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PREMENSTRUAL AFFECTIVE SUBTYPE DIFFERENTIATION

ROSALINDE KLEMPAN

Thesis presented to the School of Graduate Studies
of the University of Ottawa in partial fulfillment
of the requirements for the degree of Doctor of Philosophy.



Rosalinde Klempan, Ottawa, Canada, 1987.



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ABSTRACT

PREMENSTRUAL AFFECTIVE SUBTYPE DIFFERENTIATION

The main objective of this research was to identify and describe a wide range of combinations and severity of premenstrual affective changes. Premenstrual changes in depression, anxiety and anger were prospectively investigated in 194 normally menstruating women using a combination of self-report questionnaires (i.e., POMS, SAI X-1, and MDQ-T). A modified daily recording procedure was used to collect data concerning affective and physical changes during one menstrual cycle. The combined features of methodology not employed in previous studies of premenstrual affective changes included the use of a normal subject group; standardized self-report measures sensitive to mood fluctuations; separate measures of negative affect; the use of an intermenstrual baseline and individual magnitude of change scores; a dimensional clustering approach to subject subtyping. By virtue of the methodological approach employed to meet the primary research objective, this study was expected to obtain more accurate and valid measures of separate affective changes. It was also expected to obtain subgroups of women with similar change patterns, a better description of the severity and subtypes of premenstrual dysphoria, and information concerning the discrete or continuous nature of the changes. The secondary objectives of the study involved the testing of hypotheses relating neuroticism and increased premenstrual depression, high trait anxiety and increased

premenstrual state anxiety, and the relationship of premenstrual changes in physical and affective symptoms. Premenstrual dysphoric increases were not ubiquitous as they were reported to some degree by only about one half of the sample. Approximately one third of the sample evidenced mild to moderate premenstrual dysphoric increases. Severe increases were rare as evidenced by about one fifth of the sample. Severe premenstrual dysphoria seems to have a common essential component of depression with a strong additional component of either anxiety or anger. About one tenth of the sample demonstrated premenstrual decreases in dysphoric affect. The presence of a premenstrual 'elation' syndrome was not, however, supported as the decreases reflected a premenstrual return to normal levels of negative affect reporting. Significant premenstrual increases of each negative affect were found for all dysphoric subtype subjects combined, but not for the total sample. Given the present findings concerning the bidirectional nature of premenstrual affective changes and the fact that only a subgroup of women evidenced premenstrual dysphoria, it is suggested that future researchers examine individual change score patterns. Trait anxiety levels did not appear to be related to increased premenstrual state anxiety. Elevations in neuroticism and trait anxiety were associated with increases in the continuum of dysphoric severity. The results suggested that high premenstrual depression may represent an affective link between premenstrual dysphoria and personality disturbance. Premenstrual physical changes appeared to be independent from affective changes. The significant premenstrual increases in physical symptom reporting seemed

to represent a separate but temporally overlapping 'syndrome' to premenstrual dysphoria. This study demonstrated that subjects forming relatively discrete affective subgroups may be identified by statistical means. These subgroups are characterized by combinations of changes in premenstrual dysphoric affect. The subgroups, representing discrete dysphoric change combinations, are partially overlapping on a continuum of severity of any separate affect variable. Premenstrual dysphoria may be conceptualized as a discrete phenomenon with a continuous nature of severity. The subtypes of premenstrual dysphoria imply a diversity of dysphoric disturbances occurring at lower levels of severity than for psychiatric populations. The results are interpreted as primarily supportive of the use of an individual differences, rather than an 'illness' model to study premenstrual affective changes.

ACKNOWLEDGEMENTS

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CURRICULUM STUDORIUM

Rosalinde Klempan was born July 19, 1957, in Ottawa, Ontario. She received the Bachelor of Arts degree with Concentration in Psychology from the University of Ottawa, Ontario in 1978. An Honours degree in Psychology was awarded in 1979 by the Faculty of Social Sciences of the University of Ottawa. The title of the honours thesis was "The Antagonistic Effects of a Long-Acting Neuroleptic (fluphenazine decanoate) on Amphetamine Induced Behavioral Changes in the Rat", and was prepared under the direction of Zulfiqar Merali, Ph.D.

TABLE OF CONTENTS

	Page
ABSTRACT.....	i
ACKNOWLEDGEMENTS.....	iv
CURRICULUM STUDIORUM.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	ix
INTRODUCTION.....	xji
 I REVIEW OF LITERATURE	
Menstrual Cycle Physiology.....	1
The Premenstrual Syndrome.....	2
Physical, Cognitive and Behavioral	
Fluctuations.....	9
Proposed Etiological Mechanisms.....	14
General Methodological Issues.....	33
Affective Variation during the Menstrual Cycle...	39
Methodological Issues.....	53
Premenstrual Dysphoria.....	60
Personality and Premenstrual Symptomatology.....	69
Neuroticism and Premenstrual Symptomatology..	70
Trait Anxiety and Premenstrual Symptomatology	74
Discussion.....	77
Psychiatric Disorder and Premenstrual	
Symptomatology.....	79
Somatic and Affective Premenstrual Symptomatology	88
Summary of the Review of Literature.....	94
 II RESEARCH OBJECTIVES.....	111
 III METHODS	
Subjects.....	115
Source and Number.....	115
Exclusion Criteria.....	116

TABLE OF CONTENTS (cont'd)

	Page
Data Collection.....	117
Procedure.....	117
Instruments.....	119
 IV PRESENTATION OF RESULTS	
Subject Group 1.....	122
Change Score Calculation.....	123
Affective Correlation Analysis.....	123
Subject Group 2.....	124
Total Subject Group.....	126
Change Score Calculation.....	132
Cluster Analysis Procedure and Results.....	132
Cluster Variable Comparisons.....	133
Cluster Subtype Descriptions.....	138
Cluster Subject Age Comparisons.....	142
Analysis of Across Phase Differences.....	142
Analysis of Across Phase Differences for Dysphoric Subtype Subjects.....	146
Analysis of the EPI Neuroticism Scores.....	152
Subject Group 1 - Trait Anxiety Measures.....	158
Cluster Analysis Results.....	158
Cluster Subtype Descriptions.....	162
Cluster Subject Age Comparisons.....	164
Trait Anxiety Analysis of Variance Results...	164
Trait and State Anxiety Correlation Analysis.	170
Total Subject Group.....	170
Canonical Correlation Results of Affect and Physical Variables.....	170
Canonical Correlation Results of Affect and Physical Variables for Dysphoric Subtype Subjects.....	174
 V DISCUSSION	
Overview.....	177
Discussion of the Premenstrual Affective Subtypes.....	179
Across Phase Differences.....	190
Neuroticism and Premenstrual Affective Subtypes..	201

TABLE OF CONTENTS (cont'd)

	Page
Trait Anxiety and Premenstrual Affective Subtypes.....	208
The Relationship between Affective and Physical Symptom Changes.....	211
Methodological Considerations and Limitations....	214
Summary and Implications for Future Research.....	217
REFERENCES.....	228
APPENDICES	
Appendix 1: Affective Variation During the Menstrual Cycle.....	262
Appendix 2: Premenstrual Symptomatology and Neuroticism.....	276
Appendix 3: Premenstrual Symptomatology and Trait Anxiety.....	279
Appendix 4: General Instruction Sheet.....	282
Appendix 5: Instruments: Self-report Questionnaires	285
Eysenck Personality Inventory.....	286
Menstrual Distress Questionnaire....	287
Profile of Mood States.....	288
State-Trait Anxiety Inventory.....	289
Depression Adjective Checklists.....	290
Appendix 6: Characteristics of the Participants....	292

LIST OF TABLES

Table		Page
1	Correlation Matrix of Affective Change Scores...	125
2	Means and Standard Deviations of Magnitude of Affective Change Scores of Subject Group 1.....	128
3	Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Subject Group 1.....	129
4	Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Subject Group 2.....	130
5	Means and Standard Deviations of Magnitude of Affective Change Scores of Subject Group 2.....	131
6	Affect Cluster Group Means and Standard Deviations of Total Subject Group.....	134
7	Summary of Analyses of Variance of Each Cluster Affect Variable.....	135
8	t-test Analyses of Affect Cluster Group Means...	137
9	Cluster Subtype Descriptions.....	139
10	Affect Cluster Group Means and Standard Deviations of Subject Group 2.....	140
11	Affect Cluster Group Age Means and Standard Deviations.....	143
12	Summary of One-way Analysis of Variance of Age of Subjects by Cluster Group.....	144
13	Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Total Subject Group.....	145
14	Summary of Repeated Measures Analyses of Variance of Variable Mean Scores by Phase of Measurement.....	147

LIST OF TABLES (cont'd)

Table		Page
15	Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Dysphoric Subgroup.....	149
16	Summary of Repeated Measures Analyses of Variance of Variable Mean Scores for Dysphoric Subgroup by Phase of Measurement.....	150
17	Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 by Cluster Group.....	153
18	Means and Standard Deviations of Neuroticism Scores.....	155
19	Summary of One-Way Analysis of Variance of Neuroticism Scores of Subjects by Cluster Group.	157
20	Affect Cluster Group Means and Standard Deviations of Subject Group 1.....	159
21	Summary of Analyses of Variance of Each Affect Variable for Subject Group 1.....	160
22	t-test Analyses of Affect Cluster Group Means for Subject Group 1.....	161
23	Cluster Subtype Descriptions for Subject Group 1.....	163
24	Affect Cluster Group Age Means and Standard Deviations for Subject Group 1.....	165
25	Summary of One-Way Analysis of Variance of Age of Subjects by Cluster Group for Subject Group 1.....	166
26	Affect Cluster Group Means and Standard Deviations of SAI X-2 Scores.....	167
27	Summary of Repeated Measures Analysis of Variance of SAI X-2 Scores by Cluster Group.....	168

LIST OF TABLES (cont'd)

Table		Page
28	Correlation Matrix of Affect and Physical Variables.....	172
29	Canonical Correlation Analysis of Affect and Physical Variables.....	173
30	Correlation Matrix of Affect and Physical Variables for Dysphoric Subgroup.....	175
31	Canonical Correlation Analysis of Affect and Physical Variables for Dysphoric Subgroup.....	176

INTRODUCTION

Although described as the commonest endocrine disorder (Dalton, 1964), both the extent of premenstrual symptomatology and the potential physiological correlates remain hypothetical (Ruble et al, 1980). It has become increasingly apparent that the premenstrual syndrome is actually a number of different syndromes involving symptom profiles or 'clusters' (Abraham, 1980; Blume, 1983a; Halbreich & Endicott, 1982b; Moos, 1969). If several premenstrual syndromes exist then failure to differentiate among these different subtypes or change patterns may obscure their relationships with other variables (Abplanalp, 1983b).

Much has been written concerning the relationship between the premenstrual phase and dysphoric affect. The prevailing view is that dysphoric affect is related to the premenstrual period (Dennerstein & Burrows, 1979; Green, 1982). As in the case for premenstrual syndrome, premenstrual dysphoria is a multi-dimensional phenomenon composed of several distinct types of affective changes (Abraham, 1980; Blume, 1983b; Halbreich & Endicott, 1982a; Haskett et al, 1980). Most studies investigating premenstrual affect have grouped the major dysphoric affects (i.e., depression, anxiety, anger) into a single item or dimension. Only recently have investigators become concerned with the possible differences between these affective states (Freeman et al, 1985; Haskett et al, 1980).

Although premenstrual dysphoric changes are not uncorrelated (Moos, 1969), several different types of mood change or change

combinations may form subtypes of premenstrual dysphoria. The importance of examining premenstrual negative affects separately is indicated by findings of different associations between specific dysphoric changes and variables such as reaction to oral contraceptives and cognitive changes (Culberg, 1972; Halbreich et al, 1983). It appears that better definition and discrimination between various affective subtypes may be an important factor in clarifying and identifying correlates of premenstrual changes. The importance of delineating affective subtypes is illustrated by various attempts to relate premenstrual symptoms to personality factors such as neuroticism and trait anxiety (Watts et al, 1980; Sanders et al, 1983; Golub, 1976b; Halbreich & Kas, 1977). The inconsistent findings regarding the association of personality factors to premenstrual symptoms may be partly due to a failure to account for affective subtypes of premenstrual dysphoria. For example, there are indications that premenstrual depression as opposed to irritability is related to neuroticism (Cullberg, 1972; Haskett et al, 1980). The potential premenstrual affective subtypes and combinations have not yet been clearly outlined in studies of premenstrual affective changes.

The grouping together of undifferentiated dysphoric states precludes differentiation of subgroups of women with different combinations of dysphoric mood. There is a definite need for more research delineating the relationship between personality variables, physical symptoms and specific premenstrual affective subtypes. The present research was an exploratory investigation of affective subtypes during the premenstrual period. The main objective of this research was

to identify and describe the range of the severity, and phenomenology of premenstrual affective changes in normally menstruating women. It was expected that greater specification of premenstrual affective subtypes would lead to a better description of this syndrome, help increase replicability of results in research on premenstrual dysphoria, and help identify correlates of premenstrual dysphoric changes. In the present study the identified subtypes were also employed to help clarify the relationship of premenstrual dysphoric symptoms to the personality factors of neuroticism and trait anxiety, and to physical symptoms.

The methodology employed in the present study included a unique combination of features that together would allow for a better specification of premenstrual affective subtypes. A prospective study of premenstrual affective subtypes, using the combined aspects of methodology as adopted in this research, has not been conducted. The procedures utilized in the current study included the use of normal subject group to focus on the potential universality of the phenomenon. Standardized and well-researched rating scales were adopted. These scales were designed to be sensitive to mood fluctuation and were able to measure each affect separately. Prospective self-report measures were administered on a modified daily-recording basis. The data was analyzed on an individual basis, using an intermenstrual baseline and magnitude of change scores to represent mood shifts. The latter procedure allowed for bidirectionality of affective change as well as the ability to determine the intensity of affective change. Finally, a dimensional clustering approach to affective subtyping was applied. This approach

allowed for a better description of the range and continuum of premenstrual affective change in a normal sample. It also allowed for better clarification as to whether premenstrual dysphoria is ubiquitous or a discrete syndrome.

By virtue of the chosen methodology this research was expected to

- 1) yield more valid and accurate measures of separate affective changes,
- 2) distinguish clusters of women with similar premenstrual affective configurations,
- 3) lead to a more accurate description of the subtypes of premenstrual dysphoria in terms of both affect combinations and severity levels,
- 4) provide information regarding the discrete or continuous nature of the affective changes,
- 5) provide the ability to compare subtype groups on the dimensions of neuroticism and trait anxiety and help determine the degree of relationship between mood and physical changes.

The focus of the following review of the literature will be to provide information concerning the theoretical and empirical basis of examining premenstrual dysphoric subtypes and their potential links to personality variables and physical symptomatology. This type of research contributes to the gaining of a clearer understanding of premenstrual mood changes and the potential psychologic and physical accompaniments or predisposing factors. At the same time, the importance of the contribution of physiological and psychosocial factors must be acknowledged. It has also been suggested that investigations of known subtypes of premenstrual syndrome(s) would aid in examining therapeutic responses of women presenting differing symptom patterns (Green, 1982).

Some treatments may be more effective for women who, for example, experience primarily premenstrual depression than other subgroups of women. Premenstrual affective subtyping may ultimately contribute to the description of the syndrome(s), clarification of its etiology and effective symptom management techniques.

Chapter I

REVIEW OF THE LITERATURE

Menstrual Cycle Physiology

The normal human menstrual cycle is a recurrent process of ovulation and menstruation dependent upon the coordination of intricate relationships between the hypothalamus, pituitary gland, ovary, adrenal cortex and endometrium. A complex interplay of hormones control the menstrual cycle and they are regulated by a series of feedback loops along the hypothalamic-pituitary-gonadal system (Speroff et al., 1973; Weile et al., 1970).

Endocrine control of the menstrual cycle can be briefly described by referring to major changes in ovarian hormones (estrogen and progesterone) which are regulated by the gonadotropins secreted by the pituitary (follicle-stimulating hormone (FSH) and leuteinizing hormone (LH)). At the time of menstruation, both estrogen and progesterone are low, but FSH is rising, stimulating follicular growth in the ovary during the first week of the cycle. Estrogens rise gradually around day 8, inhibiting FSH secretion, and then peak just prior to ovulation. High levels of estrogen also stimulate a preovulatory burst of LH from the pituitary which triggers ovulation about 16-24 hours later. Soon after the LH rise, a drop in plasma estrogens occur. After ovulation, LH stimulates the ovary to form the corpus luteum, a collection of cells in the ruptured follicle that produce progesterone. The rising progesterone

secretion suppresses LH and about 8 or 9 days after ovulation, a peak level of progesterone and a second peak of estrogen occurs. Both ovarian hormones then show a gradual decline, followed by a rapid drop during the premenstruum (about day 25-28). In response to the estrogen decline, a rise in FSH occurs and the cycle begins again.

Various methods have been used to partition the menstrual cycle into phases, the most common ones being the menstrual phase for days 1-5, the follicular phase (days 6-12), the ovulatory phase (days 13-16) and the luteal phase (days 17-28). Days 25-28 are sometimes referred to as the premenstrual phase.

The Premenstrual Syndrome

Extensive research of the influence of the menstrual cycle on somatic, mood and behavioural changes in women has led to the commonplace usage of such terms as premenstrual tension and premenstrual syndrome. The term 'premenstrual tension' was coined by Frank (1931) to describe a condition in women characterized by nervous tension, weight gain, edema and headaches. Subsequent to Frank's publication, many symptoms have been added to this syndrome. They encompass a wide variety of physical, psychological and behavioral changes that are said to recur episodically during the late luteal phase of the menstrual cycle. The vast array of symptoms associated with premenstrual tension have included tension, anxiety, depression, headaches, fluid retention, painful and enlarged breasts, abdominal distension, weight gain, edema, fatigue and increased appetite (Dalton, 1964; Rees, 1953; Reid & Yen,

1981). The clinical dimensions of this syndrome, which is referred to by such terms as 'premenstrual syndrome(s)', 'premenstrual distress', 'premenstrual tension', 'premenstrual tension syndrome(s)', 'perimenstrual symptoms' (symptoms occurring about the time menstruation commences) are therefore rather broad (Steiner & Carroll, 1977). A comprehensive review of the literature by Moos (1969) identified over 150 symptoms that have been associated with various phase of the menstrual cycle. Furthermore, the severity of premenstrual symptoms is said to range from mild to incapacitating (Reid & Yen, 1981).

Despite more than 50 years of investigation, the definition of what constitutes the premenstrual syndrome is still unclear. Given the fact that the undifferentiated concept of 'premenstrual syndrome' has been inconsistently used and associated with such a wide range of symptoms and severity, it is not surprising that incidence estimates vary widely ((e.g., 25-100%, (Moos & Liederman, 1978), 25-95% (Clare, 1977)). It is questionable whether investigators of this syndrome have been examining the same phenomenon.

The prevalence figures for premenstrual syndrome are in a sense meaningless because of the lack of an agreed upon definition of what constitutes the phenomena. Many kinds of somatic, mood and behavioural changes are often lumped together to define premenstrual syndrome in these studies. The populations chosen for examination vary and retrospective studies may exaggerate the incidence of symptomatology due to attribution based on cultural stereotypes, expectations and beliefs.

Dalton (1982) estimated that 50% of women have premenstrual tension although degree of severity is not specified. Moos (1968a) approximated that premenstrual symptoms occur in 30-50% of women. Sutherland and Stewart (1965) found cyclical symptoms in 97% of 150 healthy nulliparous women. Ninety percent of American women in Weideger's (1977) survey reported more than one premenstrual symptom.

A recent retrospective Swedish epidemiological study of 1083 women found 2-3% reported severe premenstrual symptoms and 10% would have welcomed treatment in regard to their symptoms (Andersch, 1980). Mild or moderate emotional and physical changes were reported by 70% while 92% reported at least one premenstrual change. Andersch and Hahn (1981) report a prevalence of premenstrual changes of 50-70%. Van Keep and Leherter (1981) report the results of an epidemiological study of 2501 women in France, conducted between 1978-1979. Premenstrual symptoms were reported as occurring regularly by 38% of the sample, from time to time by 27% and occasionally by 12%. Reid and Yen (1981) reviewed the literature on prevalence and concluded that 70-90% of women experience recurrent premenstrual symptoms with some impairment reported in 20-40%. Clare (1985) comes to the conclusion that whereas figures in excess of 70% were once claimed regarding the proportion of actively menstruating women reporting premenstrual changes severe enough to warrant the 'illness' label, a figure between 2 and 8% now seems to be established (Andersch, 1980).

The relationship of premenstrual symptomatology to the so-called extraneous variables such as age, irregularity of periods, parity,

pregnancy, and marital status is still unclear. The data relating such variables to the premenstrual syndrome is somewhat contradictory. Generally, women over 30 are thought to have more premenstrual problems than younger women (Dalton, 1982; Rubinow & Byrne, 1984). Lloyd (1963) labelled premenstrual syndrome as the 'mid-thirties' syndrome. Rouse (1978) found that older women (over 30) had a greater tendency to complain of symptomatology in the premenstruum and menstruum compared to the under 30 and under 20 age groups. The opinion that moderate-severe premenstrual symptomatology is more likely to occur in the 30's and 40's than the teens and 20's (Abplanalp et al., 1980) is based on such findings as those of Moos (1969). He found 'menstrual' problems more common in younger (less than 20) women and 'premenstrual' problems more common in older women. Moreover, Golub (1976b) found differences in premenstrual and intermenstrual measures of depression and anxiety in women over 30 but not in adolescents (Golub & Harrington, 1981). Dalton (1982) concludes that premenstrual tension increases with age and parity and often starts after pregnancy, while in contrast, dysmenorrhea is more common in the late teens and early 20's. Hain et al. (1970) found menstrual irregularity to be associated with several psychological and physical premenstrual symptoms.

In contrast to the above conclusions, Reid and Yen (1981) concluded that age and parity are not relevant variables with respect to the premenstrual syndrome. In a commentary, Golub (1984) urges that more research be conducted on such variables. As Bancroft and Backstrom (1985) point out, the often stated conclusion that premenstrual syndrome

51

is related to increasing age and parity is not based on conclusive evidence as studies usually fail to control for parity while considering age and vice versa. The comparison of two prevalence studies illustrates that the relationship of such factors as age and parity to premenstrual symptoms has not been documented beyond controversy. Van Keep and Lehert (1981) reported that a particular tendency to premenstrual symptoms was associated with parity, irregularity of cycle, and long menstrual bleeding. Women with premenstrual syndrome did not differ from those without as far as such variables as age, education, socio-economic standing and marital status were concerned. In the prevalence study of Woods et al. (1982) older women had fewer premenstrual complaints in terms of premenstrual irritability, depression and cramps than younger women. Marital status did not appear to influence prevalence, however women with more education had a significantly lower prevalence of several premenstrual symptoms, including headache, cramps, irritability, depression and tension.

It has become increasingly apparent that the 'premenstrual syndrome' is actually a number of different syndromes (Blume, 1983a; Halbreich & Endicott, 1982b). A number of different symptom 'clusters' or 'profiles' are probably involved. If the term premenstrual syndrome is actually a misnomer and several or perhaps many different premenstrual syndromes exist then failure to differentiate among different change patterns may obscure relationships with other variables (Abplanalp, 1983b). A large factor analytic study of the premenstrual syndrome led Moos (1969) to identify seven major symptom clusters thus

providing information leading towards a more precise definition of the syndrome. He proposed that the concept 'premenstrual syndrome' be conceptualized more appropriately as the 'premenstrual syndromes'. Moos developed a 47 item instrument to assess these subclusters (labelled pain, concentration, behavior change, autonomic reactions, water retention, negative affect, and arousal), called the Menstrual Distress Questionnaire (MDQ) (Moos, 1977). The MDQ has a 'today' form (MDQ-T) on which symptoms can be rated daily and a retrospective form (MDQ-A) to assess the most recent menstrual cycle.

A cluster analysis of the MDQ scores of 579 women by Moos and Liederman (1978) identified many different subtypes of menstrual cycle symptoms and provided further evidence that menstrual distress is not experienced by women in a uniform manner. The MDQ has limitations in its applicability as half of Moos's normative sample were taking oral contraceptives and about 10% were pregnant. The MDQ, however has been one of the most widely used symptom rating scales for the past decade (Dennerstein & Abraham, 1982; Sampson & Prescott, 1981). A study by Markum (1976) concluded that the MDQ (Form T) is internally consistent and has high test-retest reliability. Altered instructions, not indicating the relationship of the test to menstruation, did not significantly affect symptom ratings. These authors recommend the test be used to compare a single subjects ratings across different menstrual cycle phases.

Steiner et al. (1980a) have also attempted to develop a procedure to bring order to symptom ratings concerning the menstrual cycle. Using

the MDQ and several psychaitric rating scales they developed research diagnostic criteria and rating scales for the assessment of premenstrual syndrome. Five of the eight identified major mood and behavioural symptoms are required for the diagnosis of premenstrual syndrome. Their definition of premenstrual symptomatology is very narrow, excluding somatic symptoms and patients with a psychiatric history, yet their criteria would tend to yield a more homogeneous group of premenstrual symptom sufferers.

Abraham (1980) defined four symptom categories (anxiety, depression, weight-gain and bloating, headaches, and carbohydrate craving) based on clinical experience. His symptom scale contains only 19 items. Construction using standard psychometric procedures would have helped to ensure internal consistency, reliability, and lack of redundancy and cohesiveness of subgroups (Rubinow & Byrne, 1984).

The Premenstrual Assessment Form (PAF), developed by Halbreich, Endicott and associates. (Halbreich et al., 1982a) is an extremely complex retrospective questionnaire with 95 items. These authors produced a branching classification using the PAF. It includes major and minor depressive syndromes, the syndromes of anxiety, irritability, general pain, fatigue, impulsiveness, water retention, 'organic' mental state, autonomic physical syndrome, and decreased well-being. The measurement of bidirectionality of change in the same symptom area is a feature of this questionnaire.

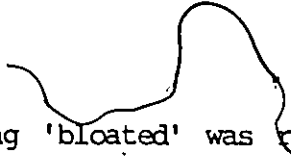
Physical, Cognitive and Behavioral Fluctuations

Over the years, research on cyclic menstrual changes has produced a body of scientific literature in which almost every mental or bodily phenomenon has been measured against the human menstrual cycle phases (Smith, 1975). A complete review of this abundance of research will not be undertaken as it is not directly appropriate to the focus of the present discussion. However, the reader is referred to reviews of the literature by Smith (1975), Steiner and Carroll (1977), Abraham et al. (1978) and Sommer (1973). A brief survey of evidence concerning some of the physical, cognitive and behavioural cyclic fluctuations will be presented. The evidence concerned with affective variation during the menstrual cycle will be discussed in some depth in a later section.

Discernible cyclic fluctuations of a number of physical symptoms have been reported in studies of the menstrual cycle. Aches and pains are generally described as headache, backache, breast tenderness and cramps (Smith, 1975). Retrospective self-report data collected by Coppen and Kessel (1963) led to their findings that more than one woman in nine reported severe degrees of pain or headache, and one in three reported moderate pain related to menstruation. Also using self-report data, Moos (1968a) found the prevalence of at least mild menstrual pain to be 35-40% in the women tested and the prevalence of premenstrual pain to be 25%. Coppen and Kessel (1963) distinguished between dysmenorrhea (pain occurring during menstruation) and premenstrual pain and implied that dysmenorrhea may have a more direct physiological basis than premenstrual pain (Parlee, 1973). It seems that premenstrual dysphoria

is distinguishable from dysmenorrhea (Coppen & Kessel, 1963; Dalton, 1964; Moos, 1969). Premenstrual syndrome symptoms have been found to be positively correlated with dysmenorrhea (Clare, 1983; Coppen & Kessel, 1963; Steege et al., 1985), however the nature of the relationship is not yet clear.

Premenstrual fluid retention and weight gain have also been reported by various investigators. Sweeney (1934) observed a premenstrual weight gain of more than 3 lbs in 30% of their subjects. In comparison, Golub et al. (1965) observed a weight gain during the cycle that was always less than 3 lbs above the cycle mean value. Coppen and Kessel (1963) found 72% of their subjects to be conscious of premenstrual swelling of their body and Moos (1968a) reported that 30% of the women studied complained of premenstrual water retention. Although many authors agree that weight gain does occur premenstrually, studies have not confirmed this weight gain. For example, Chesley and Hellman (1957) point out that random fluctuations of body weight during the menstrual cycle show a range of less than 3 lbs, and that by chance random fluctuations would show a premenstrual weight rise one-third of the time. They argue that a criterion for premenstrual weight gain should be a gain of more than 3 lbs during three consecutive cycles. When Janowsky et al. (1973) controlled for diet, it was found that a weight gain peaked premenstrually and then dropped rapidly. These results were attributed to an increase in water retention. A recent investigation by Faratian et al. (1984) found that although a significant premenstrual increase in perceived body size and



feeling 'bloated' was reported in their sample, no significant weight change or increases in abdominal dimensions were found. The findings in the area of fluid retention and weight gain related to cycle phase are inconsistent and conclusions await further assessment of these symptoms with objective measurements.

Studies of variations in physiological indices of arousal related to the menstrual cycle have shown discrepant results. Some authors have claimed to find a premenstrual lowering of arousal (Friedman & Meares, 1979; Klaiber et al., 1971) while others found an elevation of arousal (Asso & Beech, 1975; Wineman, 1971). Asso (1978) recently reviewed studies which related arousal to the menstrual cycle. It was concluded that the majority of studies have shown a premenstrual increase in behavioural/psychological and autonomic arousal, but that only inconclusive evidence exists for cortical arousal. Sommer (1982) reviewed the recent research concerning cortical and autonomic arousal and concluded that no statements could be made regarding arousal increases or decreases and the menstrual cycle.

Findings related to cognitive changes during the menstrual cycle are inconsistent. While Moos (1968a) found that a small percentage of women (about 13%) reported impaired concentration during the premenstrual and menstrual phases, Patkai et al. (1974) could document no self-reported changes across the cycle in estimates of level of concentration and efficiency. A review by Sommer (1973) of studies examining cognitive changes and the menstrual cycle led to the conclusion that studies utilizing objective performance measures have

generally failed to demonstrate cycle-related changes. For example, Sommer (1972) failed to find any cycle effects on classroom tests or standardized tests, and other investigators were unable to find cyclic fluctuations in reaction time tasks (Kopell et al., 1969; Zimmerman & Parlee, 1973), or in cognitive test performance (Golub, 1976a). It is important to note that whatever the occurrence of premenstrual negative affect, these changes do not seem to be generally accompanied by cognitive or performance deficits. That the evidence supports no cycle-related changes in cognition is a view that has been reiterated nine years after Sommer (1973) published a review of the area (Parlee, 1982; Sommer, 1982).

A number of studies have attempted to link the premenstrual and/or menstrual phase of the cycle to overt behaviour such as suicidal behaviour, violent or criminal behaviour, psychiatric hospitalization and psychiatric emergencies. Several studies have found a relationship between such suicidal behaviours as threats, attempts or death from accident or suicide and the premenstrual and menstrual phase of the cycle (Dalton, 1960; MacKinnon & MacKinnon, 1956; Mandell & Mandell, 1967; Pallis & Holding, 1976; Tonks, et al., 1968; Wetzel & McClure, 1972). Some more methodologically sound reports however, have failed to support any relationship between suicide and the menstrual cycle (Birtchnell & Floyd, 1974, 1975). Correlations have also been reported between the commission of violent crimes and the premenstrual or menstrual phase of the cycle (Cooke, 1945; Dalton, 1961; Morton et al., 1953).

Reports of aggressive, violent, suicidal or criminal behaviour during the premenstruum are not well substantiated according to an excellent critique of this research by Parlee (1973). Few of the published findings have withstood critical review. Parlee (1973) correctly emphasizes the poor methodological quality of the studies in the field. With regard to interpretation, she points out that since psychological stress can precipitate menstruation, the direction of causality may be reversed, whereby the stress or trauma of violent behaviour may trigger menstruation. She further cautions that although increased crime etc. may be related to the premenstruum in persons already prone to such acts, this correlation should not be generalized to make statements about all women being more inclined to violent behaviours at this point in the menstrual cycle. Interestingly, Birtchnell and Floyd (1974) found evidence to support the proposition that suicidal behavior that may seem associated with the menstrual cycle may be more closely associated with the woman knowing or fearing she is pregnant.

In summary, it seems that some physical changes may be associated with the menstrual cycle. While this view is considered to be relatively well substantiated, conclusions regarding physical changes await further research employing more objective measurements. Cognitive performance does not appear to fluctuate significantly across the menstrual cycle. Due to methodological and interpretative difficulties, the contention that a premenstrual or menstrual increase occurs in acts of aggression, violent crime and suicidal behavior remains controversial (Dennerstein &

Abraham, 1982). For a more detailed analysis the reader is referred to articles with excellent reviews of the area of behavior and the menstrual cycle by Sommer (1982), Clare (1985), and Parlee (1982).

Proposed Etiological Mechanisms

A wide range of theories regarding the etiology of menstrual cycle changes, especially those of the premenstruum have been proposed. These theories may generally be categorized as psychological, psychosocial, psychophysiological and physiological.

One type of psychological theory of menstrual changes arises out of psychoanalytic theory. The psychoanalytic view emphasizes childhood experiences and individual attitudes toward femininity as determinants of premenstrual and menstrual symptoms (Smith, 1975). Anxieties and conflicts about sexuality (Ivey & Bardwick, 1968) and a rejection of, or lack of comfort in the mature feminine psychosexual role have been suggested as related to premenstrual tension (Fortin et al., 1958; Paulson, 1961). Smith (1975) points out that psychoanalytic studies of premenstrual and menstrual disturbances have not generally been of high quality.

Psychosocial factors have been suggested as playing a part in determining premenstrual and menstrual distress. The conditioned acceptance of cultural stereotypes has been implicated as leading to the expectation of negative symptoms (Koeske & Koeske, 1975; Paige, 1971; Ruble, 1977). A few lines of research have lent some indirect support to the hypothesis that social expectations or attitudes influence menstrual-related symptoms. Paige (1973) related degree of reported

menstrual distress to religious affiliation, general illness behaviour, and various other socialization factors. Paige's (1973) results seemed to indicate that learned social attitudes have an influence on women's reactions to the menstrual cycle. Women may thus learn to attribute physical discomfort to menstruation. May (1976) found differences in attitudes and feelings between women who were most depressed premenstrually versus those who experienced a low during menstruation. Levitt and Lubin (1967) observed that women with unfavourable attitudes to menstruation tended to report more intense menstrual complaints while Di Nardo (1975) found a relationship between positive body attitude and fewer menstrual cycle symptoms.

Parlee's (1974) findings suggested that women have expectations concerning menstrual-related cycle changes that form stereotypic beliefs about such changes. Women may have such expectations for their own experiences. Ruble (1977) found that when women were falsely led to believe they were premenstrual, more negative symptoms were reported than in subjects in the same phase of the cycle who were induced to believe they were intermenstrual.

The results of Koeske and Koeske (1975) showed that general cultural expectations may predispose women to react to menstruation in a certain way. Subjects displayed a specific pattern of attribution in linking negative moods to the premenstrual phase. This attribution pattern links negative moods to the premenstrual state and positive moods to external factors. It was also noted that this pattern may



result in the retrospective exaggeration of the recall of negative moods.

In summary, research of psychosocial factors indicates that complex sociocultural factors may influence the effects of the menstrual cycle on mood and behavior, while the psychosocial point of view does not deny that hormonal fluctuations may also play a role (Lips, 1978).

Psychophysiological theories acknowledge both physiological and cognitive factors in their account of premenstrual symptomatology. Based on Mandler's (1975) theory of emotion, which is partly an extension of Schacter and Singer's original work (Schacter, 1964), these theories generally postulate that a premenstrual rise in autonomic arousal interacts with cognitive expectations to produce an experience of mood. For example, Asso (1978) proposed that premenstrual arousability would prime a woman for intense emotional experience. Cognitive factors would determine the manner in which the arousal is labelled and experienced as an emotion. Premenstrual negative affect would arise from the general expectancy of a negative premenstrual mood and personal negative expectancies related to the menstrual period. This would, in turn, increase physiological arousal in a synergistic spiral. From her research findings Rodin (1976) argues that expectancies that are confirmed by later experience would help to counteract the physiological arousal. Thus, in contrast to the model of Asso (1978), this theory predicts that expectancy of negative moods premenstrually may actually reduce the experience of negative affect. Further research is needed to

support or disconfirm the predictions of the two psychophysiological models of premenstrual distress that have been briefly described.

A number of theories that have been proposed regarding the etiology of menstrual cycle changes may be categorized as physiological theories. These theories postulate a pathophysiologic mechanism as being involved in the etiology of premenstrual tension. In general, cyclic fluctuations of estrogen and/or progesterone are linked to affective changes either by a direct action of these hormones within certain centers of the CNS (such as the limbic system or hypothalamus), or by an indirect mechanism. Indirect action theories suggest that the alterations in levels of estrogen and/or progesterone affect levels of CNS neurotransmitters or related enzymes which, in turn, cause the menstrual-related symptoms. Various hypotheses that have been proposed with respect to premenstrual tension represent extensions of the indirect action theories. The major hypotheses to be examined are the monoamine oxidase (MAO) hypothesis, the renin-angiotensin aldosterone hypothesis, the prolactin hypothesis, and the hypothesis of a vitamin B6 deficiency. Following a brief discussion of other hypotheses, and the major indirect action hypotheses, a survey of the evidence related to the direct action theory of premenstrual tension will be presented.

A wide variety of etiologies of menstrual cycle changes have been suggested, including nutritional deficiencies (Abraham, 1980), alterations in prostoglandins (Horrobin, 1979), fluctuations of androgens (Bancroft et al., 1983), subclinical hypoglycemia (Morton, 1950), changes in central monoamines (Rausch & Janowsky, 1982), and

premenstrual changes in levels of endorphins (Giannini et al., 1984; Halbreich & Endicott, 1981; Reid & Yen, 1981, 1983). Most theories were derived from the known behavioral effects of these substances, alterations in their activity or amount over menstrual cycle phase, or their role in mediating an interaction between gonadal steroids and biological substances with relevant behavioral effects (Rubinow & Byrne, 1984). For reviews of the numerous etiologies the reader is referred to articles by Rausch and Janowsky (1982) and Reid and Yen (1981, 1983).

MAO is an enzyme which metabolizes and inactivates catecholamines. The MAO hypothesis is closely related to those theories emphasizing the role of brain catecholamines and related enzymes as the physiological basis of affective disorders, such as depression (Baldessarini, 1975; Schildkraut, 1965). According to such theories, high levels of MAO would be associated with low catecholamine activity and this is believed to have a depressant effect. Indeed, MAO inhibitors are believed to be effective as a treatment to relieve depression.

Briefly, the MAO hypothesis postulates that the gonadal hormones affect levels of MAO. The levels, in turn, affect catecholamine mediated neural activity in the brain and so lead to psychological states of depression and irritability (Grant & Pryse-Davies, 1968; Klaiber et al., 1971).

Indirect evidence has been offered to support the MAO hypothesis. Such evidence includes reports of a late luteal phase rise in MAO activity in the endometrium (Grant & Pryse-Davies, 1968), or a rise in plasma MAO levels in the luteal phase (Klaiber et al., 1971). An

association between the highest probability of depression, elevated endometrial MAO activity and a highly progestogenic oral contraceptive, as opposed to a highly estrogenic preparation, led to the proposal that progesterone stimulated MAO metabolism changes which played a role in the occurrence of depression (Grant & Pryse-Davies, 1968).

