletin, 1973

Parlee, M. Stereotypic beliefs about menstruation: a methodologic note on the Moos Menstrual Distress Questionnaire and some new data. Psychosomatic Medicine, 1974, 36, 230-241.

Patkai, P., Johannson, G., & Post, B. Mood, alertness, and sympathetic adrenal medullary activity during the menstrual cycle. Psychosomatic Medicine, 1974, 36, 503-512.

Paulson, M. Psychological concomitants of premenstrual tension. Journal of Obstetrics and Gynecology. 1961, 81, 733.

Ribeiro, A. Menstruation and crime. British Medical Journal, 1962, 1, 640.

Ribeiro, W., Mishell, D., & Thorneycroft, I. Comparison of the patterns of androstenedione, progesterone, and estradiol during the human menstrual cycle. American Journal of Obstetrics and Gynecology, 1974, 119, 1026-1032.

Shainess, N. A re-evaluation of some aspects of femininity through a study of menstruation: a preliminary report. Comprehensive Psychiatry, 1961, 2, 20-26.

Silbergeld, S., Brast, N., & Noble, E. The menstrual cycle: a double blind study of symptoms, mood, and behavior, and biochemical variables using enovid and placebo. Psychosomatic Medicine, 1971, 33, 411-428.

Sommer, B. Menstrual cycle changes and intellectual performance. Psychosomatic Medicine, 1971, 34, 263-268.

Spence, J., Helmreich, R., & Stapp, J. Ratings of self and peers on sex role attributes and their relation to self-esteem and conceptions of masculinity and femininity. Journal of Personality and Social Psychology, 1975, 32, 29-39.

Spielberger, C., Gorsuch, R., & Lushene, R. STAI Manual for the State-Trait-Anxiety Index. Palo Alto: Consulting Psychologists Press, 1970.

Strott, C., Yoshimi, T., Ross, G., & Lipsett, M. Ovarian physiology: relationship between plasma and hand steroidogenesis by the follicle and corpus luteum, affect on HCG. Journal of Clinical Endocrinology, 1969, 29, 1157-1167.

Tonks, C., Rack, P., & Rose, M. Attempted suicide and the menstrual cycle. Journal of Psychosomatic Research, 1968, 11, 319-323.

Weidiger, P. Menstruation and menopause: the physiology and psychology, the myth and the realty. New York: Random House, 1975.

Wilcoxon, L., Schrader, S., & Sherif, C. Daily self-reports on activities, life events, moods, and somatic changes during the menstrual cycle. Psychosomatic Medicine, 1976, 38, 402-417.

Yen, S., Vela, P., Rankin J., & Littell, S. Hormonal relationship during the menstrual cycle. Journal of the American Medical Association, 1970, 211, 1513-1517.

Zimmerman, E., & Parlee, M. Behavior changes associated with the menstrual cycle: an experimental investigation. Journal of Applied Social Psychology, 1973, 3, 335-344.

Zuspan, R., & Zuspan, K. Ovulatory plasma amine (epinephrine and norepinephrine) surge in the women. American Journal of Obstetrics, 1973, 117, 654-661.

APPENDIX A

Mean Scores for the Five Phases for All Variables

	1	2	3	4	5	6	7	8	9	10
					S_1					
M	10.1	8.1	5.6	4.0	5.8	8.7	6.7	6.0	56.29	32.00
F	6.7	8.0	5.0	4.0	4.0	9.3	8.0	6.0	52.00	29.33
O	6.8	9.6	5.5	4.0	4.3	8.8	6.3	6.0	52.25	36.50
L	6.6	9.0	5.3	4.0	4.0	8.1	7.6	6.4	52.90	37.90
P	10.3	9.5	5.8	4.0	7.0	12.5	6.8	7.3	64.00	40.75
					S_2					
M	10.0	11.1	6.3	4.6	5.0	16.3	12.4	9.0	76.14	31.83
F	9.8	9.6	6.7	5.0	4.5	14.2	14.1	10.0	75.91	30.82
O	13.0	10.3	7.3	6.0	4.8	10.6	12.5	9.8	76.00	27.00
L	9.3	11.3	7.3	4.7	4.3	15.3	16.0	13.3	82.67	36.00
P	9.3	10.8	7.8	4.5	4.3	10.5	8.3	11.5	67.75	36.50
					S_3					
M	10.4	9.2	6.4	4.0	9.4	15.2	9.8	6.4	72.8	45.80
F	11.4	9.6	6.4	4.0	4.0	13.0	8.4	6.8	64.80	42.40
O	14.7	14.7	9.0	5.0	4.0	20.7	7.0	8.0	84.00	62.67
L	18.2	12.4	10.9	5.6	5.6	15.1	22.2	6.0	84.86	46.70
P	10.7	9.0	5.0	4.0	4.3	10.3	10.3	9.7	60.33	40.75
					S_4					
M	6.9	8.0	5.2	4.0	4.6	10.4	9.6	6.8	56.00	35.14
F	6.0	8.8	5.2	4.2	5.0	11.4	11.4	6.4	59.40	37.75
O	6.8	8.5	5.0	4.0	5.0	8.5	11.0	6.0	55.75	35.67
L	7.3	8.2	5.5	4.0	5.3	8.3	10.0	5.8	57.00	32.60
P	9.0	8.0	5.0	5.5	7.5	8.5	9.5	6.6	59.75	34.50
					S_5					
M	15.3	10.0	10.5	5.5	5.7	13.8	11.5	6.0	79.25	36.75
F	8.1	8.4	5.1	4.0	4.7	8.7	16.7	6.0	62.71	25.42
L	16.8	11.5	12.5	7.0	4.0	15.5	12.0	6.8	88.00	42.00
O	9.3	8.7	5.0	4.0	5.0	9.0	17.5	6.0	65.00	25.50
P	12.0	10.5	6.5	4.5	7.3	13.8	13.3	6.0	77.00	38.00

