

MENSTRUAL CYCLE MOODS AND SYMPTOMS IN YOUNG, HEALTHY WOMEN: A HEURISTIC MODEL

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ABSTRACT

There is a need for development of theoretical models in menstrual cycle research. Changes in moods and symptoms related to the menstrual cycle are problematic for a small, but significant proportion of women, and the complexity of such interrelationships remains a barrier to more effective management. The present study provides empirical data on symptom-mood interrelationships, using a sample of 370 healthy undergraduate women, all of whom responded to the Eight State Questionnaire, and the Menstrual Distress Questionnaire, within the context of a between-groups experimental design. Effects due to age, oral contraceptives, and menstrual cycle phase were tested using MANOVA procedures. Although age effects were not significant, physical symptoms were elevated both menstrually and premenstrually, while use of the contraceptive pill significantly reduced negative mood states. In addition, a nonrecursive heuristic model is postulated, providing hypotheses as to putative "causal influences." Overall, the empirical (LISREL) model suggests that menstrual cycle symptoms and mood states are discrete constructs, which interact reciprocally.

INTRODUCTION

Understanding of the complex interrelationships between menstrual cycle symptoms and associated mood states is still rather incomplete (Aganoff & Boyle, 1994; Siegal, Myers, & Dineen, 1987; Bancroft, Cook, & Williamson, 1988; Weidner & Helmig, 1990), and consequently, there is an ongoing need for developing and testing theoretical models in menstrual cycle research. Physical symptoms are mostly attributed to the menstrual and premenstrual phases (Fernandez & Brown, 1991; Fernandez & Turk, 1992; Pazy, Yedlin & Lomranz, 1989; van der Ploeg, 1989; Wilson & Keye, 1989), while elevations in unpleasant mood states tend to arise premenstrually (Cumming, Cumming, Krausher, & Fox, 1991; Freeman, Sondheimer, & Rickels, 1988; Johnson, McChesney, & Bean, 1988; Kirsch & Geer, 1988; Metcalf, Livesey, Hudson, & Wells, 1988; Nakatani, Sato, Matsui, Matsunami, & Kumashiro, 1994; Richardson, 1992; Rosen, Moghadam, & Endicott, 1988). However, many of these studies relied on retrospective self-

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reports of menstrual cycle symptoms and mood states, which are known to be exaggerated, as compared with prospective reports (see Boyle & Grant, 1992a,b; Grant & Boyle, 1991; McFarland, Ross, & DeCourville, 1989).

Moreover, discernible changes in moods and symptoms are not always observed (Ainscough, 1990; Laessle, Tuschl, Schweiger, & Pirke, 1990; Mansfield, Hood, & Henderson, 1989), and some changes may involve elevations in positive affectivity, especially intermenstrually (e.g., Logue & Moos, 1988). Prevalence estimates as low as 5-10% for clinically significant paramenstrual emotional distress are claimed by many authorities, while Ramcharan, Love, Fick, and Goldfien (1992) suggested that even a smaller proportion of women experience debilitating depression or anxiety premenstrually.

Interrelationships between menstrual cycle phase and mood states are often reported under conditions of heightened emotionality (Beck, Gevirtz, & Mortola, 1990; Heilbrun & Frank, 1989). For instance, Boyle (1983) found that experimental manipulation of depressive mood resulted in significantly *increased susceptibility* to elevations in sadness, shame, fear, and hostility among normal women paramenstrually. In extreme cases, premenstrual susceptibility to emotional stimuli has sometimes been implicated in criminal acts (Chiat, 1986; Diliberto, 1986; Riley, 1986; Lewis, 1990), and associated with illness and absenteeism (Busch, Cosata, Whitehead, & Heller, 1988).