In contrast to plasma levels, low platelet MAO levels have been reported in premenstrual monkeys (Redmond et al., 1975), and women, where peak MAO activity was noted during the mid-cycle phase (Belmaker et al., 1974). Furthermore, a relationship between a global scale of menstrual mood variation and measures of platelet MAO activity could not be demonstrated (Belmaker et al., 1974).

Various authors have pointed to a large number of assumptions required by the MAO hypothesis that remain to be validated (Cullberg, 1972; Parlee, 1973; Ruble et al., 1980). For example, the assumption that peripheral measures of MAO activity (e.g., blood plasma, endometrial MAO, platelet MAO) reflect CNS levels has not been directly verified. An additional difficulty concerns the manner in which steroid hormones affect MAO levels. Only indirect evidence is currently available showing that the sex hormones may affect MAO activity or the metabolism of catecholamines (Youdin et al., 1974). Cullberg (1972) points out that a further problem may be encountered with the MAO hypothesis when considering the assumption that mental symptoms, such as those reported with oral contraceptives, are actually typical of the endogenous depressive syndrome.

In summary, a considerable number of reviews of the MAO hypothesis have regarded this hypothesis as far from established due to untested assumptions, inconsistent findings and methodological difficulties (Parlee, 1973; Ruble et al., 1980; Steiner & Carroll, 1977).

Janowsky et al. (1973) have argued that activation of the renin-angiotensin aldosterone system may be responsible for premenstrual tension. This hypothesis is related to studies documenting increased urinary excretion of aldosterone during the luteal as opposed to the follicular phase in normal females during the menstrual cycle (Reich, 1962). Similar changes have been reported in the secretion rate of aldosterone (Gray et al., 1968) and in plasma aldosterone levels (Schwartz & Abraham, 1975).

The luteal phase rise in aldosterone secretion is believed to be the result of increased activity of the renin-angiotensin system. Sundsfjord and Aakvaag (1970) observed plasma angiotensin II levels during the luteal phase to be about twice that of the follicular phase. They suggested that an increase in progesterone secretion leads to sodium loss through the kidneys which in turn leads to an increase in the secretion of renin and angiotensin. The rise in angiotensin would then lead to an increased aldosterone secretion. This postulated sequence of events was subsequently supported by observations of plasma renin activity and aldosterone levels (Katz & Romfh, 1972; Michelakis et al., 1975). Support for the hypothetical role of progesterone is added by the findings that no changes in plasma renin activity or plasma aldosterone levels are observed during anovulatory cycles when

progesterone and pregnanediol secretion did not rise during the luteal phase (Michelakis et al., 1975; Sundsfjord & Aakvaag, 1970).

Janowsky et al. (1973) related activation of the renin-angiotensin aldosterone system to premenstrual disturbances by their findings of luteal phase increases in negative affect, urinary sodium and potassium excretion and body weight in college women. These authors speculated that since angiotensin has been shown to exert effects on behaviour and central neurotransmitters in animals, angiotensin may be the agent responsible for premenstrual negative affect. As pointed out by Steiner and Carroll (1977), this study encounters some difficulty with respect to the global measure of 'negative affect'. The global measure may include a number of symptoms not necessarily belonging to the same category. Furthermore, the measure of urinary sodium/potassium ratio provides only indirect evidence of presumably increased aldosterone secretion.

A number of additional lines of evidence serve to cast doubt on the validity of Janowsky's argument with particular reference to the renin-angiotensin-aldosterone hypothesis. For example, some studies have found plasma aldosterone levels in patients suffering from premenstrual tension to be no different from control values (Munday et al., 1977; Munday et al., 1981). The temporal activity of plasma aldosterone which shows a rapid drop six or seven days prior to menstruation (Katz & Romfh, 1972; Michelakis et al., 1975), does not correspond to the argument of Janowsky et al. (1973) that angiotensin is responsible for late luteal negative affect and fluid retention (Steiner & Carroll,

1977). Several studies indicate that premenstrual tension can occur in menstrual cycles which are anovulatory (Adamopoulos et al., 1972; Andersch et al., 1979; Benedek-Jaszmann & Hearn-Sturtevant, 1976), and as already mentioned, changes in the renin-angiotensin-aldosterone system do not occur in anovulatory cycles. The contention that angiotensin is responsible for premenstrual negative affect is thus rendered less likely. In conclusion, the hypothesis that changes in the renin-angiotensin-aldosterone system play a significant role in the occurrence of premenstrual tension has not been consistently nor convincingly supported.

Horrobin (1974) was the first to suggest that the hormone prolactin could play an important role in the etiology of the premenstrual syndrome as prolactin has major actions on the gonads and on fluid and electrolyte balance. Friesen et al. (1972) and Vekemans et al. (1977) found prolactin to be increased premenstrually in some women. Subsequently, Halbreich et al. (1976), noting that prolactin causes water, sodium and potassium retention, compared subjects with premenstrual symptoms to asymptomatic women. Prolactin levels were reported to be significantly higher throughout the menstrual cycle in the symptomatic women as compared to their control group.

Other researchers (Brush, 1979; Munday, 1977) found prolactin levels to be higher in premenstrual sufferers with concomitant low progesterone levels, or found plasma prolactin levels to be higher in the luteal than the follicular phase in the premenstrual tension subjects (Andersch et al., 1979). Conflicting results were reported by

Andersen et al. (1977) who did not detect differences in prolactin levels over the menstrual cycle in women with premenstrual tension.

Recently, Backstrom and Aakvaag (1981), and O'brien and Symonds (1982) found no difference between luteal phase prolactin levels in premenstrual syndrome subjects versus controls. Steiner et al. (1984a) found no difference in the circadian hormonal secretory profiles of serum prolactin in two women suffering premenstrual tension syndrome versus two asymptomatic controls. Furthermore, Steiner et al. (1984b) found no evidence of abnormal prolactin levels in 37 women suffering from premenstrual tension syndrome. According to Abplanalp (1983a) the original enthusiasm of advocates of the prolactin hypothesis such as Carroll and Steiner (1978), regarding the potential role of prolactin in premenstrual symptomatology, has considerably dampened.

It was initially suggested by the Biskinds (1942, 1943) that a vitamin B complex deficiency may be related to premenstrual symptomatology. It is now known that vitamin B6 (pyridoxine) plays a role in the regulation of brain monoamine production, as pyridoxine in the form of pyridoxal phosphate acts as a coenzyme in tryptophan metabolism and in the synthesis of dopamine. It is therefore likely that a lack of pyridoxine would reduce both dopamine synthesis and the synthesis of serotonin from tryptophan. Since an incorrect balance of these brain monoamines has been implicated in a variety of mood and behaviour disorders such as depression (Lapin & Oxenkrug, 1969; Winston,

1969), a functional deficiency of pyridoxine could be the basis for premenstrual depression (Rose, 1969).

Pyridoxine has been successfully used in the treatment of depression in oral contraceptive users (Adams et al., 1973; Baumbblatt & Winston, 1970; Winston, 1969). Based on literature concerning interactions of pyridoxine and steroid hormones, it has been speculated that the depressed affect in oral contraceptive users and women with premenstrual dysphoria is related to an estrogen-induced deficiency of pyridoxal phosphate (Rose, 1978). Such a deficiency would then be proposed to lead to a reduced biosynthesis of serotonin from tryptophan.

Another possible mechanism of action of pyridoxine in premenstrual dysphoria is related to the postulate that increased prolactin secretion plays a role in this disorder (Carroll & Steiner, 1978). There is evidence that the administration of pyridoxine, such as in the treatment of depression in oral contraceptive users, would serve to suppress prolactin secretion presumably by augmenting dopamine biosynthesis (Delitala et al., 1976; McIntosh, 1976). Other studies, however, have failed to demonstrate that pyridoxine administration leads to a significant and consistent dopaminergic effect (Canales et al., 1976; Busami et al., 1978; Toliš et al., 1977).

In summary, it is possible that a pyridoxine deficiency is involved in premenstrual dysphoria. However, the exact mechanism(s) of the action of pyridoxine in this disorder awaits confirmation. It must further be demonstrated that a cyclic vitamin deficiency exists in patients demonstrating premenstrual dysphoria. The relationship between

hormonal metabolism and pyridoxine also awaits clarification before the hypothesis of a vitamin deficiency in relation to premenstrual dysphoria may be fully substantiated.

Many theories of hormonal etiology of the premenstrual syndrome have focused upon changes in ovarian estrogen or progesterone secretion. Various investigators have hypothesized that the syndrome is caused by an excess or deficiency of one hormone or the other, an imbalance of the two hormones, or a withdrawal reaction to either of these hormones (Smith, 1975). The literature concerning steroid hormone changes in the premenstrual syndrome remains controversial, partly due to a lack of uniformity in describing the category of premenstrual symptomatology investigated.

The pattern of hormonal change most consistently advanced as a cause of premenstrual symptoms is that of either elevated estrogen levels or an increased ratio of estrogen to progesterone. A number of early papers lent support to this contention (Frank, 1931; Israel, 1938; Morton, 1950; Widholm et al., 1967).

Despite speculation based on early studies, the preponderance of later evidence did not indicate a clear relationship between ovarian hormone changes and the premenstrual syndrome. Studies on the levels of estrogen and/or progesterone in subjects described as having the premenstrual syndrome have provided a myriad of inconsistent and contradictory results. Some researchers have concluded that abnormalities in the endocrine parameters investigated were not a feature of the premenstrual tension condition (Adamopoulos et al., 1972;

Taylor, 1979a). Others have reported lower progesterone levels during the midluteal phase (about days 8-5 before menstruation) in premenstrual tension sufferers (Munday, 1977; Munday et al., 1981) as well as higher premenstrual oestradiol levels (Munday et al., 1981) as compared to controls. O'Brien et al. (1980) found women demonstrating the premenstrual syndrome to have a higher progesterone concentration than controls during the post ovulatory phase of the cycle but not during any other phase. In contrast, a recent study by Dennerstein et al. (1984) found significantly lower pregnanediol values during the follicular and luteal phases in women with complaints of premenstrual tension as compared to a matched control group. Backstrom et al. (1983) found no differences in progesterone or estradiol levels in women with high premenstrual mood change versus women with low mood change.

It is difficult to account for the inconsistent results of investigators in this field, but the criteria by which patients are selected may be an important factor. Moos (1969) emphasized that within the larger group of women reporting premenstrual symptoms, there exists subgroups of women with various constellations of symptoms. It is possible that different symptom subgroups may be related to different psychophysiological mechanisms. The use of a total symptom rating of a broad range of symptomatology would serve to group women with different conditions. It would thereby obscure any real differences in steroid hormone changes over the course of the menstrual cycle. Indeed, in investigations of estrogen and progesterone levels, the symptomatology of the group labelled as having the premenstrual syndrome is very

difficult to compare across studies. Assessments of premenstrual symptomatology ranges from vague descriptions (Adamopoulos et al., 1972) to ratings on a daily symptom rating scale (DSRS) (Taylor, 1979c), or a premenstrual mood index (O'Brien et al., 1980) and often included a wide variety of affective and somatic complaints. From a review of the literature, Carroll and Steiner (1978) point out that the confusion and disagreement in studies investigating hormonal levels may be attributed to this lack of uniformity as to what type of premenstrual symptoms are being described. They propose that two major types of premenstrual dysphoria (i.e., premenstrual depression and premenstrual anxiety-irritability) are separate conditions. Although they acknowledge that these two conditions could coexist in some women, they indicate that studies including a clear differentiation between the two groups lead to a more consistent picture of hormonal patterns.

A number of researchers have investigated the possibility that certain affective symptoms may be related to altered premenstrual steroid hormone levels. In these studies, subjects were designated as having the specific premenstrual dysphoric symptoms of either depression or anxiety. The premenstrual symptomatology to be considered was, therefore, more narrowly defined in these studies as an affective type, as opposed to those using the criteria of the more general 'premenstrual syndrome'. Evidence from studies investigating hormonal levels in women with premenstrual anxiety appears to provide some support to the hypothesis that the relative balance of estrogen to progesterone is indicative of this type of symptomatology. Although premenstrual anxiety

seems to be associated with an increase in the estrogen to progesterone ratio, the findings with respect to premenstrual depression remain more equivocal.

Several studies have focused upon ovarian hormone levels in a group of women suffering mainly from premenstrual depression as opposed to those demonstrating anxiety, irritability or edema. No general pattern of changes can be detected from this literature to date, however, the possibility that an altered estrogen to progesterone ratio may be associated with premenstrual depression has not been excluded. Backstrom and Mattson (1975) found that depression ratings in women suffering from premenstrual tension were significantly correlated with estrogen levels on day three premenstrually. No significant correlation was reported between progesterone levels and ratings of depression. Other researchers have observed a slight lowering of progesterone levels in the 'depressive' groups during the seven days preceding menses, but no significant differences were found between depressives and controls in estrogen levels or the estrogen to progesterone ratio (Smith, 1975). Unlike the results reported by Smith (1975), Abraham observed lowered estradiol-17B to progesterone ratios in patients with premenstrual depression during days eleven to four premenstrually (Abraham et al., 1978).

It is apparent from the above review of studies investigating the relationship of steroid hormones to premenstrual depression that further carefully controlled research with more precise symptom definition is

necessary to confirm whether any hormonal pattern(s) is related to premenstrual depression.

Backstrom and Carstensen (1974) found women with premenstrual anxiety had a significantly higher estrogen to progesterone ratio than controls on days six to three before menstruation. A further study by Backstrom and Mattson (1975) found that symptom ratings of premenstrual anxiety and irritability were significantly correlated with estrogen levels (days four and three premenstrually). The findings implied that the patients with high anxiety and irritability scores also have high plasma estrogen levels. Even more recently, Backstrom et al. (1976) showed that women suffering from premenstrual anxiety demonstrated elevated estrogen levels (days 5-2 premenstrually) and lower progesterone levels (days 8-4 premenstrually) than controls. Abraham presented evidence similar to that reported by Backstrom and his associates, on estrogen and progesterone levels in women with premenstrual anxiety-irritability (Abraham et al., 1978).

From a review of the available evidence on ovarian hormone levels in subjects with premenstrual anxiety-irritability, it may be concluded that the specific pattern of an increased estrogen to progesterone ratio could accompany premenstrual dysphoric symptoms of anxiety. This elevated ratio appears to be the result of increased estrogen levels alone, or in conjunction with lowered progesterone concentrations. This conclusion, however, awaits confirmation using a more precise definition and discrimination of premenstrual mood changes.

The reason for an altered ovarian steroid pattern such as the one that may be associated with premenstrual anxiety remains obscure. Backstrom et al. (1976) observed elevated FSH levels in their premenstrual group during the early luteal phase. They suggested that low ovarian steroid levels early in the luteal phase in their premenstrual anxiety group may have caused the increased FSH secretion. Elevated FSH levels would stimulate proliferation of a second set of follicles, which in turn would lead to a rise in estrogen in the late luteal phase, however, no progesterone would be produced in the follicles. According to this postulate, the follicles would then regress due to inhibition of FSH secretion that occurs at increasing estrogen levels. Other researchers have speculated that lowered progesterone secretion in the luteal phase may be due to an imbalance between prolactin, FSH, and LH levels at the time of ovulation resulting in an adverse effect on steroidogenesis by the corpus luteum (Brush, 1977; Munday et al., 1981). Evidence that prolactin reduces progesterone production by corpus luteum cells has been described in in vitro experiments by McNatty et al. (1974).

Other mechanisms have been proposed to account for increased estrogen levels, such as those which may be associated with premenstrual anxiety. Frank (1931) postulated that the excess estrogen is due to a decreased renal clearance of estrogen and Biskind (1943) proposed a decreased liver metabolism of estrogen as a result of vitamin B complex deficiencies.

Evidence described earlier has indicated that raised levels of estrogen are associated with premenstrual anxiety-irritability. Several mechanisms by which ovarian hormones might exert an effect on mood in the premenstrual disorders have been proposed. One explanation for estrogen-related mood changes takes into account the possibility of a direct or indirect effect of estrogen upon central nervous system structures such as the limbic system. Woolley and Timiras (1962) have shown, in rats, that estrogen decreases the electroshock seizure threshold and that progesterone counteracts the effects to a certain extent. It was also shown by Timiras (1971) that in rats, the microelectroshock seizure threshold in the hippocampus is decreased by estradiol. Furthermore, the rate of stimulation of animals with electrodes implanted in hypothalamic self-stimulation areas can be reduced by estrogen injections into those areas and increased by progesterone (Campbell, 1968). Estrogen also appears to accumulate in the limbic system (Zigmond & McEwen, 1970).

Furthermore, estrogens appear to be capable of modulating the functional amounts of neurotransmitters such as the catecholamines and modifying MAO activity. For example, estradiol has been shown to be capable of blocking the action of noradrenaline on pinealocytes (Marks et al., 1972). The work of Stumpf (1971) suggests that noradrenaline and estradiol may occupy the same binding sites in the hypothalamus. Estradiol has been found to decrease MAO and choline acetylase activity in certain areas of the hypothalamus (Kobayashi et al., 1966). The foregoing evidence suggests that it is not improbable that steroid

hormones play a role in premenstrual mood alterations through effects upon the central nervous system.

It is interesting that a hormonal profile of an elevated estrogen to progesterone ratio may accompany symptoms of premenstrual anxiety-irritability. The hormonal profile could, in fact, indicate biological differences between women who suffer from premenstrual anxiety and those who do not. However, the demonstration of an association between sex steroid profiles and a certain affective symptom during the premenstrual phase is not proof of a cause-and-effect relationship. The timing of hormonal changes occurring earlier in the cycle could predispose certain individuals to respond to the biochemical changes taking place premenstrually with psychological symptoms.

It is important to note that any theory attending only to an increased estrogen to progesterone ratio as the indicator or cause of a certain negative affect premenstrually encounters a major difficulty. This difficulty is the fact that during the first half of the menstrual cycle there are high levels of circulating estrogen and very little progesterone. In view of the fact that mood disturbance are not generally associated with the first half of the cycle, it is unlikely that a simple relationship of mood to an imbalance in the ratio of estrogen to progesterone is in operation. The existence of some other factor may be postulated, that serves to render this hormonal imbalance irrelevant at all times with the exception of the luteal phase of the cycle. In effect, a multifactorial theory that takes into account hormone interactions may be necessary in order to elucidate the

relationship between a particular hormonal profile and the premenstrual mood disturbance.

In conclusion, no consistent data supports any single proposed etiology of the premenstrual syndrome (Rubinow & Byrne, 1984). It seems that no detectable and consistent hormonal abnormality has been found to differentiate premenstrual symptom sufferers from those with no symptoms (Clare, 1985). Halbreich and Endicott (1982b) urge that researchers adopt a multivariate imbalance hypothesis of the pathophysiology of premenstrual changes. Women with different subtypes of premenstrual changes would be identified and repeated measurement of the dynamic multiple balance of biological variables would be conducted. These authors hypothesize that various carefully specified subtypes of premenstrual changes may be associated with different and only partially overlapping biological mechanisms.

General Methodological Issues

Methodological problems have rendered difficult the extent to which one can interpret and generalize the results of much of the research on premenstrual symptomatology. One major problem has been the previously mentioned lack of a consensus on the definition of premenstrual syndrome (Halbreich & Endicott, 1985a). This lack of a commonly agreed upon definition has led to the creation of numerous terms to denote the timing of symptoms. 'Premenstrual' has been used to refer to a variable number of days including its definition as the last six days of the luteal phase plus the first two days of menstruation

(Kramp, 1968). 'Premenstrual' has also referred to symptoms occurring only during the premenstruum or symptoms which may be present throughout the cycle but accentuated premenstrually. The issue of the nature of the baseline against which premenstrual symptoms should be measured is unresolved. Some researchers, however, have suggested a focus on the degree of 'change' in symptoms rather than the intensity of symptom 'occurrence' (Gannon, 1981; Halbreich & Endicott, 1985a).

The term 'paramenstruum' was defined by Dalton (1964) as referring to the four days prior to and the four days following the onset of menstruation and this definition is still in use (Dalton, 1977, 1984). Taylor (1979c) used the term 'perimenstrual' to refer to symptoms occurring 'about' the time menstruation commences. Some researchers state that premenstrual symptoms must, by definition, vanish with the onset of menses (Dalton, 1982; Halbreich & Kas, 1977; Steiner et al., 1980a; Sutherland & Stewart, 1965). The terminology related to the symptoms is confusing, unfortunately seems to be proliferating, and it also renders cross-study comparisons almost impossible.

No commonly agreed upon definition of menstrual cycle phases have been used in the research (Abplanalp, 1983b; Rossi & Rossi, 1980). This variability in the number of cycle days as representative of a cycle phase leads to further confusion and incomparability of results. Phase definition has varied from a broad categorization of menstrual and intermenstrual to adopting a five phase definition (i.e., menstrual, follicular, ovulatory, luteal, premenstrual) (Rossi & Rossi, 1980). One review of studies examining premenstrual arousal found 'premenstrual' to

be variably defined, ranging from day 15 to day 28 and phase intervals varied from two weeks to one day (Asso, 1978). Many studies use the day of onset of menses as the cycle marker, but women do not demonstrate invariable cycle lengths and hormonal events cannot be presumed to proceed in an invariant pattern for every cycle (Dennerstein & Abraham, 1982). When not directly addressing hormonal events, which cannot be deduced from the onset of menses, menstruation onset is an easily recognized and reported marker.

Strictly defined, the premenstrual phase should be characterized by biological markers such as the measurement of declining estradiol and progesterone levels. Measurements of basal (morning) temperature have also been used to determine the beginning of the luteal phase, with menses expected fourteen days after the determined day of ovulation. The accuracy of basal temperature ratings to predict ovulation has been seriously questioned (Halbreich & Endicott, 1985a; Lenton et al., 1977) and the frequent determination of plasma hormone levels is probably not acceptable to many normal ambulatory volunteers (Halbreich & Endicott, 1985a).

Different techniques have been used to organize data from cycles of different lengths. Some authors simplify the matter by selecting only parts of the cycle for measurement such as three days in each phase of interest. This method yields the least data, and is subject to the failings of a minimal sampling technique. Other researchers only include women with cycle lengths of less than 28 days, however, this seems to overly bias the sample. Daily recording of symptoms, or a modified daily

recording (e.g., measuring daily from a part of the follicular phase, and then daily from day 19 or 20 until onset of menses) results in the necessity of a method to deal with cycles of different lengths (Abplanalp, 1983b).

One method to manage unequal cycle lengths is to assume an arbitrary length of cycle such as 28 days and squeeze longer cycles together while proportionally lengthening shorter cycles (Moos et al., 1969). Another technique is to assign cycle phase by counting backwards from the onset of menses (reverse cycle day). This method of standardization of cycle length assumes the often noted contention that irregularities in length occur before ovulation and the time between ovulation and onset of menses is relatively constant (Dennerstein & Abraham, 1982). The reverse cycle day method allows one to include luteal phase measures according to individual subject cycle length patterns.

Additional methodological problems are introduced by the method of selection and description of subjects (Rubinow & Byrne, 1984). Studies have used a variety of populations which included subjects who have attended premenstrual tension clinics (Freeman et al., 1985; Sanders et al., 1983), infertility clinic population (Slade, 1981), patients of general practitioners (Clare, 1983), college populations (Swandby, 1980), 'normal' women who are symptomatic and not seeking treatment (Sanders et al., 1983), and 'normal' women (Little & Zahn, 1974; Taylor, 1979c). Some authors exclude all women with a history of psychiatric disorder (Haskett & Abplanalp, 1983). The heterogeneity of

the subject groups makes cross-study comparisons difficult, however the need to study different samples of women is acknowledged. Unfortunately, in many studies subjects are inadequately described and in addition to age, many variables such as occupation, marital status, use of oral contraceptives or other medication are not included.

When there is a need for subjects with severe premenstrual changes for studies such as those evaluating treatments, women seeking treatment are a suitable subject group. To study a wide range of severity and phenomenology, Halbreich and Endicott (1985a) recommend the use of entire specific groups such as members of clubs or classes of students.

Another major methodological problem in research on the menstrual cycle is that inadequate attention has been given to controlling the demand characteristics of the research (Wilcoxon et al., 1976). In general, subjects have been aware that the experimenter was studying the menstrual cycle. The effect of subject expectancies on symptom reporting was illustrated by Ruble (1977). Women showed increased reporting of premenstrual symptoms when deceived into believing they were about to begin menstruating. As Bancroft and Backstrom (1985) point out, the significance of this finding was lessened by the fact that women with severe premenstrual symptoms were not included in the study. It was also not shown that symptom reporting could be lessened or avoided by deceiving premenstrual women into believing they were not about to menstruate. Furthermore, findings that in a double-blind study premenstrual symptoms can continue in the absence of the uterus (Backstrom et al., 1981), imply that expectation of menstruation cannot

sufficiently explain premenstrual symptomatology. The findings of Beumont et al. (1975), where cyclic mood changes were not detected after hysterectomy, seem to provide contrary evidence to the results of Backstrom et al. (1981). In the subjects of Beumont et al., (1975), however, it was not established that their subjects suffered cyclic mood changes prior to their operation.

The methodological difficulty posed by the effect of demand characteristics may be dealt with by obtaining menstrual data in retrospect. However, evidence has been obtained suggesting that retrospective questionnaires may elicit stereotypic responses (Parlee, 1974). Given that menstrual cycle research is an enterprise concerned solely with a female phenomenon, and the abundance of stereotypic notions and implications regarding sexual differences, experimenter bias may also pose a problem in this type of research. Abplanalp (1983b) considers the potential effects of demand characteristics on premenstrual symptom research. It was concluded that it is overly simplistic to rectify this problem by disguising the focus of studies in the future. This conclusion is based on the fact that the minority of women have severe premenstrual symptoms and these women must be identified and studied. Yet the time and expense of disguised-purpose prospective studies to find an adequate sample of these women would be prohibitive. Furthermore, some recent research evidence indicates that the more severe the premenstrual changes described, the more likely they are to be confirmed by daily ratings (Halbreich et al., 1983; Halbreich et al., 1982b). Evidence also indicates that for premenstrually

symptomatic women, the influence of extraneous factors such as cultural beliefs was minimal (Abplanalp, 1983b).

An additional major problem that has plagued research on the menstrual cycle is the diversity of assessment techniques. Idiosyncratic methods of defining and rating symptoms have led to difficulties in comparing results across studies (Halbreich & Endicott, 1985a; Wilcoxon et al., 1976). The various methods of assessment that have been used with regard to investigating affective variation over the menstrual cycle will be examined in detail in a later section.

Affective Variation During the Menstrual Cycle

The question of whether affective fluctuations are associated with phases of the menstrual cycle has led to a considerable amount of research and speculation. The study of such episodic recurrences of psychological changes is potentially important as a clinical problem of phenomenological significance to many women. It is also a valid topic of research as a potential illustration of a complex interaction of physiological and psychological factors.

The premenstrual occurrence of various negative emotions (described as irritability, hostility, anxiety, depression, restlessness, sadness, fatigue, tearfulness, tension, insecurity, etc.) has been the frequent assertion of numerous reports. Little differentiation is made between the negative affects in the majority of studies. The incidence estimates of significant premenstrual dysphoria range from as low as 6% to as high as 95% (Golub, 1976b; May, 1976;

Steiner & Carroll, 1977). They reflect the methodological confusion and imprecision, as well as our underlying difficulty in understanding the various symptom profiles of premenstrual dysphoria. The samples have varied greatly in terms of age, parity, and other demographic characteristics.

Coppen and Kessel (1963) found moderate to severe premenstrual mood changes on up to 25% of their sample of women. Sutherland and Stewart (1965) reported finding an increase in premenstrual negative affect in up to 63% of their subjects. Irritability was reported by 60%, depression by 63%, and both irritability and depression by 45%. Moos (1968a) approximated the prevalence of mild-moderate negative affect to be 25-39% and strong-severe dysphoria to be 3-13%.

Andersch and Bahn (1981) found moderate and severe premenstrual irritability in 30% of a randomly selected group of women. Moderate and severe premenstrual sadness (10%), anxiety (8%), and mild premenstrual irritability (41%), sadness (27%), and anxiety (28%) were also reported. Smith (1976) reports that from 30-60% of women note a major mood change premenstrually.

Weideger's (1977) survey found 24% of the American women reported only premenstrual physical symptoms, 18% reported mood changes, while 46% reported a mixture of physical and emotional complaints. The epidemiological study of Van Keep and Leher (1981) found irritability and moodiness was experienced by 37% of the sample, while in 9% it was reported as very severe. Tearfulness or depression was experienced by 18% of the sample and reported very severe by 5%.

Woods et al., (1982) found premenstrual reporting of anxiety, irritability, depression and tension to be 27%, 44%, 30% and 34% respectively. Premenstrual irritability was rated as severe by 12% of their sample. Premenstrual symptom prevalence studies of mainly university students have reported rates for irritability (70%, 33%), depression (43%, 31%) and tension (12%) (Sheldrake & Cormack, 1976; Timonen & Procope, 1971).

As Smith (1975) points out, mood fluctuations are a phenomenon which may be observed only indirectly. Major approaches to the measurement of affective changes during the menstrual cycle have thus, been the use of thematic analysis of unstructured verbal material, retrospective questionnaires and self-report checklists and rating scales. The results of studies using the above mentioned instruments will be summarized and methodological considerations will be discussed. A summary table of the results of these studies may be found in Appendix 1.

As the majority of studies that have investigated affective changes have reported at least small cyclical effects, the general conclusion that cyclic mood variations do occur is a persuasive one (Dennerstein & Burrows, 1979). However, it must also be noted that cyclic variations in mood show a great deal of individual variation. Furthermore, comparison across studies is rendered difficult due to a lack of methodological consistency.

Benedek and Rubenstein (1939, 1942) published the first study which examined the relationship between menstrual cycle phases and

moods. They correlated verbal therapeutic material of 15 patients with menstrual cycle phase. These authors associated psychodynamic tendencies such as the tendency to an active heterosexual drive with the hormone estrogen, and passive-receptive tendencies were associated with progesterone. Since this classic study which documented mood changes in a sample of patients, mood shifts and the menstrual cycle have been examined in non-clinical populations.

Gottschalk et al. (1962) used psychoanalytic theory to devise a quantitative system for scoring verbal free-association material along the dimensions of two broad categories of affects; hostility (directed outward and inward) and anxiety-fear. Using this content analysis technique (Gottschalk Free-Association Test (FAT)), affective changes in a group of five women were studied over the course of the menstrual cycle. Although four of the five women showed significant rhythmical changes in the magnitude of at least one of the affects, consistent cyclic fluctuations were not found (results attributed to the small size of the sample).

Later studies which utilized the Gottschalk FAT were able to document significant cyclic affective fluctuations over the course of the menstrual cycle in larger groups of normal women (Ivey & Bardwick, 1968; Paige, 1971; Silbergeld et al., 1971). Premenstrual anxiety scores were found to be higher than those at ovulation (Ivey & Bardwick, 1968; Paige, 1971; Silbergeld et al., 1971) and higher premenstrual hostility levels were also reported (Paige, 1971; Silbergeld et al., 1971). Studies in which the Gottschalk FAT was used have detected changes in

negative affect over the course of the menstrual cycle. This is the case apart from an initial investigation on a small number of subjects (Gottschalk et al., 1962) and a recent study of phobic patients (Villa & Beech, 1980), most of whom were taking potentially mood altering medication,

The evidence presented with respect to the Gottschalk technique must be considered in light of the fact that the psychoanalytic theoretical basis of the FAT scoring system has yet to be confirmed empirically. Furthermore, the unstructured task situation provides rather indirect and compounded indices of negative moods. This is true insofar as Silbergeld et al. (1971) considers the Gottschalk results as reflecting an analysis of affect on the basis of preconscious, unconscious and conscious thought content. It is, therefore, not entirely clear what is being measured or whether this technique is a better key to true feelings than self-report data. According to Sherif (1980) an ambiguous task such as the Gottschalk technique requires that the subject herself structure it. It remains possible that women impose a structure according to learned social attitudes about the menstrual cycle, particularly when the subject knows the research is concerned with the menstrual cycle.

Another type of methodology that has been used to investigate mood changes during the menstrual cycle is based upon the use of retrospective questionnaires. These questionnaires ask women to report their memory of various moods at different stages of the cycle. Studies using retrospective data tend to find that reports of negative affective

states (such as irritability, depression and tension), are associated with the premenstrual and/or menstrual phases of the cycle (Coppen & Kessel, 1963; Englander-Golden et al., 1978; Moos, 1968a; Schuckitt et al., 1975; Villa & Beech, 1980).

Despite the consistent results associated with retrospective reports of mood changes, major criticisms have been directed at this type of methodology for the measurement of menstrual symptomatology (Bardwick, 1976). The retrospective report is subject to various kinds of biases, such as the fallibility of memory. One obvious bias is that responses may reflect cultural beliefs concerning what women are supposed to experience during the cycle (Bardwick, 1976). Such stereotypic reporting is thought to be particularly probable when subjects are aware that the study is concerned with menstrual-related changes. General beliefs that women normally experience a variety of premenstrual symptoms may thus, result in exaggerated retrospective reporting (Ruble et al., 1980).

The majority of studies investigating affective changes by the use of non-retrospective self-report checklists or rating scales have found evidence of cyclic fluctuations in relation to the menstrual cycle. Many reports, however, have failed to confirm this hypothesized relationship between mood changes and menstrual cycle phase (Apblanalp et al., 1979a; Englander-Golden et al., 1978; Golub & Harrington, 1981; Lahmeyer et al., 1982; Little & Zahn, 1974; Persky, 1974; Silbergeld et al., 1971; Slade, 1981, 1984; Swandby, 1980; Villa & Beech, 1980; Zimmerman & Parlee, 1973). The evidence pointing to a lack of mood variation in

relation to the menstrual cycle is certainly not sufficient. This is especially true in light of the fact that across study comparison is rendered difficult by many factors. These factors include subject incomparability, the use of varied types of measurement devices, and differences in testing design with respect to number of rating sessions and menstrual cycle phase definition. Prospective studies such as the ones just cited suffer from a number of methodological difficulties such as small sample size ($n = 8-21$) (Lahmeyer et al., 1982; Little & Zahn, 1974; Persky, 1974; Silbergeld et al., 1971; Slade, 1981; Swandby, 1980; Zimmerman & Parlee, 1973), a small number of rating sessions or a one time self-report (Golub-Harrington, 1981; Persky, 1974; Villa & Beech, 1980), or a subject response rate of less than 50% (Slade, 1984).

The most frequent assertion in the literature of self-reported affective changes is that fluctuations occur across the menstrual cycle. The results of some of these studies will now be summarized.

The results of Moos et al. (1969) showed anxiety and aggression scores to be higher menstrually and premenstrually than at midcycle, while pleasantness and activation were lowest in the menstrual and premenstrual phases. Their data also suggested a greater variability of symptoms in the menstrual and premenstrual phases than intermenstrually.

A study conducted by May (1976) found 50% of a group of subjects to be most depressed premenstrually, while 40% felt worse during the menstrual phase. May's (1976) notion of a possible menstrual rather than a premenstrual peak of symptoms in some subjects is supported by the results of Beumont et al. (1978) and Wilcoxon et al. (1976). In the

study of Wilcoxon et al. (1976) the results also indicated that the most important determinant of negative mood ratings is individual differences among women. This determinant was followed by stressful events (reports of which are affected by individual and social definitions of the stressor as well as physiological changes), followed by phase of the menstrual cycle.

Golub (1976b) found premenstrual scores of state anxiety and depression to be significantly higher than those obtained at midcycle. The mean state anxiety scores for premenstrual subjects were much lower than that obtained by psychiatric patients and closer to mildly stressed levels. The mean premenstrual depression scores were also much lower than the norms for depressed psychiatric patients.

Rossi and Rossi (1980) found the luteal phase to be characterized by a significant elevation of negative moods and a significant depression of positive moods. While the negative moods of the luteal phase were psychological in character, those of the menstrual phase were found to be somatic in nature.

Sampson and Jenner (1977) studied one cycle in 19 women. They fitted least mean square sine waves to daily MDQ-T data. Nine women showed significant cycles for negative affect and eight peaked premenstrually. They conclude that sine wave fitting may be used to measure menstrual distress and that many 'normal' women do experience premenstrual difficulties. As they point out, however, their statistical method does not necessarily indicate the specific day of maximal symptoms or the number of days for which symptoms are present.

A study by Taylor (1979c) resulted in findings of significantly higher means for negative emotional factors in the premenstrual and the menstrual phases than during the intermenstruum. Using a daily symptom rating scale, Taylor found symptom timing to be 'perimenstrual' in that symptoms increased 3-5 days before menstruation, were maximal the day before or day after commencement of menstruation and subsided again in 3-4 days.

One explanation has been offered concerning any discrepancies that may be found in the literature of cyclic mood changes and the menstrual cycle. It is that those studies showing cyclic affective fluctuations in apparently 'normal' women may have included some women suffering from 'premenstrual tension' in their normal groups (Abraham, 1978). It is, therefore, especially important to examine women with consistent premenstrual symptoms. These women may constitute the group of subjects with significant mood fluctuations and in which endocrinological studies may shed light upon the factors involved in their symptomatology. There are only a few studies available which have examined cyclic mood changes in women who were enrolled in a treatment program for premenstrual syndrome, or who were judged according to predetermined criteria as specifically suffering from premenstrual symptoms. These studies have shown a premenstrual lowering of mood (Reynolds, 1969), or premenstrual anxiety elevation (Halbreich & Kas, 1977), or severe premenstrual symptom levels where emotional symptoms predominated (Freeman et al., 1985).

A study by Haskett et al. (1980) found a significant premenstrual worsening of symptoms, as measured by a variety of standard instruments, in women suffering from severe premenstrual tension. These authors applied stringent subject selection and screening criteria to identify subjects with a 'pure' premenstrual tension syndrome. This selection of a more homogeneous group of subjects indicates a new and promising trend in premenstrual symptom research. Their results, however, that the 'core' affective symptomatology of premenstrual tension is irritability, restlessness, tension, and emotional lability are not easily generalized. Among other requirements, the subjects were required not only to be free from psychiatric disorder but were required to have both physical and psychological premenstrual symptoms. The subjects were also required to have premenstrual dysphoric symptoms for at least six preceding menstrual cycles and marked relief of symptoms at the onset of menses, with symptoms 'only' during the premenstrual period. These strict criteria do not necessarily address the 'core' affective symptoms of the possible group of women suffering only dysphoric and not physical premenstrual symptomatology. Furthermore, 'severe' premenstrual dysphoria may not actually occur regularly over cycles. The 'pure' premenstrual tension syndrome of these authors refers to the presence of symptoms which are absent at other times. A premenstrual syndrome, however, may be a significant premenstrual worsening of affective symptoms which could also occur intermenstrually. Their research did indicate how severely affected their sample was in terms of

symptomatology, by comparison of scores to previously studied populations and normative data.

A more recent study by Haskett and Abplanalp (1983) tested diagnostic criteria for premenstrual tension syndrome in 24 symptomatic volunteers. Daily reports of symptoms were subsequently collected over 1.5 menstrual cycles. Symptom profiles from women meeting the diagnostic and self-report criteria for 'primary recurrent premenstrual tension syndrome' (PMRS) ($n = 8$) were compared with profiles from subjects who failed to meet one or both criteria ($n = 15$). A highly significant menstrual cycle main effect was present for all scales of the Profile of Mood States (POMS) rated daily. Negative mood scores were higher premenstrually. A significant group by phase interaction effect was present for all five negative affect scales of the POMS. Comparing POMS negative mood scale scores to the norms, the premenstrual scores for women meeting criteria ($n = 8$) were lower than the scores obtained from psychiatric patients. Premenstrual scores for women meeting criteria were, however, higher than the premenstrual scores for the asymptomatic volunteers. These authors conclude that the diagnostic criteria and report criteria for PMRS identified a group of women whose daily symptom profiles revealed a severe and time-limited premenstrual disturbance. The selection criteria were very strict as in the study of Haskett et al. (1980).