	1	2	3	4	5	6	7	8	9	10
					S_6					
M	15.0	10.3	5.8	4.0	5.5	13.5	13.0	6.8	85.60	36.60
F	17.1	9.5	6.4	4.7	6.4	11.2	13.4	7.3	93.00	39.78
O	17.8	11.5	7.3	4.5	5.0	16.3	12.3	8.0	87.22	35.67
L	13.7	10.5	6.2	4.3	6.0	11.8	14.8	7.4	86.38	31.63
P	13.5	12.0	6.5	4.0	8.3	13.3	13.8	6.0	78.67	41.00
					S_7					
M	12.3	11.7	7.7	7.3	8.7	10.7	12.4	9.0	76.14	29.00
F	10.5	12.0	7.5	4.8	6.8	10.8	14.3	9.3	78.00	31.75
O	16.3	12.8	8.3	4.5	10.3	13.8	21.3	11.0	101.00	29.00
L	14.1	13.5	7.9	4.7	10.0	14.0	16.2	11.6	94.56	30.44
P	11.0	13.0	6.8	4.5	9.5	12.8	15.8	11.5	87.75	36.25
					S_8					
M	11.0	8.4	6.0	6.4	7.3	9.2	13.2	6.0	68.60	36.75
F	7.9	10.2	5.5	5.2	6.5	9.5	12.1	6.5	64.31	35.42
O	6.0	8.0	5.0	4.5	8.3	8.5	14.5	6.0	61.75	42.00
L	6.0	8.7	5.7	4.0	8.3	10.3	12.0	6.0	62.00	25.50
P	6.0	8.0	5.0	4.0	8.8	8.0	12.5	6.0	59.30	38.00
					S_9					
M	6.7	8.0	5.3	4.0	4.1	8.0	5.0	6.0	49.40	33.60
F	6.3	8.0	5.0	4.0	4.0	8.0	5.0	6.0	47.33	36.44
O	6.0	8.0	5.0	4.0	4.0	8.0	5.0	6.0	47.00	42.00
L	6.0	9.3	5.0	4.0	4.0	8.0	5.0	6.0	48.30	25.67
P	6.0	8.0	5.0	4.0	4.0	8.0	5.0	6.0	47.00	35.25
					S_{10}					
M	10.4	9.0	5.2	5.0	8.0	11.8	12.6	6.6	70.20	25.60
F	14.0	10.0	5.8	4.0	5.8	22.5	9.3	6.0	78.50	37.75
O	8.3	9.3	5.5	4.3	5.5	14.5	15.8	6.0	70.00	32.25
L	9.0	10.9	5.3	4.3	7.0	16.9	11.1	6.0	72.00	33.13
P	9.3	9.0	5.3	4.0	10.3	14.0	10.3	6.0	67.67	40.25

	1	2	3	4	5	6	7	8	9	10
					S_{11}					
M	9.4	9.8	7.1	4.5	5.9	10.8	11.1	6.0	64.00	34.38
F	9.7	10.5	7.8	4.5	4.5	10.7	10.2	6.0	65.67	31.50
O	9.8	10.3	8.5	4.5	7.3	12.3	9.8	6.0	68.75	39.50
L	7.5	9.5	6.0	4.0	8.3	10.0	10.5	6.0	64.00	24.75
P	10.0	16.0	10.3	4.0	10.8	11.0	12.3	6.0	82.50	35.75
					S_{12}					
M	10.0	9.4	7.6	4.3	4.9	19.0	10.4	6.5	73.25	34.22
F	8.4	8.0	5.8	4.0	4.0	10.6	9.6	6.0	57.40	32.00
O	10.5	8.5	7.0	4.0	4.0	14.0	9.5	6.3	64.75	32.50
L	8.1	9.5	6.8	4.0	7.3	11.4	8.1	6.0	62.12	33.88
P	8.3	9.5	6.0	4.0	10.8	13.3	10.5	7.0	70.25	33.25
					S_{13}					
M	11.8	13.4	11.2	4.4	8.0	13.4	14.4	6.8	85.60	36.60
F	13.1	19.0	9.4	4.1	8.1	14.4	15.4	7.4	93.00	39.78
O	12.8	13.0	9.5	5.5	8.0	14.0	14.0	8.0	87.25	35.67
L	12.4	13.5	7.5	4.5	10.0	14.0	14.8	7.4	86.38	31.63
P	9.0	10.0	8.3	4.0	7.7	17.0	14.0	6.0	78.67	41.00

Note. - 1= pain; 2= concentration; 3= behavior change;
4= autonomic reactions; 5= water retention;
6= negative affect; 7= arousal; 8= control;
9= MDQ total; 10= STAI state-anxiety.

APPENDIX B

Trait-anxiety and Androgyny Scores

Subject	STAI Trait-Anxiety	Androgyny	
		M	F
1	24	4.45	5.25
2	31	4.2	4.25
3	43	4.05	4.45
4	26	3.8	4.85
5	23	4.4	6.05
6	26	4.25	5.00
7	34	4.35	5.25
8	32	5.85	4.90
9	37	5.55	4.78
10	39	5.7	4.5
11	47	5.65	4.55
12	30	5.55	5.35
13	36	4.8	5.15

APPROVAL SHEET

The thesis submitted by Mary L. O'Connor has been read and approved by the following committee:

Dr. Alan DeWolfe, Director
Physiology, Loyola

Dr. James Johnson
Associate Professor, Physiology, Loyola

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

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Science.

12/5/78
Date

Alan S. DeWolfe
Director's Signature