Cyclical hormonal variations play a role in mood and symptom changes (Chihal, 1987; Halbreich, Holtz, & Paul, 1988; Roy-Byrne, Rubinow, & Hoban, 1988). While cognitive functioning may be susceptible to hormonal changes across the menstrual cycle (Hampson, 1990; Kirstein, Rosenberg, & Smith, 1981), more recent work (e.g., Boyle, 1996) suggested that generally this effect is slight. Oral contraceptives may have some discernible influence (including positive effects) on moods and symptoms (Harding, Vail, & Brown, 1985; Warner & Bancroft, 1988). Nevertheless, the relationship between fluctuating monthly hormonal levels and related mood states is far from clear (Walker, 1992; Walker & Bancroft, 1990).

To understand these dynamic interrelationships more fully, *multidimensional models* are essential to reveal the diversity of mood-symptom interrelationships, and associated "causal influences." Some work using multidimensional models has been undertaken in menstrual cycle research (e.g., Taylor, Woods, Lentz, Mitchell, & Lee, 1991). Taylor et al. made extensive use of structural modelling techniques, and concluded that life stress is a significant predictor of perimenstrual negative affect (cf. Woods, Dery, & Most, 1982). In the present study, current and ongoing life stress is incorporated using a psychometric measure of stress, and a heuristic model is proposed wherein the nonrecursive interrelationships between symptoms and states are investigated, with attention focused on the directionality of "causal influences."

Since physical symptoms such as pain bring about secondary changes in psychological mood states (e.g., Fernandez & Milburn, 1994; Fernandez & Turk, 1995), the major hypothesis is that physical symptoms (e.g., Pain, and Water Retention) will directly relate to elevations in unpleasant psychological mood states (Anxiety, Stress, Regression, and Guilt) — which in turn will "exacerbate" menstrual cycle symptomatology. Likewise, it is predicted that more anxious and neurotic women will be more likely to experience paramenstrual

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elevations in *both* physical and psychological symptoms and negative mood states. The present study has the methodological advantage of enabling relatively comprehensive assessment of a diverse array of *both* physical and psychological variables across the menstrual cycle, using well-established, standardized self-report measures.

METHOD

PARTICIPANTS

The sample comprised 370 female students enrolled in an undergraduate degree program at the University of Melbourne, Australia. Participation was voluntary, and took place as part of regularly scheduled classes. Virtually all of the female students agreed to participate in the study voluntarily, at the request of their regular class instructor, and very few incomplete response forms were obtained. Since the Menstrual Distress Questionnaire (MDQ) was being administered, no attempt was made to disguise the fact that the study concerned mood states in relation to menstrual cycle symptoms.

Many of the women undergraduates whose mean age was 21.10 years ($SD = 4.72$ years), were from multicultural backgrounds, as found in metropolitan Australia. The women were generally healthy and in their early 20s, and therefore were likely to be experiencing on average only very minor changes in menstrual cycle related symptoms and mood states. Given the very low prevalence of clinical symptomatology among the general adult population, it was considered important to use a non-clinical sample rather than an unrepresentative clinical sample, in which menstrual cycle symptoms and moods clearly would have been exaggerated.

Since age is known to correlate positively with menstrual distress and premenstrual tension (Moos, 1985), age was dichotomized with women aged 20 years or younger included in one group, and those 21 years and above in an older group, in order to examine its influence as an independent variable within the MANOVA design. The two groups were split at such a young age in order to keep the number of participants in each age group comparable (thereby avoiding problems associated with heterogeneity of variance). For the younger group, the median age was 19 years (ranging from 18-20 years), while the median age for the older group was 30 years (ranging from 21-48 years). Consequently, the younger group had a considerably smaller age variance and range as compared with the older group.

PSYCHOMETRIC INSTRUMENTS

The Menstrual Distress Questionnaire (MDQ; Moos, 1985) is a 47-item self-report inventory, measuring menstrual cycle symptoms such as fatigue, backache, distractibility, insomnia, painful swelling, decreased efficiency, hot flushes, and irritability (cf. Boyle, 1991a). The MDQ comprises somatic symptom scales (Pain, Water Retention, Autonomic Reactions), three mood/behavior change scales (Negative Affect, Impaired Concentration, Behavior Change), as well as Arousal, and Control. The MDQ responses were scored on a 5-point Likert scale. Although use of the MDQ has to some extent been controversial in menstrual cycle research (e.g., Hawes & Oei, 1992; Richardson, 1990), its psychometric