The selection criteria of Haskett and Abplanalp (1983) illustrate the assumption that there is but one premenstrual syndrome although it may take many forms (Abplanalp, 1983a). This is evident by the fact that

subjects were chosen on the basis of reporting moderate to severe premenstrual physical and/or psychological symptoms (Haskett & Abplanalp, 1983). The implicit assumption is that complaints of somatic or emotional symptoms only, or a combination of the two types are treated as equivalent.

Sanders et al. (1983) investigated a total of 55 women with normal ovulatory cycles. Twenty-two women had attended a premenstrual syndrome clinic (clinic PMS group). The remainder were volunteers of which 21 had a history of premenstrual syndrome (non-clinic PMS group) and 23 had no history of premenstrual syndrome (no PMS group). Most affective items loaded on the 'well-being' component of their principal components analysis. Self-ratings of 'well-being' reached a maximum in the late follicular phase and significantly declined during the luteal half of the cycle. This occurred in clinic and non-clinic PMS groups but not in the no PMS group. These authors had the impression that cyclical variation in general 'well-being' occurs with specific feelings such as depression and irritability, varying in impact from one woman to another. The clinic PMS group of women had the most intense negative experiences. The no PMS group showed a slight but non-significant cycle pattern of 'well-being'. The authors also consider that cyclicity of 'well-being' may be a normal pattern varying in degree, with their three groups representing three parts of the continuum.

In summary, some cautious generalizations regarding affective variation and the menstrual cycle are possible. The prevailing view is that negative affect is related to the premenstrual period (Dennerstein

& Burrows, 1979; Green, 1982). The prospective studies, however, on various samples of women not selected, or grouped on the basis of premenstrual symptomatology are inconsistent in their findings as well as difficult to compare. One explanation that may account for much of the discrepancy is that only a subgroup of women may have increased negative affect premenstrually. Thus, the use of group means in the study of cyclic affective fluctuations over the cycle may account for the failures to find increased premenstrual reporting of negative affect in some prospective studies. Women who suffer from negative mood changes may not be included in the samples or may be obscured by a method which does not allow for examination of individual mood change patterns. That increases in premenstrual dysphoria in a subgroup of women may be obscured by the sampling and methodological techniques employed is supported by findings of a greater variability in affect premenstrually (Moos et al., 1969). Further support is lent to this explanation by evidence that will be discussed in a later section of this review indicating that some women experience positive mood changes premenstrually. Finally, relatively few studies have examined affective changes in women categorized as having premenstrual symptomatology. Even so, the preceding summary of the results of this research leads to the conclusion that a pattern of increased premenstrual dysphoria is consistently being found.

One issue raised by the above discussion and yet unresolved, is based upon the given that a subgroup of women evidence severe premenstrual dysphoric increases and that this may be considered 'rare'

(Abplanalp, 1983a, 1983b). The issue raises the question whether premenstrual dysphoric changes are in any sense ubiquitous in a general sample of relatively homogeneous women. Prospective studies showing cyclic affective fluctuations may have included some severe premenstrual dysphoria sufferers in the sample, or the phenomena of premenstrual dysphoria may lie on a continuum. Premenstrual symptoms such as dysphoria may lie on a continuum (e.g., from mild to severe). It is thus possible that such samples as the 'pure' premenstrual tension syndrome group of Haskett and his coworkers (Haskett & Abplanalp, 1983; Haskett et al., 1980) actually represent a group of premenstrual dysphoric sufferers at the severe end of the continuum. As Abplanalp et al. (1979a) point out, menstrual cycles are experienced by almost all women. It thus may actually be more fruitful to focus on the universality of the phenomenon, in terms of psychological research, than on the fact that some women may be defined as 'patients' (Abplanalp et al., 1979a). Abplanalp et al. (1980) address the issue of a continuum and state that the presence of such is yet unknown.

Any definition of premenstrual affective change(s) that restricts it to phenomena or affective symptoms only appearing premenstrually and not at other periods of the menstrual cycle omits women who evidence premenstrual exacerbation or deterioration of affective states (Halbreich & Endicott, 1985a). Any substantial change from baseline measure during the premenstrual period that is significantly measureable (e.g., from mild or moderate to severe) may be considered evidence of premenstrual 'changes', although the degree of change and measures to be

applied are debatable (Halbreich et al., 1982b; Parlee, 1974; Sampson & Prescott, 1981). There probably is a continuum in the intensity of premenstrual changes (e.g., mild to severe). In light of this and since severe premenstrual changes are probably not that prevalent, the delineation or consideration of intensity of changes when examining premenstrual features in a 'normal' sample is important.

Methodological Issues

Since methodological problems have plagued the study of cyclic variations in affect over the course of the menstrual cycle, it is imperative to recognize such limitations. Attempts are necessary to overcome drawbacks to the accurate and specific differentiation and measurement of premenstrual affect. The phenomenology of affective changes that may occur premenstrually is, as yet, not well understood and the question of severity of such changes has hardly been addressed (Abplanalp, 1983b; Rubinow & Byrne, 1984).

At present, there is no standardized observer rating instrument, or generally accepted way of 'objectively' rating mood changes, which often consist of internally experienced symptoms rather than observable behavioral changes (Rubinow & Byrne, 1984). Thus, one is left with the employment of retrospective questionnaires or prospective self-report measures.

New retrospective report instruments such as the Premenstrual Assessment Form (PAF) are available (Halbreich et al., 1982a). As already discussed, retrospective ratings tend to overestimate the degree of symptomatology, perhaps by eliciting stereotypic beliefs about cyclic

changes. They are not consistently supported by daily ratings (Endicott & Halbreich, 1982; May, 1976; Sampson & Jenner, 1977). This has led to the conclusion that retrospective reports such as the PAF are best used for subject screening. Daily ratings are recommended for identification of premenstrual changes and levels of severity in the selection of homogeneous groups of subjects (Endicott & Halbreich, 1982). Only prospective measures that use an intermenstrual baseline can allow differentiation of symptom occurrence from the exacerbation of symptoms (Rubinow et al., 1984).

Steiner et al., (1980a) have developed new research diagnostic criteria and rating scales for 'primary recurrent premenstrual tension syndrome'. As Endicott et al. (1981) have pointed out, however, specific criteria for differentiating subtypes of dysphoric changes are lacking in these procedures. The use of longitudinal prospective self-reports appears to be the best method available to provide valid and sensitive measures of premenstrual affective changes (Lips, 1978; May, 1976; Rubinow & Byrne, 1984; Sampson & Prescott, 1981).

The self-report method overcomes the major disadvantage of the retrospective report in that it does not chiefly rely upon memory and is therefore generally assumed to be more valid (Abplanalp et al., 1980). Self-report responses may still be reflective of cultural beliefs if subjects are aware that the menstrual cycle is being studied. Some investigations that have employed the self-report method have attempted to disguise the purpose of the study (Englander-Golden et al., 1978; Golub, 1976b; Villa & Beech, 1980; Wilcoxon et al., 1976). Even when the

subject is not aware of the nature of the study, she may be aware of her own cycle phase and her perceptions of the symptom phase connection may affect her self-report responses (Ruble et al., 1980). In any case, discrediting self-report data on the grounds that it may reflect cultural stereotypes may leave researchers with the unanswerable question of whether women report what they actually feel. Rejecting self-report data may leave us in the hopeless search for a perfectly valid method to measure their experiences (Sherif, 1980). It appears that despite the possibility of stereotypic reporting, the self-report method is considered superior to both the retrospective and thematic analysis approaches, when the menstrual cycle is under investigation (Lips, 1978; May, 1976).

One major difficulty that has been encountered with the measurement of menstrual symptomatology is the frequent failure in obtaining cross-measure consistency (Parlee, 1973; Ruble et al., 1980). For example, daily self-reports of affective fluctuations are often unrelated to retrospective reports (Englander-Golden et al., 1978; Golub, 1976a; May, 1976; Rouse, 1978; Villa & Beech, 1980). The discrepancy between retrospective and prospective accounts has been extensively documented in studies demonstrating that retrospective results are not consistently supported by daily ratings, and suggest that the research based on retrospective data collection is of questionable validity (Abplanalp et al., 1979a; Aubuchon & Calhoun, 1985; Parlee, 1974, 1982). These discrepancies may reflect the greater amount of stereotypic responses associated with retrospective

questionnaires and/or difficulties in accuracy of memory. Endicott and Halbreich (1982) and Halbreich and Endicott (1983) concluded that women tend to describe their 'worst case' on initial retrospective ratings. It does appear, however, that consistency of results may be found within a specific type of assessment method such as self-reports (Silbergeld et al., 1971).

One of the major methodological problems in the study of cyclical variations in affect over the course of the menstrual cycle has been the use of various types of instruments in the measurement of mood. These instruments range from standardized and well-researched rating scales and checklists to global idiosyncratic measures that lack demonstrated validity and reliability. Bardwick (1976) points out that problems may be encountered in measuring mood changes even when a standardized personality instrument is used. Since mood fluctuations are changes in state, as opposed to stable or trait qualities, one is attempting to detect relatively subtle and small changes. Most standardized personality instruments for the measure of psychological variables are designed to measure trait qualities while remaining insensitive to transient fluctuations. Sensitive and valid measures of mood must thus, be identified and adopted in order to detect affective changes over the course of the menstrual cycle.

In May's (1976) recommendations for studies investigating the relationship between mood and the menstrual cycle, attention is drawn to the fact that mood changes must be distinguished from physical symptoms such as bodily pain and discomfort. Physical forms of distress cannot be

assumed to be independent of mood changes and the correlations between ratings of somatic distress and those of mood must be examined. This becomes more apparent when one is investigating a possible hormonal influence on affective changes. Psychological reactions may be a secondary response to somatic effects that are hormonally induced. It is clear that in future studies a more careful analysis of the relationship between mood changes and physical symptoms must be conducted. The relationship between somatic and affective premenstrual symptoms will be addressed in a later section of this review.

The pattern of increased variance in reports of psychological changes associated with the premenstrual period has led to the suggestion that group means may not provide the most meaningful measure of normative patterns (Bardwick, 1976; Schilling, 1980; Sherif, 1980). This may be especially true where an examination of the range of responses and analyses of individual patterns of variation are not conducted. The best method of analyzing the data concerning affective fluctuations may be on an individual basis, using magnitude of change scores across menstrual phase-related test sessions, as the scores representing the mood shifts of an individual.

A brief discussion concerning the stability of change score measures and the use of average change scores is pertinent regarding the suggested use of magnitude of change scores in menstrual cycle research on mood. Bereiter (1967) points out that three basic dilemmas are encountered when dealing with change measurement. Of these three

dilemmas, the over-correction-under-correction dilemma and the unreliability-invalidity dilemma will be examined.

The over-correction-under-correction dilemma refers to the spurious negative element in the correlation of an initial score with gains on the same test. This arises because of the sharing of the same errors of measurement in a test-retest situation (Bereiter, 1967). Methods of solving for the regression of gains on initial scores are available, however if individuals are not assigned to 'treatment' groups at random there is often no way to determine what appropriate adjustment should be made for initial differences between groups (Lord, 1967). When raw change scores are used, these differences tend to overcorrect for initial level. Also pointed out by Bereiter (1967) is the observation that partialing out initial level in a change score tends to undercorrect for initial level. Further complications are only introduced if one uses regression estimates of true scores instead of correcting directly for attenuation (Bereiter, 1967).

The unreliability-invalidity dilemma refers to the fact that the higher the correlation between a pretest and a post-test, the lower the reliability of the difference score. Change scores are often noted to be unreliable due to both unreliability in the pretest score and unreliability in the post-test score. Bereiter (1967) states that change item scores, however, may be treated like any other item scores and they may be summed to get a molar change score (Bereiter, 1967). It is further pointed out that the reliability of difference scores will be

higher for matched rather than unmatched forms of a test (Webster & Bereiter, 1967).

It is noted that extreme scores on a pretest tend to regress toward the mean on a post-test (Webster & Bereiter, 1967), and a difference score will almost always be less reliable than its components. Thus, persons will not be ordered as precisely by a change score than they would be by either of the component scores (Webster & Bereiter, 1967). It is important that any transformation of raw scores should be order-preserving for the subjects and the simplest transformations of raw scores are preferred over more complicated ones (Webster & Bereiter, 1967). For example, the use of item deviation scores or item standard scores is thought to merely complicate the measurement problem (Webster & Bereiter, 1967).

In summary, Webster and Bereiter (1967) conclude that the irregularities encountered in changing from single scores to difference scores are seldom so large that the same operations will fail to be meaningful for both. Thus, one can view a difference score as enough like a single observation to treat a difference score as such in most analyses. It is still true that the reliability of change scores on mental tests is quite low. However, this does not rule out the use of scores from tests of low reliability to test hypotheses concerning mean changes in subject groups (Webster & Bereiter, 1967).

In conclusion, premenstrual negative affect has appeared to be a real phenomenon, although it shows a great deal of individual variation. The best available method of measurement of mood changes across the

menstrual cycle is the non-retrospective self-report capable of detecting changes in mood states.

It may be possible to use prospective self-report measures of mood to identify subgroups of women. These subgroupings would classify women who suffer from distinct affective changes or combinations of such changes premenstrually, such as those of depression, anxiety, or irritability. In this type of examination one must bear in mind that affective changes do not occur premenstrually in all women and do occur in men and non-menstruating women (Smith, 1975). They occur at other times apart from the premenstrual period, and do not necessarily occur in every cycle (Smith, 1975).

Premenstrual Dysphoria

Many indications in the literature point out that premenstrual dysphoria is a multi-dimensional phenomenon, composed of several distinct types of affective changes. Smith (1975) pointed out that premenstrual mood 'disorder' is unlikely to be a unitary phenomenon. It was also noted that many descriptors have been included in the affective category of premenstrual symptoms, such as irritability, sadness, depression, anxiety, insecurity, tearfulness, fatigue, restlessness and tension. Most studies investigating premenstrual affect have not attempted to clearly differentiate the various types of dysphoria, lumping together several dysphoric affects (e.g., depression, anxiety, anger) into a single item or affective dimension. This precludes differentiation of subgroups of women with various combinations of

dysphoric moods. Only recently have investigators become concerned with the possible differences between these various affective states.

Although the factor analysis of Moos (1969) found that most of the affects clustered together in one factor (termed Negative Affect) and dysphoric changes are not uncorrelated, some differential correlates have been demonstrated. Cullberg (1972) did find differences between patients reporting mainly premenstrual irritability as opposed to depression. Studies of the correlation of levels of the ovarian hormones with subtypes of premenstrual dysphoria, although not consistent in their findings, have focused upon depression or anxiety-irritability as the major dysphoric subtypes (Abraham et al., 1978; Backstrom & Carstensen, 1974; Backstrom et al., 1976; Backstrom & Mattson, 1975; Smith, 1975). The determination of the subtype of premenstrual dysphoria was done by psychiatric or gynecologist interviews, patient self-report on a brief rating scale or by undiscussed 'rigorous' objective criteria. More recently, Clare (1983) found evidence that certain symptoms such as irritability and tension may show a stronger relationship with premenstrual physical symptoms than with anxiety or depression.

Steiner and Carroll (1977) in their review of premenstrual dysphoria, concluded that the literature suggested the existence of three distinct premenstrual behavioural syndromes labelled depression, elation and hostile-irritability. These authors, however, were also of the opinion that most women experience some combination of these symptoms.

Based upon the results of an analyses of separate mood items of the MDQ in 42 women with severe 'premenstrual tension syndrome', Baskett et al. (1980) concluded that the syndrome is not typically one of anxiety or depression. These authors concluded that the core affective symptomatology is irritability, emotional lability, tension and restlessness. The severity index scores of items of the MDQ were rank ordered for a subset of the 42 subjects who had low follicular scores on MDQ items. This rank ordering was used to define 'core' premenstrual symptomatology. The subset of subjects that were high scoring in the follicular phase were thought to have mild psychopathology and they reported more premenstrual depression. These authors did not examine the specific combination of affective states reported within individual subjects, so no conclusion regarding intraindividual dysphoric symptom combinations can be drawn. Intergroup dysphoric symptom combination results were available concerning the contrasts between their two defined subsets of women.

Freeman et al. (1985) concluded that although numerous behavioural, emotional and somatic symptoms are associated with premenstrual syndrome, the 'emotional' symptoms, primarily those of depression, anxiety and hostility were predominant. Depression was reported by 56% of their sample, anxiety by 36% and hostility was reported by 48%. Although this research suffers from serious methodological flaws, a notable effort was made to examine symptom subtypes and combinations employing Abraham's (1980) 19 symptom checklist. In Freeman's sample of 241 women, discrete symptom subtypes

were able to be differentiated with the use of arbitrarily established clusters. A cluster of anxiety-irritability and one of depression were included. It appeared that of the 37% of women presenting only severe emotional symptoms premenstrually, about 17% reported only anxiety, an additional 17% reported anxiety and depression and approximately 3% reported depression only. For the group of women presenting a severe symptom level on any cluster ($n = 209$), about 35% reported only anxiety-irritability while 58% reported a combination of anxiety and depression.

The diversity of premenstrual symptoms has been most widely investigated by Halbreich and his associates. The development of the PAF represents these investigators' efforts to delineate different dimensions of premenstrual changes (Halbreich et al., 1982b). The PAF has 95 items descriptive of changes in mood, behaviour and physical condition. It has scoring systems for 18 typological categories, 18 unipolar dimension scales and 7 bipolar continua of negative and positive changes. The instructions are to retrospectively rate the severity of change in each item on a 6 point scale compared with the usual non-premenstrual state.

Results from the PAF developmental sample of 154 women (students or employees at a medical centre) include frequencies with which subjects met criteria for PAF typological categories (Halbreich & Endicott, 1982a). Forty-five percent of the group met criteria for major depressive syndrome and 19% met criteria for minor depressive syndrome, while no subjects met criteria for endogenous depressive features.

Criteria for the agitated-anxious subtype of a depressive syndrome was met by 20% while 29% met criteria for the hostile subtype of a depressive syndrome. One of the items on the bipolar continua is that of global mood (depressed to increased well-being) and there are also criteria for an increased well-being syndrome. Seventeen percent of the sample met criteria for an increased well-being syndrome.

The joint classification report indicated that the majority of subjects (69%) meeting criteria for the agitated-anxious subtype and the majority (80%) meeting criteria for the hostile subtype, also met criteria for a major depressive syndrome. Not only did the presence of anxiety and hostility overlap greatly with depression but they also overlapped with each other. Of subjects with agitated-anxious features, 68% also met criteria for hostile features and of subjects with hostile features, 48% met criteria for anxious features. Criteria for a PAF anxiety syndrome, or an irritable-angry syndrome in the absence of depression were not met by any subjects indicating these 'pure' syndromes are rare or nonexistent premenstrually.

In one report, the frequency of affective changes on the PAF (either slight or mild, or moderate-severe) ranged from about 26% to approximately 44% depending on the specific affect (Halbreich et al., 1982b). An investigation of premenstrual depressive changes and differential correlates of specific subtypes of premenstrual dysphoria examined the three kinds of dysphoric changes reported most frequently (i.e., atypical, hostile, anxious) (Halbreich et al., 1983). Differential associations were found for these types of dysphoric changes with different kinds of physical and cognitive changes. For

example, anxious features were correlated to physical changes such as headache and dizziness, while hostile features were not. There was a greater association of hostile features with effects on social functioning as compared to anxious features.

Premenstrual mood elevation has been noted in several studies (McClure et al., 1971; Wetzel et al., 1975) and there are indications that this elation may be related to bipolar affective disorder. Halbreich et al. (1985) discuss their group of women who actually have positive changes premenstrually (e.g., increased energy, sex drive and affection). Not only did the data of these authors show positive changes in some women but also the occurrence of a mixed picture of changes in both directions during one premenstrual period for some subjects (Halbreich et al., 1983). These authors do consider the resemblance of this bipolarity of premenstrual symptoms to patients with bipolar affective disorder during a cycling or mixed affective episode. These investigators suggest the phrase 'premenstrual changes' replace the umbrella term of 'premenstrual tension syndrome'. They suggest the new term be used in order to indicate the diversity and bipolarity of some premenstrual changes. One may then refer to any subtype or cluster of premenstrual symptoms as a 'premenstrual syndrome'.

In summary, it appears that distinctions between various premenstrual affective symptoms may be an important factor in establishing and clarifying the mechanisms involved in premenstrual symptomatology. As pointed out by various authors, the frequent failure to find consistent biologic changes associated with premenstrual

symptoms may be the partial consequence of both inadequate subtyping of premenstrual features and not accounting for the bipolarity of affective expressivity (Bancroft & Backstrom, 1985; Clare, 1983; Halbreich & Endicott, 1985a; Halbreich et al., 1983).

It seems that the typological categories or dimensional measures of affect are not independent and there are varying degrees of intercorrelations between them. Differential correlates with other variables have, however, been both hypothesized and demonstrated (Cullberg, 1972; Halbreich et al., 1983; Haskett et al., 1980). The major types of dysphoric affect seem to be depression, anxiety and irritability-hostility (Abplanalp, 1983a). The possible presence of premenstrual mood elevation should also be examined in research of affective subtypes and thus, result in a total of four major types of premenstrual affective change dimensions.

The subtyping of affective changes could facilitate the identification of any specific correlates of different subtypes of premenstrual changes (Endicott et al., 1981). Failure to differentiate among different patterns of change may obscure relationships with other variables. More recognition of the need for better definition of and discrimination among subtypes of premenstrual changes is apparent (Blum, 1983b; Halbreich & Endicott, 1982b).

Two major approaches are available to develop criteria for subtyping individuals: the categorical and the dimensional (Halbreich & Endicott, 1982a). In the categorical approach evaluations are made on the basis of whether the criteria for a particular 'type' are met and

subjects then either belong in the category or not. Halbreich and Endicott (1982a) describe how the criteria for a typological category may be simple or complicated and may include rules for both inclusion and exclusion. The typological approach facilitates selection of subjects for studies in which a restricted range of phenomena are to be studied. Furthermore, the typological approach often uses evidence of the differential significance of clinical features and facilitates descriptions which are clinically recognizable.

The dimensional approach may also be simple or complicated. It involves describing a subject either by level of severity on dimension(s) of interest, or by determination of the degree to which a dimensional 'profile' fits a specific subtype pattern. The dimensional scores of a subject may be compared with those of others derived from a cluster or discriminant function analysis (Halbreich & Endicott, 1982a).

There is controversy as to which subtyping approach is best. However, the choice of approach partially depends upon the purpose of the investigation. Clinicians are most familiar and comfortable with the categorical approach (Halbreich & Endicott; 1982a). The categorical approach involves considering clinical features. It seems most applicable to situations where much clinical experience as well as research evidence of the differential significance of a specific combination of clinical features is available. Premenstrual affective changes have not been widely investigated and easily differentiated both from the clinical and research perspectives. An investigation attempting to examine the range of symptom levels and combinations in a particular

subject group would be best served by the use of a dimensional approach. This approach allows for a better description of the range and continuum of experience of the phenomena under inspection by inclusion of all possible 'profiles' or combinations of the dimension(s) of interest. While the typological approach is more clinically useful, it is based on a consensus that a particular cluster of features at a determined level of severity represents a 'type'. More evidence is needed of the differential significance of any particular combination or severity level of premenstrual affective changes before the determination of what particular features (or combination of features), at what level of severity, seems to constitute a 'type'.

A dimensional approach to the subtyping of premenstrual affective changes in normal women would help clarify what pattern of features or subtypes tend to occur and the relatively discrete or continuous nature of such changes. One must also bear in mind that fluctuations in affect are experienced by all women and therefore, affective 'changes' per se are expected to occur premenstrually. The nature of the phenomena must be better understood in a normal population and the possible links between subtypes and other variables need to be established. Once this is accomplished, evidence will be available to help justify any identification of 'clinical' features and categorical criteria to define a 'type', 'subtype' or 'patient'. As Hamilton (1984) points out in her commentary, the psychiatric research criteria that have been developed to study premenstrual changes should not be confused with or mistaken for well-validated clinical diagnostic criteria. She considers that it

would be premature to begin defining 'premenstrual syndrome' as a sex-specific, primary 'psychiatric' diagnosis.

Personality and Premenstrual Symptomatology

Despite the lack of a clear understanding of the nature of premenstrual phenomena, efforts have been made to relate premenstrual features to indices of psychological 'ill health' on various multiple personality inventories or questionnaires. Levitt and Lubin (1967) reported a positive correlation between premenstrual tension, menstrual discomfort and several inventories. The inventories included the intraception scale of the Edwards Personal Preference Schedule and the emotional stability scale of the Guilford-Zimmerman Temperament Survey. Hain et al. (1970), using the Minnesota Multiphasic Personality Inventory (MMPI) and a menstrual history questionnaire found that a factor analysis produced six factors. One factor, 'normal personality', correlated negatively with the factors of 'premenstrual tension' and 'premenstrual headache' and positively with the factor 'freedom from menstrual symptoms'.

Gough (1975) reported the correlation of premenstrual symptomatology and several personality inventories and described women who tended to report symptoms as shy, self-doubting and eager to help. Women reporting little symptomatology were described as apprehensive, cautious, conventional, stable and unemotional. Taylor (1979b) used Cattells' 16 Personality Factor Questionnaire (16PF) and a daily symptom rating scale to investigate psychological factors and premenstrual

symptoms. Subjects positive of two or more criteria of premenstrual symptomatology differed significantly from the remainder of the group on 16 PF subscales. Subjects positive of two or more criteria had high L (suspicious, not trusting), O (apprehensive, not self-assured), Q4 (tense, not relaxed), and having low C (easily upset, not emotionally stable), N (artless, not shrewd) and Q3 (undisciplined, not controlled). Gruba and Rohrbaugh (1975) examined premenstrual symptoms in 60 students. They found the premenstrual pain and negative affect subscales of the Menstrual Distress Questionnaire correlated positively with MMPI elevated scales.

Clare (1977) found that women reporting premenstrual symptoms were as likely to be psychologically healthy as to be disturbed. Few women who had psychological difficulties as measured by the General Health Questionnaire (GHQ) showed no premenstrual symptoms. The General Health Questionnaire is an instrument designed to identify non-psychotic psychiatric ill-health and minor psychiatric morbidity (Goldberg, 1972). In a more recent study, Clare (1983) reported a positive association between the GHQ measures of psychiatric ill-health and premenstrual complaints of mostly dysphoria (as measured by a modified MDQ), in women attending general practitioner's clinics.

Neuroticism and Premenstrual Symptomatology

Some investigators have attempted to outline an association between premenstrual complaints and more specific personality factors such as a general 'neurotic' tendency. A summary table of the results of these studies may be found in Appendix 2. As defined by Eysenck (1964),

neuroticism is a general emotional lability and emotional overresponsiveness with a liability to neurotic breakdown under stress. Neuroticism is not considered to be the equivalent of 'neurosis' or 'neurotic illness'.

Morton (1950) was of the opinion that premenstrual tension was most common in emotionally unstable women. In a study of 145 subjects including normal women and psychiatric patients, Rees (1953) reported that 'neurotic' women (as defined by the results of the Maudsley Personality Inventory (MPI), Medical Questionnaire, clinical interview and word connection tests) demonstrated premenstrual syndrome more frequently than normal women. Rees found, however, that some very 'neurotic' women had no symptoms of premenstrual syndrome. Also, Rees observed that some women with little or no evidence of personality instability suffered from premenstrual symptoms. It was also noted that successful treatment of the 'neurosis' would often not affect premenstrual symptoms. Rees concluded that there was no simple relationship between neuroticism and premenstrual tension and that both psychological and physiological factors appear to be important.

Coppen and Kessel (1963) reported a significant positive correlation between premenstrual tension and neuroticism (as defined by the MPI) in a study of 500 randomly sampled women surveyed by mail. He found that women with severe premenstrual irritability or depression had significantly higher MPI neuroticism scores than controls. This study has been criticized on the basis that the MPI neuroticism factor contains questions that a sufferer of premenstrual tension would tend to

answer positively (Clare, 1977; Gannon, 1981). The correlation, however, still held after Coppen and Kessel removed 8 of the 24 items that were judged to be the potentially confounding questions.

Several other studies have outlined a possible relationship between premenstrual complaints and a 'neurotic' tendency. Kramp (1968) using a rather poorly designed questionnaire, found that 50% of women referred to an abortion service had premenstrual symptomatology and that 52% of these women had a 'neurotic predisposition'. Of the women without premenstrual symptoms, 26% were considered as having a 'neurotic predisposition'. More recently, Sampson and Jenner (1977) studied a group of 19 rather heterogeneous women. They found no statistically significant relation between the neuroticism scale score of the Eysenck Personality Inventory (EPI) (Eysenck & Eysenck, 1964) and premenstrual complainers versus non-complainers. Taylor (1979b) found a strong positive correlation between neuroticism scores as measured by the EPI neuroticism scale and both a daily symptom rating scale (negative affect subscale) for 38 women. A positive correlation was also found between neuroticism scores and the presence of two or more of four possible criteria of severe premenstrual syndrome symptoms ($n = 15$). Taylor's results suggested a personality profile description of high premenstrual complainers similar to that put forth by Paulson (1961), Hain et al. (1970) and Gough (1975). The characteristics of the profile are listed as emotionally unstable, suspicious, unassertive, guilt-prone, apprehensive, self-conflicted, tense and frustrated.

Only two recent studies have compared premenstrual tension complainers with non-complainers in terms of neuroticism scores. Watts et al. (1980) found significantly higher neuroticism scores (EPI) in 24 subjects with premenstrual syndrome as compared to 22 control subjects. Sanders et al. (1983) compared EPI neuroticism scores of 19 women seeking treatment for premenstrual syndrome (clinic PMS group) with 18 volunteers reporting premenstrual cyclic changes (nonclinic PMS group) and 18 volunteers reporting no cyclic changes (no PMS group). The three groups showed no significant differences in neuroticism scores although a trend in the means was apparent (clinics PMS > nonclinic PMS > no PMS).

Given that several different types of mood changes may form subtypes of premenstrual dysphoria, the importance of delineating affective subtypes may account in part for the lack of consistency in the findings concerning neuroticism and premenstrual symptomatology. The available evidence indicates that psychological factors in general may only account for a minor part of the variance of premenstrual symptomatology. These factors may operate differentially with respect to the premenstrual symptom under investigation. A well documented and carefully controlled study by Cullberg (1972) indicated that premenstrual depression as opposed to irritability seemed to be more highly loaded with 'neuroticism'. Premenstrual depression was less frequently reported and apparently less influenced by hormonal factors. This observation is consistent with the findings of Haskett et al. (1980) which suggested that women with 'neurotic' personality factors

may tend to report a mainly depressed type of affect premenstrually. In the latter study, women with a tendency to intermenstrual symptom reporting were thought to be demonstrating subclinical psychopathological or 'neurotic' features. They showed a symptom profile of mainly depression. To the authors knowledge, no adequately controlled study has tested the proposed relationship between neuroticism and premenstrual depression using valid measures of neuroticism and indices of specific subtypes of premenstrual dysphoric symptomatology.

Trait Anxiety and Premenstrual Symptomatology

Some investigators have examined measures of trait anxiety and their relation to state anxiety and the premenstrual syndrome. A summary table of the results of these studies may be found in Appendix 3. Moos (1977) observed that women with high anxiety throughout all cycle phases had the highest premenstrual anxiety. Golub (1976b) studied premenstrual mood changes in 50 parous women, aged 30-45. Although premenstrual anxiety and depression scores were significantly higher than at midcycle, trait-anxiety scores (State-Trait Anxiety Inventory, Spielberger et al., 1970) were lower than any of the normative data. Trait-anxiety scores were not significantly correlated with premenstrual state anxiety or depression. In this study no relationship was found between a measure of a women's trait or characteristic measure of anxiety and the magnitude of affective measures at premenstruum. The author concludes that the suggestion that premenstrual mood changes are a function of personal adjustment is not supported by this research.

Awaritefe et al. (1980) found state and trait-anxiety scores of the State-Trait Anxiety Inventory (STAI) were positively and significantly correlated in a retrospective study of 40 parous and 40 nulliparous Nigerian women. Halbreich and Kas (1977) found the Taylor Manifest Anxiety Scale (TMAS) scores to be higher in women with premenstrual symptoms compared to controls during the entire cycle. The scores of the symptomatic group rose significantly during the premenstrual period, but scores of the control group did not. The authors concluded that the TMAS may not be a reliable instrument for measuring trait anxiety, but also concluded that women with high trait anxiety may be predisposed to the premenstrual syndrome. It is notable that in Golub's (1976b) study as in a study by Abplanalp et al. (1977), trait-anxiety levels as measured by the STAI were expectedly unaffected by cycle phase. Lahmeyer et al. (1982) found that trait anxiety did not correlate significantly with the average state-anxiety scores for each individual across their menstrual cycles in a sample of eleven women.

The significant findings of associations of personality variables with premenstrual symptomatology must be considered in light of the different and often poor methodologies employed in these studies. Many studies had flaws in design, sampling or instruments of measurement.

Gannon (1981) criticizes the statistical treatment of the data of both Levitt and Lubin's (1967) study and Gruba and Rohrbaugh's (1975) research. Concerning neuroticism and premenstrual complaints, any conclusion as to their relationship is difficult to make. Times of testing during the cycle and differentiation of cycle phases varied.

Some studies utilized retrospective data (Awaritefe et al., 1980; Coppen & Kessel, 1963). Instruments for measuring premenstrual symptomatology varied widely. In the study of Sampson and Jenner (1977) no relationship between neuroticism scores and premenstrual complainers versus non-complainers was found but significant cycle phase differences were not found for all premenstrual complainers. The best designed and conducted investigations were that of Taylor (1979b) and Sanders et al. (1983). Unlike Taylor (1979b), Sanders et al. (1983) did not find a significant relationship between neuroticism scores and the presence or absence of premenstrual symptomatology in subject groups. The groups, however, included a small number of subjects and the trend of the mean neuroticism values indicated higher neuroticism in premenstrual symptomatology groups. One might conclude that if a relationship between neuroticism and premenstrual symptomatology does exist it may best be examined in a prospective study of a larger number of women. Premenstrual symptomatology subjects must be differentiated from those women not demonstrating cyclic mood changes. In view of indications in the literature that premenstrual depression may specifically be related to neuroticism, premenstrual symptomatology must be affectively subtyped and not considered as a global composite 'disorder'.

The literature concerning measures of trait anxiety and premenstrual symptomatology also suffers from many of the shortcomings just discussed. The studies were retrospective in design (Awaritefe et al., 1980), found no cycle phase differences in premenstrual or menstrual measures of affect (Abplanalp et al., 1977; Lahmeyer et al.,

1982), utilized only two test sessions during the entire cycle (Golub, 1976b), or the measure of trait anxiety was perhaps sensitive to changes in state anxiety (Halbreich & Kas, 1977). In the study of Abplanalp et al. (1977) subjects were never tested for state anxiety under true 'base-line' conditions but were examined just prior to and following a stress interview. The relationship between measures of state and trait anxiety during phases of the menstrual cycle and premenstrual symptomatology warrants further examination. This is particularly true for women with specific subtypes of premenstrual dysphoria. The total available evidence does not clearly lead to the conclusion that trait anxiety is related to state anxiety or premenstrual affective symptomatology. The findings are inconsistent and difficult to evaluate.

Discussion

Overall findings suggest some relationship between personality 'dysfunctions' and premenstrual symptomatology (Dennerstein & Abraham, 1982). Some studies have not supported the belief that premenstrual symptomatology reflects personality characteristics or level of adjustment (Di Nardo, 1975; Kleinsasser, 1976; Seagull, 1974).

Taylor (1979b) speculated that physiological changes associated with menstruation are detectable by the majority of women and that these changes may be extreme or unpleasant in some women. According to Taylor (1979b) some women may be particularly sensitive to menstrual phenomena, perhaps due to psychological, social and physiological factors. For these women, their subjective appreciation of such menstrually-related changes will be magnified. These women may report high symptom ratings,

as well as those women who resemble neurotic patients, by having maladaptive defences to stress, being dependent or seeking secondary gain for symptom reporting. A subset of high premenstrual symptom reporting women may thus be expected to score highly on tests such as the EPI neuroticism scale and resemble neurotic patients in this regard.

Rees (1976) considered the premenstrual syndrome as a somatico-psychic disorder with physiological changes as primary but degree of distress being increased by neurotic illness, personality traits, instability and environmental stress. Similarly, Dennerstein et al (1981) postulated that the minority of women with premenstrual complaints may be very sensitive to endogenous hormonal changes. They may present little evidence of environmental stress or intrapsychic phenomena as causative factors. The average premenstrual syndrome sufferer is presented as a vulnerable person in terms of biological and personality factors (e.g., high trait anxiety, high neuroticism). Environmental stress may increase her feelings of loss of control and helplessness (Dennerstein & Abraham, 1982). Support for the 'vulnerability' hypothesis is given by the tendency suggested by high trait anxiety to perceive situations as 'ego-threatening' (Shedletsky & Endler, 1974) with a lowering of self-esteem or self-concept. The association of high neuroticism scores to irritability, mood changes, guilt and self-dissatisfaction (Tellegen, 1978) are also noted by Dennerstein and Abraham (1982).

Despite common conclusions and speculations that premenstrual symptom reporting is a result of a personality flaw or disposition

(Coppen & Kessel, 1963; Halbreich & Kas, 1977), a direct etiologic or unidirectional relationship cannot be assumed as supported by research findings. Alternative conclusions may be that premenstrual symptomatology leads to psychological maladjustment or the coexistence of premenstrual symptoms and neuroticism may cause them to exacerbate in the presence of each other (Abplanalp et al., 1980). It is possible that there is an etiologic factor common to both, and also possible that the correlational data is inflated by measurement of the same symptoms common to both neurotic and premenstrual conditions (Abplanalp et al., 1980; Gannon, 1981). The reanalysis of the data of Coppen and Kessel (1963) tends to render the latter possibility as less likely. 'Neurotic' women may be more sensitive to premenstrual physiological cues and this may contribute to mood changes, or they may have a tendency to responding positively to any item presented as a symptom (Abplanalp et al., 1980). In any case, while psychological factors such as neuroticism may play a role in the development of premenstrual symptomatology, most writers acknowledge that other factors such as primary physiological changes and socio-cultural phenomena also play a role.

Psychiatric Disorder and Premenstrual Symptomatology

There are many reports dealing with the premenstrual exacerbation of psychiatric illness. There is evidence that psychiatric emergencies and psychiatric admissions to the hospital in females occur more frequently than expected during the premenstruum (Abramowitz et al., 1982; Dalton, 1959; Glass et al. 1971; Kramp, 1968; Janowsky et al.,

1969). The contention that episodic psychoses are exacerbated premenstrually is supported by a number of studies (Simpson et al., 1964; Swanson et al., 1964; Torghele, 1957). A number of authors have addressed the obvious possibility that episodic psychoses which seem to exacerbate premenstrually may be related to affective disorders such as manic-depressive or depressive illness (Kramp, 1968; McClure et al., 1971; Wetzel et al., 1975).

Coppen (1965) found no increased prevalence of premenstrual irritability, depression, or tension in patients with affective disorders as compared to controls but did find a high incidence in 'neurotics'. Coppen, however, focused upon menstrual rather than premenstrual symptoms.

More recently, Kashiwagi et al. (1976) found an increased prevalence of premenstrual mood changes in women with primary affective disorders when compared with women suffering from hysteria or anxiety neurosis. In this study the 'Feighner' criteria (Feighner et al., 1972) were used to divide the women (75% of the sample were black women) attending a headache clinic into three groups of affective disorder, other mental disorder and no mental disorder. They found 65% of the affective disorder women, 14% of other mental disorder women and 21% of the no mental disorder women met their criteria for premenstrual 'affective' syndrome. The three groups did not differ in the prevalence of a 'somatic' premenstrual syndrome.

A study by Diamond et al. (1976) compared women with previously diagnosed primary affective disorder by the Feighner criteria with a

control group. The two groups did not differ significantly on the incidence of premenstrual 'depressive' syndrome. Lifetime diagnoses for mental disorder were not, however, conducted in the control group of social workers and spouses. The incidence of depression in the affective disorder groups of both Kashiwagi et al. (1976) and Diamond et al. (1976) was a remarkably similar 65%.

Diamond et al. (1976) reported that dysphoric menstrual symptoms showed a 'slight trend' toward increased reporting in the affective disorder group as compared to the control group. They concluded that women predisposed to affective disorders and suffering from a current episode may experience premenstrual exacerbation of their symptoms. When these women are not suffering from a current episode of affective illness, they would experience menstruation as most women do.

Few studies have attempted to assess the psychiatric morbidity in women with premenstrual syndrome. The results of a four year follow-up study by Wetzel et al. (1975) reported that 18% of college students with premenstrual 'affective' syndrome were later diagnosed as having a depressive disorder (Feighner criteria). This is compared to a 10% diagnosis in those without premenstrual 'affective' syndrome. In this study, as well as that of McClure et al. (1971), a small number of women appeared to show a premenstrual mood elevation. These women were found to have personal and family histories of bipolar affective disorder.

Similarly to Wetzel et al. (1975), Schuckitt et al. (1975) found that college students with premenstrual 'emotional' syndrome had a higher incidence (11%) of premenstrual depressive episodes than the

incidence (5%) of those without the 'emotional' syndrome. In a 12 month prospective follow-up, depressive disorder developed in 7% of students with premenstrual 'emotional' syndrome and 0% of those without the 'emotional' syndrome.

There has been much ambiguity about the role of depression in the premenstrual syndrome. Most studies of affective changes premenstrually include the measure of, and report depressive features. Haskett et al. (1980), however, argue that depression is not an essential factor of the premenstrual 'affective' syndrome. Their research indicated that premenstrual depression may be linked to 'subclinical' psychopathological features which manifest as high follicular phase reporting of dysphoria. Endicott et al. (1981) suggest that significant premenstrual depression (by PAF criteria) may depend on the presence of a lifetime diagnosis of affective disorder. This was suggested as only women who met such criteria (Research Diagnostic Criteria (RDC) of Spitzer et al. (1978)) developed significant premenstrual depression. Clare (1983) concludes that his study provides supportive evidence for the view that premenstrual depression in psychiatrically ill women may represent an exacerbation of depression occurring elsewhere in the cycle. The suggestion is that premenstrual depression in women may indicate the coexistence of psychiatric disturbance. Hurt et al. (1982) are of the opinion that the role of depression in premenstrual 'affective' syndrome has yet to be clearly established and that depression seems to be a recurrent symptom for one subgroup of women.

Some authors have suggested that although premenstrual depressive features are generally less severe than in patients with affective disorders, premenstrual changes may serve as a model for an affective disorder (Halbreich et al., 1983). Their proposal is supported by previously discussed findings that a positive relationship exists between premenstrual 'depressive' syndrome and a lifetime diagnosis of affective disorder as opposed to other mental disorders. Further support is provided by studies associating suicide attempts and hospital admission for psychiatric care as related to the premenstrual period. Furthermore, tendencies for women with a depressive disorder to have premenstrual exacerbation of depression have been noted (Diamond et al., 1976).

Some investigators are of the opinion that premenstrual changes cannot serve as a model for affective disorder as the depressive features are not those of a 'classic' endogenous depression. According to Smith (1975) premenstrual depression appears to resemble a 'neurotic' depression in that it is accompanied by few vegetative and sleep disturbances. Others have come to the same conclusion, noting the lack of endogenous features (e.g., guilt, early-morning waking, loss of appetite) (Haskett et al., 1980; Steiner et al., 1980a). A recent study by Haskett et al. (1984) found that none of 42 subjects with severe premenstrual 'tension' syndrome and marked premenstrual dysphoria, met criteria for an endogenous subtype of a major depressive disorder. The contention is, however, that there is sufficient evidence to support the study of premenstrual depressive changes as a model for other depressive

syndromes. These other depressive syndromes include 'nonendogenous' major depressive disorder or milder chronic or episodic depressive disorder.

In the study of Endicott et al. (1981), specific subtypes of premenstrual changes and specific subtypes of mental disorder were studied using the RDC and the PAF. Their results are preliminary because of sample size, selection procedures and statistical analyses. They found 62% of the women in the major depressive disorder diagnostic group met categorical criteria for a major depressive syndrome on the PAF, as compared to 7% of the women with no mental disorder. The percentage rate of 62% is close to that found for the rate of premenstrual 'depressive' and 'affective' syndrome appearing in the affective disorder groups of Kashiwagi et al. (1976) and Diamond et al. (1976).

The work of Halbreich et al. (1982a) on the development of the PAF led these researchers to conclude that it is premature to consider that premenstrual affective changes cannot serve as a model for affective changes at other times. They reach this conclusion based on the percentage of women meeting PAF criteria for atypical, anxious-agitated and hostile features. These three syndromes may be of interest to both investigators and clinicians and the authors urge research considering the diversity of premenstrual syndromal changes.

Halbreich et al. (1983) concluded that some specific subtypes of premenstrual changes of a depressive nature resemble some subtypes of affective disorder. They suggest that specific subtypes of premenstrual

dysphoria be examined as they appear differentially correlated with premenstrual depressive changes. Of the 145 women meeting criteria for a premenstrual 'depressive' syndrome (by PAF criteria) the largest percentage (63%) met the subtype of the depressive syndrome characterized by 'atypical' features (rapid mood changes, rated mild or moderate; at least two of; hypersomnia, feels sleepy, craves specific foods or increased appetite). Other predominant subtypes were 'hostile' features (52%), 'anxious-agitated' features (43%), and 'withdrawn' features (42%). None of the women met criteria for an endogenous subtype and levels of severity and impairment were noted as usually lower than that of an affective 'disorder'.

Halbreich and Endicott (1985b) found an association between premenstrual dysphoric changes and depressive disorders in a group of 170 women. Using the RDC and the PAF, they found criteria for a PAF full depressive syndrome was met by 57% of women with a lifetime diagnosis of major depressive disorder. Of the 'never mentally ill' women, only 14% met this PAF criteria. Upon examining women who had PAF depressive syndrome, 84% also met criteria for a major depressive disorder (using RDC). Only 9% of 'never mentally ill' women met criteria for a major depressive disorder.

Finally, Hurt et al. (1982) have reported findings that when severe character pathology is present (i.e., borderline personality disorder) in conjunction with major depression, there is a marked prevalence of premenstrual dysphoria. The presence of personality

disorder alone was associated with the lowest prevalence of premenstrual 'affective' syndrome.

The results of the studies concerning psychiatric disorders and premenstrual symptomatology must be evaluated in light of methodological problems and shortcomings. Sampling problems were mentioned (Endicott et al., 1981) and in some studies the samples were clearly non-representative of the general population (Halbreich & Endicott, 1985b; Kashiwagi et al., 1976). The criteria used to define premenstrual 'affective' or 'depressive' syndrome differed across studies such as those of Kashiwagi et al. (1976), Diamond et al. (1976), Rurt et al. (1982) and Haskett et al. (1984). Almost all of the studies were retrospective in their evaluation of premenstrual symptomatology. Halbreich and Endicott (1985b) urge that the relationship between life-time depressive disorders and premenstrual depression found using the retrospective PAF be confirmed by daily ratings. Difficulties in design (Diamond et al., 1976) and statistical analyses of the data (Schuckitt et al., 1975) are also noted.

Almost all studies did not differentiate between premenstrual 'depressive' and 'hypomanic' features. Systematic research concerning the reported relationship between better mood premenstrually resembling 'hypomanic' episodes and a family or personal history of bipolar affective disorder have to the authors knowledge, not yet been conducted.

The overall research findings do indicate some association between affective disorders and premenstrual negative affect which is a possible

premenstrual exacerbation of an affective disorder. One possible explanation is that a predisposition to psychiatric illness is a factor which lowers a woman's tolerance to menstrual cycle changes. Clare (1983) hypothesizes that psychiatric ill health may 'sensitize' the subject to a normally occurring or mildly abnormal premenstrual mood alteration and lead the subject to identify the change as a symptom or complaint. The potential state of affairs is that psychiatrically ill premenstrual complainers may have the same premenstrual alterations as those of the average non-complaining woman or even perhaps a less severe form of premenstrual disturbance (Clare, 1983). Cyclic mood changes may, however, be a trigger or a precursor for a sustained mood change in women, such as the development of an affective illness (Bancroft & Backstrom, 1985; Rubinow & Byrne, 1984).

It is also possible that premenstrual symptomatology and psychopathology are etiologically independent conditions. Many women with premenstrual symptomatology do not meet criteria for psychiatric illness. Women with a preexisting psychopathological disorder could experience exacerbation of this disorder premenstrually in addition to the group of symptoms that may 'normally' occur premenstrually (Hurt et al., 1982). It is not, therefore, clear whether one should make a distinction between premenstrual symptom sufferers with a diagnosed psychiatric illness and patients with premenstrual symptoms who are not reporting such symptoms intermenstrually. This distinction is one that is recommended in the Haskett et al. (1980) study.

It would appear that if premenstrual dysphoric subtypes do resemble subtypes of an affective disorder as retrospectively assessed by Halbreich et al. (1983), the resemblance does not include an endogenous depressive subtype. The role of depression in premenstrual affective changes is not yet clear. The severity of premenstrual 'affective' syndrome is less than that of an endogenous major depressive disorder and does seem to resemble a chronic or episodic milder depressive state.

Somatic and Affective Premenstrual Symptomatology

Much of the focus of the research on the premenstrual syndrome has been on the psychologic or emotional complaints. Possibly this is because clinicians have been more successful in treating the physical complaints yet seek effective treatments for the psychological phenomena (Abplanalp, 1983b). Most studies investigating premenstrual complaints do, however, include information on both somatic and emotional symptoms in the same subjects. It seems that many women who experience premenstrual emotional changes also report one or more somatic complaints (e.g., headache, abdominal bloating, breast tenderness, back pain) (Abplanalp, 1983b).

Smith (1975) drew attention to the fact that psychological premenstrual problems may be partly or entirely due to the direct or indirect effects of recurrent physiological changes. Emotional and physiological changes may share a common cause or they may be independent phenomena that sometimes occur together.

A fair number of researchers have speculated that the physical and emotional components of the premenstrual syndrome(s) are independent (Andersch et al., 1978; Haskett & Abplanalp, 1983; Janowsky et al., 1973; May, 1976; Moos & Liederman, 1978; Tonks, 1975). There is also some agreement from experiential and research evidence that fluid retention is not strongly related to premenstrual dysphoria (Golub et al., 1965; Reeves et al., 1971; Smith, 1975). Few studies have directly examined the relationship between physical and emotional changes premenstrually.

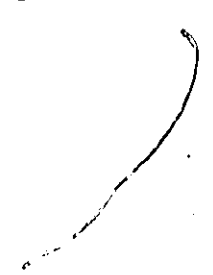
According to the results of Moos and Liederman (1978) obtained from a cluster analysis of subjects, premenstrual psychological symptoms almost always occurred in conjunction with physical symptoms in one group of clusters. These authors suggest that psychological changes may result from the experience of menstrual pain and cramping. When observing the whole range of clusters, however, somatic and emotional symptoms were not consistently correlated, as in the report of Moos (1977). Moos et al. (1969) found that women who had consistently high premenstrual tension were significantly higher on pain and autonomic reaction symptoms in both the premenstrual and intermenstrual phases.

May (1976) recognized the importance of distinguishing between mood changes and other forms of distress such as physical symptoms. Using retrospective descriptive data of cycle related physical discomfort and mood changes obtained at an interview, no significant relation was found between the physical and emotional complaints. The independence of the ratings of mood and physiological discomfort must be

considered in light of the fact that there was also no relation between a woman's interview report of mood changes and those changes as actually reported at three phases of the cycle.

Taylor (1979c) found a peak of somatic symptom ratings at the onset of menstruation. Somatic symptoms showed the most definite pattern of change during the cycle with increases as menstruation approached. The intercorrelation of the daily symptom ratings in the premenstrual phase showed intercorrelations over .5 of backache and headache with both depression and irritability.

Schilling (1980) hypothesized that 'nonhormonally' based negative physical symptomatology (54 physical symptoms list) would relate to mood change in their 'normal' sample of subjects. Although this study found no phase differences for affective experiences, measures of subjects' overall judgements of sickness or 'well-being' and the mood dimensions of anxiety and sadness were significantly correlated. Affective variability appeared to be related to 'nonhormonal' physical symptomatology. A composite health-sickness score (sum of symptom severity scores for all health symptoms rated daily) evidenced no relationship to mood. The authors conclude that an index of feelings of health or sickness may not be obtainable by assuming equivalence of any two symptoms of reported equal severity. Although this study was not specifically investigating somatic premenstrual symptomatology, the authors did note an inter-subject inconsistency in the strength of relationship between mood and health measures. They also pointed out the



absence of investigations attempting to statistically partial out the effects of physical symptoms on affective experience.

Haskett et al. (1980) required subjects to have moderate to severe psychological and physical premenstrual symptoms (at least two of the following; swelling and tenderness of breast or abdomen, peripheral edema, general physical aches and pains), for inclusion in their research. Based upon their experience in the subject selection procedure, they were led to believe that a typical premenstrual tension syndrome could be manifested without significant physical discomfort. They could not conclude what the relationship might be between premenstrual physical and emotional changes. They felt that further studies were needed to determine whether physical symptoms are an essential component of premenstrual tension syndrome. A study by Rossi and Rossi (1980) reported that the negative moods associated with the menstrual phase are essentially 'somatic' in character while the negative moods of the luteal phase are of a 'psychological' nature.

In the study of Haskett and Abplanalp (1983) cycle phase ratings were taken of somatic discomfort (i.e., breast tenderness, breast swelling, headache, backache, weight gain) using Somatic-Behavioral Sexual Symptom Profile. These items showed significant cycle differences where higher scores were obtained premenstrually but no differences were found between the subject subgroups on these ratings. The subject subgroups were divided as to subjects meeting, or not meeting, diagnostic criteria for premenstrual tension syndrome or criteria for primary recurrent premenstrual tension. The daily symptom ratings of the

items did not support a particular association between premenstrual tension syndrome and somatic discomfort. These authors acknowledge that somatic and emotional disturbances could coexist and somatic discomfort may be a variable accompaniment of premenstrual tension syndrome. As their subjects were selected on the basis of reporting moderate to severe premenstrual physical and/or emotional symptoms, their results did not actually demonstrate that somatic discomfort is a distinct and separate syndrome.

Sanders et al. (1983) found significant cycle changes of a physical distress component in all of their subject groups. Their subject groups included women with severe premenstrual syndrome who had attended a clinic as well as a group of women with no evidence of premenstrual syndrome. The cycle pattern of physical symptoms was mild although significant in the latter group. A clear 'temporal' relationship was said to be demonstrated between mood and physical state. These authors speculate that physical symptoms may represent an independent cyclical pattern affecting a large number of women. They also speculate that this cyclic pattern may interact with some other cyclical pattern to produce changes in well-being such as increased irritability and tension.

Clare's (1983) monograph regarding premenstrual complaints found that women reporting few premenstrual symptoms tend to complain mainly of physical ones. Psychological symptoms (negative affect) were a proportionally greater part of the total score in women complaining of many premenstrual symptoms. No evidence was found that psychiatrically

healthy premenstrual complainers experienced more severe premenstrual physical changes than psychiatrically ill complainers.

In summary, the relationship between premenstrual physical and emotional changes is not yet clear. Studies such as that of Moos and Liederman (1978) seem to confound menstrual phase physical symptoms such as menstrual cramps with premenstrual affect. The results of Moos et al. (1969) seem in opposition to those of Clare (1983).

It does appear that since no consistent or conclusive relationship has been found between premenstrual physical and emotional changes, they may indeed represent independent yet sometimes temporally overlapping 'syndromes'. The premenstrual timing of increases in both types of changes may establish a temporal relationship. Only a careful analysis of the intercorrelations of such changes could determine if, for example, a great deal of the variance in emotional changes may represent a reaction to physical discomfort. The results of the studies of Clare (1983), Rossi and Rossi (1980), and Haskett and Abplanalp (1983) tend to render the just discussed possibility as unlikely. It may, however, be important to partial out the effects of physical symptoms on affective experience in order to examine premenstrual affective experience as a more 'pure' but not necessarily separate phenomena. This type of result could lead to a modified view of premenstrual emotional changes as being more of a secondary reaction to physical discomfort.

Summary of the Review of Literature

Extensive research of the influence of the menstrual cycle on somatic, mood, and behavioural changes in women have led to the commonplace usage of such terms as premenstrual tension and premenstrual syndrome. The premenstrual syndrome is not, as yet, a well understood phenomenon and both the extent of premenstrual symptomatology and its physiological links remain hypothetical (Bancroft & Backstrom, 1985; Reid & Yen, 1981). No consistent data supports any single proposed etiology of premenstrual syndrome (Rubinow & Byrne, 1984). No consistently detectable hormonal abnormality has been found to be associated with subjects having premenstrual syndrome (Clare, 1985). It is therefore not surprising that although many treatment studies have been conducted, no single treatment has proven effective in relieving all premenstrual symptoms in double blind, placebo-controlled trials (Green, 1982; Rubinow & Byrne, 1984; Smith, 1975; Steiner & Carroll, 1977).

Despite more than 50 years of investigation, the definition of what constitutes the premenstrual syndrome is still unclear (Rubinow & Byrne, 1984). Thus, one major methodological problem in the research has been this lack of consensus on the definition of 'premenstrual syndrome' (Halbreich & Endicott, 1985a; Rubinow & Byrne, 1984). Premenstrual and premenstrual syndrome have been used to refer to a variable number of days of the menstrual cycle and both a varied and different combination of symptoms. Syndrome presence has been indicated by either symptom presence or symptom exacerbation (Halbreich & Endicott, 1985a). For some

researchers, premenstrual symptoms must by definition, vanish with the onset of menses (Dalton, 1982; Halbreich & Kas, 1977; Steiner et al., 1980a). Other researchers focus on the degree of 'change' in symptoms rather than the occurrence (Gannon, 1981; Halbreich & Endicott, 1985a). No commonly agreed upon definition of menstrual cycle phases have been used in the research (Abplanalp, 1983b; Rossi & Rossi, 1980). Different techniques have been used to define and rate symptoms (Halbreich & Endicott, 1985a; Wilcoxon et al., 1976) and to organize data from cycles of different lengths (Dennerstein & Abraham, 1982).

Subject selection methods vary widely and subject group characteristics are often inadequately described (Rubinow & Byrne, 1984). To study a wide range of severity and phenomenology, Halbreich and Endicott (1985a) recommend the use of entire specific groups such as classes of students. In general, subjects have been aware that the experimenter was studying the menstrual cycle. Abplanalp (1983b) has considered the potential effects of demand characteristics on premenstrual symptom research. She concludes that the time and expense of disguised-purpose prospective studies to find an adequate sample of women with severe premenstrual tension is prohibitive. There is some evidence that the influence of extraneous factors such as cultural beliefs is minimal for the Menstrual Distress Questionnaire (Form T) (Markum, 1976), and for severe premenstrually symptomatic women (Abplanalp, 1983b).

It has become increasingly apparent that the premenstrual syndrome is actually a number of different syndromes involving many symptom

'clusters' or profiles (Abraham, 1980; Blume, 1983a; Halbreich & Endicott, 1982b; Moos, 1969). Major symptom clusters (Moos, 1969), symptom categories (Abraham, 1980), and psychiatrically based diagnostic syndromes (Halbreich & Endicott, 1982a) have been differentiated. If the unitary term 'premenstrual syndrome' is actually a misnomer, failure to differentiate among different change patterns in the research may obscure relationships with other variables (Abplanalp, 1983b).

In spite of the lack of precise knowledge concerning premenstrual symptomatology, much has been written about the relationship between the premenstrual phase and affective changes. The prevailing view is that dysphoric affect (such as irritability, hostility, anxiety, sadness, depression, tension, etc.) is related to the premenstrual period (Dennerstein & Burrows, 1979; Green, 1982). Prospective self-report studies on various samples of women, not selected or grouped on the basis of presence of premenstrual symptomatology, are inconsistent in findings and difficult to compare. Some studies have found evidence of a premenstrual increase in the occurrence of various negative emotions (Golub, 1976b; May, 1976; Moos et al., 1969; Sampson & Jenner, 1977; Taylor, 1979c; Wilcoxon et al., 1976). Other investigations have failed to confirm a relationship between mood changes and menstrual cycle phase (Englander-Golden et al., 1978; Little & Zahn, 1974; Persky, 1974; Silbergeld et al., 1971; Slade, 1981, 1984; Swandby, 1980; Vila & Beech, 1980; Zimmerman & Parlee, 1973). Such factors as subject incomparability, the use of varied types of measurement devices, little differentiation between negative affects, and differences in testing

design and menstrual cycle phase definition render across study comparisons difficult.

One explanation that may account for much of the discrepancy is that only a subgroup of women have increased negative affect premenstrually. Thus, studies concluding affective variation occurs in 'normal' women may have included some premenstrual dysphoria sufferers in their normal groups (Abraham, 1978). The use of group mean scores in these studies may therefore not provide the most meaningful measure of normative patterns (Bardwick, 1976; Schilling, 1980; Sherif, 1980). Furthermore, premenstrual dysphoria may be a significant premenstrual worsening of affective symptoms (Abplanalp, 1983a), and failure to find increased negative affect premenstrually may be due to a lack of examination of individual mood change patterns. This view is supported by reports of greater variability in affect premenstrually (Moos et al., 1969) and that some women actually experience positive premenstrual mood changes (Halbreich et al., 1985; McClure et al., 1971; Wetzel et al., 1975).

A few studies have examined cyclic mood changes in women predetermined by various methods as having 'premenstrual syndrome' and these studies have consistently shown the presence of premenstrual negative affect (Freeman et al., 1985; Halbreich & Kas, 1977; Haskett & Abplanalp, 1983; Haskett et al., 1980; Reynolds, 1969; Sanders et al., 1983). It is apparent that some women do experience cyclic mood changes. It is not yet clear whether increases in premenstrual negative affect are ubiquitous in women and lie on a continuum from mild to severe, or

whether they constitute a more discrete 'syndrome' (Abplanalp et al., 1980):

There are many indications in the literature that premenstrual dysphoria is a multi-dimensional phenomenon, composed of several distinct types of affective changes (Abraham, 1980; Blume, 1983b; Halbreich & Endicott, 1982a; Halbreich et al., 1982b; Haskett et al., 1980; Moos, 1969; Smith, 1975; Steiner et al., 1977). Most studies investigating premenstrual affect have not clearly differentiated between the various types of dysphoria. These studies lump together several dysphoric affects (e.g., depression, anxiety, anger, tension, etc.) into a single item or affective dimension. This precludes differentiation of subgroups of women with different combinations of dysphoric moods. Only recently have investigators become concerned with the possible differences between these affective states (Freeman et al., 1985; Haskett et al., 1980).

Halbreich and his associates have most widely investigated the diversity and bipolarity of premenstrual symptoms (Halbreich et al., 1982b), using psychiatric research criteria applied to retrospectively study premenstrual changes. These authors found that a percentage of their developmental sample met criteria for such premenstrual syndromes as major and minor depression and depressive subtypes such as 'anxious - agitated' or 'hostile'. Some women actually showed positive changes premenstrually (Halbreich & Endicott, 1982a). There were indications of a premenstrual increased 'well-being' syndrome. The presence of a

premenstrual irritable-angry syndrome or an anxiety syndrome in the absence of depression was rare.

Although premenstrual dysphoric changes are not uncorrelated (Moos, 1969), and most women experience some combination of affective symptoms (Halbreich et al., 1982; Steiner et al., 1977), some differential correlates have been demonstrated. Cullberg (1972) observed a negative reaction to estrogen dominated oral contraceptive treatment in subjects reporting mainly premenstrual irritability as opposed to depression. Clare (1983) found evidence that symptoms such as irritability may show a stronger relationship to premenstrual-physical symptoms than anxiety or depression. Halbreich et al. (1983) found differential associations between types of premenstrual dysphoric changes and some physical and cognitive changes.

The phenomenology of possible affective changes has not been clearly outlined, particularly with respect to the potential premenstrual affective subtypes and combinations. Freeman et al. (1985) concluded that although numerous behavioral and somatic symptoms are associated with the premenstrual syndrome, the emotional symptoms were predominant. It appears that better definition and discrimination between various premenstrual affective subtypes may be an important factor in establishing and clarifying the mechanisms involved in premenstrual symptomatology. The major types of dysphoric premenstrual affect seem to be depression, anxiety, irritability-hostility (Abplanalp, 1983a), with the possibility of premenstrual mood elevation that may evidence as a relative decrease in dysphoric affect. The

importance of delineating affective subtypes is illustrated by various attempts to be discussed, to relate the presence of premenstrual symptoms to personality factors such as neuroticism or trait anxiety.

Methodological problems have plagued the study of cyclic variation in affect over the course of the menstrual cycle. It is therefore important to recognize such limitations and attempt to overcome drawbacks to the accurate and specific differentiation and measurement of premenstrual affect. Since premenstrual symptoms may lie on a continuum one must account for the intensity of premenstrual changes. Any substantial change from a baseline measure during the premenstrual period may be considered evidence of a premenstrual change (Halbreich & Endicott, 1985a). A definition of premenstrual affective change that restricts it to affective changes only appearing premenstrually and not at other periods of the cycle omits women who evidence premenstrual exacerbation or deterioration of affective states (Halbreich & Endicott, 1985a).

To study the presence of the various premenstrual affective states and combination of such states it may be important to focus on the potential universality of the phenomena. This may be accomplished by utilizing normal subject groups rather than focusing on the fact that some women experience such a severity of changes that they may be labelled 'patients' (Abplanalp et al., 1979a). Only prospective measures applied on a daily basis and that use an intermenstrual baseline can differentiate symptom occurrence from symptom exacerbation (Rubinow & Byrne, 1984). The prospective self-report method appears to be the best

available method to investigate affective changes (Lips, 1978; May, 1976; Rubinow & Byrne, 1984; Sampson & Prescott, 1981). Since mood changes are changes in state, when choosing instruments for the measure of mood it appears important to use standardized and well-researched rating scales that are sensitive to transient mood fluctuations. It also appears that increased variance of psychological changes may occur premenstrually. Group means may not provide the most meaningful measure of normative patterns (Bardwick, 1976; Sherif, 1980). Data should be analyzed on an individual basis, using magnitude of change scores across menstrual phase-related test sessions as the scores representing the mood shifts of an individual. The use of magnitude of change scores also allows the possible bidirectionality of change in affect to be accounted for. One criticism of research on the premenstrual phase has been the almost constant focus on negative emotions rather than positive ones. If researchers are to examine variations in negative affect, detection of a decrease in levels of such affect should not be ruled out by data analysis procedures.

The categorical (typological) approach to subtyping a phenomenon is most familiar to clinicians and facilitates selection of homogeneous subject groups for research (Halbreich & Endicott, 1982a). Any investigation attempting to examine the range of symptom levels and combinations, however, would best be served by the dimensional approach. The dimensional approach may, for example, utilize cluster analytic techniques to group subjects by profile. The dimensional approach allows for a better description of the range and continuum of experience of

phenomena. This is accomplished by inclusion of all possible profiles or combinations of interest. It would help clarify what pattern of features or subtypes tend to occur, the discrete or continuous nature of such changes and possible links may be investigated between such feature clusters and other variables. Premenstrual affective changes have not been widely investigated and easily differentiated both from clinical and research perspectives. Since these types of investigation form the basis of a categorical approach, it may be premature to form typologies. More evidence is needed of the differential significance of any particular combination or severity level of premenstrual affective changes. Then it may be determined what particular feature(s) at what level of severity seem to constitute a 'type'. Hamilton (1984) warns that the psychiatric research criteria that have been developed to study premenstrual changes are not to be confused with well-validated clinical diagnostic criteria.

Despite the lack of a clear understanding of premenstrual phenomena, some authors have investigated and found associations between premenstrual features and indices of psychological 'ill health' on various multiple personality inventories or questionnaires (Clare, 1983; Gough, 1975; Hain et al., 1970; Levitt & Lubin, 1967; Taylor, 1979b). In contrast, some studies have not supported the belief that premenstrual symptomatology reflects personality characteristics or level of adjustment (Di Nardo, 1975; Kleinsasser, 1976; Seagull, 1974). Some authors have reported an association between premenstrual complaints and more specific personality factors such as neuroticism (Coppen & Kessel,

1963; Kramp, 1968; Rees, 1953; Taylor, 1979b). Comparing the neuroticism scores of premenstrual tension complainers with non-complainers, Watts et al. (1980) found significantly higher neuroticism scores in women with premenstrual syndrome as compared to controls. The results of Sanders et al. (1983), however, did not support this finding.

Measures of trait anxiety and their relation to state anxiety and the premenstrual syndrome have also been examined. Some authors have reported an association between trait anxiety measures and premenstrual anxiety or magnitude of premenstrual affective symptom reporting (Awaritefe et al., 1980; Halbreich & Kas, 1977; Moos, 1977). No such association was found in other investigations (Golub, 1976b; Lahmeyer et al., 1982). Trait anxiety levels seem unaffected by cycle phase (Abplanalp et al., 1977; Golub, 1976b).

Overall findings suggest some relationship between personality 'dysfunctions' and premenstrual symptomatology (Dennerstein & Abraham, 1982). The inconsistent findings regarding the association of personality variables to premenstrual symptomatology may be due to the incomparable and often poor methodologies employed in these studies (Gannon, 1981). Given that several different types of mood changes may form subtypes of premenstrual dysphoria, the failure to account for the importance of delineating affective subtypes may also account, in part, for the lack of consistency in the findings. There are indications in the literature that premenstrual depression as opposed to irritability seems to be related to neuroticism (Cullberg, 1972; Haskett et al., 1980). No adequately controlled study has tested the proposed

relationship between neuroticism and premenstrual depression using valid measures of neuroticism and indices of specific subtypes of premenstrual dysphoric symptomatology. The relationship between measures of state and trait anxiety and premenstrual symptomatology warrants further examination. This examination is particularly necessary in women with specific subtypes of premenstrual dysphoria, such as primarily depressed or primarily anxious premenstrual affect. Theoretically, the relationship between premenstrual depression and neuroticism is based partly on the 'vulnerability' hypothesis of the personality of premenstrual syndrome sufferers (Dennerstein & Abraham, 1982; Rees, 1976). The predicted relationship is also based in part on the proposed resemblance between premenstrual depression and a 'neurotic' or mild depression (Haskett et al., 1980, 1984; Smith, 1975; Steiner et al., 1980a). Regarding trait anxiety and premenstrually increased state anxiety, the theoretical connection is based again on the 'vulnerability' hypothesis and the relationship between high trait anxiety and sensitivity to perceiving situations (such as premenstrual changes) as 'ego threatening' (Shedletsky & Endler, 1974).

A number of authors have addressed the possibility that episodic psychoses which seem to exacerbate premenstrually (Simpson et al., 1964; Swanson et al., 1964; Torghelle, 1957) may be related to affective disorders. A trend to, or an increased prevalence of premenstrual mood changes has been reported in women with primary affective disorders (Diamond et al., 1976; Endicott et al., 1981; Kashiwagi et al., 1976). An increased risk of psychiatric morbidity in women with premenstrual

syndrome has also been reported (McClure et al., 1971; Wetzel et al., 1975).

It has been suggested that premenstrual affective features may serve as a model for an affective disorder (Halbreich et al., 1983) such as 'nonendogenous' major depressive disorder or milder chronic or episodic depressive disorder. A positive relationship has been found between significant premenstrual depression and the presence of a lifetime diagnosis of affective disorder (Endicott et al., 1981). Premenstrual depressive features are generally less severe than in patients with affective disorders (Halbreich et al., 1983) and do not seem to resemble endogenous depression (Haskett et al., 1984). Indications that a relationship exists between premenstrual mood elevation and a personal or family history of bipolar affective disorder (McClure et al., 1971; Wetzel et al., 1975) have yet to be systematically investigated.

It appears that about 57-65% of women with affective disorder show premenstrual 'depressive' or affective syndrome (Diamond et al., 1976; Endicott et al., 1981; Halbreich & Endicott, 1985b; Kashiwagi et al., 1976). Overall research findings do indicate an association between affective disorders and premenstrual negative affect yet the nature of the association is as yet unclear and subject to much speculation (Bancroft & Backstrom, 1985; Clare, 1983; Hurt et al., 1982; Rubinow & Byrne, 1984). It is questionable whether one should distinguish between premenstrual symptomatology sufferers with a diagnosed psychiatric illness and those without, as premenstrual symptomatology and

psychiatric illness may be independent conditions (Abplanalp et al., 1980). Many women with premenstrual symptomatology do not meet criteria for a diagnosis of psychiatric illness. As Hamilton (1984) points out in her commentary, it would be premature to begin defining premenstrual syndrome as a sex-specific, primary 'psychiatric' diagnosis.

Many women who experience premenstrual emotional changes have also been found to report one or more somatic complaints (Abplanalp, 1983b). Premenstrual psychological and physiological changes may share a common cause or may be independent phenomena that sometimes occur together. Smith (1975) drew attention to the fact that psychological premenstrual problems may be partly or entirely due to the direct or indirect effects of recurrent physiological changes.

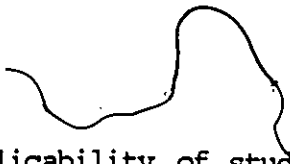
Many researchers have concluded or speculated that the physical and emotional components of premenstrual syndrome(s) are independent (Andersch et al., 1978; Haskett & Abplanalp, 1983; Haskett et al., 1980; Janowsky et al., 1973; May, 1976; Moos & Liederman, 1978; Tonks, 1975). Some investigations report an association between premenstrual tension and high premenstrual somatic reporting (Moos et al., 1969), or positive correlations of somatic and emotional premenstrual symptoms (Taylor, 1979c). A 'temporal' relationship has been reported between mood and physical state premenstrually (Sanders et al., 1983) as well as evaluations of the 'psychological' nature of luteal phase negative moods as opposed to the 'somatic' character of menstrual phase negative affect (Rossi & Rossi, 1980). It has also been noted that women reporting many

premenstrual symptoms report a greater proportion of psychological symptoms than women reporting few premenstrual symptoms (Clare, 1983).

No consistent or conclusive relationship has been found between premenstrual physical and emotional symptoms. It may be that both types of changes represent independent yet sometimes temporally overlapping 'syndromes' or cyclic patterns (Sanders et al., 1983). Somatic discomfort may be a variable accompaniment of premenstrual increases in negative affect. Premenstrual mood changes cannot as yet be assumed as independent of somatic discomfort. It is also possible that different premenstrual affective changes may have a differential correlational relationship to somatic complaints. Therefore, the possible links between premenstrual affect or affective subtypes and physical symptomatology should be investigated further.

If several or many different premenstrual syndromes exist, then failure to differentiate among different change patterns or subtypes of premenstrual features may obscure relationships with other variables. Failure to differentiate among subtypes of premenstrual features may partly account for frequent failures to find consistent biologic changes as associated with premenstrual syndrome (Abplanalp, 1983b; Bancroft & Backstrom, 1985; Clare, 1983; Halbreich & Endicott, 1985a; Halbreich et al., 1983). This obscuring of any relationship may apply to premenstrual affective subtypes and personality variables such as the ones of neuroticism and trait anxiety.

Greater specification of subtypes of premenstrual changes may contribute to better descriptions of the syndrome(s), increase



replicability of studies and help identify the correlates of specific subtypes of premenstrual changes (Endicott et al., 1981). Greater subtype specification may ultimately increase the understanding of potential physical and psychologic accompaniments to premenstrual mood changes. Investigations of premenstrual subtypes may aid in the differential examination of treatment responses (Green, 1982) and thus clarify effective management techniques for premenstrual complaints. Different syndromal clusters may require different treatments (Bernsted et al., 1984). Such research may also help in the clarification of the etiologies of specific premenstrual changes. This may be accomplished by identifying subtypes more clearly and thus, repeated measurement of biological variables could be conducted in reference to a clearly specified 'syndrome' subtype (Endicott, 1982b).



Chapter II

RESEARCH OBJECTIVES

This study was designed primarily to prospectively identify, describe, and investigate a wide range of severity and phenomenology of the major types of premenstrual affective changes in normally menstruating women. Attempts were made to overcome many of the common methodological difficulties in this type of research.

Although researchers have studied the diversity of premenstrual negative affects, interpretation of previous research has been difficult due to methodological problems such as in the study of Freeman et al. (1985). Subjects were drawn from a premenstrual syndrome treatment program and not a more heterogeneous or 'normal' sample. They also received counselling for symptom management at the first diagnostic phase visit (Freeman et al., 1985). Furthermore, the affect symptom clustering was conducted by arbitrarily, for example, combining the affective measures of irritability and anxiety and separating this cluster from one containing depression. The work of Halbreich and his associates has provided information concerning the combinations, diversity and bidirectionality of premenstrual affective changes. Their research, however, utilizes a retrospective design and employs a typological or categorical approach based on psychiatric research criteria (Halbreich et al., 1982b). The main objective of the present study differed from that of prior research. Premenstrual negative affect

changes and combinations were prospectively investigated in a large sample of normally menstruating women, using standardized self-report rating scales that provided magnitude of change scores to allow a dimensional approach to affective subtyping. This dimensional subtyping approach using prospective measures and an intermenstrual baseline allowed for differentiation of symptom occurrence from symptom exacerbation. It also allowed for a better description of the range and continuum of affective symptom levels and combinations in a normal sample of women. Prospective studies of premenstrual affective changes in normal women have not been conducted using standardized rating scales, differentiated mood measures, an intermenstrual baseline period and a dimensional clustering approach to detect affective combinations and possible bidirectional changes along a potential continuum.

For the purposes of this study, menstrual cycle phases were defined as menstrual (days 1-5), follicular (days 6-12), ovulatory (days 13-16), and luteal (days 17-28). The intermenstrual period is defined as days 6-12, and premenstrual refers to from day 21 to the onset of menses, which was restricted to necessarily occur on or before day 34 in order to include subject data. Any substantial change in measures from the intermenstrual baseline to the premenstrual levels was considered evidence of premenstrual affective changes.

To meet the main objective, a large sample of mainly student volunteers was screened to ensure the presence of a fairly regular, normal menstrual cycle, good physical health and lack of previously diagnosed or treated psychiatric disorder. Thus, a relatively

homogeneous but not overly restricted sample of women was identified. Demographic data was collected on all participants.

All subjects were administered a selected combination of standardized self-report mood questionnaires during the intermenstrual and premenstrual phase of one menstrual cycle. A modified daily recording procedure was thus utilized with day of onset of menses as the cycle marker. Subjects were aware that the purpose of the study was to investigate 'mood and the menstrual cycle'. This procedure was used to optimize the number of participants suspecting cyclic mood changes. At the same time, potential volunteers were informed that it was not necessary to have perceived or suspected mood changes related to their cycle in order to participate. The necessity for inclusion of subjects with a wide range of severity and combinations of premenstrual affective changes rendered the above procedure methodologically useful in spite of the potential introduction of research demand characteristics. The self-report mood ratings were collected after the intermenstrual phase ratings and prior to premenstrual ratings to reduce the potential bias effects of subjects knowledge of their intermenstrual ratings on premenstrual ratings.