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properties have been encouraging. For example, Moos (1985) reported moderate to high internal consistency estimates for the scales of the prospective Today Form (Form T) of the instrument (mean Cronbach alpha = 0.75 — in the present study, mean alpha = 0.81), while test-retest studies have suggested that the MDQ scales have adequate reliability for situationally sensitive state measures (e.g., Lahmeyer, Miller, & DeLeon-Jones, 1982). Likewise, Moos (1985) reported moderate to high inter-cycle stability coefficients (average test-retest $r = 0.57$), suggesting adequate reliability for an instrument sensitive to fluctuations in menstrual-cycle symptoms and associated mood states. Furthermore, Boyle (1991a) carried out separate congeneric and confirmatory factor analyses, which provided strong support for the internal factor structure of the MDQ.

The Eight State Questionnaire (8SQ; Curran & Cattell, 1976) is a 96-item self-report measure of mood states labeled Anxiety, Stress, Depression, Regression, Fatigue, Guilt, Extraversion, and Arousal. Item responses are scored on a 4-point Likert scale. Predictive validity of the 8SQ has been reported (Boyle & Cattell, 1984). Boyle (1988) reported alpha coefficients ranging from 0.47 to 0.89 ($M = 0.73$ — in the present study, the alpha coefficient based on all 8SQ scales was 0.60, indicating moderate internal consistency, and low item redundancy). Curran and Cattell reported immediate test-retest (dependability) coefficients ranging from 0.91 to 0.96 ($M = 0.94$) for Form A of the 8SQ, suggesting good reliability for situationally sensitive state measures. Stabilities (one-week retest) ranged from 0.26 to 0.48 ($M = 0.36$), as expected for state measures sensitive to situational fluctuations in transitory mood states across occasions. Boyle (1991b,c) has also provided congeneric and confirmatory factor analytic support for the internal structure of the 8SQ instrument.

Both the MDQ and the 8SQ meet the requirements for comprehensive, multi-dimensional measurement, and each instrument provides measures of a variety of both positive and negative variables, directly relevant to menstrual cycle research. The MDQ has been available for many years, and is the most widely used menstrual cycle questionnaire (Hawes & Oei, 1992).

DESIGN AND PROCEDURE

Form T of the MDQ and Form A of the 8SQ were administered, enabling data collection of *prospective* responses. Women recorded the dates of their previous menstruation, as well as for their next expected period. Following administration of the psychometric instruments, verification of actual period dates was subsequently undertaken anonymously (by serial code, rather than by name), enabling accurate classification of menstrual cycle phase at the time of testing. The women were required to complete a verification form at a later date, indicating the exact date of onset of their next menstruation. Thus, any demand characteristics of the study were minimized, by asking women to focus on their own cycles only after completing the questionnaires.

In developing a heuristic model of menstrual cycle moods and symptoms, classification of women into logically distinct menstrual, intermenstrual, and premenstrual groups was undertaken as recommended by Moos (1985). Thus, women were classified into three logically distinct menstrual cycle phases (based on the prototypical 28-day monthly cycle), with adjustments for cycle length

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using the *actual date* of next menstruation. This resulted in 53 women being included in the premenstrual group, 79 in the menstrual group, and 238 in the intermenstrual group. Since retrospective reports of cycle-related moods and symptoms tend to be exaggerated (Ainscough, 1990; Boyle & Grant, 1992a,b; Grant & Boyle, 1991; Rapkin, Chang, & Reading, 1988; McFarland et al., 1989), collection of *prospective* data enabled actual rather than socially expected changes to be observed.

Women were further classified with respect to oral contraceptive use (on the pill vs. not on the pill). There were 87 out of 259 women on the pill (33.6%) in the younger age group and 42 out of 111 women on the pill (37.8%) in the older age group.