The mood questionnaires were chosen on the basis of provision of valid and sensitive measures of the major mood states that have been connected with the premenstrual phase (i.e., depression, hostility-irritability and anxiety-tension). The measures of affect that were adopted were judged to be the best available measures with sensitivity to transient fluctuations in affect. All subjects were also

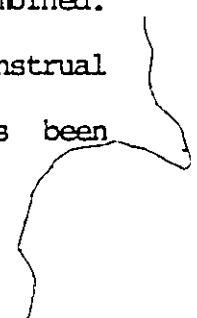
administered a questionnaire, designed for use with the menstrual cycle, that includes three factors composed of somatic items. Somatic ratings were made on the same modified daily basis as the mood ratings.

The individual magnitude of mood change scores between intermenstrual and premenstrual test periods were used to differentiate between subjects. This differentiation was between subjects reporting specific types or combinations of types of premenstrual increases or decreases in negative affect, and subjects who reported little or no changes in mood. Thus, each subject served as her own control using an intermenstrual baseline for comparison. The reverse cycle day method was used to organize data from each individual's menstrual cycle.

A cluster analytic technique was applied to group subjects on the basis of their dimensional profiles of the change scores on the affective combinations investigated. This technique allows for examination of the range and variety of symptom levels and combinations by organization into affective cluster subject groups.

Once the major objective of clustering subjects into affective subtypes was accomplished, certain secondary hypotheses were planned to be tested. Across cycle phase comparisons of mood measures were conducted. It was postulated that across phase differences in affect measures would be significantly different (in that higher negative affect measures would be found in the premenstrual phase) for subjects falling into dysphoric subtype groups but not for all subjects combined.

The relationship between premenstrual affect or premenstrual syndrome and measures of neuroticism and trait anxiety has been



investigated but the research has not yielded consistent results. One possible explanation for this inconsistency is that the diversity and combinations of premenstrual affective changes have not been carefully specified or accounted for in prior studies investigating the relationship of personality variables to premenstrual changes. No adequately controlled study has tested the proposed relationship between elevated neuroticism and premenstrual depression using both valid neuroticism measures and indices of specific subtypes of premenstrual dysphoria. Regarding trait anxiety, the total available evidence does not clearly lead to the conclusion that high trait anxiety is related to premenstrual state anxiety elevation or premenstrual affective symptomatology. Previous research has not focused on the possible links between specific subtypes of premenstrual dysphoric changes such as elevated state anxiety (or combinations of such an elevation with premenstrual elevations in other types of dysphoric affect) and levels of trait anxiety.

Neuroticism scores (obtained at an initial interview) of the affective subtype groups were compared. A primary hypothesis was that subtype groups demonstrating depressed premenstrual affect would demonstrate a higher neuroticism score than the other dysphoric subtype groups and any group(s) reporting little or no premenstrual mood change.

An investigation of across subgroup differences in trait anxiety measures (obtained at two separate points of the menstrual cycle), and their possible relation to state anxiety measures was conducted. Trait anxiety measures were not expected to be significantly different over

the two times of testing. Another primary hypothesis was that subjects in subgroups reporting increased premenstrual state anxiety were expected to demonstrate trait anxiety measures higher than those of other dysphoric subtype^{ov} groups or any group(s) evidencing little or no premenstrual mood changes.

Finally, the secondary question of whether premenstrual negative affect may be a secondary response to physical symptoms was addressed. The possible link between premenstrual affective and physical changes has not been well investigated, particularly with regard to different types of premenstrual affective changes. Prior research has not sought the correlation between change scores of carefully and prospectively specified types of negative affect and premenstrual physical symptom changes. It was postulated as a secondary hypothesis that very little of the difference between intermenstrual and premenstrual affect measures could be accounted for by increases in premenstrual physical symptom reporting, or vice versa regarding physical measures being accounted for by differences in premenstrual affect reports.

Chapter III

METHODS

Subjects

Source and Number

A total of 537 volunteers were obtained from the student population of the University of Ottawa and from the Ottawa sector of the Serena organization. Members of Serena practice a contraception method based on the monitoring of basal body temperature, and additional signs of ovulation.

The volunteers were obtained in two groups with a 12 month time difference in their recruitment and participation in the study. The first volunteer group was composed of 317 subjects of the student population and Serena members, and the second group consisted of 116 volunteers from the student population. Subjects were asked to participate in a study on 'mood and the menstrual cycle' and informed that it was not necessary that they believe that their mood was in any way connected to their cycle.

Of the original first volunteer group ($n = 317$), 26 subjects could not be contacted and after screening the remaining 291 by telephone, 126 subjects (43% of contacted volunteers) met the exclusion criteria described below. A total of 165 subjects of the first volunteer group were individually interviewed for the study.

Of the second group of volunteers ($n = 116$), 12 subjects could not be contacted and after screening the remaining 104 volunteers by telephone, 44 subjects (42% of contacted volunteers) met the exclusion criteria. A total of 60 subjects of the second volunteer group were interviewed for the study.

Exclusion Criteria

Any of the following criteria formed a basis for exclusion from the study. These criteria were used to obtain a sample of normally menstruating women without diagnosed psychiatric illness.

- i) Age less than 18 or greater than 45 years.
- ii) Current use of oral contraceptives.
- iii) Use of oral contraceptives within six months prior to participation in the study.
- iv) Pregnant or planning to become pregnant.
- v) Taking medication on a regular basis (particularly anxiolytics, antidepressants, diuretics, hormones or neuroleptics), or during the study, or within four weeks preceding the study.
- vi) Suffering from a serious medical illness (particularly an endocrine or gynecologic disorder).
- vii) Previous psychiatric care.
- viii) The average length of the menstrual cycle is estimated to be greater than 34, or less than 24 days.
- ix) The date of expected menstruation is estimated to fluctuate by more than three days around the average cycle length.
- x) Non-regular menses for six previous cycles.

- xi) Pregnant within six months prior to the study.
- xii) Breast feeding a child within six months prior to the study.

Data Collection

Procedure

All subjects were individually interviewed during which they were explained the method of completion of the self-report questionnaires. They were also asked to sign a consent form informing them of anonymity and confidentiality regarding the information they provided in their participation. Each subject was administered the Eysenck Personality Inventory (EPI) to obtain a measure of neuroticism (possible score range = 0-24). Demographic data was collected concerning details of marital status, parity, education, employment, religion, residential setting and mother tongue. Subjects were given all of the self-report mood questionnaires to take home and left with the instructions to report the first day of onset of their next menstrual period to the experimenter.

A previously conducted pilot study ($n = 10$) regarding the feasibility of collection of mood questionnaires on a modified daily basis resulted in high attrition and a low compliance rate for completed questionnaires. Based on the results of the preliminary pilot study the following procedures were instituted to increase the response rate: informing subjects of the importance of the completion of questionnaires; inclusion of a general instruction sheet; inclusion of a schedule sheet for questionnaire completion; telephone contact with subjects at least four times during the test cycle.

Each subject began completing the mood questionnaires daily from day 6 of her test menstrual cycle (next cycle not including an exam-writing period) to day 12 (intermenstrual phase measures based on a standard 28 day cycle). Mood measures were also obtained daily from day 21-34 (premenstrual phase measures). Subjects were not explicitly informed that the dates of completion of self-reports corresponded to the intermenstrual or premenstrual period of their cycle. A schedule was provided to each subject to keep track of the dates on which she would be required to complete mood ratings. The data was collected from each subject in two sets. The first set consisted of the daily ratings from days 6-12 and the second was the data of days 21-34. Subjects were instructed to note down the exact date of onset of menstruation occurring sometime near completion of the test cycle.

The subjects were instructed to leave the questionnaires for a daily rating blank if they failed to complete that daily rating, but to continue to complete the rest of the daily ratings as instructed. They were asked to report their mood on the questionnaires as accurately as possible, at about the same time on each day. They were asked to report their mood without editing or distortion according to their perception of the influence of daily events on their mood or consideration of menstrual cycle phase. They were encouraged to note down any significant personal events or situations on the questionnaires. A copy of the general instructions given to each subject can be found in Appendix 4.

During the course of data collection, subjects were telephoned at least four times; a reminder to begin the first set of daily ratings (on

day 6); a check-up call on their progress two days later; a reminder to begin the second set of daily ratings on day 21; a second check-up call four days later. This procedure ensured greater subject compliance and avoided any misunderstandings of the instructions.

Instruments

The following self-report questionnaires were completed at each daily rating.

- i) Menstrual Distress Questionnaire (MDQ-T, Today form).
- ii) Profile of Mood States (POMS, 'Today' version).
- iii) State-Trait Anxiety Inventory (STAI X-1, 'How you feel today').
- iv) Depression Adjective Checklist (DACL, 'How you feel today').

The above mood questionnaires were chosen as they were designed to provide sensitive measures of change over repeated administrations. The SAI X-1 (Spielberger et al., 1970) and the DACL (Lubin, 1976) were chosen to provide valid measures of anxiety and depression respectively. On the SAI X-1 the range of possible scores varies from a minimum score of 20 to a maximum score of 80. The DACL forms A-D were alternated over rating days for variation. On the DACL the possible score range is minus 10 to 34.

The POMS provides measures of negative affect with the factors of tension-anxiety (T), depression-dejection (D) and anger-hostility (A) (McNair et al., 1971). The score range is 0-35 points for the POMS-T, 0-60 for the POMS-D, and 0-48 for the POMS-A.

The MDQ-T (Moos, 1977) was included as it provides an overall measure of negative affect (Negative Affect factor, (NA)), as well as

several factors related to somatic symptoms (i.e., Pain (P), Water Retention (WR), and Autonomic Reactions (AR)). The score ranges for the MDQ-T factors are 8-48 for the MDQ Negative Affect factor, 6-36 for the Pain factor, 4-24 for the Water Retention factor, and 4-24 for the Autonomic Reactions factor. The degree of correlation between premenstrual affective symptoms and premenstrual somatic complaints could thus be computed. The correlation would provide a measure of the relative dependence or independence of physical and affective symptomatology.

Subjects also completed the SAI (Form X-2), which is a measure of trait anxiety, on day 6 and day 21 of the test cycle in order to allow examination of the possible relationship between measures of state and trait anxiety.

The EPI (Form A) was administered at the initial interview in order to obtain measures of neuroticism and, therefore, allow a test of the hypothesized relationship between neuroticism and premenstrual depression. The EPI was chosen to obtain measures of neuroticism, despite criticisms that have been directed at the use of such standard personality tests to support the notion that frequency and/or severity of menstrual distress is related to neuroticism (Gannon, 1981). It is argued that significant correlations between menstrual distress questionnaires and personality tests may be due to confounding (i.e., similar questions on both types of tests, such as those questions regarding mood swings) rather than any actual association between menstrual disorders and poor adjustment (Gannon, 1981). For the purposes

of this study, however, EPI neuroticism measures will be used to support or refute a specific hypothesized relationship between neuroticism and premenstrual depression as opposed to premenstrual anxiety/irritability. Premenstrual depression and anxiety/irritability are both types of menstrually related mood swings. Thus, the similarity of EPI neuroticism questions to those on reports of questionnaires of mood should not serve to confound the this type of group comparison.

For a more complete description of each of the self-report instruments used in this study, the reader is referred to Appendix 5.

Chapter IV

PRESENTATION OF RESULTS

Subject Group 1

Of the 165 subjects interviewed for the study from the first volunteer group, data from 149 (mean age, 24.6 years; standard deviation, 7.1 years) were included in the analyses. Data from 13 subjects was discarded due to their extremely long test menstrual cycle. One subject became pregnant, one developed gynecological problems and another subject was excluded due to a bereavement reaction. Eleven of the final 149 subjects were Serena members.

The average number of completed questionnaires in the 7-day intermenstrual set of measures was 5.4 with a range from 5-7 ($n = 149$). For the possible 14-day premenstrual phase measures, the average number of completed questionnaires was 7.8 with a range from 3-14 ($n = 149$). Incomplete questionnaires or factors of questionnaires not responded to were considered as missing data for any given subject. Any data missing from the 7-day intermenstrual set of measures was due to non-compliance. In the 14-day premenstrual set of measures data may be missing due to non-compliance or length of menstrual cycle. For non-compliance only, incompleted daily questionnaire sets equalled 88 ($n = 149$). This averages to approximately 1.7 missing days of data per subject.

Change Score Calculation

Total daily scores for each completed test (i.e., DACL, SAI X-1), or factors of each test (i.e., POMS, MDQ-T) were calculated for each subject. A magnitude of change score for each subject was obtained on the SAI X-1 and DACL. A change score ~~was~~ obtained by subtracting the average of the composite seven-day intermenstrual measures from the average of the composite premenstrual measures. Data for the composite premenstrual measures was obtained by averaging the scores on all questionnaires completed up to and including the day before onset of menses. Each subject thus served as her own control in the estimation of a possible premenstrual increase in these ratings of anxiety and depression. The scores of the factors of the POMS (T, D, A) and the factors of the MDQ-T (NA, P, WR, AR) were each averaged within the two phases (intermenstrual and premenstrual). They were then converted into a magnitude of change score for each subject.

Affective Correlation Analysis

A correlational analysis (BMDP8D) (Dixon & Brown, 1979) was conducted using the magnitude of change scores of the six affect variables (i.e., POMS-T, D, A; MDQ-T NA; DACL; SAI X-1). The correlations are presented in Table 1. A correlation of .81 was found between the POMS-T factor change scores and the SAI X-1 change scores. A correlation of .75 was found between the POMS-D factor difference scores and the DACL difference scores. The general Negative Affect factor (MDQ-T) change scores correlated at or above .71 with all other affective change score measures except the POMS-A factor ($r = .64$).

These correlations provide evidence of the convergent validity of the chosen affect measures. The DACL and POMS-T change scores were considered redundant to the POMS-D and SAI X-1 measures respectively. The range and standard deviations of the DACL and POMS-T change scores were lower than those of the POMS-D and SAI X-1 (as shown in Table 2). Since a high degree of variation and flexibility was sought for the study in these measures, the POMS-T and DACL ratings were excluded in any further analyses.

Subject Group 2

From the 60 subjects of the second subject group, data from 45 (mean age, 22.8 years; standard deviation, 9.3 years) were included in the analyses. Data from four subjects was discarded due to their extremely long test menstrual cycle. Two subjects began menstruating too early in the cycle to collect adequate data and nine subjects were excluded because of incomplete or lost questionnaires. The average number of completed questionnaires in the seven-day intermenstrual set of measures was 6.6 with a range of 5-7 ($\underline{n} = 45$). The average number of completed premenstrual phase questionnaires was 8.3 with a range of 5-14 ($\underline{n} = 45$). Incomplete questionnaires or factors of questionnaires not clearly responded to were considered as missing data. For non-compliance only, incompleting daily questionnaire sets equalled 43 ($\underline{n} = 45$). This averages to approximately 1 missing day of data per subject.

Due to the results of the affective correlational analysis (see Table 1) of the Subject Group 1 ($\underline{n} = 149$), the 60 subjects of the second

Table 1Correlation Matrix of Magnitude of Affective Change Scores

Variable Name	POMS-T	POMS-D	POMS-A	MDQ-T NA	DACL	SAI X-1
POMS-T	1.00					
POMS-D	0.60	1.00				
POMS-A	0.57	0.65	1.00			
MDQ-T NA	0.71	0.78	0.64	1.00		
DACL	0.54	0.75	0.47	0.71	1.00	
SAI X-1	0.81	0.62	0.44	0.72	0.70	1.00

Note: n = 149.



subject group were not administered the redundant DACL self-report questionnaires. The second subject group was also not administered the SAI X-2. This reduced the rather large number of self-report questionnaires to complete over the course of the test menstrual cycle.

Total Subject Group

The first subject group ($n = 149$) and the second subject group ($n = 45$) were combined to conduct all of the following data analyses, except for the analyses of the SAI X-2 scores ($n = 149$) and its associated cluster analysis ($n = 149$).

The groups were able to be combined on the basis that the mean age and standard deviation of Subject Group 1 (i.e., $\bar{X} = 24.6$, $SD = 7.1$) did not differ appreciably from that of Subject Group 2 ($\bar{X} = 22.8$, $SD = 9.3$). Furthermore, the subject groups were both drawn from the same main population sample of students and were tested at the same time of year, with menstrual test cycles about 12 months apart. When separate demographic data for each subject group was examined the data was similar except that Subject Group 2 had a higher percentage of single (82.2%) as opposed to married (6.7%) women than Subject Group 1 (67.1% single women; 26.2% married women). The parity of subject groups did not seem to differ except in the case of having two or more children, where the percentage for Subject Group 1 was 13.4% and that of Subject Group 2 was 0%. Relatively little consistent research findings are available to relate such factors as age, marital status, and increasing parity to premenstrual symptomatology (Bancroft & Backstrom, 1985; Reid & Yen,

1981; Van Keep & Lebert, 1981; Woods et al., 1982). Since the focus of the present study is not to collect epidemiological data, it was considered more feasible for the analyses to combine the subject groups than to focus on a few factors of heterogeneity.

The means and standard deviations of the composite average follicular phase scores (time 1) and the composite average luteal scores (time 2) for the POMS factors, MDQ-T factors and the SAI X-1 are presented in Tables 3 and 4. Table 3 presents the means for subject group 1 ($n = 149$) and Table 4 presents the means for subject Group 2 ($n = 45$). The time 1 means, as well as the time 2 means, were compared for each variable across the above two subject groups using the two-sample t -statistic and significance level referred to under the section of this paper entitled Cluster Variable Comparisons. No significant differences were found across subject groups 1 and 2 on any variable for either time 1 or time 2 measures. These results support the position that subject groups 1 and 2 may be pooled for further analyses. The validity of combining the two subject groups is based upon the similar average intermenstrual and average premenstrual variable scores of each group. Furthermore, the means of the magnitude of affective change scores of subject group 1 (Table 2) were compared to those of subject group, 2 (Table 5). No significant differences were found using the above mentioned t statistic. It therefore appears to be an acceptable procedure to conduct analyses on the total subject group ($n = 194$) which is composed of subject groups 1 and 2.

Table 2

Means and Standard Deviations of Magnitude of Affective Change Scores of
Subject Group 1

Variable	X	<u>SD</u>	Smallest Case Value	Largest Case Value
POMS-D	0.82	4.72	-11.82	16.77
POMS-A	0.71	4.04	-14.71	14.80
MDQ-T. NA	1.07	3.83	- 9.69	11.34
SAI X-1	1.27	7.04	-30.92	24.43

Note: n = 149.

Variable means not significantly different from those of Table 5
 (Subject Group 2).

Table 3

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Subject Group 1

Variable Name	X	SD
POMS-D		
Time 1	4.974	5.665
Time 2	5.798	7.087
POMS-A		
Time 1	3.913	3.808
Time 2	4.621	4.922
MDQ-NA		
Time 1	13.691	4.472
Time 2	14.746	5.640
MDQ-WR		
Time 1	5.134	1.145
Time 2	7.627	2.918
MDQ-P		
Time 1	9.364	2.539
Time 2	9.961	3.063
MDQ-AR		
Time 1	4.401	0.710
Time 2	4.748	1.118
SAI X-1		
Time 1	38.349	8.280
Time 2	39.615	9.065

Note: Time 1 = intermenstrual phase.

Time 2 = premenstrual phase.

n = 149.

Variable means not significantly different from those of Table 4 (Subject Group 2) for both time 1 and time 2.

Table 4

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Subject Group 2

Variable Name	X	SD
POMS-D		
Time 1	6.578	7.916
Time 2	5.714	5.206
POMS-A		
Time 1	4.683	5.503
Time 2	4.650	5.362
MDQ-NA		
Time 1	14.257	5.791
Time 2	14.612	5.146
MDQ-WR		
Time 1	5.479	1.568
Time 2	7.336	2.532
MDQ-P		
Time 1	9.344	2.956
Time 2	10.212	3.536
MDQ-AR		
Time 1	4.474	0.982
Time 2	4.739	1.077
SAI X-1		
Time 1	39.862	9.130
Time 2	41.176	8.479

Note: Time 1 = intermenstrual phase.
Time 2 = premenstrual phase
n = 45.

Table 5

Means and Standard Deviations of Magnitude of Affective Change Scores of Subject Group 2

Variable	$\bar{X}$	<u>SD</u>	Smallest Case Value	Largest Case Value
POMS-D	-0.86	7.51	-34.57	14.83
POMS-A	-0.03	5.39	-16.95	12.86
MDQ-T NA	0.35	5.07	-16.27	11.46
SAI X-1	1.31	8.23	-26.64	15.17

Note: n = 45.

The total subject group was composed of 194 subjects (mean age, 25.2 years; standard deviation, 7.0 years). For a description of the demographic data of the total subject group ($n = 194$) see Appendix 6.

Change Score Calculation

The magnitude of change scores for each variable for $n = 194$, were computed in the same manner as that described under the section entitled change score calculation for Subject Group 1 ($n = 149$).

Cluster Analysis Procedure and Results

In order to separate the total subject sample ($n = 194$) into subgroups based upon the presence or absence of the major types of premenstrual affective change, the magnitude of change scores of the mood questionnaires (i.e., POMS-D, -A, SAI X-1) were used as data for the BMDP-79 program PRM (or K-means) clustering. PRM partitions cases into clusters based upon an Euclidean distance measure separating the cases. In the completed analysis each case belongs to the cluster whose center is closest to that case and each cluster center is the mean of cases within that cluster.

The cluster analysis demonstrated that 51% ($n = 98$) of the total sample of women ($n = 194$) fell into cluster groups characterized by increases in premenstrual dysphoric symptomatology. Three major categories of premenstrual dysphoria emerged from the analysis. These subtypes were based on the cluster means using change scores on depression-dejection (POMS-D), anger-hostility (POMS-A) and anxiety (SAI X-1). MDQ-NA scores were excluded from the cluster analysis as they provided an overall measure of negative affect instead of specific mood

variables. A total of six cluster groups was considered optimal as requesting cluster formation of more than six groups did not result in any further separation of major dysphoric subtype clusters. Requesting cluster formation of more than six groups led to a further breakdown of non-dysphoric clusters. Since the dysphoric subtype clusters were the main ones of interest in this investigation, six clusters are reported upon.

The affect cluster group means and standard deviations (based on change scores) are reported in Table 6. Table 7 reports the analyses of variance results for each affect variable (change score). The between-cluster mean square is compared to the within-cluster mean square. Since the cluster groups are obtained empirically, the F ratios are 'descriptive' of differences between clusters rather than a significance statement on the overall clustering.

Cluster Variable Comparisons

A two-sample t-statistic was used to conduct across cluster group mean comparisons on the variables of depression, anxiety, and anger. The results obtained from the t-test comparisons were used to aid in the description of the groups formed by the cluster analysis rather than serve as a type of statistical a posteriori comparison of means. The cluster mean values on each affect variable (see Table 6) were compared across Groups 1, 3, 4 and 6. The t-statistic estimates the variance of each group separately and the probability values correspond to two-sided tests of significance. Due to the number of comparisons to be conducted (six per variable), the experimentwise error rate was set at a

Table 6Affect Gluster Group Means and Standard Deviations of Total Subject Group 1

Cluster Group Number	<u>n</u>	Variable Name					
		POMS-D		POMS-A		SAI X-1	
		X	<u>SD</u>	X	<u>SD</u>	X	<u>SD</u>
1	13	10.38	3.25	5.34	4.10	14.15	3.77
2	18	-6.99	3.72	-5.61	5.37	-11.57	5.88
3	20	6.75	4.21	7.24	3.80	4.47	3.31
4	65	0.80	2.57	1.03	2.14	5.67	3.11
5	1	-34.57	0.00	-5.63	0.00	-26.64	0.00
6	77	-1.01	1.93	-0.92	2.17	-2.07	2.59
Grand Mean		0.43		0.54		1.28	

Note: Total n = 194.

Table 7Summary of Analyses of Variance of Each Cluster Affect Variable

Variable Name	Mean Squares		df	F-ratio	Prob.
	Between	Within			
POMS-D	894.063	7.472	5, 188	119.66	0.0
POMS-A	419.116	8.602	5, 188	48.72	0.0
SAI X-1	1645.252	11.134	5, 188	147.77	0.0

Note: $n = 194$.

probability level of .05. According to the formula of Keppel (1973), and to control for this error rate probability level, only obtained probability values of less than .001 were considered 'significant' (at $p < .05$).

Table 8 summarizes the results of the t -test comparisons. The high depression mean scores of cluster Groups 1 and 3 were not significantly different, $t(29.9) = 2.76$, $p < .01$. The moderate depression mean of Group 4 was significantly lower than that of Group 1, $t(15.2) = 10.04$, $p < .001$, or 3, $t(23.5) = 5.99$, $p < .001$. Compared to Group 6, Groups 1, $t(13.5) = 12.28$, $p < .001$, 3, $t(21.1) = 8.04$, $p < .001$, and 4, $t(117.1) = 4.68$, $p < .001$, all had significantly higher depression means. For anxiety, Group 1's mean was significantly higher than that of the moderate mean values of Groups 3, $t(23.4) = 7.56$, $p < .001$, and 4, $t(15.4) = 7.63$, $p < .001$. Cluster Groups 3 and 4 did not differ significantly in their mean anxiety values, $t(30.0) = 1.44$, $p < .20$. Compared to Group 6, cluster Groups 1, $t(14.0) = 14.94$, $p < .001$, 3, $t(25.3) = 8.20$, $p < .001$, and 4, $t(124.8) = 15.96$, $p < .001$, all had significantly higher anxiety means. Similarly, in comparison to Group 6, cluster Groups 1, $t(13.2) = 5.38$, $p < .001$, 3, $t(22.3) = 9.23$, $p < .001$, and 4, $t(136.7) = 5.37$, $p < .001$, had significantly higher anger means. Cluster mean anger values were not found to be significantly different between Groups 1 and 3, $t(9.9) = 1.34$, N.S., nor between Groups 1 and 4, $t(13.3) = 3.69$, $p < .05$. Groups 3 and 4 did differ significantly in their cluster mean anger values, $t(22.8) = 6.98$, $p < .001$. The highest anger mean was for Group 3 and the lowest was for

Table 8

t-test Analyses of Affect Cluster Group Means

Cluster Group Number	n	Cluster Group <u>t</u>			
		1	3	4	6
POMS-D					
1	13	-	2.76 ^{ns}	10.04*	12.28*
3	20	-	-	5.99*	8.04*
4	65	-	-	-	4.68*
6	77	-	-	-	-
POMS-A					
1	13	-	1.34 ^{ns}	3.69 ^{ns}	5.38*
3	20	-	-	6.98*	9.23*
4	65	-	-	-	5.37*
6	77	-	-	-	-
SAI X-1					
1	13	-	7.56*	7.63*	14.94*
3	20	-	-	1.44 ^{ns}	8.20*
4	65	-	-	-	15.96*
6	77	-	-	-	-

Note: Two-tailed t-tests with variances not assumed equal.
Total n = 194.

* $p < .05$.

Group 4. The Group 1 anger mean seemed to fall in the moderate range while overlapping, in terms of being nonsignificantly different, with Groups 3 and 4.

Cluster Subtype Descriptions

The subtypes identified from the cluster analysis may be described as outlined in the summary chart (see Table 9). Three major dysphoric categories were described. Descriptions were formed according to the value of affect cluster group means (see Table 6) and the t-test analyses (Table 5) comparing means, such as the comparisons to Group 6 (n = 77) which demonstrated little change in mood on all affect measures. The dysphoric subtype groups were those numbered 1, 3 and 4. Group 1 appears to demonstrate premenstrual increases in all three of the negative affects, where depression and anxiety predominate. In Group 3, depression and anger seem to predominate. In Group 4 moderate or low levels of increases in the negative affects are observed. Premenstrual mood elevation was apparent in Group 2 (n = 18) and Group 5 (n = 1) which together represent 9.8% of the total subject group (i.e., n = 194).

The reliability of the cluster subtyping was checked by a comparison of the affect cluster group means of subject Group 1 (n = 149) (see Table 20) with the respective means of subject Group 2 (n = 44) (Table 10). Subject Group 2 contains 44 subjects rather than the total of 45 as one outlier subject which formed a single cluster (see Table 6, cluster Group 5) was discarded to simplify the analyses. The comparisons of interest were between the two subject groups on each

Table 9

Cluster Subtype Descriptions

Cluster Group Number	n	Description	Age		% of Dysphoric $\bar{n}^a$	% of Total $\bar{n}^b$
			$\bar{X}$	SD		
1	13	High PM depression. High PM anxiety. Moderate PM anger.	25.2	7.0	13.3	6.7
2	18	Moderate-high PM decrease in depression, anxiety, anger.	26.2	7.1	-	9.3
3	20	High-moderate PM depression. Moderate-low PM anxiety. High-moderate PM anger.	23.3	7.0	20.4	10.3
4	65	Moderate-low PM depression. Moderate PM anxiety. Low-moderate PM anger.	26.4	7.6	66.3	33.5
5	1	High PM decrease in depression, anxiety, anger.	22	-	-	.5
6	77	Mild PM decrease in depression, anxiety, anger.	24.5	6.3	-	39.7

Note: PM = premenstrual.

 $\bar{n}^a$ Dysphoric = 98. $\bar{n}^b$ Total = 194.

Table 10

Affect Cluster Group Means and Standard Deviations of Subject Group 2

Cluster Group Number	<u>n</u>	Variable Name					
		POMS-D		POMS-A		SAI X-1	
		<u>$\bar{X}$</u>	<u>SD</u>	<u>$\bar{X}$</u>	<u>SD</u>	<u>$\bar{X}$</u>	<u>SD</u>
1	3	6.58	1.71	1.29	1.43	8.90	5.52
2	11	-2.06	2.21	-1.29	2.33	-4.10	2.08
3	5	8.09	4.91	9.83	2.24	10.12	2.16
4	6	0.78	1.43	2.18	1.87	10.67	1.84
5	4	-11.21	2.83	-11.51	3.89	-10.06	4.70
6	15	-0.12	2.99	-0.11	1.65	1.98	2.09
Grand Mean		-0.10		0.10		1.95	

Note: Total n = 44.

affect variable of the clusters. The t statistic and level of significance as outlined in the section entitled Cluster Variable Comparisons was applied.

No significant differences emerged between the two subject groups on each cluster for the affect cluster means of the POMS-D and POMS-A variables. For the SAI X-1, subject Group 1 ($n = 149$) and subject Group 2 demonstrated significant differences in clusters 2, 4 and 6. For cluster 2, subject Group 1 demonstrated a significantly lower SAI X-1 cluster group mean change than that of subject Group 2, $t(25) = 5.19$, $p < .001$. For cluster 4, subject Group 1 demonstrated a significantly lower SAI X-1 cluster group mean change than that of subject Group 2, $t(8) = 6.55$, $p < .001$. Finally, for cluster 6, subject Group 1 demonstrated a significantly lower SAI X-1 cluster group mean change than that of subject Group 2, $t(23) = 5.26$, $p < .001$.

The reasons for the across subject group differences in the cluster means of SAI X-1 may only be speculated upon. The small number of subjects composing subject Group 2 ($n = 44$) is one factor which must be considered when examining the reliability of the cluster subtypes in terms of a replication of the subtypes of subject Group 1. Furthermore, it may be noted that the range and standard deviations of the SAI X-1 variable change scores are high in comparison to the other affect variables (see Tables 2 and 5). There may be some reason for the significant findings that relates it to the constant lower cluster mean anxiety values of subject Group 1 for clusters 2, 4 and 6. In any case, the total number of affect cluster mean comparisons across subject

groups equalled eighteen. It seems that overall the cluster subtypes may be considered as fairly reliable. Of the eighteen comparisons conducted between the subject groups, only three comparisons pointed to significant differences. The affect cluster subtypes seem to be similar in both subject samples (i.e., Group 1 and 2) and thus the affect changes demonstrated may be considered as fairly typical for the type of population sampled in this study.

Cluster Subject Age Comparisons

The affect cluster group age means and standard deviations are presented in Table 11 for the total subject group ($n = 194$). Cluster groups were examined for age differences by applying a one-way ANOVA (BMDP7D) using clusters 1-6 as the grouping factor. No significant overall age difference emerged from the analysis, $F(5,188) = 0.94$, $p < .45$, indicating that cluster groups did not differ in the mean age of their subjects. The ANOVA results are presented in Table 12.

Analysis of Across Phase Differences

The means and standard deviations of the composite average intermenstrual phase scores (time 1) and the composite average premenstrual phase scores (time 2) for the POMS factors, MDQ-T factors and the SAI X-1 are presented in Table 13 ($n = 194$). For each affect variable, these scores were tested for significant across phase differences by analysis of repeated measures factors (BMDP2V). This analysis is similar to paired comparison t -tests. As seven separate comparisons were conducted, the experimentwise error rate was set at a probability level of approximately .05 according to the formula of

Table 11Affect Cluster Group Age Means and Standard Deviations

Cluster Group Number	<u>n</u>	$\bar{X}$	<u>SD</u>	Age Maximum	Age Minimum
1	13	25.23	6.85	39	18
2	18	26.17	7.08	40	19
3	20	23.30	7.41	42	18
4	65	26.39	7.58	45	18
5	1	22.00	0.00	22	22
6	77	24.48	6.32	45	18

Note: Total n = 194.

Table 12Summary of One-Way Analysis of Variance of Age of Subjects by Cluster Group

Source	Sum of Squares	<u>df</u>	Mean Square	<u>F</u> -Ratio	Prob.
Age (Between groups)	230.33	5	46.07	0.94	0.4533 ^{ns}
Age (Within groups)	9167.61	188	48.76		

Note: Groups = 1-6.

n = 194.

Table 13

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Total Subject Group

Variable Name		X	SD	Time ANOVA	
				F Ratio	Prob.
POMS-D	Time 1	5.346	6.273	1.19	0.2763
	Time 2	5.778	6.685		
POMS-A	Time 1	4.091	4.258	2.90	0.0903
	Time 2	4.627	5.013		
MDQ-NA	Time 1	13.822	4.800	9.01	0.0030*
	Time 2	14.715	5.517		
MDQ-WR	Time 1	5.214	1.260	167.47	0.0*
	Time 2	7.560	2.830		
MDQ-P	Time 1	9.360	2.633	14.40	0.0002*
	Time 2	10.019	3.171		
MDQ-AR	Time 1	4.418	0.779	23.45	0.0*
	Time 2	4.746	1.106		
SAI X-1	Time 1	38.670	8.484	5.92	0.0159
	Time 2	39.977	8.936		

Note: Time 1 = intermenstrual phase.

Time 2 = premenstrual phase.

n = 194.

Time ANOVA = repeated measures ANOVA trial factor with two levels; intermenstrual and premenstrual (see Table 14).

*p < .05.

Keppel (1973). Obtained probability values of less than .001 were considered significant (at $p < .05$).

Premenstrual phase measures of MDQ-T NA, WR, P, and AR were significantly higher than intermenstrual phase measures as indicated in Table 14 by the F ratios for NA, $F(1,193) = 9.01$, $p < .003$, WR, $F(1,193) = 167.47$, $p < 0.0$, P, $F(1,193) = 14.40$, $p < .002$, and AR, $F(1,193) = 23.45$, $p < 0.0$. The hypothesis that across phase differences in affect measures would not be significantly different for all subjects combined ($n = 194$) was supported, except for the higher global negative affect measure (MDQ-T NA) in the premenstrual phase.

Analysis of Across Phase Differences for Dysphoric Subtype Subjects

The means and standard deviations of the composite average intermenstrual phase scores (time 1) on the POMS factors, MDQ-T factors, the SAI X-1, and the composite average premenstrual phase scores (time 2) are reported in Table 15. Table 15 reports the means and standard deviations for only those subjects who fell into cluster groups characterized by dysphoric premenstrual symptomatology (Groups 1, 3 and 4; total $n = 98$). The across phase analysis was reconducted for only those subjects of Groups 1, 3, and 4. Table 16 summarizes the results of the analysis of repeated measures factors. As explained in the previous section entitled Analysis of Across Phase Differences, probability levels of less than .001 were considered significant. All factors of interest of the POMS, MDQ-T, and the SAI X-1 were significantly higher (at $p < .05$) in the premenstrual phase than in the intermenstrual phase

Table 14

Summary of Repeated Measures Analyses of Variance of Variable Mean Scores by Phase of Measurement

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
<u>POMS-D</u>					
Mean	12002.816	1	12002.816	174.39	0.0
Error	13283.400	193	68.826		
Time	18.138	1	18.138	1.19	0.2763
Error	2937.416	193	15.220		
<u>POMS-A</u>					
Mean	7373.805	1	7373.805	219.16	0.0
Error	6493.536	193	33.645		
Time	27.876	1	27.876	2.90	0.0903
Error	1856.214	193	9.618		
<u>MDQ-NA</u>					
Mean	78992.991	1	78992.991	1759.76	0.0
Error	8663.495	193	44.889		
Time	77.333	1	77.333	9.01	0.0030*
Error	1657.220	193	8.587		
<u>MDQ-WR</u>					
Mean	15827.393	1	15827.393	2470.89	0.0
Error	1236.269	193	6.406		
Time	533.781	1	533.781	167.47	0.0*
Error	615.166	193	3.187		

Table 14 (Cont'd)

Summary of Repeated Measures Analyses of Variance of Variable Mean Scores by Phase of Measurement

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
<u>MDQ-P</u>					
Mean	36425.094	1	36425.094	2590.95	0.0
Error	2713.304	193	14.059		
Time	42.266	1	42.266	14.40	0.0002*
Error	566.300	193	2.934		
<u>MDQ-AR</u>					
Mean	8145.439	1	8145.439	5879.88	0.0
Error	267.364	193	1.385		
Time	10.432	1	10.432	23.45	0.0*
Error	85.857	193	0.445		
<u>SAI-X1</u>					
Mean	600432.058	1	600432.058	4799.98	0.0
Error	24142.461	193	125.090		
Time	158.183	1	158.183	5.92	0.0159
Error	5159.993	193	26.736		

Note: Time = trial factor with two levels: intermenstrual and premenstrual.
n = 194.

* $p < .05$.

Table 15

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 for Dysphoric Subgroup

Variable Name		X	SD	Time ANOVA	
				F Ratio	Prob.
POMS-D					
	Time 1	4.656	5.749	47.06	0.000*
	Time 2	7.942	7.812		
POMS-A					
	Time 1	3.507	3.719	54.02	0.000*
	Time 2	6.377	5.749		
MDQ-NA					
	Time 1	13.132	4.599	106.36	0.000*
	Time 2	16.503	6.006		
MDQ-WR					
	Time 1	5.258	1.157	110.68	0.000*
	Time 2	8.097	3.001		
MDQ-P					
	Time 1	9.379	2.731	27.34	0.000*
	Time 2	10.643	3.244		
MDQ-AR					
	Time 1	4.471	0.818	12.93	0.000*
	Time 2	4.826	1.102		
SAI X-1					
	Time 1	37.272	8.259	216.52	0.000*
	Time 2	43.824	8.796		

Note: Time 1 = intermenstrual phase.

Time 2 = premenstrual phase.

n = 98.

Time ANOVA = repeated measures ANOVA trial factor with two levels; intermenstrual and premenstrual (see Table 16).

*p < .05.

Table 16

Summary of Repeated Measures Analyses of Variance of Variable Mean Scores for
Dysphoric Subgroup by Phase of Measurement

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
<u>POMS-D</u>					
Mean	7776.970	1	7776.970	93.87	0.000
Error	8035.920	97	82.845		
Time	529.066	1	529.066	47.06	0.000*
Error	1090.583	97	11.243		
<u>POMS-A</u>					
Mean	4786.958	1	4786.958	121.48	0.000
Error	3822.372	97	39.406		
Time	403.694	1	403.694	54.02	0.000*
Error	724.902	97	7.473		
<u>MDQ-NA</u>					
Mean	43031.638	1	43031.638	827.78	0.000
Error	5042.513	97	51.985		
Time	556.724	1	556.724	106.36	0.000*
Error	507.736	97	5.234		
<u>MDQ-WR</u>					
Mean	8739.711	1	8739.711	1289.67	0.000
Error	657.338	97	6.777		
Time	394.902	1	394.902	110.68	0.000*
Error	346.078	97	3.568		

Table 16 (Cont'd)

Summary of Repeated Measures Analyses of Variance of Variable Mean Scores for
Dysphoric Subgroup by Phase of Measurement

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
<u>MDQ-P</u>					
Mean	19642.821	1	19642.821	1299.21	0.000
Error	1466.550	97	15.119		
Time	78.247	1	78.247	27.34	0.000*
Error	277.626	97	2.862		
<u>MDQ-AR</u>					
Mean	4235.406	1	4235.406	3017.16	0.000
Error	136.166	97	1.404		
Time	6.200	1	6.200	12.93	0.000*
Error	46.504	97	0.479		
<u>SAI-X1</u>					
Mean	322253.988	1	322253.988	2371.86	0.000
Error	13178.940	97	135.865		
Time	2103.533	1	2103.533	216.52	0.000*
Error	942.370	97	9.715		

Note: Time = trial factor with two levels; intermenstrual and premenstrual.
n = 98.

* $p < .05$.

(Total $n = 98$). Thus, the hypothesis that across phase differences in affect measures would be significantly different (i.e., higher negative affect in the premenstrual phase) for subjects falling into dysphoric subgroups ($n = 98$) was supported.

For each separate affect cluster (Groups 1-6) the means and standard deviations of the composite average intermenstrual phase scores (time 1) and the composite average premenstrual phase scores (time 2) are reported. The means and standard deviations on the selected POMS factors, MDQ-T factors and the SAI X-1 are presented in Table 17 (total $n = 194$).

Analysis of the EPI Neuroticism Scores

The means and standard deviations of the EPI neuroticism scores are reported by cluster group in Table 18. Cluster groups high on premenstrual depression (i.e., Groups 1 and 3) were combined ($n = 32$). The cluster groups (i.e., Groups 1 and 3) were combined to compare their neuroticism scores to those of Group 4 (moderate-low premenstrual depression, $n = 65$) and Group 6 (little mood change premenstrually, $n = 75$). The high premenstrual depression cluster groups (i.e. Groups 1 and 3) were combined to test the hypothesis that cluster groups demonstrating depressed premenstrual affective changes would have higher neuroticism scores than other dysphoric subtype groups (i.e., Group 4) or groups demonstrating little mood change premenstrually (i.e., Group 6). Cluster Groups 1 and 3 were combined as both of these groups demonstrated highly depressed premenstrual affective changes. Three subjects who fell into the above cluster categories (i.e., Groups 1, 3,

Table 17

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 by Cluster Group

Variable Name	Cluster Group Number	n	$\bar{X}$		SD	
			Time 1	Time 2	Time 1	Time 2
POMS-D						
	1	13	4.84	15.21	3.87	5.18
	2	18	11.29	4.30	7.37	6.04
	3	20	8.28	15.03	8.30	9.98
	4	65	3.50	4.31	4.62	4.25
	5	1	42.57	8.00	0.0	0.0
	6	77	4.35	3.34	4.17	3.85
POMS-A						
	1	13	3.95	9.29	2.44	4.97
	2	18	8.96	3.35	6.17	4.00
	3	20	5.96	13.20	4.90	6.16
	4	65	2.66	3.70	3.18	3.26
	5	1	6.00	0.36	0.0	0.0
	6	77	3.67	2.75	3.69	3.15
MDQ-NA						
	1	13	13.99	21.95	5.05	5.19
	2	18	18.37	13.04	5.08	4.24
	3	20	16.55	21.78	5.61	6.33
	4	65	11.90	13.79	3.55	3.94
	5	1	33.14	16.88	0.0	0.0
	6	77	13.39	12.80	3.89	4.32
MDQ-WR						
	1	13	5.07	8.72	0.69	2.56
	2	18	5.08	6.77	0.96	2.13
	3	20	5.56	9.59	1.28	3.49
	4	65	5.20	7.51	1.19	2.77
	5	1	8.86	8.38	0.0	0.0
	6	77	5.14	7.05	1.39	2.65

Table 17 (Cont'd)

Means and Standard Deviations of Affect and Physical Variable Scores at Time 1 and Time 2 by Cluster Group

Variable Name	Cluster Group Number	n	X		SD	
			Time 1	Time 2	Time 1	Time 2
MDQ-P						
	1	13	9.39	11.62	2.15	2.58
	2	18	9.70	8.74	2.93	1.89
	3	20	10.72	12.54	3.18	4.00
	4	65	8.96	9.86	2.58	2.83
	5	1	16.43	15.38	0.0	0.0
	6	77	9.16	9.46	2.33	3.12
MDQ-AR						
	1	13	4.68	4.84	0.72	0.69
	2	18	4.26	4.60	0.51	1.21
	3	20	4.85	5.31	0.99	1.63
	4	65	4.31	4.67	0.74	0.93
	5	1	6.29	5.25	0.0	0.0
	6	77	4.36	4.67	0.76	1.97
SAI X-1						
	1	13	37.54	51.69	6.25	5.77
	2	18	47.56	35.99	8.87	8.03
	3	20	44.20	48.67	9.62	8.96
	4	65	35.09	40.76	6.98	7.60
	5	1	59.14	32.50	0.0	0.0
	6	77	38.18	36.11	7.15	7.13

Note: Time 1 = intermenstrual phase.
 Time 2 = premenstrual phase.
 Total n = 194.

Table 18Means and Standard Deviations of Neuroticism Scores

Cluster Group Number	<u>n</u>	<u>X</u>	<u>SD</u>	<u>F</u> Ratio ^{Group}	Prob.
1	12	12.583	5.160	3.67	0.0274*
3	20	11.800	5.337		
1+3	32	12.094	5.201		
4	65	10.308	4.883		
6	75	9.333	4.630		

Note: Total n = 172.

Group = Between Groups ANOVA of neuroticism score (see Table 19).

*p < .05.

4 or 6) had a lie scale score on the EPI neuroticism scale of greater than 5. Their neuroticism measures were excluded from the analysis as per the guidelines for the lie scale in the EPI manual (Eysenck & Eysenck, 1968).

The neuroticism score data was analyzed by applying a one-way ANOVA using cluster groups (Total $n = 172$) as grouping factors. The analysis revealed a significant overall difference in neuroticism means between the groups, $F(2,169) = 3.67, p < .0274$. The summary of the ANOVA results are reported in Table 19.

A post-hoc analysis was conducted using Dunn's multiple comparison procedure for planned comparisons with unequal sample sizes (Kirk, 1982). The subjects of combined cluster Groups 1 and 3 were found to have significantly higher neuroticism scores than cluster Group 6, $t_D(169) = 2.704, p < .05$. No significant difference on neuroticism measures were found between combined cluster Groups 1 and 3 and cluster Group 4, $t_D(169) = 1.710$. The hypothesized higher neuroticism scores of subgroups with high depressed premenstrual affect as opposed to moderate-low premenstrual depression was not supported. The high premenstrual depression subgroups did, however, demonstrate the expected higher neuroticism scores than the subgroup evidencing little premenstrual change in affect. As may be noted by examination of Table 18, the trend in the neuroticism means of the cluster groups is in the hypothesized direction.



Table 19

Summary of One-Way Analysis of Variance of Neuroticism Scores of Subjects by Cluster Group

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
N-score (Between groups)	171.809	2	55.90	3.67	0.0274*
N-score (Within groups)	3951.232	169	23.38		

Note: Groups = 1 + 3, 4, and 6.
 N-score = Neuroticism score of the EPI.
 n = 172.

* $p < .05$.

Subject Group 1 - Trait Anxiety Measures

Trait anxiety measures (SAI X-2) were obtained once during the intermenstrual phase (day 6) and once during the premenstrual phase (day 21) for $n = 149$. These measures were tested for stability over time and for potential differences across cluster groups by a one-way repeated measures ANOVA.

Cluster Analysis Results

As the SAI_X-2 score data was obtained on subject group 1 ($n = 149$) only, the cluster analysis as previously described for the total subject group (i.e., $n = 194$) was conducted on subject group 1 only, to form accurate cluster groups for SAI X-2 score comparisons. The results of this cluster analysis are summarized in Table 20 (Affect Cluster Group Means and Standard Deviations), Table 21 (Summary of Analysis of Variance of Each Affect Variable), and Table 22 (t-test Analyses of Affect Cluster Group Means). These tables may be interpreted as those already described for the cluster analysis of $n = 194$ in the sections entitled Cluster Analysis Procedure and Results, and Cluster Variable Comparisons.

The subtypes identified from this cluster analysis were similar to those obtained for the total subject group (i.e., $n = 194$). The cluster analysis demonstrated that 51% ($n = 76$) of the total sample of subject group 1 fell into cluster groups characterized by premenstrual dysphoric symptomatology. Three major categories of premenstrual dysphoria emerged from the analysis.

Table 20

Affect Cluster Group Means and Standard Deviations of Subject Group 1

Cluster Group Number	n	Variable Name					
		POMS-U		POMS-A		SAI X-1	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1	9	9.42	2.79	3.68	2.66	15.06	4.01
2	18	-3.72	2.97	-1.68	2.46	-8.66	2.61
3	12	9.10	3.94	7.85	4.71	4.27	3.51
4	55	1.08	2.07	1.75	2.47	5.13	2.88
5	3	-8.06	3.79	-9.08	6.53	-20.00	9.81
6	52	-0.90	1.97	-1.16	2.35	-1.24	2.08
Grand Mean		.82		.71		1.27	

Note: Total n = 149.

Table 21Summary of Analyses of Variance of Each Affect Variable for Subject Group 1

Variable Name	Mean Squares		df	F-ratio	Prob.
	Between	Within			
POMS-D	490.602	5.880	5, 143	83.44	0.0
POMS-A	264.386	7.688	5, 143	34.39	0.0
SAI X-1	1219.869	8.668	5, 143	140.76	0.0

Note: n = 149.

Table 22

t-test Analyses of Affect Cluster Group Means for Subject Group 1

Cluster Group Number	n	Cluster Group <u>t</u>			
		1	3	4	6
POMS-D					
1	9	-	0.39 ^{ns}	8.59*	9.82*
3	12	-	-	7.61*	9.36*
4	55	-	-	-	5.21*
6	52	-	-	-	-
POMS-A					
1	9	-	-2.57 ^{ns}	2.04 ^{ns}	5.13*
3	12	-	-	4.36*	6.44*
4	55	-	-	-	4.42*
6	52	-	-	-	-
SAI X-1					
1	9	-	6.43*	7.13*	11.91*
3	12	-	-	0.79 ^{ns}	5.24*
4	55	-	-	-	13.18*
6	52	-	-	-	-

Note: Two-tailed t-tests with variances not assumed equal.
Total n = 149.

* $p < .05$.

Cluster Subtype Descriptions

The subtypes identified from the cluster analysis may be described as outlined in the summary chart (see Table 23). Three major dysphoric categories were described. Descriptions were formed according to the value of affect cluster group means (see Table 20) and the t-test analyses (Table 22) comparing means, such as the comparisons to Group 6 (n = 52) which demonstrated little change in mood on all affect measures. The dysphoric subtype Groups were those numbered 1, 3 and 4. Group 1 appears to demonstrate premenstrual increases in all three negative affects, where depression and anxiety predominate. In Group 3, depression and anger seem to predominate. In Group 4 moderate or low levels of increases in the negative affects are observed. Premenstrual mood elevation was apparent in Group 2 (n = 18) and Group 5 (n = 3) which together represent 14.1% of the total subject group (i.e., n = 149).

As subject group 1 was drawn from both the student population and Serena members, the inclusion of Serena members into cluster groups was examined. The validity of combining the Serena members with the student population was not statistically analyzed. No analysis was conducted as the number of Serena volunteers and participants was very small in comparison to the total number of subjects in subject group 1. Serena members accounted for 7.4% (n = 11) of subject group 1. The expected number of Serena members falling into each cluster group based upon the percentage breakdown of subject group 1 into clusters (see Table 23) would be .7 for Group 1, 1.3 for Group 2, .9 for Group 3, 4.1 for Group

Table 23

Cluster Subtype Descriptions for Subject Group 1

Cluster Group Number	n	Description	Age		% of Dysphoric $\bar{n}^a$	% of Total $\bar{n}^b$
			X	SD		
1	9	High PM depression. High PM anxiety. Moderate-low PM anger.	24.6	5.9	11.8	6.0
2	18	Moderate PM decrease in depression, anxiety, anger.	26.7	7.1	-	12.1
3	12	High PM depression. Moderate-low PM anxiety. High-moderate PM anger.	20.7	5.9	15.8	8.1
4	55	Moderate-low PM depression. Moderate PM anxiety. Low-moderate PM anger.	26.6	7.1	72.4	36.9
5	3	High PM decrease in depression, anxiety, anger.	27.7	7.4	-	2.0
6	52	Mild PM decrease in depression, anxiety, anger.	26.2	7.3	-	34.9

Note: PM = premenstrual.
 $\bar{n}$ Dysphoric = 76.
 $\bar{n}$ Total = 149.

4, .2 for Group 5 and 3.8 for Group 6. Cluster Group 1 contained 1 Serena member, as did cluster Group 2. No Serena members appeared in cluster Group 3 or 5. Cluster Group 4 contained six cases which were Serena members and cluster Group 6 contained three Serena members. It seems that a disproportionate number of Serena members did not appear in any one cluster group.

Cluster Subject Age Comparisons

The affect cluster group age means and standard deviations are presented in Table 24 for subject group 1 ($n = 149$). Cluster groups were examined for age differences by applying a one-way ANOVA using clusters 1-6 as the grouping factor. No significant overall age difference emerged from the analysis, $F(5,143) = 1.62$, $p < .1582$, indicating that cluster groups did not differ in the mean age of their subjects. The ANOVA results are presented in Table 25.

Trait Anxiety Analysis of Variance Results

The means and standard deviations for the SAI X-2 scores at the two times of testing (i.e., intermenstrual = day 6, premenstrual = day 21) are presented in Table 26. The results of the one-way repeated measures ANOVA of the trait anxiety measures across cluster groups (i.e., Groups 1, 3, 4 and 6) for subject group 1 ($n = 119$) are presented in Table 27. Subjects with incomplete data for the SAI X-2, or missing SAI X-2 measures at either testing time (either day 6 or day 21), were excluded by the analysis.

Trait anxiety measures were not significantly different at the two times of testing, $F(1,115) = 2.55$, $p < .113$. This supports the

Table 24

Affect Cluster Group Age Means and Standard Deviations for Subject Group 1

Cluster Group Number	<u>n</u>	$\bar{X}$	<u>SD</u>	Age Maximum	Age Minimum
1	9	24.56	5.86	39	20
2	18	26.67	7.09	40	18
3	12	20.67	5.85	39	18
4	55	26.60	7.10	45	18
5	3	27.67	7.37	36	22
6	52	26.23	7.25	45	18

Note: Total n = 149.

Table 25

Summary of One-Way Analysis of Variance of Age of Subjects by Cluster Group for Subject Group 1

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
Age (Between groups)	397.50	5	79.50	1.62	0.1582 ^{ns}
Age (Within groups)	7013.99	143	49.05		

Note: Groups = 1-6.

n = 194.

Table 26Affect Cluster Group Means and Standard Deviations of SAI X-2 Scores

Cluster Group Number	<u>n</u>	Trait 1 ^a		Trait 2 ^b		Marginal Mean
		<u>$\bar{X}$</u>	<u>SD</u>	<u>$\bar{X}$</u>	<u>SD</u>	
1	9	42.56	10.77	47.44	12.92	45.00
3	10	49.30	11.55	50.40	14.19	49.85
4	52	36.06	6.90	36.67	9.15	36.37
6	48	34.83	6.90	33.75	7.56	34.29

Note: Total n = 119.

a Trait 1 = SAI X-2 scores of day 6 of test cycle.

b Trait 2 = SAI X-2 scores of day 21 of test cycle.

Table 27

Summary of Repeated Measures Analysis of Variance of SAI X-2 Scores by Cluster Group

Source	Sum of Squares	df	Mean Square	F-Ratio	Prob.
Cluster	5176.87	3	1725.62	14.01	0.0000***
Error (within)	14162.10	115	123.16		
Time	60.68	1	60.68	2.55	0.1131
Time x Cluster	146.47	3	48.82	2.05	0.1107
Error (between)	2737.88	115	23.81		

Note: n = 119.

Time = trial factor with two levels; intermenstrual and premenstrual.

*** p < .001.

hypothesis that trait measures of anxiety should not differ over testing sessions. The main effect for cluster group indicates that some clusters differ significantly in their mean trait anxiety scores, $F(3,115) = 14.01$, $p < .0000$. No significant interaction was found between time of test session and cluster group, $F(3,115) = 2.05$, $p < .1107$.

To complete the analysis, a post-hoc procedure was utilized. The post-hoc analyses was used to test the hypothesis that high premenstrual state anxiety subjects would demonstrate higher trait anxiety measures than women with premenstrual negative mood elevation but not evidencing high premenstrual anxiety, or women showing little mood change premenstrually. The Dunn's multiple comparison procedure for unequal sample sizes was applied (Kirk, 1982) using marginal means of trait anxiety (see Table 26) for cluster group comparisons. Cluster Group 1 (high premenstrual anxiety) had mean trait anxiety measures significantly higher than those of Group 6 (little premenstrual mood change), $t_D(115) = 2.66$, $p < .05$, but not significantly different from Group 3 (moderate-low premenstrual anxiety), $t_D(115) = .95$, or Group 4 (moderate premenstrual anxiety), $t_D(115) = 2.16$. Cluster Group 3 had a significantly higher trait anxiety mean than that of Group 4, $t_D(115) = 3.52$, $p < .01$, and Group 6, $t_D(115) = 4.03$, $p < .01$. The hypothesis that high premenstrual state anxiety subjects would demonstrate higher trait anxiety than other dysphoric subgroups or women with little premenstrual mood change was considered. It was partially supported by the significantly higher trait anxiety mean of cluster Group 1 as compared to Group 6. The proposed relationship between state and trait

anxiety was not, however, in accord with the significant findings regarding the higher trait measures of Group 3 as compared to Group 4 and 6.

Trait and State Anxiety Correlation Analysis

The correlation coefficient between the SAI X-2 scores of day 6 and the magnitude of change scores across intermenstrual and premenstrual test periods of SAI X-1 was computed. For subject group 1 ($n = 149$) a correlation coefficient of 0.0791 was found. For subjects categorized as evidencing premenstrual increases in negative affect (cluster Groups 1, 3 and 4, total $n = 76$) the correlation was also close to zero ($r = .0415$). This analysis indicates a lack of relationship between trait anxiety and follicular to luteal change in state anxiety measures.

Total Subject Group

Canonical Correlation Results of Affect and Physical Variables

A canonical correlation analysis (BMDP6M) was performed between the phase difference scores of the affect measures (POMS-D, POMS-A, SAI X-1) and the phase difference scores of the physical symptom measures (MDQ-T WR, P, and AR factors). It was hypothesized that very little of the change between intermenstrual and premenstrual measures of one category (i.e., either affect or physical) of symptom reporting could be accounted for by differences in the other category. The canonical correlation analysis is similar to multiple regression analysis, however, it is generalized to any number of dependent variables. It may

be applied to study the underlying relations between two sets of variables where one may seek some source of common variance in the two sets of variables. In this study, the two sets of variables are labelled 'affect' variables and 'physical' variables.

Table 28 presents the correlation matrix for the difference scores of the two sets of variables for $n = 194$. The affect measures appear to be more highly correlated with each other than with the physical change measures. Table 29 presents the results of the canonical correlation analysis. In this table the canonical correlations are the square roots of the eigenvalues, and are the correlations between two linear composites formed by least squares analysis for each of the two sets of variables. Bartlett's test indicates the number of canonical variables necessary to express the dependency between the two sets of variables. The necessary number of canonical variables is the smallest number of eigenvalues such that the test of the remaining eigenvalues is nonsignificant.

In Table 29, the uppermost line (chi-square = 30.50, $df = 9$, $p < .0004$) indicates that the two sets of variables are not independent. The next uppermost line (chi-square = 5.96, $df = 4$, $p < .2021$) indicates that only one canonical variable is necessary to express the dependence between the two sets of variables. The value of the canonical correlation ($r_c = .34850$) when squared, is interpreted similarly to the squared multiple correlation coefficient in that it represents the variance shared by the two linear composites. The variance shared by the two composites is 12%. The results of the canonical correlation analysis

Table 28

Correlation Matrix of Affect and Physical Variables

Variable Name	POMS-D	POMS-A	SAI X-1	MDQ-WR	MDQ-P	MDQ-AR
POMS-D	1.00					
POMS-A	0.67	1.00				
SAI X-1	0.67	0.53	1.00			
MDQ-WR	0.20	0.27	0.21	1.00		
MDQ-P	0.27	0.20	0.30	0.35	1.00	
MDQ-AR	0.08	0.28	0.05	0.18	0.28	1.00

Note: n = 194.

Table 29

Canonical Correlation Analysis of Affect and Physical Variables

Eigenvalue	Canonical Correlation	Number of Eigenvalues	Bartlett's test for Remaining Eigenvalues		
			Chi-Square	df	Prob.
			30.50	9	0.0004***
0.12145	0.34850	1	5.96	4	0.2021 ^{ns}
0.02928	0.17110	2	0.33	1	0.5654 ^{ns}
0.00174	0.04174				)

Note: $n = 194$.

*** $p < .001$.

support the hypothesis that very little variance in affect change measures from intermenstrual to premenstrual phase can be accounted for by changes in physical symptom reporting.

Canonical Correlation Results of Affect and Physical Variables for
Dysphoric Subtype Subjects

The canonical correlation analysis was reconducted for only those subjects falling into cluster groups characterized by dysphoric premenstrual affect ($n = 98$). The interpretation of the analysis is similar to that described in the section entitled Canonical Correlation Results of Affect and Physical Variables.

The correlation matrix for the change scores of the two sets of variables (i.e., affect and physical) are presented in Table 30. The affect and physical change measures do not appear to correlate strongly. In Table 31 the nonsignificant chi-square (chi-square = 14.98, $df = 9$, $p < .0916$) indicates that the two sets of variables are independent and no canonical variables are necessary to express the dependency between the two sets of variables (chi-square = 5.82, $df = 4$, $p < .2128$). The results of the canonical correlation analysis for dysphoric subtype subjects support the hypothesis that changes in physical and affect level reporting from the intermenstrual to premenstrual phase are relatively independent. The canonical correlation analysis was not performed on separate dysphoric cluster groups as the overall canonical results for the dysphoric subgroups (i.e., Groups 1, 3, and 4 combined), resulted in no significant canonical variables.

Table 30Correlation Matrix of Affect and Physical Variables for Dysphoric Subgroup

Variable Name	POMS-D	POMS-A	SAI X-1	MDQ-WR	MDQ-P	MDQ-AR
POMS-D	1.00					
POMS-A	0.60	1.00				
SAI X-1	0.33	0.06	1.00			
MDQ-WR	0.13	0.26	0.01	1.00		
MDQ-P	0.25	0.19	0.19	0.37	1.00	
MDQ-AR	0.06	0.17	0.00	0.20	0.30	1.00

Note: n = 98.

Table 31

Canonical Correlation Analysis of Affect and Physical Variables for Dysphoric Subgroup

Eigenvalue	Canonical Correlation	Number of Eigenvalues	Bartlett's test for Remaining Eigenvalues		
			Chi-Square	df	Prob.
			14.98	9	0.0916 ^{ns}
0.09326	0.30538	1	5.82	4	0.2128 ^{ns}
0.05991	0.24477	2	0.05	1	0.8300 ^{ns}
0.00049	0.02219				

Note: $n = 98$.

Chapter V

DISCUSSION

Overview

The objective of this research was to clarify, describe and investigate a wide range of severity of the phenomenology of major types of premenstrual affective changes in normally menstruating women. Primary hypotheses were planned and tested regarding the relationship between the personality variables of neuroticism and trait anxiety and the premenstrual affective subtype groups. The relationship between premenstrual physical and affective symptom reporting was also investigated as a secondary aspect of this study. Although researchers have studied the diversity of premenstrual negative affects, previous research has been flawed by many methodological problems (Freeman et al., 1985), or used a retrospective design, employing a typological approach and psychiatric research criteria (Halbreich et al., 1982b).

This study was designed to differentiate between the major types of negative affect from a phenomenological viewpoint using standardized self-report rating scales sensitive to affective fluctuations. Prospective measures were adopted with the focus on change from an intermenstrual baseline and the use of magnitude of change scores to determine premenstrual affective change. Consideration was given to the possibility that only a subgroup of women may evidence a premenstrual increase in dysphoria. The research allowed for the detection of

affective changes on a continuum from a premenstrual decrease in dysphoric affect to an increase in dysphoric affect. A dimensional approach was applied to study the range and continuum of symptom levels and combinations.

The relationship between premenstrual affect or premenstrual syndrome and measures of neuroticism and trait anxiety has been investigated. Previous research studies have not yielded consistent results. Differences in design, sampling procedures and criteria for premenstrual changes may account for the lack of consistency in the findings. One possible explanation considers the diversity and combinations of premenstrual affective changes. These have not been adequately specified or accounted for in prior studies investigating the relationship of personality variables to premenstrual changes. The possible link between premenstrual affective and physical changes has not been well investigated, particularly with regard to different types of premenstrual affective changes. A differential correlation has not been sought in prior research between carefully and prospectively specified subtypes such as certain combinations of premenstrual dysphoric changes and physical symptom reporting.

The format of the discussion will generally follow the order of the presentation of the results section. Initial consideration will be given to the affective clusters or subtypes identified in this study and their characteristics. The results concerning secondary hypotheses related to across phase differences in variable scores and the across phase results will then be discussed. The discussion will then address

the a priori hypotheses concerning the personality variables (neuroticism and trait anxiety) and premenstrual affective changes. The secondary results investigating the connection between physical and affective premenstrual symptom reporting will then be reviewed and examined. Methodological issues of this research and the limitations to which generalizations or conclusions may be drawn will then be explored. Finally, a summary of the conclusions, the theoretical implications of the results of this research, and the possible implications for future research will be presented.

Discussion of the Premenstrual Affective Subtypes

The cluster analysis of affective changes resulted in three major categories of premenstrual dysphoria (i.e., Groups 1, 3, and 4), a category of little premenstrual affective change (i.e., Group 6) and one cluster of decreased dysphoria premenstrually (i.e., Group 2). One person who evidenced a high decrease of dysphoria premenstrually was situated in her own cluster (Group 5). The six cluster groups (see Table 9) were based on the magnitude of change scores of the affect variables of depression, anxiety and anger. The correlation analysis of the magnitude of change scores of the affect variables (see Table 1) revealed that the affect measures used in the cluster analysis were not uncorrelated. This was to be expected as the intercorrelations of various types of premenstrual negative affect have previously been reported (Moos, 1969; Taylor, 1979c; Sanders et al., 1983). High correlations of various types of negative affect are a common finding in

general studies of mood changes, as reported for the measures of depression, anxiety and hostility in the test construction of Zuckerman and Lubin (1965). In the present study, the finding that the affective change variables used in the cluster analysis correlated (range from $r = .44$ to $r = .65$) may be considered supportive evidence of an 'affective' type of premenstrual syndrome. This conclusion, however, must be viewed in light of the fact that negative emotions seem to correlate in general and not only in specific association to any menstrual cycle phase. The results of the correlation analysis do not rule out or render unfounded the basis for an exploration of the differential significance of specific dysphoric affect changes or combinations of such changes (Clare, 1983; Cullberg, 1972; Halbreich et al., 1983).

Although the study was not designed as a survey of the incidence of premenstrual symptoms, the approximately 51% of the sample which demonstrated mild-severe premenstrual affective changes compares favourably to some of the figures cited by other researchers. For example, the estimate of the incidence of premenstrual tension of Moos (1968a) is 30-50%, that of Dalton (1982) is 50% and Andersch and Hahn (1981) report a 50-70% incidence for premenstrual changes. The example incidence figures just cited include premenstrual symptoms other than dysphoric affect. In the present study the incidence is based only on affective variables and the focus was on affective changes from an intermenstrual baseline, rather than absolute values of premenstrual measures.

For premenstrual negative affect in particular, Moos (1968a) estimated a prevalence in the mild to moderate range of 25-30%. This compares fairly well to the slightly higher 33.5% of the sample that Group 4 (mild-moderate increase in dysphoric affects) of this study represents. Smith (1976) estimated a 30-60% prevalence of a 'major' mood change premenstrually which compares favorably to the 51% finding of this research. Similarly, Freeman et al. (1985) found that for depression, anxiety and hostility, the range of incidence was 36-56%.

The strong-severe premenstrual negative affect estimate of Moos (1968a) is 3-13% and Group 1 (severe-moderate premenstrual dysphoric increases) of this study which represents 6.7% of the total sample, falls into his range. Of the 37% of the total sample presenting only severe emotional symptoms in the study of Freeman et al. (1985), 17% evidenced a combination of anxiety and depression which is close to the 13% figure of Group 1 for this study. Van Keep and Lehert (1981) found depression in 18% of their sample which compares well to the Group 1 and 3 (high premenstrual depressive increase) combined percentage of 17% of this study. Severe premenstrual irritability was evidenced by 12% of the sample of Woods et al. (1982) and in the present research may be found in 10.3% of the sample (as represented by Group 3 with high premenstrual anger increase). The present study found 9.8% of the sample (Group 2 and 5) to show a premenstrual decrease in dysphoric affect. One might consider this type of change to be similar to the 'increased well-being' syndrome of Halbreich et al. (1983). If so, the percentage of the present sample is close to that of the approximately 9% found for

subjects who did not meet criteria for a PAF depressive syndrome (Halbreich et al., 1983). To the authors knowledge, apart from the figures for increased well-being syndrome of the PAF, no studies to date have reported an incidence for decreased premenstrual dysphoric affect.

The sample of the present study may be generally characterized as young (age $\bar{X}$ = 25.2 years; SD = 7.0 years), mostly single, nulliparous and well-educated. The subject group was composed mainly of English speaking full-time students who were urban or suburban dwelling and mainly Roman Catholic or Protestant (see Appendix 6). For this sample, the affect cluster groups did not differ in the mean age of their subjects (see Table 12). This is in contrast to the view that older women are thought to have more premenstrual symptomatology than younger ones (Dalton, 1982; Rubinow & Byrne, 1984). For the sample of the present study, age was not found to be related to membership in affective change cluster. For premenstrual affective changes, the age analysis results support the view that age is not a relevant extraneous variable (Reid & Yen, 1981; Van Keep & Lehert, 1981). It must be emphasized that the results concerning age may apply only to the sample of the present study with its restrictions in age bracket. The characteristics of the subject group as just described must be kept in mind when interpreting the results of the cluster analysis.

For the sample of this study, most women experienced a combination of affective changes as predicted by Steiner and Carroll (1977). Similar to the results of the joint classification report of Halbreich and Endicott (1982a) no one cluster group characterized by increases in

either anxiety or anger-hostility without depression emerged from the analysis. The findings of this research thus support the view that no 'pure' premenstrual affective syndrome of one primary negative affect seems to be evident (Halbreich & Endicott, 1982a).

The three premenstrual dysphoric subtype clusters appear to represent different combinations of premenstrual increases in the negative affects as well as different levels of severity of each. The smallest percentage of cases is represented by Group 1 (6.7%) in which all three of the negative affects play a role with increases in depression and anxiety dominating. Group 3 represents a slightly higher percentage of cases (10.3%) with premenstrual increases in depression and anger predominating.

The question of why depression is present to at least a moderate degree in all the identified premenstrual dysphoric subtypes has yet to be adequately explained. One type of explanation may be based on the assumption that premenstrual affective changes may be conceptualized as major or minor 'depressive syndromes'. Possible subtypes of such syndromes may be characterized by such features as anxious-agitated or hostile-depressive (Halbreich & Endicott, 1982a). The suggestion that 'significant' premenstrual depression may depend upon the presence of a lifetime diagnosis of affective disorder (Endicott et al., 1981) does not account for the fact that it seems to play a significant role in all the dysphoric cluster groups. The preceding suggestion may be rejected unless the dysphoric subgroup of the total sample were thought to have undiagnosed evidence of an affective disorder. This possibility does not

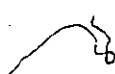
seem plausible upon first consideration. However, data has been collected and summarized by Halbreich and Endicott (1985b) that found 42% of a community control sample of women under 40 in the area of New York met criteria for a major depressive disorder (using RDC criteria). As the present study was not investigating the relationship of premenstrual dysphoria and affective disorder, data on the presence of affective disorder in the subject sample was not collected and is therefore unknown. Thus, the increased depression of the dysphoric cluster groups in this study may or may not be associated to the presence of affective disorder.

The presence of increased premenstrual depression in all dysphoric cluster groups may be viewed from the perspective of theories and research on emotion in general. For Izard (1972) depression is seen as a higher level concept or cluster composed of primary emotional states. He analyzed depression using the Discrete Emotion Scale and found it to be composed of several major components. These components were anxiety, sadness, loneliness, and a triad composed of anger, contempt and disgust which Izard termed the 'anger' triad. By this formulation, depression is not considered as a primary emotional state, but is in fact composed of anger, anxiety and sadness. It would thus seem reasonable to conclude that the manner by which premenstrual depression is assessed would affect its resulting incidence and the data concerning its relationship to such factors as affective disorder.

In studies such as those of Halbreich and his associates, using the PAF, premenstrual major depressive syndrome may be evidenced by such

components as sadness or irritability and physical agitation (Endicott et al., 1981). In contrast, the present study measured the components of premenstrual depression, anxiety and anger separately. The depression factor of the POMS instrument seems to tap an emotional state close to the sadness or loneliness components of depression as characterized by Izard (1972). The premenstrual increases in dysphoric affect of Group 1 may therefore be more accurately described as mainly a sad or lonely anxiety and the increases of Group 3 may be described as a sad anger. It may, therefore, be more accurate to refer to the presence of 'depression' in all dysphoric clusters as the common presence of the 'sadness' component of depression. A stronger additional component of either the anxiety or anger component of depression appears in Groups 1 and 3. One might conclude that moderate-severe premenstrual dysphoria is typically one of sadness with a predominance of either anxiety or anger. One must bear in mind that these dysphoric affect factors or conglomerates were initially chosen to characterize premenstrual dysphoria.

The largest dysphoric subgroup cluster found was that of Group 4 where the cases of this group represent 33.5% of the sample. Premenstrual increases of moderate to low levels in all three of the main negative affects characterized Group 4. No one negative affect seems to predominate at high levels. It may be that Group 4 represents a subgroup of women with detectable premenstrual dysphoric increases yet at a lower level of severity than that of Group 1 or 3. The reason for a lack of predominance of any one type of negative affect may be due to



the low level of severity or intensity of the affective change. Some theorists of the emotions have clearly stated that as the intensity level of an emotion decreases, the ability to distinguish between emotions becomes more difficult and results in labelling problems (Pluchik, 1980; Polivy, 1981).

The cluster showing decreased dysphoria premenstrually (Group 2) was comprised of 9.3% of the total subject group. Group 5 represents only one case in which a very high premenstrual dysphoric decrease seemed to occur and this person may be considered an outlier where for some reason(s) an extreme premenstrual dysphoric decrease occurred during the test cycle.

Very little information is available concerning premenstrual decreases in negative affect, perhaps because researchers examining affective changes and the menstrual cycle have focused almost exclusively on data concerning negative emotional states and labels. Steiner and Carroll (1977) suggested the possible presence of premenstrual syndrome of 'elation' and the PAF contains criteria for a premenstrual 'increased well-being' syndrome (Halbreich & Endicott, 1982a). Indications that premenstrual 'elation' or mood elevation may be related to bipolar affective disorder have been addressed by several authors (Halbreich et al., 1985; McClure et al., 1971; Wetzel et al., 1975) but no conclusive evidence is yet available. The results of the present study concerning cluster Group 2 indicate that premenstrual dysphoric decreases were rare in the subject sample which agrees with the findings of 'increased well-being' syndrome by Halbreich et al.

(1983). Whether such decreases are reflective of the presence of any affective disorder in the subject sample of the present study is unknown. The results do, however, support the view that a small percentage of women do indeed evidence less dysphoria premenstrually as compared to an intermenstrual baseline.

The general results of the cluster analysis of the present study provides evidence supportive of the view that premenstrual exacerbation of dysphoria (or the negative mood changes), in a group of normal women are rarely greater than mild or moderate (Abplanalp et al., 1980; Golub, 1984). This is evident by the fact that Group 4 represented 66.3% of the total dysphoric subgroup of the sample. As previously mentioned, the different dysphoric subtype clusters seem to represent both different types of combinations of premenstrual increases in the negative affects and different severity levels of affect changes. The cluster analysis indicated that fairly discrete subgroups of premenstrual negative affect increases may be identified. Even so, such an analysis based upon a multi-syndrome or multifactorial approach to defining premenstrual syndromes (by the use of statistically derived symptom clusters or subtypes) has been described as in a state of infancy (Abplanalp, 1983a). The cluster analysis results of the present research may, however, be used to attempt to address such issues as whether severe premenstrual dysphoria represents one end of a continuum which also includes much milder forms of the same dysphoric increases premenstrually.



The dysphoric premenstrual clusters or subgroups do seem to lie on a continuum with reference to each other and to the subgroup of women showing little premenstrual changes in affect. Of the approximately 51% of the women evidencing premenstrual dysphoric increases in the negative affects, about 2/3 evidence a low-moderate increase (Group 4) while 1/3 evidence a moderate-severe increase (Group 1 and 3), using a global consideration of all three negative affects examined. It appears that in the moderate-severe range of affective change reporting premenstrually, a predominance of either an anxious-depressive or an angry-depressive type of premenstrual affect can be found. In the moderate-severe range, anxious-depressive increases were represented by the smallest percentage of cases. The cluster findings support the impressions of Sanders et al. (1983) that when cyclic variation in affect occurs, the specific feelings such as depression and irritability vary in impact from one woman to another.

The pattern and characteristics of the dysphoric subtypes identified in this research imply that premenstrual dysphoric increases are not ubiquitous. Only about one half of the total subject sample gave evidence of such increases. Thus, it does appear that only a subgroup of women show increased negative affect premenstrually. The pattern of dysphoric changes across subgroups shows that it varies in degree. Subgroups seem to represent types of partially overlapping groups on a continuum with regard to the separate affect variables rather than combinations of variables. One conclusion that may be reached is that the three premenstrual dysphoric subgroups each represent parts of a

continuum of premenstrual dysphoria. Premenstrual dysphoric change subjects may be differentiated from those who do not show such changes as seen by the results of the cluster analysis, where relatively discrete subgroups may be identified. It is also noted, however, that within dysphoric subgroups a range of combinations of affective change from mild to severe may be identified. An integration of both of the just mentioned observations leads to the conclusion that premenstrual dysphoric increases may be a discrete phenomenon that is also characterized by a varied continuous nature. This perspective accounts for the ability to statistically separate different dysphoric subtype clusters from no change clusters. It also accounts for the pattern and characteristics of affective change found in an examination of the dysphoric subtype groups.