The main purpose of the study was to develop a heuristic model of the interrelationships between various menstrual cycle moods and symptoms, as applicable to the vast majority (up to 95%) of normal, healthy women. Since relatively few of the menstrual cycle phase effects were statistically significant (see Results Section below), structural model fitting was undertaken across all menstrual cycle phases combined using the LISREL (Jöreskog & Sörbom, 1989) package. The resultant heuristic model was tested statistically for its goodness-of-fit to the empirical MDQ and 8SQ scale data, using the AGFI and RMR indices (see below).

RESULTS

The SPSS MANOVA program was used within the framework of a 2 (age) \times 2 (pill) \times 3 (menstrual cycle phase) between-groups experimental design. The dependent variables comprised the 16 MDQ and 8SQ subscale scores. None of the multivariate main effects for age were significant, suggesting that age effects were not pronounced in the present sample. Also, as none of the multivariate interaction effects were significant, this enabled a relatively straightforward interpretation of the statistical results.

The multivariate main effect for the contraceptive pill was statistically significant ($F_{16,343} = 1.79, p < .03$). Irrespective of menstrual cycle phase, women on the pill exhibited significantly lower mean scores on each of the following variables: Impaired Concentration ($F_{1,358} = 5.25, p < .02$)—(4.72 vs. 5.32); Anxiety ($F_{1,358} = 7.94, p < .01$)—(14.66 vs. 16.30); Depression ($F_{1,358} = 6.06, p < .01$)—(16.92 vs. 18.01); Regression ($F_{1,358} = 4.18, p < .04$)—(16.83 vs. 17.63); Guilt ($F_{1,358} = 7.40, p < .01$)—(11.34 vs. 12.39), and a significantly higher mean score on Extraversion ($F_{1,358} = 4.96, p < .03$)—(16.36 vs. 14.83). On this evidence, it would appear that use of oral contraceptives has an influence primarily on psychological mood states rather than on physical symptoms (cf. Boyle & Grant, 1992b) since five of the 8SQ states exhibited significant differences, whereas only one of the MDQ variables (Impaired Concentration) differed significantly in relation to contraceptive pill usage. Conceivably, this single significant effect for the MDQ measures might have been due to chance alone. Even though a number of univariate effects related to oral contraceptive usage were statistically significant, most of the "observed changes" in mean scores were rather trivial, and of little practical consequence.

Interpretation of the univariate effects for menstrual cycle phase was considered warranted in view of the rationale proposed by Huberty and Morris (1989).

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For the menstrual, premenstrual, and intermenstrual phases respectively, there were 31, 13, and 85 women on the pill, and 48, 40, and 153 women not on the pill. Significant main effects occurred for menstrual cycle phase on MDQ physical symptoms Water Retention ($F_{2,358} = 3.41, p < .03$), and Autonomic Reactions ($F_{2,358} = 3.39, p < .04$). Also, Pain, Negative Affect, Control, and Extraversion exhibited main effects at the $p < .10$ level, which may have reached statistical significance had a larger sample size been employed. Mean scores for Water Retention and Autonomic Reactions were significantly higher menstrually and premenstrually than intermenstrually (3.75 and 3.38 vs. 2.40; and 1.34 and 1.08 vs. 0.75) respectively. Means and standard deviations for all 16 MDQ and 8SQ dependent variables are shown in Table 1.