Considerable evidence is available to support the view that emotions can be conceived of as configurations of continuous variables or affective dimensions (Roseman, 1984; Scherer, 1982). According to the theory of Fehr and Russell (1984) emotions are best seen as prototypes rather than categorical variables. Thus, a prototypic or 'pure' emotion such as anger is considered as a clear entity. There is, however, no clear boundary between such an emotion and other emotions, as a partially overlapping configuration of continuous variables comprises an emotion such as anger. The characterization of an emotion can thus be evaluated as close to that of a prototypic emotion or not. However, it is not a strictly categorized entity as it has indefinite boundaries. A higher order emotional state such as depression can be composed of these

prototypic states, as has been previously mentioned. In summary, research on premenstrual affective changes may need to focus on a more complex view of the affective changes rather than mere presence or absence of such changes. For example, once the significant presence of such an affective change is used to identify a discrete subgroup of subjects, the configuration of affect dimensions or variables should be examined. It appears that the best way to conduct such an examination is to conceive the affect variables as having a continuous nature. It may be important to evaluate the level of affect variables on a continuum in order to accurately describe or evaluate the premenstrual affective change as an emotional state or configuration that may be a complex combination of states at a 'higher order' level.

Across Phase Differences

It was hypothesized that the means of the composite average intermenstrual phase scores (or intermenstrual means) for the affect variables would not be significantly different from the means of the composite average premenstrual phase scores (premenstrual means) for the total subject group. This hypothesis was confirmed for the affect variables used in the cluster analysis (POMS-D, A, and SAI X-1). It was not confirmed for the MDQ-T overall measure of negative affect (NA) which was found to be significantly higher in the premenstrual as opposed to the intermenstrual phase. The original hypothesis was based on the assumption that only a subgroup of the total subject group would demonstrate increases in negative affect premenstrually. Further

subgroups were expected to show little or no changes or decreases in negative affect measures premenstrually. The effect of such an assumption on the actual across phase analysis of means was the expected result that findings of no significant change would be found across phases for the negative affects. The increases in negative affect of any subgroup with increased dysphoria premenstrually were expected to be masked or cancelled out by the inclusion of the no change subgroup and the possible subgroup evidencing premenstrual decreases in negative affect.

Of the total subject group, 51% evidenced some premenstrual increase (ranging from mild to severe) on each of the measures of depression, anger and anxiety, leaving about 49% in the no change or premenstrual decrease in negative affect category. It is, however, not unreasonable to expect that the total group premenstrual mean measures for any one specific affect variable may not reach a level which renders it significantly higher than the intermenstrual mean measure. The MDQ-TNA measure is a global composite of ratings of various negative affect descriptors (including anxiety, depression and irritability). A global measure of negative affect may more easily achieve a significant premenstrual elevation over average intermenstrual measures than one specific measure of affect. This may be due to the fact that a global negative affect rating value may be inflated by high ratings on any one particular negative affect. Each individual dysphoric increase subgroup (either Group 1, 3 and 4), altogether representing 51% of the total subject group, evidenced premenstrual increases of at least a moderate

level on at least one of the specific affect variables (POMS-D, A, or SAI X-1). Thus, the level of any single type of negative affect may have inflated the premenstrual MDQ-T NA mean.

It may be concluded that the results of the across phase analysis for the total subject group supports the view that using group means for cycle phases does not seem to be the best method of evaluation of affective changes associated with the menstrual cycle. If one accepts the outlined interpretation of the significant across phase finding concerning the MDQ-T NA variable and considers the varied and bidirectional affective nature of the cluster group findings discussed earlier an implication arises. The implication is that individual patterns of affective change may best differentiate and characterize premenstrual affect in unselected groups of normal women. One might conclude that much of the inconsistency in the findings of studies of affective variation over the course of the menstrual cycle may indeed be the result of some methodological and sampling factors. Global measures of negative affect and the use of cycle phase mean comparisons may show premenstrual increases if enough women with negative premenstrual mood changes are included in the sample. If, however, a normal sample is small and includes a small proportion of such women, the detection of negative premenstrual mood may be obscured by analytic procedures using group means. The use of a group mean analysis procedure to compare cycle phases may partly explain why in a group of normal subjects prospective negative mood assessment by the POMS showed no cycle differences. The use of group mean analysis may also explain why the retrospective MDQ NA

factor evidenced a significant increase compared to intermenstrual scores (Abplanalp et al., 1979a).

Table 14 and 16 presents the results of the across phase analysis and includes the analysis of each affect variable as well as each physical symptom variable. It may be noted that the physical symptom variable means (i.e., MDQ-T WR, P, and AR) were found to be significantly higher in the premenstrual than in the intermenstrual phase for the total subject group and for the dysphoric subgroup. The findings regarding premenstrual physical and affective changes will be evaluated in a later section of this discussion.

It was hypothesized that the means of the composite average premenstrual phase scores for the affect variables would be significantly higher than the means of the composite average intermenstrual phase scores for the dysphoric subgroup of the total subject group. This hypothesis was confirmed for the affect variables used in the cluster analysis (i.e., POMS-D, A, and SAI X-1) as well as the MDQ-T NA variable. The subjects which formed the dysphoric subgroup were drawn from a combination of cluster Groups 1, 3, and 4 and these cluster groups were formed on the basis of subjects having similar intermenstrual to premenstrual phase difference scores on the affect variables. This fact renders the just mentioned significant finding to be not that remarkable or surprising. It does illustrate, however, that in contrast to the across phase analysis of the total subject group, the dysphoric subgroups combined demonstrate across phase differences in group means of specific affect variables. Support is thus provided for

the view that premenstrual increases in dysphoric affect do occur in a subgroup of women (approximately 51% of the total subject sample of this study). In such a subgroup one may expect to find the group premenstrual means for specific affect variables to be higher than the intermenstrual means. This conclusion serves to explain why for example, in a study examining groups of women identified on the basis of premenstrual complaints, the group premenstrual mean scores of specific negative affects are found to be higher than the intermenstrual group mean scores (Sanders et al., 1983). No such finding is reported for asymptomatic women (Sanders et al., 1983).

To this point of the discussion, the premenstrual dysphoric clusters (Group 1, 3 and 4) have been referred to in terms of labels such as mild, moderate or severe, particularly when referring to any specific affect component such as depression, anger or anxiety. The labels were originally applied as descriptors to aid in the differential characterization of the ~~cluster groups~~. The choice of descriptors was previously explained in the results section as based upon between cluster comparisons of cluster mean difference scores on each affect variable. The descriptors are useful in the sense of providing a label to differentiate clusters as to the degree of magnitude of change of affect across the menstrual phases examined. They do not, however, necessarily indicate the premenstrual level of severity of reporting on any affect variable. The labels or descriptors, therefore, refer to severity of magnitude of change in affect only. The issue of severity of level of dysphoric affect reporting in the premenstrual period may be

evaluated by examining the premenstrual cluster group means on affect variables.

The average premenstrual measure scores on each of the relevant affect variables for all cluster groups are presented in Table 17. To provide a guideline to severity, these means for each cluster may be compared to norms. The norms available are those for each variable as provided in previous research and by the authors of the self-report instruments.

As pointed out by Abplanalp et al. (1980), the severity of premenstrual symptoms has been largely ignored in past literature. Referring to the increases in dysphoric affect of the cluster groups of this study as 'symptoms' would be presumptuous without an examination of severity. Data is lacking as to whether the subjects of this research found any dysphoric increases to be problematic, in any way obvious or considered them as symptoms. In view of this, the use of normative data for comparison is the only clue as to whether the menstrual phase changes for any subgroup could be considered clinically meaningful.

For the POMS depression (D) and anger (A) factor scores, comparisons may be made using the premenstrual phase means of the present study and the mean values obtained from the 'right now' version under relaxed or 'true baseline' conditions in college males (POMS-D; $X = 4.4$, $SD = 8.3$, POMS-A; $X = 2.7$, $SD = 5.0$) (McNair et al., 1971). The authors state that only 1% or less variance is associated with sex in normals (McNair et al., 1971). Another more applicable reference population is that of asymptomatic female volunteers studied at three

points in the menstrual cycle (Abplanalp et al., 1979a). The premenstrual means for the POMS-D ($X = 3.3$, $SD = 3.3$) and the POMS-A ($X = 3.8$, $SD = 3.9$) are provided.

The premenstrual mean scores for the POMS-D in cluster Group 1 ($X = 15.21$, $SD = 5.18$) and Group 3 ($X = 15.03$, $SD = 9.98$) were much higher than the premenstrual means for asymptomatic female volunteers or college males under relaxed conditions. The means of Group 1 and 3 were however, lower than those obtained from female psychiatric patients on the POMS-D ($X = 28.0$, $SD = 15.9$) (McNair et al., 1971). The POMS-D premenstrual mean for cluster Groups 1 and 3 are close in comparison to the mean found by Haskett and Abplanalp (1983) for women who met diagnostic criteria for 'premenstrual tension syndrome' and whose 'primary recurrent premenstrual tension' scores met above criteria level ($X = 15.7$, $SD = 5.9$). For cluster Groups 4 and 6, the premenstrual POMS-D means appear to be well in the range of those means found for asymptomatic female volunteers (Abplanalp et al., 1979a).

The POMS-A premenstrual means for Groups 4 and 6 are close in comparison to the reference group norms for relaxed conditions in college males and for asymptomatic female volunteers premenstrually. The POMS-A premenstrual mean for Group 1 was higher than that obtained for the just mentioned reference groups. The POMS-A premenstrual mean for Group 1 was, however, lower than the premenstrual mean ($X = 13.4$, $SD = 7.0$) for 'premenstrual tension syndrome' subjects in the study of Haskett and Abplanalp (1983). Cluster Group 3 demonstrated a POMS-A premenstrual mean ($X = 13.20$, $SD = 6.16$) similar to that of the POMS-A

premenstrual mean for symptomatic women in the study of Haskett and Abplanalp (1983). This mean score of the POMS-A is still slightly lower than that obtained for female psychiatric patients ($X = 14.9$, $SD = 11.5$) (McNair et al., 1971).

The SAI X-1 premenstrual means for cluster Group 4 ($X = 40.76$, $SD = 7.60$) and 6 ($X = 38.18$, $SD = 7.13$) are close to those reported by the authors of the instrument (Spielberger et al., 1970) for college females under normal conditions ($X = 37.24$, $SD = 10.27$). The SAI X-1 means for cluster Groups 1 ($X = 51.69$, $SD = 5.77$) and 3 ($X = 48.67$, $SD = 8.96$) lie between those reported for two stressful conditions for college females; exam condition ($X = 43.69$, $SD = 11.59$) and post stressful movie condition ($X = 60.94$, $SD = 11.99$) (Spielberger et al., 1970).

The premenstrual mean scores for each of the affect variables in Group 4 are quite close to those for Group 6. One might therefore conclude that Group 4 demonstrates little or no severity of premenstrual dysphoria, however the intermenstrual means of Group 4 are somewhat lower than those of Group 6. The magnitude of change across the two cycle phases was therefore higher for Group 4 than Group 6. Group 4 began intermenstrually at a slightly lower level of dysphoric affect reporting and achieved a slightly higher premenstrual mean on each affect variable. The conclusion that Group 4 experienced moderate changes, in anxiety for example, is as true as it is for Group 3. This is so although the premenstrual anxiety mean for Group 3 is higher than that of Group 4 and resembles a reference group mean under stressful conditions, while the mean of Group 4 bears no such resemblance. The

absolute mean levels of reporting for each affect variable do not appear to be of any remarkable clinical significance for group 4. The premenstrual increase in dysphoria in Group 4 may be significant as part of the continuum of change in negative affect that was previously discussed.

An interesting observation that may be of importance is that cluster Group 2 which evidenced premenstrual decreases in negative affect, demonstrated premenstrual group means for the affect variables in the asymptomatic or normal range. The Group 2 intermenstrual phase means, however were somewhat elevated as compared to the intermenstrual means reported for POMS-D ($X = 2.9$, $SD = 3.5$), and POMS-A ($X = 3.6$, $SD = 4.0$) by Abplanalp et al. (1979a), and as compared to the SAI X-1 mean for females under normal conditions (Spielberger et al., 1970). Thus, the high intermenstrual scoring subjects appeared to demonstrate a premenstrual lessening of negative affect.

According to the study of Haskett et al. (1980), a subset of their severe 'premenstrual tension syndrome' subjects who were high scoring on MDQ variables in the intermenstrual phase, reported more premenstrual depression and were thought to have mild psychopathology. Their research findings indicated that depression is not an essential factor of premenstrual 'affective syndrome'. It was also indicated that premenstrual depression may be related to psychopathological features which manifest as high intermenstrual phase reporting of dysphoria. The authors recommend making a distinction between high and low intermenstrual phase reporting for women with premenstrual symptoms.

Examination of the intermenstrual and premenstrual affect means of the subgroups of the present study reveals that Group 2 does not actually represent subjects with premenstrually elated or elevated mood. Rather, their mean scores indicate that a mild moderate level of intermenstrual dysphoria returns to more normal levels of reporting of the negative affects premenstrually. It is evident that considering all subgroups, high intermenstrual scores in a subgroup seem related to premenstrual decreases in negative affect. The Group 3 mean dysphoric affect scores in the intermenstrual phase were slightly elevated, as similarly noted for Group 2. However Group 3 showed increased premenstrual dysphoria.

In consideration of the findings and recommendations of Haskett et al. (1980) one might argue that Group 3 may contain the high intermenstrual scoring subset of subjects which may be considered indicative of the presence of psychopathological features. One might argue that these subjects are responsible for the premenstrual increases in depression of Group 3. This argument is not however supported by the observation of normal intermenstrual phase affect means in Group 1 and the increased premenstrual depression of Group 1. The results of the present study indicate that depression is an essential component of premenstrual dysphoric increases. One rather tentative observation concerns the presence of somewhat elevated intermenstrual mean score reporting of depression, anxiety or anger. This elevation seems to be associated with either a premenstrual depressive-angry state or a decrease of the dysphoria premenstrually to more normal levels.

98

The severity of premenstrual dysphoria in cluster Groups 1 and 3 is generally not as severe as reported levels available for a psychiatric population. This lower level of disturbance has been previously noted for premenstrual negative affect (Abplanalp et al., 1979b; Golub, 1976b; Halbreich et al., 1983; Baskett & Abplanalp, 1983; Lahmeyer et al., 1982). Halbreich et al. (1983) concluded that specific subtypes of premenstrual dysphoria resemble those of an affective disorder and thus may serve as a model for an affective disorder. As pointed out by Golub (1984), it may, however, still be premature to cast premenstrual changes per se into an illness model. This is reasonable given that the magnitude of premenstrual negative mood levels is much lower than the levels noted for women with a diagnosed psychiatric illness.

The comparisons of the cluster group mean premenstrual phase scores on the affect variables to various reference group means provide indications regarding the clinical significance of negative affect. For cluster Group 1 and 3 the average premenstrual level of reporting of such negative affect is high in comparison to norms for normal or relaxed subjects. The clinical importance of the levels of reporting is deducible from the observation that the premenstrual levels seem to lie between the means of normal or asymptomatic reference populations and the means for psychiatric populations. The means compare well to those for subjects labelled 'premenstrual tension sufferers'. For example the global MDQ-T NA mean for both Group 1 and 3 premenstrually is quite similar to that reported by Moos (1977) for the normative samples'

'worst menstrual cycle' ($X = 21.59$, $SD = 9.50$). The elevation of reporting of negative affect levels indicates a meaningful level of disturbance in affect premenstrually but not of the proportions of a clinically disturbed psychiatric population. Support is thus evident for the view that the existence of what might be termed 'severe' premenstrual symptomatology (dysphoria in the present study) is relatively rare (Abplanalp, 1983). It was judged to be evident in only Group 1 and 3. It seems to be true that the probability is low that an investigator will by chance collect a large number of women with severe premenstrual dysphoria from a largely unselected or unscreened subject sample.

Neuroticism and Premenstrual Affective Subtypes

The hypotheses tested were that cluster groups demonstrating depressed premenstrual affective increases (i.e., Groups 1 and 3) would have higher neuroticism scores than other dysphoric subtype groups (i.e., Group 4). Groups 1 and 3 were also expected to have higher neuroticism scores than any group demonstrating little mood change premenstrually (i.e., Group 6). The subjects of Groups 1 and 3 combined did demonstrate a significantly higher neuroticism mean when compared to Group 6. The neuroticism mean of Groups 1 and 3 combined was, however, not significantly different from that of Group 4. Thus, one hypothesis was confirmed regarding neuroticism while the other was not.

Examining the levels of neuroticism of the present study (see Table 18) shows the mean neuroticism score for Group 6 compares

favourably to the norms reported for American college students ($X = 10.9$, $SD = 4.7$) (Eysenck & Eysenck, 1968). The mean neuroticism score for Group 6 also compares favourably to the norms for the normal population sample ($X = 9.0$, $SD = 4.8$), as provided in the manual of the EPI (Eysenck & Eysenck, 1968). The neuroticism mean of Groups 1 and 3 was somewhat lower than means reported for any neurotic groups, such as that for anxiety neurotics ($X = 15.8$, $SD = 5.1$) (Eysenck & Eysenck, 1968). In the study of Watts et al. (1980) using the EPI Form B, neuroticism means are provided for the premenstrual syndrome subjects ($X = 14.88$, $SD = 3.60$), and the control subjects ($X = 11.75$, $SD = 4.94$). These means were only slightly higher than the means found for combined Groups 1 and 3 of the present study ($X = 12.1$, $SD = 5.2$) and Group 6 ($X = 9.3$, $SD = 4.6$) in respective comparison.

The finding of a significantly elevated neuroticism mean in the premenstrual dysphoric Groups 1 and 3 as compared to the non-dysphoric Group 6 may be considered to be an example of the potential confounding due to similarity of the questionnaire data. It has been argued that any association between high neuroticism and increased premenstrual symptom reporting may be due to subjects' endorsement of items of the EPI neuroticism scale (such as mood swings, energy swings or outbursts of anger) that are also endorsed on questionnaires of premenstrual symptomatology (Gannon, 1981). The results of one investigation (i.e., Coppen & Kessel, 1963) rendered the above explanation as less likely to explain the significantly higher neuroticism scores of premenstrually dysphoric versus non-dysphoric groups. Higher neuroticism scores for

dysphoric groups were found both in the present study and that of Watts et al. (1980). In the study of Coppen and Kessel (1963) the significant positive correlation between premenstrual irritability and/or depression and neuroticism still held after the authors removed eight of the twenty-four items of the MPI that were judged to be the potentially confounding questions. The removal of items from questionnaires such as the MPI or EPI may serve to strengthen the validity of the association of neuroticism and premenstrual dysphoria. Other difficulties in interpretation are, however, introduced. The standardization of such personality factors as neuroticism as measured by the EPI was conducted on the basis of inclusion of all items. No reliability or validity data are available for a reduced neuroticism scale.

It may be noted that in the study of Sanders et al. (1983), although the group mean scores were not found to be significantly different, the trend in the mean neuroticism scores was in the expected direction. The highest mean was for their clinic PMS group and the lowest for their no PMS group. This type of trend was also apparent in the neuroticism means for the cluster subgroups of the present study (see Table 18). This trend was apparent with highest neuroticism scores corresponding to the subject group which demonstrated the most severe premenstrual dysphoria in the Sanders et al. (1983) study for a total of three subject groups. This type of trend appeared in the present study for four cluster groups (i.e., Groups 1, 3, 4, and 6) and in the expected rank order.

One might conclude that women with severe premenstrual increases in dysphoric affects (such as anxiety, depression, and anger of the present study) demonstrate higher neuroticism scores than women who show no such premenstrual increases. This conclusion is based upon the significant findings in comparing Group 1 and 3 with Group 6. (It is not clear whether the higher neuroticism scores in Group 1 and 3 are somehow a function of high premenstrual depression alone as was indicated by the original hypothesis. The high neuroticism scores in Group 1 and 3 may perhaps be a function of premenstrual elevations in anxiety, anger or all three types of dysphoric affect. This is due to the fact that both Group 1 and 3 evidenced a combination of premenstrual negative affect elevations. The lack of a significant difference in neuroticism between Group 1 and 3 combined and Group 4 demonstrates nothing clearly regarding depression. No conclusion can be reached as Group 4 demonstrated not just a moderate-low level of premenstrual increases in depression but a moderate-low level regarding the other negative affects as well. No 'pure' dysphoric cluster group which demonstrated only premenstrual increases in depression, anxiety, or anger was available to make comparisons of neuroticism based upon the presence or absence of any specific dysphoric affect.

Examination of the data of the present study and consideration of previous comparable work on neuroticism and premenstrual symptoms leads one to formulate a certain impression. It is probably the presence of a higher level of severity of premenstrual increases in negative affect that is related to increasing neuroticism. This may explain why some

studies have found significant positive correlations between premenstrual levels of negative affect and neuroticism scores (Coppen & Kessel, 1963; Taylor, 1979b). It may also explain why the use of asymptomatic controls for comparison may result in finding significantly higher neuroticism in subjects with premenstrual symptoms (Watts et al., 1980).

The fact remains that in the study of Sanders et al. (1983) subgroups of subjects that seemed to lie on a continuum of premenstrual dysphoric severity did not show significant differences in mean neuroticism scores. The standard deviations of the neuroticism scores of the subgroups of this study as well as that of Sanders et al. (1983) were rather high in comparison to the numerical differences in the means. These high standard deviations result in a great degree of overlap in the means contraindicating possible findings of significant differences. More importantly perhaps, the range of the means in the present study is somewhat restricted. This restriction is to a range beginning at that of a normal population (as compared to available norms) and ending at a somewhat lower level of neuroticism than found for disturbed or neurotic groups. It is interesting to consider that this range may be quite similar in its implications to the range discussed for levels of premenstrual reporting of the negative affects of cluster subgroups. The cluster subgroups demonstrated premenstrual means of negative affect between the values reported for a normal sample and a level lower than those reported for psychiatric populations. Bearing this similarity in mind, one might conclude that as was the case

for premenstrual levels of dysphoria, it is only at the most severe levels (i.e., Groups 1 and 3) that the clinical significance of factors such as dysphoric affect or levels of neuroticism may be judged as apparent. This significance is, however, restricted to mean elevations of such factors below that of abnormal populations. The same continuum operating with respect to premenstrual dysphoria seems to be reflected in neuroticism scores. Thus, elevations in neuroticism do seem related to high levels of premenstrual dysphoric increases in comparison to no such increase. Since premenstrual dysphoric increases seem to lie on a continuum, the elevations of neuroticism scores follow the same type of continuum, with Group 6 at the lowest level, followed by Group 4, Group 3 and then Group 1.

Given the above hypothetical explanation for the state of affairs concerning neuroticism, it would be difficult for example, for clinicians to use neuroticism scores as a marker to attempt to separate premenstrual dysphoric sufferers from non sufferers. It would also be unlikely that one could predict from the level of premenstrual dysphoric affect reporting the level of neuroticism to be expected. The high degree of overlap of neuroticism means across premenstrual dysphoric subgroups in this study and the relative restriction of the range of the mean scores, from the normal to below abnormal group means must be emphasized. This leads to the conclusion that neuroticism measures are unlikely to be useful for a clinical diagnosis of premenstrual dysphoria. The association between significantly elevated neuroticism and premenstrual dysphoria seems restricted to severe dysphoria. The

elevation in neuroticism seems such that any member of a severe premenstrually dysphoric sample may evidence a neuroticism score in the normal range.

It may be stressed at this point of the discussion that the multi-subgroup approach to premenstrual affective changes of this study was based on a certain expectation. Such a separation of affective change groups was hoped to lead to clarifications of any associations of such specific changes to other variables. Abplanalp (1983a) hoped that such an approach may serve to eventually help clarify etiological questions regarding premenstrual symptoms or prove instrumental in the development of effective treatment approaches. The usefulness of the statistically derived symptom clusters or subgroups with respect to etiology or treatment is not immediately apparent from the results of the present research. Some conclusions and speculations based upon the results may, however, be advanced. The findings regarding the association of subgroups of premenstrual dysphoria to neuroticism levels indicates that a relationship does exist with a severe level of reporting of premenstrual dysphoria. This association must be qualified by the observation that the elevation of neuroticism is not of the proportion of psychiatric populations and that it may be due to confounding of the measurement devices. The presence of high premenstrual increases in depression may be related to higher levels of neuroticism. As the depression is commonly accompanied by high anxiety or anger, the exact relationship of high premenstrual depression to neuroticism is still unclear. Regarding the possible nature of the

association of premenstrual dysphoria to neuroticism, premenstrual dysphoric increases may cause neuroticism, neuroticism may cause the dysphoria, or a third variable may mediate the association. As Gannon (1981) points out, to establish a causal relationship between psychological factors and premenstrual symptoms it would be necessary to manipulate both or study the relationship between the variables longitudinally.

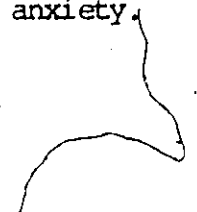
Trait Anxiety and Premenstrual Affective Subtypes

Trait anxiety measures (SAI X-2) of subject group 1 were hypothesized to show no significant differences over the two times of testing (i.e., intermenstrual and premenstrual). This hypothesis was confirmed. The affect cluster group(s) of subject group 1 reporting the most increased anxiety premenstrually (i.e., Group 1) was expected to demonstrate higher trait anxiety measures than other dysphoric subtype groups (i.e., Groups 3 and 4). Group 1 was expected to demonstrate higher trait anxiety measure than group(s) with little or no premenstrual affective changes (i.e., Group 6). This hypothesis was only partially supported by the significantly higher trait anxiety mean of Group 1 as compared to Group 6.

Trait anxiety measures remained stable when testing was conducted at two points of the menstrual cycle. This was expected as the high reliability of this trait measure of anxiety is stressed by the authors of the SAI (Spielberger et al., 1970). The trait anxiety means of Groups 6 and 4 (see Table 26) are close to those cited by the authors of the

SAI for undergraduate female college students ($X = 38.25$, $SD = 9.4$). The means of Groups 1 and 3, however, (while still being within one standard deviation of the college students mean), are more similar to those cited for male neuropsychiatric patients with anxiety reaction ($X = 48.08$, $SD = 10.65$) or character disorder ($X = 40.32$, $SD = 13.06$). Cluster Groups 1 and 3 appear to demonstrate meaningful elevations of trait anxiety.

A significantly higher trait anxiety mean was found for the two cluster groups demonstrating high premenstrual increases in dysphoric affect (i.e., Group 1 and 3) as compared to the cluster group showing little premenstrual changes in negative affect (Group 6). Groups 1 and 3 did not differ significantly in their trait anxiety means. The mean trait anxiety of Group 3 was the highest, however, and it was found to be significantly higher than that of Group 4 while the mean of Group 1 was not different from that of Group 4. According to the hypothesis for cluster group trait anxiety means, Group 1 would be expected to have a mean higher than that of Group 3, 4, or 6 if the variable of increased state anxiety was related to trait anxiety measures. The only support for this hypothesis is the significantly higher trait anxiety mean of Group 1 as compared to Group 6. The postulated relationship between trait anxiety and changes in state anxiety is contraindicated, however, by the finding that Group 1 and Group 3 had similar trait anxiety means and the fact that Group 3 (reporting moderate-low premenstrual increases in anxiety) actually demonstrated the highest trait anxiety mean. There are no strong indications from the data that trait anxiety is specifically related to premenstrual increases in state anxiety.



An apparent lack of a relationship between premenstrual state anxiety and trait anxiety measures has been previously reported (Abplanalp et al., 1977; Lahmeyer et al., 1982). The state and trait anxiety correlation analysis of the present study indicated no relationship between levels of trait anxiety and intermenstrual to premenstrual changes in state anxiety reporting. No relationship was indicated in either subject group 1 ($r = .08$) or dysphoric subgroup subjects ($r = .04$).

There are indications that trait anxiety is related to high levels of increases in dysphoric affect premenstrually, as evidenced by the higher trait anxiety of Groups 1 and 3 as compared to Group 6. As was discussed for the relation between neuroticism and premenstrual affective subtypes, the trend in the means of trait anxiety across cluster groups shows a continuum. This indicates that trait anxiety elevation seems to lie on much the same continuum as increases in premenstrual dysphoric affect. The only notable difference for trait anxiety when compared to the findings for neuroticism is that although cluster Groups 1 and 3 did not differ significantly in trait anxiety means, Group 3 demonstrated the highest mean, while for neuroticism Group 1 had the highest mean.

One might develop speculations based on the possibility that the elevation of scores on such personality variable measures as neuroticism and trait anxiety are in some way related to the same underlying personality structure, sometimes generally described as an inadequate ability to cope (Watts et al., 1980). This structure may be speculated

to be related to severe premenstrual increases in dysphoria. As in the discussion for neuroticism, it is not clear whether elevated trait anxiety is differentially related to premenstrual increases in one specific type of negative affect. The findings for both neuroticism and trait anxiety do indicate that a possible marker to indicate elevations of scores on either personality variable is the presence of severe premenstrual depression. The connection between major and minor depressive disorder, risk of future depressive disorder and premenstrual dysphoria is noted in this regard (Endicott et al., 1981; Halbreich & Endicott, 1985b; Wetzel et al., 1975). In light of these previous findings one could postulate that the high premenstrual increases of depression such as evident in Groups 1 and 3 of the present study may be the affective marker or link between premenstrual dysphoria and personality disturbances.

The Relationship between Affective and Physical Symptom Changes

It was hypothesized that differences between intermenstrual and premenstrual measures of the negative affects could not be accounted for by increases in premenstrual physical symptom reporting. Stated conversely, physical symptom differences could not be adequately accounted for by premenstrual increases in negative affects. This hypothesis was confirmed.

An examination of the across phase analysis results of the total subject group for the physical symptom measures (see Table 14) was conducted. It indicates that premenstrual means of the factors of Water

Retention (WR), Autonomic Reactions (AR), and Pain (P) of the MDQ-T were significantly elevated compared to intermenstrual means. This indicates that the total subject group reported a higher level of experience of those physical symptoms during the premenstrual period. Similar across phase analysis results were found for the dysphoric subgroup of the total subject group (see Table 16).

An examination of the means and standard deviations of the physical symptom factors in the intermenstrual and premenstrual phases for the total subject group (see Table 13) and the dysphoric subgroup (see Table 15) was conducted. It indicates that very similar means were demonstrated by the dysphoric subgroup and the total subject group. A comparison to the normative sample means of the retrospective MDQ (Moos, 1977) of the physical symptom factor means of Table 13 and 15 is revealing. The physical symptom factor means of Table 13 and 15 closely resemble those on the retrospective MDQ reported intermenstrually and premenstrually for subjects 'most recent' cycle but not for 'worst menstrual' cycle. In the present study a similarity of the means of the total subject group to those of the dysphoric subgroup is apparent. It indicates that while across phase differences were found for both types of subject groups, the dysphoric subgroup does not appear to show a much higher level of physical symptom reporting either intermenstrually or premenstrually. This may be taken as preliminary evidence of the lack of connection between premenstrual dysphoric increases and increases in physical symptom reporting.

The correlations between the physical and affect variable change scores across cycle phase for the total subject group (see Table 28) and for the dysphoric subgroup (see Table 30) were found to be quite low. This may be interpreted as further evidence of the independence of physical and affective changes from the intermenstrual to premenstrual period. The canonical correlation results for the total subject group revealed that a rather unremarkable 12% of the variance was found to be shared by statistically formed composites of the change scores of the two sets of variables (i.e., physical and affective). For the dysphoric subgroup, the magnitude of changes in the two sets of variables were found to be independent as no significant sharing of variance resulted. The canonical correlation analysis was not performed for separate cluster subgroups as there was no indication that meaningful or significant results would be found.

It appears that for the subjects of the present study, premenstrual changes in affect are almost completely independent from premenstrual changes in physical symptom reporting. This conclusion is even stronger when considering only the dysphoric subgroup of the total subject group. It is also evident, however, from the across phase analyses that physical symptom reporting is significantly increased in the premenstrual as opposed to the intermenstrual period.

The findings of the present research support the opinions of other investigators regarding the independence of premenstrual physical and affective symptoms (Andersch et al., 1978; Haskett & Abplanalp, 1983; Haskett et al., 1980; Janowsky et al., 1973; May, 1976; Moos &

Liederman, 1978; Tonks, 1975). The general timing of the premenstrual increases in physical symptom reporting corresponds to the timing of increases in dysphoric affect as has been previously noted (Moos & Liederman, 1978; Sanders et al., 1983; Taylor, 1979c). No particular association, however, seems to exist between the two types (somatic and affective) of changes. It does seem likely that physical symptoms represent an independent cyclical pattern of change that does not appear to be directly associated with negative affect reporting. Some support is also provided by the findings of the present study for a conclusion regarding women reporting little or no premenstrual dysphoria. They may evidence some relationship, although not a strong one, between changes of physical symptoms and changes in dysphoric affect. This may be of importance in consideration of other researchers' convictions that for psychopathologically 'normal' women premenstrual symptoms are predominantly physical ones (Clare, 1983; Lahmeyer, 1984). The analysis of the relationship between premenstrual affective and physical changes of the subjects in this study leads to the conclusion that the two types of changes seem to represent independent yet temporally overlapping 'syndromes' that evidence no direct relationship.

Methodological Considerations and Limitations

The total subject group of this research has been described in general as composed of young, single, nulliparous, well-educated and English-speaking women. They were screened prior to their participation to ensure that no oral contraceptives or medication affecting their mood

or hormonal state was being consumed, that they were relatively physically and psychologically healthy and had a fairly normal menstrual cycle. This type of sample is likely to be biased and the volunteer students of this study are nonrepresentative of the general public. A sample such as the one of this study may be expected to be more highly motivated, intelligent and cooperative as compared to a group of subjects picked at random from a general population. Bearing in mind that the method of subject selection biased the sample toward an overrepresentation of young nulliparous and healthy women, the use of this sample to construct norms for the whole population of menstruating women is not justified. There is, however, no convincing evidence in the literature to date that factors such as differences in age, parity, or marital status of subjects affect reports of premenstrual symptoms (Taylor, 1979c).

Another consideration regarding the subjects of the present study is the fact that they were all volunteers for a study described as investigating 'mood and the menstrual cycle'. There is a greater likelihood that women with premenstrual problems would volunteer to participate in a study of the menstrual cycle (Halbreich et al., 1983). The mention of mood in presenting the study to volunteers may have increased the levels of reporting of dysphoric affect above that of randomly selected women. The subjects were not blind to the purpose of the study. Mood was mentioned in order to increase the probability of finding an adequate subgroup of the sample showing premenstrual dysphoric increases. In an attempt to keep the subjects unaware of

previous affect ratings and their possible rhythmicity, data was collected in two sets. This procedure may have resulted in more accurate reporting. With respect to the effect of demand characteristics, there is evidence that the effects of such may be quite small at the extreme end of severity of reporting of premenstrual symptoms (Apblanalp, 1983b; Halbreich et al., 1982b; Halbreich et al., 1983).

Apart from the limitations to generalizability of the results that arise from the subject sample itself, the chosen measurement devices and design of the research naturally contains limiting factors. Affect in this study was defined (by the instruments employed) as a pattern of subjective responses tapped from inferred sources such as self-perception. The sole source of information on affect was the self-report data, which contains the limitations of a system where all information is derived from the subjects' own perceptions of the level of dysphoria and where no objective measures are available. Thus, the results concerning the levels of affect and affective combinations must be considered as phenomenologically based. This statement is also true for the measures of physical symptom reporting and it must be stressed that the physical symptom measures reflect the subjects' own perceptions.

The number and combinations of affective and physical symptoms reported were limited by the method of study employed. Prospective population studies are time consuming and daily measurement yields a large quantity of data so limitations of the symptoms to be examined is to be reasonably expected. Initial doubts may arise concerning the

accuracy of reporting when subjects are completing daily measurements and the ability of subjects to complete the task (Dennerstein & Abraham, 1983). Despite such doubts, it is feasible and certainly preferable to utilize prospective daily self-report measures. When collecting such measures it may be of importance for the investigator to include certain procedures. Frequent contact with subjects and the inclusion of clear instructions were utilized in the present study and are recommended to ensure task completion.

The methodology employed was applied to one menstrual cycle for each subject. Rarely do premenstrual symptoms occur with absolute regularity (Tonks, 1975). The one cycle design of the present study may be seen as implying that the data collected during one cycle for any given subject will represent all cycles. It is apparent, however, that premenstrual symptom reporting may vary considerably across cycles with respect to types and severity but the factors influencing such variability are not yet understood (Abplanalp, 1983b). The one cycle design of this research yields results that may be considered limited to some, as yet unknown degree, to the particular test menstrual cycle in question. Thus, the stability of the affective subtypes for any given subject over time is unknown. For the subjects of this study, given the presence of intrasubject differences in cycle length, amount of missing data and considering the method of collapsing the data, the exact timing of symptom increases is not evident. The measures of affect and physical variables in the follicular and luteal phases are therefore, generally referred to as intermenstrual and premenstrual phase measures.

Summary and Implications for Future Research

Some conclusions and theoretical implications of the results of the present study may be summarized. For a sample of young, nulliparous and well-educated women not taking oral contraceptives about one half of the subjects evidenced some degree (mild-severe) of premenstrual dysphoric increases. Premenstrual increases in dysphoria do not appear to be ubiquitous in women. Approximately one quarter to one third of the sample evidenced premenstrual dysphoric increases of mild-moderate levels. About one fifth of the sample evidenced severe or high increases in premenstrual dysphoria and approximately one tenth of the sample evidenced premenstrual decreases in dysphoric affect. The data indicate that high increases or decreases in dysphoric affect in a sample of normal women are rare. Premenstrual decreases in levels of dysphoric affects do not appear to be an elation of mood premenstrually. Rather, they appear to be a return of mild-moderate intermenstrual elevation of negative affect reporting to more normal levels. Age did not appear related to any subtype of premenstrual affective change.

Premenstrual dysphoria may be considered a multi-dimensional phenomenon with respect to the affects of depression, anxiety and anger, although all these negative affects are correlated. No 'pure' type of premenstrual dysphoric change seems to exist that is composed of any one negative affect. A range of combinations of premenstrual affective changes may be observed. At high levels of increase of dysphoria premenstrually, a predominance of high depression seems combined with

high anxiety or anger. At lower levels of premenstrual dysphoric increases all three negative affects are present, perhaps because it is more difficult to distinguish between emotions occurring at low levels of intensity.

The feature of premenstrual depression does seem to be an essential component of severe premenstrual dysphoria. The presence of depression may be able to be accounted for by the presence of an affective disorder in subjects evidencing high premenstrual increases in dysphoria. Depression may also be viewed as a higher order emotional state composed of components such as sadness, anxiety and anger, in which case the sadness component of depression seems to predominate severe premenstrual dysphoria. The presence of high premenstrual depression does not appear related to high intermenstrual reporting of dysphoric affect, the reporting of which has sometimes been considered as evidence of psychopathology.

Relatively discrete subgroups composed of combinations of changes in premenstrual dysphoric affect may be identified by statistical means. These subgroups seem to lie on a continuum of severity of change where some subgroups partially overlap in terms of severity of dysphoric change on any individual negative affect variable. Premenstrual dysphoria may be conceptualized as a discrete phenomenon that characterizes a subgroup of women, yet it has a varied and continuous nature.

The comparison of group means for cycle phases does not seem to be the best method of evaluating a specific affective change for the

menstrual cycle in normal women. Given the bidirectional nature of such changes in a group of normal women and the fact that only a subgroup demonstrated evidence of premenstrual dysphoria, magnitude of change scores are preferable as data to represent individual mood changes. Mean difference procedures allow for zero-sum outcomes as a result of bidirectional changes and are thus, not adequate to elucidate the complex response patterns of dysphoric increases and decreases premenstrually. For a subgroup of women preselected or screened on the basis of premenstrual dysphoric increases, comparing group means across cycle phases may be useful to study the significance of dysphoric changes and severity levels.