TABLE 1
MDQ AND 8SQ MEANS AND STANDARD DEVIATIONS
ACROSS MENSTRUAL CYCLE PHASE

MDQ	Menstrual (N = 79)	Intermenstrual (N = 238)	Premenstrual (N = 53)
MDQ1 Pain	5.66 (5.05)	3.85 (3.79)	4.43 (3.79)
MDQ2 Water Retention	3.75 (3.26)	2.40 (2.34)	3.38 (2.88)
MDQ3 Autonomic Reactions	1.34 (2.17)	0.75 (1.51)	1.08 (1.56)
MDQ4 Negative Affect	8.25 (7.43)	6.38 (6.51)	8.45 (7.51)
MDQ5 Impaired Concentration	5.72 (5.19)	4.71 (4.48)	5.98 (5.57)
MDQ6 Behaviour Change	4.77 (4.85)	3.83 (3.71)	4.55 (3.96)
MDQ7 Arousal	5.44 (3.39)	5.86 (3.56)	5.06 (3.51)
MDQ8 Control	1.61 (2.57)	1.31 (2.39)	1.66 (2.57)
8SQ			
8SQ1 Anxiety	16.49 (7.09)	15.14 (7.05)	17.19 (8.03)
8SQ2 Stress	19.05 (4.91)	18.12 (5.24)	19.34 (4.93)
8SQ3 Depression	18.52 (6.57)	17.11 (6.73)	18.64 (6.12)
8SQ4 Regression	18.00 (5.46)	17.08 (5.26)	17.57 (6.32)
8SQ5 Fatigue	21.23 (7.29)	19.59 (7.49)	21.25 (7.44)
8SQ6 Guilt	12.58 (6.92)	11.69 (6.37)	12.74 (7.28)
8SQ7 Extraversion	14.66 (5.72)	15.80 (5.76)	14.45 (5.86)
8SQ8 Arousal	14.48 (5.38)	15.79 (5.75)	14.68 (5.42)

Note. The number of items in the MDQ scales vary as follows: Pain (6), Water Retention (4), Autonomic Reactions (4), Negative Affect (8), Impaired Concentration (8), Behavior Change (5), Arousal (5), Control (6); the 8SQ scales have 12 items each.

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As the data were derived solely from women subjects, and since most of the MDQ variables pertain specifically to menstrual cycle symptoms and behavioral changes, the heuristic model described below (based on the data from all three cycle phases combined) provides some tentative insights into *menstrually related* symptom and mood interrelationships.

EXPLORATORY FITTING OF LATENT TRAITS

In order to ascertain the higher-order dimensions measured by each instrument, necessary for formulating and testing the proposed heuristic model, separate exploratory factor analyses were undertaken on the intercorrelations for the MDQ and 8SQ scales. Factor analysis was employed (see Boyle, Stankov, & Cattell, 1996; Cattell, 1978; Gorsuch, 1983), using an iterative maximum likelihood procedure, together with direct oblimin simple structure rotation (Tables 2 and 3).

TABLE 2
OBLIQUE (OBLIMIN) FACTOR PATTERN SOLUTION
FOR MDQ

MDQ Scale	Factor 1	Factor 2	h ²
MDQ5 Impaired Concentration	.99	-.22	.99
MDQ6 Behavior Change	.75	.04	.60
MDQ4 Negative Affect	.66	.19	.60
MDQ8 Control	.65	.10	.50
MDQ1 Pain	.35	.65	.78
MDQ2 Water Retention	.28	.46	.42
MDQ3 Autonomic Reactions	.40	.41	.50
MDQ7 Arousal	.03	-.20	.03
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Latent Root:	4.32	1.05	
Percentage Variance:	54.10%	13.10%	Total = 67.20%

Notes. Factor loadings are reported to two decimal places only. Oblimin converged in 7 iterations. Factors 1 and 2 (Psychological Symptoms and Physical Symptoms) are moderately correlated (.53).

The MDQ factor solution converged in 25 iterations, and the Scree test (Cattell, 1978) clearly indicated two distinct higher-order factors, accounting for 67.1% of the variance associated with the unrotated principal components factors (the first three eigenvalues were: 4.32, 1.05, and 0.75, respectively). With the extraction of a third higher-order factor, the total variance would have increased to 76.5%, a marginal increase only. Factor 1 (labeled *Psychological Symptoms*)

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loaded very strongly on Impaired Concentration, Behavior Change, Negative Affect, and Control. Factor 2 (labeled *Physical Symptoms*) loaded strongly on Pain, and Water Retention.