For high levels of premenstrual dysphoric increases the premenstrual levels of depression, anxiety and anger lie between those reported for normal and psychiatric or stressed populations. The disturbance does not seem to be of a general proportion that is comparable to a formally disturbed or psychiatrically labelled group, but rather seems to resemble a mild or episodic angrily-depressed or anxious-depressive state. For women demonstrating mild-moderate premenstrual dysphoric changes, the premenstrual levels of negative affect do not seem to be of remarkable clinical significance as they are close to the levels reported by normal groups.

Elevations of neuroticism scores are associated with high increases in premenstrual dysphoric affect. The elevations of neuroticism are not of severe proportions, are generally restricted to a range between those of normal and disturbed groups, and they tend to

follow the continuum of severity with dysphoric subgroup overlap in mean neuroticism scores. Elevated neuroticism may be associated with high premenstrual depression or a combination of premenstrual negative affects. Elevated neuroticism means in premenstrually dysphoric subgroups may be a result of confounding of items measuring neuroticism with measurement items or criteria for premenstrual dysphoria. The restricted range of neuroticism means leads to the conclusion that such measures do not appear to be an effective marker with any differential association to specific combinations of premenstrual dysphoric increases.

Trait anxiety means for subgroups with high premenstrual increases in dysphoric affect are in the range of those for abnormal population samples. Elevations of trait anxiety are found to be associated with high premenstrual increases in dysphoric affect. There are no indications that trait anxiety elevation is related to premenstrual increases or changes in state anxiety. Trait anxiety means appear to follow the continuum of severity of premenstrual dysphoria. Elevations in trait anxiety may be due to increased premenstrual depression or a combination of negative affects. A possible link between premenstrual dysphoria and personality disturbances such as indicated by elevated neuroticism and/or trait anxiety may be high premenstrual increases in depression. There does not appear to be a differential association of elevations of scores on such personality variables as neuroticism or trait anxiety to a premenstrual anxious-depressed or angry-depressed type of dysphoria.

Physical symptom factors of water retention, pain and autonomic reactions demonstrate elevated levels at premenstrual versus intermenstrual testing for the normal subjects and for the subgroup of premenstrually dysphoric subjects. Very little correlation is found between physical symptom factor change scores and affective change scores. The two types of premenstrual changes (i.e., physical and affective) share 12% of the variance of change for all subjects, but share no significant amount of variance for premenstrually dysphoric subjects only. Premenstrual physical changes appear to be relatively independent from affective ones especially when increases in premenstrual dysphoria are apparent. Premenstrual elevations in physical symptom reporting may represent a separate but temporally overlapping 'syndrome' to premenstrual dysphoria. Thus, positive correlations between absolute levels of premenstrual negative affect reporting, and premenstrual physical symptom reporting may be found. Such correlations may, however, be almost entirely due to the 'temporal' overlap of two separate 'syndromes'.

The results of the present research provide implications as to the direction of future research concerning premenstrual affective changes. It is always important to bear in mind that menstruation is a normal phenomenon and changes in mood are normal and common. Given the levels of increases in dysphoric affect premenstrually and the number of women evidencing such changes, researchers may be well advised to refrain from casting most menstrual cycle affective changes into an 'illness' model. It is acknowledged that the evidence for an association between premenstrual symptomatology and affective disorder may be of importance

yet concern has been expressed regarding the lack of information about the direction and nature of such a relationship (Hamilton, 1984). It would be unfortunate to foresee that an admission of premenstrual depression for example, may carry an automatic stigma of psychopathology in the absence of evidence concerning any clear and well understood directional relationship. As discussed by Lahmeyer (1984) premenstrual symptoms (mild or severe) can exist independently of any affective disorder but such a disorder may increase the risk of symptom occurrence, severity and perhaps diversity.

Investigators of premenstrual affective changes may be well advised to adopt an individual differences model for such changes as outlined by Sommer (1980). According to this model, events of the menstrual cycle may, or may not produce premenstrual dysphoria. Premenstrual dysphoria would be seen as not ubiquitous in women, but affecting specific women in a specific fashion. The model implies that subgroups of women may exist, which vary with respect to degree of manifestation of premenstrual affective change. This was seen on the continuum of severity of premenstrual dysphoric increases in the present study. A researchers' task would be to identify subgroups with similar premenstrual affective changes and search for corresponding variables, etiology or treatment responses. In this model, it is acknowledged that the same symptom may have different causes or different causes may produce the same symptoms.

Halbreich and Endicott (1982b) recommend that the concept of a single premenstrual change 'syndrome' be replaced by the recognition of diverse premenstrual changes with well-defined subtypes. It is

recognized, however, by these researchers as well as from the results of the present study that for affective changes, the subtype categories or dimensional measures are not independent and varying degrees of overlap exist between them (Halbreich & Endicott, 1985a). Even so, specific subtyping of premenstrual changes facilitates the study of different, perhaps partially overlapping mechanisms of etiology of each subtype (Halbreich & Endicott, 1982b). These authors propose a search for multivariate mechanism(s) of etiology of such changes as opposed to a single causative factor (Halbreich & Endicott, 1982b).

The selection of specific premenstrual changes to be assessed and the methods applied reflect the way in which a researcher conceptualizes such changes as well as the interests of the researcher. Future studies should recognize that several premenstrual 'syndromes' may exist and so carefully specify and define what group of premenstrual changes are to be examined (Halbreich & Endicott, 1982b; Hamilton, 1984; Lahmeyer, 1984). More prospective research is needed (Golub, 1984), using daily self-reports preferably with some studies concealing the purpose of the study. The use of a longitudinal design with daily assessment of variables over a period of several cycles and across phase change scores as representing the premenstrual affective change of any given subject is recommended. These procedures may help clarify the consistency of premenstrual changes. Investigators should attempt to obtain repeated measures of affect for example, during specific cycle phases by daily self-report. They should also search for reliable objective measures of assessment, perhaps by trained raters in daily contact with subjects (Abplanalp, 1980). The overreliance on self-report data in the past does

not render impossible any search for objective measurement techniques such as an observer rating instrument. Both positive and negative behaviors or types of affect should be included in the assessment. The recommended use of objective measures of assessment applies to physical symptom variables as well. The phenomenological reports of physical variables of the present study and their apparent lack of relationship to affective reports may be supported in future studies by objective measures of physical changes premenstrually.

Investigators of premenstrual affective changes must generate specific hypotheses to attempt to explain the specific changes and their external correlates. As confirmed by the present study, there are different, although not mutually exclusive types of premenstrual dysphoric changes that may be differentiated. Future investigations may wish to entertain further the hypothesis that depression is a dominant feature of premenstrual dysphoria. It may be the case that high levels of premenstrual increases in depression are a link to personality disturbances or affective disorder. With respect to neuroticism one cannot ethically attempt to produce 'neurotic' behavior. An obvious direction for research may be to reduce or eliminate either 'neurotic' behavior or symptoms, or premenstrual dysphoric symptoms, and assess the effects of such manipulations on the non manipulated variable (Gannon, 1981). The development of a method to measure neuroticism which would not confound such a score with premenstrual affective change reporting is necessary. This method may be used to first clearly establish the relationship between premenstrual dysphoria and neuroticism. Studies are also needed to resolve the contradictory findings regarding the

relationship between such factors as age, parity and premenstrual dysphoria (Golub, 1984).

The complexity and difficulty of generating sound research on the menstrual cycle has been explored by Koeske (1980). Problems in the research have included the difficulty and tediousness of collecting daily measures. Even very recently, Abplanalp et al. (1980) described such research as remaining on a rather primitive 'chaotic' level. Menstrual cycle variables are most likely dynamically related or interactive (Koeske, 1980).

Women with premenstrual symptoms are subject to the same stresses and strains of ongoing life events as other women. Statistics alone are unable to distinguish between premenstrual reactions and marital or work stress for example (Sampson & Prescott, 1981). The negative affect of the premenstrual period is likely to be mediated by a number of factors including the experience of external events. Such events in the environment may interact with cycle phase in which case the variability of mood becomes a complex product of biological, social and cognitive variables. For example, if the 'real' effects of cycle on mood are small, the contribution of cycle phase to mood may be low. This contribution may be low because cycle phase may have a weak functional relationship to mood or exposure to a certain environment may mask or remove the influence of cycle phase (Koeske, 1980). From another viewpoint, the symptoms of premenstrual dysphoria may manifest only if particular environmental changes occur (Clare, 1983). This interaction between a number of factors including external events may be one reason

why the affective experience associated with cycle phase demonstrates such a large interindividual variability (Schilling, 1980).

The ability of an individual to cope psychologically, as perhaps reflected in her reports of negative affect, is tied to stressful life experiences (Abplanalp et al., 1980). The degree of distress may thus be increased by factors such as neurotic personality traits, high trait anxiety, environmental stress and biological vulnerability to distress (Dennerstein & Abraham, 1982). A reported level of negative affect is determined by the subjects' total reaction which includes influences from all the factors just mentioned and also involves an attributional process. The effect of conditions of overall stress on premenstrual affective changes needs to be studied, particularly in women reporting high premenstrual increases of dysphoric affect.

In conclusion, the multi-dimensional phenomena of premenstrual dysphoria appear to be a complex interaction of biological, environmental, social, cognitive, and personality factors or predispositions. Greater specification of premenstrual dysphoric subtypes and their levels of dysphoric severity will, however, help identify specific biologic or personality correlates of such subtypes and should increase the replicability of research. It will aid description of and clarify our understanding of premenstrual dysphoria. This process should, in turn, aid the formulation of research plans to investigate etiology. It should also help to identify and evaluate specific treatment approaches for any women with such severe premenstrual dysphoric increases that treatment is warranted.

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Appendix 1

Affective Variation During the Menstrual Cycle

Appendix 1

Affective Variation During the Menstrual Cycle

Author (Year)	Duration (/) # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Gottschalk et al. (1962)	1, 2, or 3 cycles/ n = 5	Daily 5 minute speech samples, 5-7 days per week.	Anxiety, hostility.	-Thematic analysis of unstructured material. (i.e. Gottschalk free association test, FAT)	-4/5 women showed significant rhythmic changes in the magnitude of at least one of the affects. No uniformity was shown in patterns of change.
Coppen & Kessel (1963)	n = 464	Retrospective questionnaire.	Irritability, depression, anxiety, nervousness, tension.	-Four-point scale	-Irritability described as key psychological symptom. -Rating of best descriptors: 54% depressed, 30% tense, 10% nervous, 6% anxious. -Symptoms worse premenstrually.
Ivey & Bardwick (1968)	2 cycles/ n = 26	A 10 minute interview at ovulation and premenstrually.	Anxiety, hostility, depression.	-Gottschalk FAT	-Premenstrual anxiety significantly higher than at ovulation. -Trend toward higher premenstrual hostility and depression. -Self-esteem and self-confidence high at ovulation.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Moos (1968a)	n = 839	Retrospective questionnaire	Crying, loneliness, anxiety, restlessness, irritability, mood swings, depression, tension.	-Menstrual Distress Questionnaire (MDQ-A)	-Negative affect scale (i.e. affective symptoms assessed by MDQ) showed higher mean score in premenstrual than in menstrual or intermenstrual phase.
Moos et al. (1969)	2 cycles/ n = 15	Self-report on 9 occasions	Anxiety, aggression, depression, pleasantness, activation.	-Nowlis Mood Adjective Checklist (MACL)	-Anxiety and aggression were higher menstrually and premenstrually than at mid-cycle. Depression showed no consistent changes. Pleasantness and activation lowest in menstrual and premenstrual phases.
Reynolds (1969)	3 months/ n = 87 (60 with premenstrual syndrome plus 27 with dysmenorrhea)	Daily self-report by mail	Mood	-Rated on a 12 cm line with end-points: 'very low' & 'very cheerful'	-Marked lowering of mood during premenstruum and menses.
MDQ-T (today version) MDQ-A (retrospective version)					

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Paige* (1971)	1 cycle/ n = 102 [38 women plus 4 taking O.C. (oral contraceptives)]	5 minute speech samples on 9 occasions	Anxiety, hostility.	-Gottschalk FAT	-For women not taking O.C., cycle day had a significant effect on the magnitude of total negative affect scores, anxiety scores alone and on hostility scores alone. -Negative affect higher at menses & premenstruation than at mid-cycle.
Silbergeld et al. (1971)	4 cycles/ n = 8	Daily self- report plus interview & speech samples on 9 occasions	Included anxiety, hostility & depression	- MACL - MDQ-T - Gottschalk FAT - Interview rating scale	-For women not taking O.C., no significant phase effects seen for MDQ or MACL anxiety or MACL depression. As measured by FAT, anxiety was significantly higher pre- menstrually and menstrually than at ovulation, with a maximum at menses. -Hostility peaked during mid-follicular phase, was low at ovulation and increased premenstrually.
Zimmerman & Parlee (1973)	1 cycle/ n = 14	Daily self-report	Anxiety, fear, depression, restlessness, irritability	-6 point scale from: 'no experience of symptom' to 'acute or part- ially disabling'	-Total negative affect score differences over four phases of the cycle were not significantly different.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Persky (1974)	1 cycle/ n = 21	Self-report on 3 occasions	Included anxiety, depression, hostility, aggression.	-Zuckerman's Multiple Affect Adjective Checklist (MAACL) -Beck's Depression Inventory -MDQ-T	-Remarkably little change found across three occasions of testing for measures of mood.
Patkai et al. (1974)	2 cycles/ n = 6	Self-report 5 days a week	Brisk, tense, concentrated, apprehensive, irritable, efficient, gloomy, restless.	-100 mm graphic scale with midpoint 'Normal level' at that time of day and end-points as 'much less than usual', 'much more than usual'	-Only apprehensive and restlessness showed significant differences between four phases of the cycle. -Restlessness highest premenstrually and apprehensiveness during the postmenses.
Little & Zahn (1974)	1 cycle (6 days/wk)/ n = 12	Daily self-report	Positive activation (vigor, surgency, elation, social affection & concentration combined), anxiety, aggression, fatigue	-(MACL)	-No significant cyclic changes in negative mood scale scores but trends to peaking premenstrually. -Significant increase in positive activation just before ovulation. 

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Schuckitt et al. (1975)	n = 105	Retrospective report	Depression, irritability, anxiety, crying spells, mood change.	-Privately administered structured interview	-Irritability reported by the largest percentage of subjects, followed by depression. -Subjects reporting pre- menstrual symptoms were twice as likely as those not reporting symptoms to have a history of a serious depressive episode.
May (1976)	2 cycles/ n = 30	Retrospective report plus self-report on 3 occasions	Mood	-Elation- Depression scale (a 10 point rating scale from 'utter depression and gloom' to 'complete elation')	-Dividing the cycle into three phases, 50% of the group had their most de- pressed mood in the pre- menstrual phase. 40% felt worst in the menstrual phase. These two groups were significantly different in mood both in the premenstrual and menstrual phase, but not different in average mood level across all three phases. -One-time retrospective report of menstrual mood shifts did not correspond to actual mood ratings at that phase of the cycle.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Wilcoxon* et al. (1976)	35 consecutive days/ n = 33 (11 males, 11 females, plus 11 females on O.C.)	Daily self- report	Included factors of Negative Affect, Happy-Sad, Anxiety- Dysphoria.	-MDQ-T -MACL -Pleasant Activities Schedule -Personal Stress Inventory	-For affect measures, females no-pill group peaked negatively during menstrual period while females-pill peaked during premenstrual phase. -Experience of stressful events accounted for more of the variance of negative mood than cycle phase.
Golub* (1976b)	Approximately 3 weeks/ n = 50	Self-report 4 days prior to onset of menstruation and 2 weeks after	Anxiety, depression.	-Depression Adjective Checklist (DACL) -State-Trait Anxiety Inventory (SAI)	-Subject's scores were significantly higher (for depression and state- anxiety) premenstrually than intermenstrually. -Trait-anxiety scores were not significantly correlated with State- anxiety or depression scores.
Halbreich & Kas (1977)	3 weeks/ n = 50 (28 women with premenstrual syndrome plus 22 controls)	Self-report on 4 occasions	Anxiety	-Taylor Manifest Anxiety Scale (TMAS)	-Women with premenstrual syndrome had higher scores on TMAS during the entire cycle. These scores rose significantly during the premenstrual period in this group but not in control group. -TMAS may not be a reliable instrument for measuring trait-anxiety.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Sampson & Jenner (1977)	1 cycle/ n = 19	Daily self-report	Negative Affect factor	-MDQ-T	-53% of subjects (n=9) had significant sine wave curve fit for Negative Affect (the maximum value of the best fit curve compared to onset of menses). -For 8 of these subjects the time of maximum value of the best fit curve was premenstrual.
Beumont et al. (1978)	35 consecutive days/ n = 30	Daily self-report	Included sad, tense, irritable, mood changes	-Modified MDQ-T of physical symptoms -Modified MDQ-T of mood (visual analogue scale) -Questionnaire concerning extra-neous factors that might effect mood or physical well-being.	-Negative affect (total mood score) highest on day 2 of menstruation and higher on 4 premenstrual days and 1st and 3rd menstrual days than scores for all other days. -Gradual increase in symptoms during premenstruum.
Rouse (1978)	1 cycle/ n = 368 (172 females plus 196 on oral contraceptives)	Pretest plus self-report on 3 occasions	Negative Affect factor	-MDQ-T -MDQ-A	-Women not taking oral contraceptives report a decrease in negative affect when menstruation commences -Older women had a tendency to complain of increased menstrual symptomatology and this tendency was greater if these women were not taking the pill.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Englander, Golden* et al. (1978)	11 weeks/ n = 46 (26 females plus 20 on oral contraceptives)	Daily self- report plus retrospective report	Negative Affect factor	-MDQ-T -MDQ-A	-Retrospective MDQ for all women showed significant phase effect for negative affect but not the actual self-report MDQ for that cycle. -Non-pill women showed significant phase effect for negative affect and a significant interaction effect of phase by type of MDQ.
Abplanalp et al. (1979a)	1.5 cycles/ n = 33 (screened to exclude psychiatric disorder)	Daily self- report	Tension- anxiety, Depression, Anger- hostility, Negative Affect factor	-POMS -MDQ-A -Social/Sexual Activities Log (SSAL)	-No changes in mood as a function of cycle phase with POMS or SSAL. -MDQ Negative Affect showed significant interphase differences with higher score premenstrually.
Taylor (1979c)	1 cycle/ n = 65 (3 women taking O.C.)	Daily self- report	Hopelessness, depression, lack of initia- tive withdrawal, tension, irritability, argumentative- ness, cheerfulness, outgoingness	-Daily Symptom Rating Scale	-Premenstrually, negative affect mean ratings significantly higher than intermenstrually.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Haskett et al. (1980)	3 test sessions (one of which during follicular phase and one during luteal phase)/ n = 42 women suffering severe premenstrual symptoms	Self-report plus observer rating scales	Included anxiety, irritability, depression	-MDQ-T -MAACL -Visual analogue scale of global discomfort -SAI -Hamilton Depression Scale -Carroll Depression Scale	-Data from 26 women with normal MDQ follicular scores is reported. 23 MDQ descriptors showed definite change between visits in a majority of this subgroup. -Group mean scores for MAACL, SAI, MDQ, and Hamilton and Carroll Depression Scales changed significantly between follicular and premenstrual visits for n = 42. -Rank ordered items from MDQ and Carroll Scale used to define core symptomato- logy of premenstrual syndrome as irritability, mood swings, restlessness and tension.
Swandby* (1980)	35 consecutive days/ n = 8 (normal cycles) +n = 10 (O.C.) +n = 10 (males)	Daily self- report	Anxiety, hostility, depression	-(MAACL) -MDQ-T	-No significant cycle phase differences on affective measures. -Three women, on individual analysis, revealed negative mood premenstrually.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Rossi & Rossi (1980)	40 days/ n = 82 (67 females, 24% on oral contraceptives plus 15 men)	Daily self- report	Mood	-Global rating from good to poor spirits -Mood stability from very changeable to very stable (above on 4 point scales) -Sociability measure -16 mood adjective list	-Ovulatory phase characterized by elevation of positive moods and slight depression of negative moods. Luteal phase showed both a significant elevation of negative moods and a significant depression of positive moods. Negative moods were psychological in character. -Negative moods of menstrual phase, somatic in character.
Vila & Beech* (1980)	1 testing day either pre- menstrually or intermenstrually/ n = 48 female phobic patients (24 females plus 24 on O.C.)	One time: self-report plus 5 minute speech sample plus retrospective report	Included Negative Affect factor, anxiety, hostility	-Profile of Mood States (POMS) -Gottschalk FAT -MDQ-A	-No significant change for mood scales found using POMS or Gottschalk FAT. -Retrospective MDQ found subjects reporting negative moods more frequently during premenstrual rather than intermenstrual phase.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Golub & Harrington (1981)	1 cycle/ n = 158 (females aged 15-16)	Daily self- report (Two test sessions of SAI & DACL)	Negative Affect factor, anxiety, depression	-MDQ-T -SAI -DACL-FORM D	-No significant difference in state anxiety or depres- sion (SAI, DACL measures) was found between pre- and intermenstrual testing. -Negative affect scores significantly higher menstrually than pre- and intermenstrually. -Premenstrual negative affect scores not signifi- cantly higher than inter- menstrual scores.
Slade (1981)	n = 25 (18 volunteers, 7 involuntarily infertile women)	Daily self- report	Negative Affect factor	-MDQ-T	-Peaks in negative affect failed to occur signi- ficantly more frequently perimenstrually (i.e. 5 days premenstrually, plus 5 days menstrually). -Peaks for psychological symptoms appeared to occur almost randomly in both infertile and control group throughout the cycle.
Lahmeyer et al. (1982)	1 cycle/ n = 11 (screened for psychopathology)	Daily self- report	Anxiety, Negative Affect	-SAI -MDQ-T	-Negative Affect and state anxiety showed no significant elevation premenstrually.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Haskett & Abplanalp (1983)	1.5 cycles/ n = 24 symptomatic females (no current psychia- tric disorder)	Interview for selection criteria plus Daily self- report	Tension/ anxiety, anger, depression, fatigue, confusion, vigor	-POMS -Somatic-Behavio- ral Sexual Symptom Profile (SBS)	-Scores for negative moods higher, and vigor lower premenstrually.
Sanders et al. (1983)	1 cycle/ n = 55 (19 attended PMS clinic, 18 had history of PMS, 18 had no history of PMS) Total no. of volunteers = 36	Daily self- report (PMS history based on MDQ-A ratings)	10 mood scales included depression, aggression, irritable, tense & anxious, cheerful and happy	-Visual Analogue Scales	-Volunteers reporting no PMS showed very slight non significant cycle pattern of well-being. -PMS clinic subjects and PMS history subjects showed significant pre- menstrual decline in well- being component.
Slade* (1984)	8 weeks/ n = 118 (70 women plus 48 taking O.C.)	Daily self- report	Negative Affect factor	-MDQ-T	-For non O.C. women, 38% had statistically signifi- cant cosine wave fits on Negative Affect. -No predominance of cycle changes in negative affect peaking premenstrually or menstrually.

Author (Year)	Duration / # of subjects	Testing Method(s)	Affective symptoms assessed	Method of symptom assessment	Major results or conclusions
Freeman et al. (1985)	1 cycle/ n = 241 (82% of women from enrollment in a PMS treat- ment program)	2 interviews (at premenstrual and post- menstrual)	Symptom clusters of anxiety- irritability, depression, depression, anxiety, hostility. (HSC)	-Menstrual Symptom Questionnaire of Abraham (1980) -Hopkins Symptom Checklist (HSC)	-Emotional symptoms predominated pre- menstrually. -Most frequent complaints, depression (56%), irritability (48%), anxiety (36%), mood swings (26%). -Premenstrual HSC; highest distress factors were depression and hostility. -Postmenstrual HSC scores lower than at premenstrual assessment.

* Purpose of study disguised

Appendix 2

Premenstrual Symptomatology and Neuroticism

Appendix 2

Premenstrual Symptomatology and Neuroticism

Personality Variable	Author	Subjects	Design	Questionnaire(s)	Main findings/ Conclusions
neuroticism	Coppen & Kessel (1963)	50 controls + 50 with severe premenstrual irritability and/or depression	Mail survey	-Maudsley Personality Inventory (Eysenck, 1959), -Neuroticism (N) Score -Menstrual Symptom questionnaire	-Women with premenstrual irritability and/or depression had significantly higher N scores than controls.
neuroticism	Sampson & Jenner (1977)	19 volunteers (student health visitors)	Daily recording 1 cycle	-Eysenck Personality Inventory (Eysenck & Eysenck, 1964), -Neuroticism (N) Score -Menstrual Distress Questionnaire (MDQ-T)	-No significant relation between N score and premenstrual complainers vs. noncomplainers.
neuroticism	Taylor (1979b)	38 volunteers (various sources)	retrospective and daily report	-Eysenck Personality Inventory -Neuroticism (N) Score -Daily Symptom Rating Scale (DSRS)	-Positive correlation between N score and 1) DSRS negative affect subscale (+ .45). 2) presence of 2 or more criteria of severe PMS (n = 15).
neuroticism	Watts et al. (1980)	16 controls + 25 subjects with PMS	1 test session	-Eysenck Personality Inventory -Neuroticism (N) Score	Significantly higher N scores in PMS subjects (mean = 14.88) vs. controls (mean = 11.75).

Appendix 2 (Cont'd)

Premenstrual Symptomatology and Neuroticism

Personality Variable	Author	Subjects	Design	Questionnaire(s)	Main findings/ Conclusions
neuroticism	Awaritefe et al. (1980)	40 parous + 40 nulliparous Nigerian women	Retrospective -premenstrual and non- menstrual instruction groups	-Maudsley Personality Inventory -Neuroticism (N) Score -Premenstrual Symptom Checklist	-No significant difference between groups on N score means.
neuroticism	Sanders et al. (1983)	19 (clinic PMS) gynecology out- patient clinic + 18 (nonclinic PMS) + 18 (no PMS) various sources	Daily recording 1 cycle	-Eysenck Personality Inventory -Neuroticism (N) Score Visual Analogue Mood Scales	-No significant difference in N scores between groups. Mean N Score - clinic PMS 13.6 - nonclinic 12.1 PMS - no PMS 11.3

Appendix 3

Premenstrual Symptomatology and Trait Anxiety

Premenstrual Symptomatology and Trait Anxiety

Personality Variable	Author	Subjects	Design	Questionnaire(s)	Main findings/Conclusions
Trait Anxiety	Golub (1976b)	50 parous women (volunteers, Parent-Teacher Association)	Intermenstrual and premenstrual test session	-State-Trait Anxiety Inventory (Spielberger et al., 1970) -Depression Adjective Checklist (Lubin, 1967)	-Trait anxiety scores not significantly correlated with premenstrual depression or anxiety scores. A-trait mean score - intermenstrual 34.12 - premenstrual 34.64
Trait Anxiety	Abplanalp et al. (1977)	21 paid volunteers	Intermenstrual and menstrual (test session-state anxiety)	-State-trait Anxiety Inventory	-Trait anxiety levels (mean = 37.75) unaffected by cycle phase session, as well as state-anxiety. -Trait anxiety measures not significantly different for menstrual vs. intermenstrual group.
Trait Anxiety	Halbreich & Kas (1977)	28 PMS (referred by professionals) + 22 controls (Family Planning Clinic Attendants)	4 test sessions, 2 premenstrually	-Taylor manifest Anxiety Scale (TMAS) (Taylor, 1953)	-PMS subjects had significantly higher TMAS scores during the entire cycle. -TMAS score rose premenstrually.

Appendix 3 (Cont'd)

Premenstrual Symptomatology and Trait Anxiety

Personality Variable	Author	Subjects	Design	Questionnaire(s)	Main findings/ Conclusions
Trait Anxiety	Watts et al. (1980).	21 controls + 25 subjects with PMS	1 test session	-State-Trait Anxiety Inventory	-PMS subjects had significantly higher Trait-anxiety scores (mean = 41.48) than controls (mean = 37.19).
Trait Anxiety	Awaritefe et al. (1980)	40 parous + 40 nulliparous Nigerian women	Retrospective (menstrual & nonmenstrual instruction groups)	-State-Trait Anxiety Inventory -Premenstrual Symptom Checklist	-Menstrual group had significantly higher mean state-anxiety scores than non-menstrual group. -Significant positive correlation between state and trait anxiety scores ($r=.589$).
Trait Anxiety	Lahmeyer et al. (1982)	11 paid volunteers (students and staff)	-Daily ratings -trait anxiety, 1 rating pretest cycle	-State-Trait Anxiety Inventory -MDQ-T	-Trait anxiety measures not significantly correlated ($r=.32$) with average state-anxiety scores across the cycle. -Overall trait anxiety mean was 32.2.

Appendix 4

GENERAL INSTRUCTIONS

Appendix 4

Name: _____

GENERAL INSTRUCTIONS

PLEASE READ THESE INSTRUCTIONS CAREFULLY AND CONSULT THEM
OR CONTACT THE EXPERIMENTER IN CASE YOU HAVE ANY PROBLEMS

EXPERIMENTER: ROSALINDE KLEMPAN TEL. NO. 233-8777

This study is concerned with Mood and the Menstrual Cycle. It involves a total time period of about 34 days with the completion of self-reports on a daily basis for 21 days during the 34 days. The self-reports require 10-15 minutes to fill out on each day.

Please follow the procedure described below very
carefully in the order presented below.

1. Phone the experimenter on the day of onset of the next menstrual flow or shortly thereafter. Please have your package of questionnaires with you when you phone. The experimenter will then give you instructions over the phone. You will fill in the dates on each set of questionnaires and on the schedule that correspond to the days on which you will fill them out.
2. Post the schedule by taping it to your refrigerator. Keep the questionnaire package on top of the refrigerator with a pen and leave unanswered questionnaires outside of the package, putting each one in when it is completed.
3. Complete each questionnaire set at the same time each day, on the date(s) that is shown on the schedule.
Your package of questionnaires contains all of the questionnaires that you will need. They are in order with a first group of 7 questionnaire sets, and a second group of 14 questionnaire sets.
Please complete the questionnaires by following whatever instructions appear at the top of each questionnaire page.
Read the instructions carefully and follow them as closely as you possibly can.
4. On each day that you have filled out a questionnaire set, remember to check it off on the schedule sheet as soon as you are finished.
5. Drop off the first group of 7 questionnaire sets after completion at the drop off point.
6. Drop off the second group of 14 questionnaire sets after completion at the drop off point.

NOTES: * The schedule will help you to remember to fill out the questionnaires. In the unlikely event that you forget one, leave it blank but continue to complete the rest of the questionnaires as instructed.

- * Try to respond honestly to the questionnaires, regardless of what has happened that day, whether or not the events appear related to your menstrual cycle. If certain events of significance seem to have effected your responses, you may note these events on the back of the questionnaire (if you wish).
- * Some of the questionnaires seem to ask for very similar things. Don't worry about the consistency of your answers, simply follow the instructions.

Appendix 5

Instruments

Self-report Questionnaires

Appendix 5

InstrumentsSelf-report QuestionnairesEysenck Personality Inventory (EPI)

The Eysenck Personality Inventory (EPI) is a 57-item yes-no inventory requiring 10-15 minutes to complete. The EPI has two equivalent forms which contain scales designed for the measure of two major and independent dimensions of personality defined by Eysenck and his co-workers as extraversion-introversion (E) and neuroticism-stability (N) (Eysenck & Eysenck, 1968). Each of the scales (N and E) is measured by 24 items and the inventory contains an additional 9-item response distortion (lie) scale.

It is the N scale that is of primary importance to the purpose of the present research. Neuroticism is described as a measure of basic emotional stability. Individuals scoring high on the N dimension are prone to worrying, anxiety, over-reactivity and have difficulties recovering quickly from emotional arousal. The stable individual, or low N scorer, is described as even-tempered, controlled and unworried. He or she responds slowly to emotionally arousing experience and tends to return to baseline quickly.

The N scale demonstrates a satisfactorily high internal consistency in a variety of samples (over 0.80). The test-retest reliability, based on groups of English subjects, are also high for the N scale (0.84 for one group over a 12 month time elapse; 0.92 for another group over a 9 month time elapse) (Eysenck & Eysenck, 1968). Discussions of factorial, construct, and concurrent validity are presented in the test manual (Eysenck & Eysenck, 1968). The N scale appears to be

successful in discriminating between normal adults and neurotics. It also seems to be a useful measure of one dimension of personality, that correlates well with various measures from such inventories as the Minnesota Multiphasic Personality Inventory (MMPI). High negative correlations were obtained between N and California Psychological Inventory (CPI) scores of Well Being, Tolerance and Intellectual Efficiency. The manual presents percentile norms for American college students and for small samples of selected occupational and clinical groups.

In brief, the EPI appears to be the most convenient, reliable and valid research tool currently available for the measure of the personality dimension of neuroticism.

Menstrual Distress Questionnaire (MDQ)

-- The Menstrual Distress Questionnaire (MDQ) is a 47-item list of symptoms on which women can rate their experience of the symptoms on a six-point scale from 1 (no reaction at all) to 6 (acute or partially disabling) (Moos, 1977). The questionnaire has two forms, the Form-T (Today) on which the symptoms are to be rated according to their presence on the day of completing the scale, and Form-A which obtains a retrospective account of the symptoms experienced in three phases of the most recent menstrual cycle. The MDQ is composed of eight factors (Moos, 1977) that were found to be both stable and recurrent (i.e. pain, concentration, behaviour change, autonomic reactions, water retention, negative affect, arousal and a control scale). Internal consistencies of Form-T are listed as in the range of 0.56 (water retention) to 0.89 (negative affect) and 0.94 (autonomic reactions) (Moos, 1977). Means and standard deviations for each of the eight factor scales are provided (Form-A) in premenstrual, menstrual and intermenstrual phases as

derived from an initial normative sample of 839 women (Moos, 1977). Some evidence is also presented in the manual (Moos, 1977) that Form-T means and standard deviations are essentially comparable to those found for Form-A.

Form-T, which requires about 5 minutes to complete, was administered in this research project as it is described in the manual as suitable for repeated assessments of symptoms from the same subjects.

Profile of Mood States (POMS)

The Profile of Mood States (POMS) consists of a set of 65 adjectives describing mood and feelings (McNair et al., 1971). Each adjective is to be rated on a 5-point rating scale ranging from 'not at all' (0) to 'extremely' (4). This self-report questionnaire has the rating instructions that require subjects to assess their mood 'during the past week including today' although it has been used successfully with the instruction sets for 'today', 'right now', and in 'the past three minutes'. The factor structure of the POMS for a 'right now' rating period has been investigated in one of the factorial studies reported in the test manual (McNair et al., 1971). The factor structure which is composed of six factors (i.e. tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment) was not altered appreciably by the 'right now' rating period. The POMS was designed for the measurement of transient and fluctuating affective states as subjectively reported and so may be extremely appropriate to measure mood changes during phases of the menstrual cycle.

Test-retest reliabilities for the POMS are fairly high (ranging from 0.65 to 0.74) and concordant with the fact that the purpose of the POMS is to provide a sensitive measure of changes in state. The validity of the POMS appears well

established and is based on a number of investigations such as those of factorial validity, concurrent validity and studies of response to emotion-inducing conditions. Factor score distributions as well as norms in the T-score form are presented (separately for males and females) for both a large number of psychiatric outpatient as well as college volunteer normative samples.

The POMS with the instruction set of 'today' was administered to subjects in this study and requires 3-5 minutes to complete.

State-Trait Anxiety Inventory (SAI)

The State-Trait Anxiety Inventory (SAI) consists of two separate self-report rating scales, one for the measure of State-anxiety and one for the measure of Trait-anxiety. Each scale contains 20 items. According to Spielberger et al. (1970) who developed the inventory, state-anxiety is conceptualized as a transitory emotional state characterized by a conscious and subjective awareness of tension, apprehension, and heightened activity of the autonomic nervous system. Trait-anxiety refers to a relatively stable individual difference in anxiety-proneness. The State-anxiety scale, which is given first in a standard administration, requires that the subject report how he/she feels 'right now, that is, at this moment' to the statements on a 4 point scale ranging from 'not at all' to 'very much so'. The Trait-anxiety scale is similar except that the instructions ask the subject to indicate how she generally feels. Both scales are titled 'Self-Evaluation Questionnaire' and together they require 15-20 minutes to complete.

The SAI has been used and validated extensively and has provided impressive test-retest reliabilities (eg. over a six month period Trait-anxiety scale reliabilities were 0.73 and 0.33 for State-anxiety) (Spielberger et al., 1970). It has been demonstrated in a variety of contexts that State-anxiety scores are sensitive to manipulations of situational stress and that Trait-anxiety scores remain relatively stable and are unresponsive to situational stress (Spielberger et al., 1970). Norms are provided in the manual for both the state and trait scales for college students, high school students, neuro-psychiatric patients, general medical and surgical patients, and inmates in a state prison (Spielberger et al., 1970).

Depression Adjective Checklists (DACL)

The Depression Adjective Checklists (DACL) are brief self-report measures of a depressed affective state. Seven equivalent forms of the DACL are available (Forms A through G) that list 32 self-descriptive adjectives (Forms A to D) or 34 adjectives in the case of Forms E-G (Lubin, 1967). The inter-list correlations range from 0.80 to 0.93 indicating that the separate forms are comparable (Lubin, 1967). The instructions require that the subject check each adjective which is regarded as descriptive of 'how you feel now--Today' and completion of one form requires 3-5 minutes. A subject's score consists of the total number of depressive adjectives checked added to the total number of positive adjectives (eg. 'gay' or 'light hearted') not checked. Split-half and parallel form reliabilities for the DACL are quite satisfactory and a large amount of cross-validation data is available (Lubin, 1967). For example, patients diagnosed as depressed have been found to obtain significantly higher DACL scores than

normal on all seven checklists (Lubin, 1967). Norms are provided for samples of students, senior citizens, adolescent delinquents and psychiatric patients (Lubin, 1967). The manual suggests a repeated measures utilization of the DACL (Lubin, 1967).

Forms A to D were used in this research project as they are essentially equivalent, and these forms have been suggested to be more discriminating when used with female subjects (Lubin, 1967).

Appendix 6

Characteristics of the Participants
(n = 194)

Appendix 6

Characteristics of the Participants
(n = 194)

Characteristic	<u>n</u>	% of <u>n</u>
1. Marital Status:		
Single	137	70.62
Separated	4	2.06
Married	42	21.65
Widowed	1	0.52
Divorced	7	3.61
Cohabiting	3	1.55
2. Parity:		
0	165	85.05
1	19	9.79
(natural children)	20	10.31
3. Residence:		
Urban	100	51.55
Suburban	76	39.18
Rural	18	9.28
4. Mother Tongue:		
English	155	79.89
French	19	9.79
Other	5	10.31
5. Education:		
Elementary only	0.0	0.00
High School only	3	1.55
Partial University	140	72.16
University Graduate	45	23.19
Enrolled Grad. School	5	2.58
Vocational training	1	0.52
6. Employment:		
Full time	40	20.61
Part time	64	32.98
Unemployed-seeking	20	10.31
Unemployed not-seeking	70	36.08
7. Level of Employment:		
Homemaker	4	2.06
Student full-time	132	68.04
Student part-time	15	7.73
Major managerial/professional	3	1.55
Skilled	19	9.79
Unskilled	0	0.00
Homemaker - 2nd job	0	0.00
Self-employed	1	0.52
Minor managerial/professional	17	8.76
Semi-skilled	1	0.52
Unemployed	2	1.03

Appendix 6 (Cont'd)

Characteristics of the Participants
(n = 194)

Characteristic	<u>n</u>	% of <u>n</u>
8. Present Religion: Protestant	44	22.68
Roman Catholic	88	45.36
Agnostic	39	20.10
Atheist	6	3.09
Other	17	8.76