TABLE 3
OBLIQUE (OBLIMIN) FACTOR PATTERN SOLUTION
FOR 8SQ

8SQ Scale	Factor 1	Factor 2	h ²
8SQ1 Anxiety	.98	.05	.89
8SQ6 Guilt	.92	.03	.80
8SQ2 Stress	.76	-.02	.60
8SQ4 Regression	.57	-.33	.72
8SQ8 Arousal	.04	.93	.82
8SQ5 Fatigue	-.04	-.91	.78
8SQ7 Extraversion	-.15	.67	.63
8SQ3 Depression	.49	-.50	.86
Latent Root:	5.76	.79	
Percentage Variance:	72.00%	9.90%	Total = 81.9%

Notes. Factor loadings are shown to two decimal places only. Oblimin converged in 9 iterations. Factors 1 and 2 (*Psychological States* and *Physical States*) are highly correlated (-.76).

The 8SQ factor solution converged in only five iterations and the Scree test again clearly delineated two broad factors (the first three eigenvalues were 5.76, 0.79, and 0.40 respectively). Extraction of a third higher-order factor would have only slightly increased the total (unrotated) variance from 81.8% to 86.8%. Factor 1 (labeled *Psychological States*) loaded on Anxiety, Guilt, Stress, and Regression, reminiscent of the Eysenckian neuroticism dimension, while Factor 2 (labeled *Physical States*) was a bipolar dimension, loading primarily on Arousal versus Fatigue. Consequently, the exploratory factor analytic analyses of the MDQ and 8SQ instruments provided the four latent trait variables subsequently used to develop the postulated heuristic model of menstrual cycle symptoms and moods.

HEURISTIC MODEL

Use of structural modelling techniques enabled *statistical testing* of the heuristic model of mood-symptom interactions. The nonrecursive model (Figure 1) depicts the hypothesized relationships between the menstrual cycle symptoms and moods measured by the MDQ and 8SQ in terms of the putative relationships between the four latent traits, and their respective loadings on the subscale variables.

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No attempt was made to include the effects due to the contraceptive pill, as the main concern of the study was to investigate interrelationships between menstrual cycle moods and symptoms, uncontaminated by extraneous variables such as pill usage. Thus, the primary aim of the study was to elucidate "normal" relationships between physical and psychological variables (as measured in the MDQ and 8SQ instruments), in relation to changes across the menstrual cycle in a non-clinical sample of healthy, young women. However, since most of the dependent variables did not differ significantly across menstrual cycle phase, separate heuristic models were not warranted.

The proposed cross-sectional model was subjected to a LISREL maximum likelihood analysis, using the intercorrelation matrix for the subscale variables as the starting point. The adjusted goodness-of-fit index (AGFI) was 0.98, while the root mean square residual (RMR) was .04, indicating a good fit of the heuristic model to the data (cf. Cuttance, 1987, p. 260). As expected, on the assumption that menstrual cycle variables should interact appreciably, all four latent traits (Psychological Symptoms, Psychological States, Physical Symptoms, and Physical States) exhibited moderate intercorrelations (ranging from .65 to .98), suggesting significant covariation of physical and psychological variables across the menstrual cycle. However, the coefficients between cross-factors (Psychological States with Physical Symptoms, and Psychological Symptoms with Physical States) were very small (ranging from .03 to .21), showing nevertheless, that symptoms and mood states are fundamentally discrete dimensions (also see below).

Evidently, physical symptoms (e.g., Pain, and Water Retention) appear to contribute about 96% of the variance involved in psychological symptoms (Negative Affect, Impaired Concentration, and Behavior Change), whereas psychological symptoms contribute only about 57% of the variance associated with physical symptoms. Thus, although both physical and psychological symptoms interact appreciably, *physical symptoms contribute almost 40% more to the predictive variance, than do psychological symptoms.*

On the other hand, physical states (Depression, Arousal-Fatigue) appear to contribute about 69% of the variance involved in psychological states (Anxiety, Stress, Regression, and Guilt), whereas psychological states contribute about 54% of the variance associated with physical states (a difference of 15% in predictive variance). Consequently, neurotic personality tendencies (comprising a combination of negative psychological states such as Anxiety, Stress, Regression, and Guilt) may be partially a product of the menstrual cycle related physical states associated with Fatigue-Arousal, Depression, and Introversion.

DISCUSSION

This study highlights the need for *theoretical* approaches in menstrual cycle research, linking psychological and physical experiences. Although focusing on physical symptoms and psychological mood changes, it is important to recognize that clinically pronounced symptoms and mood changes do not trouble most women. Consequently, use of a non-clinical, undergraduate student sample was considered appropriate, given the general well-being experienced throughout the menstrual cycle in most healthy women. The present heuristic model is therefore an attempt to conceptualize mood-symptom interrelationships applicable to the

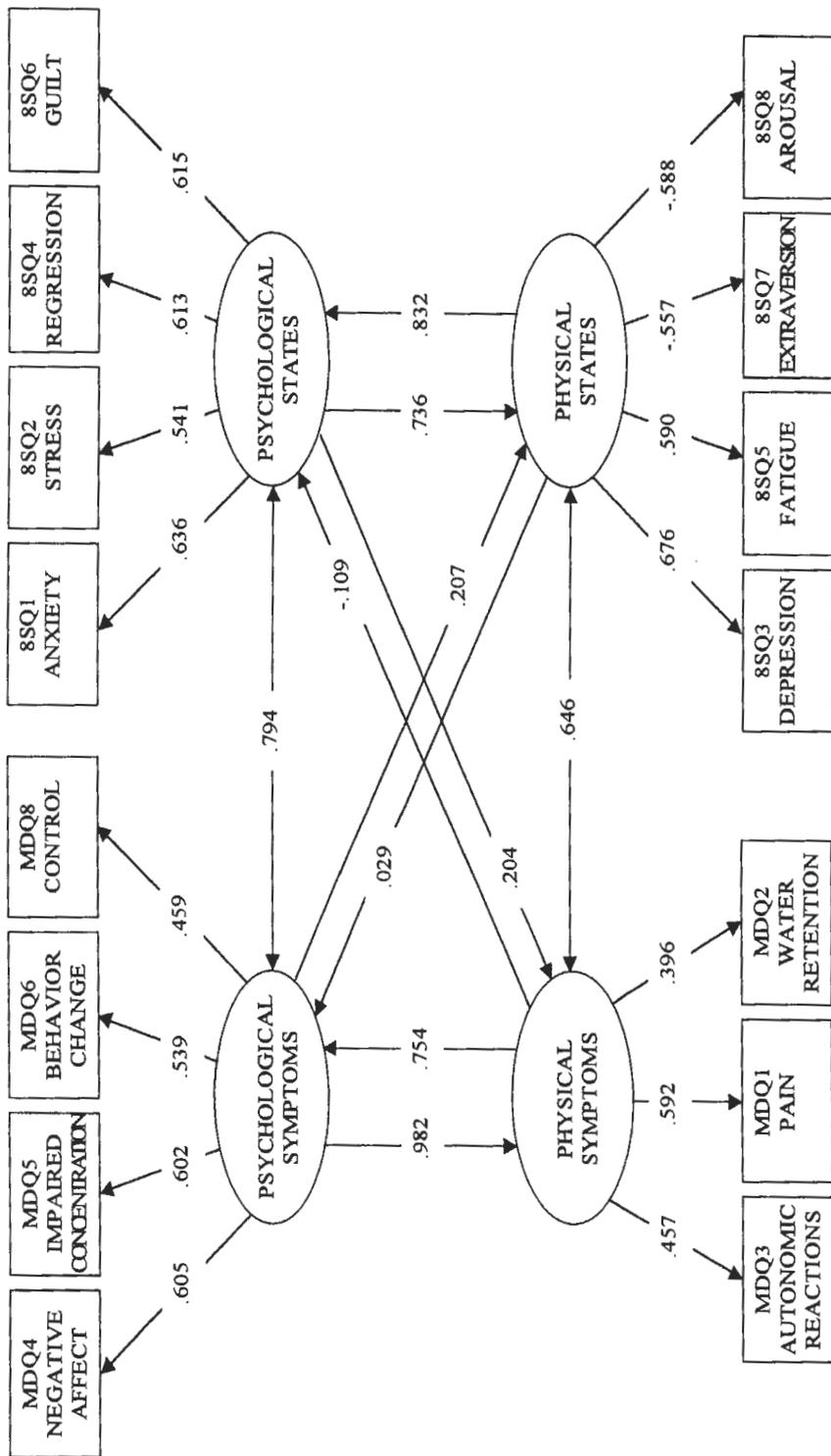


Figure 1. Heuristic model of menstrual cycle moods and symptoms.

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vast majority of women, rather than an attempt to develop a more restricted model applicable only to clinical patients.

As subjects were predominantly young, healthy women, it was expected that most would report only mild menstrual cycle related symptoms and mood changes, especially since the sample of women was very homogeneous. There is little doubt that menstrual cycle changes would have been exacerbated significantly among clinical samples of women suffering from premenstrual syndrome and/or menstrual distress. However, use of a clinical sample suffering from discernible menstrual distress or premenstrual tension would have unduly restricted the spread of variance in the psychometric data. The present sample was diverse enough to contribute broadly to the variance (the *SDs* in Table 1 attest to the broad range of scores obtained on most of the dependent variables). Excessive restriction of variance would have unduly hampered the testing of mood-symptom interrelationships as conceptualized within the proposed heuristic model.

Women on the pill constituted approximately 35% of the overall sample. That women on the pill had significantly lower mean scores than women not on the pill on Impaired Concentration, Anxiety, Depression, Regression, Guilt, and Introversion (higher mean score on Extraversion) suggests that the influence of the pill on moods and symptoms may have been positive, attenuating the overall results, somewhat.

Since the present findings are based on prospective cross-sectional data, the structural model only specifies heuristic relationships among the observed and latent variables. Consequently, claims of causality cannot be made, and the terms *influence* or *effect* are preferred. Aside from the study by Taylor et al. (1991) however, there has been a relative lack of adequate *multidimensional* measurement of fluctuations in symptoms and mood-states across the menstrual cycle.

Surprisingly, perusal of the heuristic model suggests that physical symptoms (Pain, Autonomic Reactions, and Water Retention) did not significantly predict psychological states (Anxiety, Stress, Regression, and Guilt) — the standardized beta coefficients were not significant. Likewise, physical states (Depression, Fatigue-Arousal, and Introversion) also exhibited no significant predictive relationship with psychological symptoms (Negative Affect, Impaired Concentration, Behavior Change, and Control) — beta coefficients being trivial. In contrast, the hypothesis that physical symptoms such as Pain, Water Retention, and Autonomic Reactions would significantly predict psychological symptoms (Negative Affect, Impaired Concentration, Behavior Change, and Control) was strongly confirmed, however. The beta coefficients were .98 and .75, respectively, indicating that most of the “causal influence” was from physical to psychological symptoms (96% vs. 57% of variance accounted for, respectively — a difference of almost 40% in “predictive variance”). The hypothesis that physical states (Depression, Fatigue, Introversion, and Arousal) would significantly predict psychological states such as Anxiety, Stress, Regression, and Guilt, was also supported strongly (beta coefficients being .74 and .83, respectively) — thus, 69% and 54% of the predictive variance was accounted for, in each instance — a difference of 15% in “predictive variance”).

The heuristic model suggests that the MDQ and 8SQ latent variables (symptoms and states) are fundamentally discrete constructs, emerging as separate factors in the exploratory analyses reported in Tables 2 and 3. It seems likely that

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unpleasant menstrual cycle symptoms may be largely responsible for bringing about elevations in Negative Affect, Impaired Concentration, and Behavior Change, with a concomitant increase in attempts at control over these various changes. Likewise, physical states including those such as Fatigue vs. Arousal may have a some "causal" influence in activating negative psychological states such as Anxiety, Stress, Regression, and Guilt. The present heuristic model provides some insights (provided proper precautions are taken) leading to several specific hypotheses which should be investigated more comprehensively in future repeated-measures, experimental, and structural modelling studies, using larger sample sizes, and theory-driven models.

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Footnotes

1. This study was supported by grant No. A791949 from the Australian Research Council.
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3. The kind assistance of Ken Rowe, University of Melbourne, in conducting the LISREL analysis is acknowledged.