Effects of menstrual cycle phases and reproductive aging stages on arousal symptoms: observations from the Seattle Midlife Women's Health Study

Nancy Fugate Woods, BSN, MN, PhD[1] and Ellen Sullivan Mitchell, BSN, MN, PhD[2]

Abstract

Objective: Although investigators have devoted significant effort to understanding women's experiences of depressed mood and clinical depression during the menopausal transition and early postmenopause, they have focused less on women's experiences of emotional arousal, including emotions such as anxiety, irritability, and anger during these reproductive aging stages. The purpose of these analyses was to examine the influence of menstrual cycle phases and reproductive aging stages on women's reports of symptoms reflecting emotional arousal.

Methods: A subset of Seattle Midlife Women's Health Study (SMWHS) participants (N = 301) in late reproductive stages 1 or 2 (LRS1, LRS2) or early menopausal transition (EMT) rated the severity of symptoms daily for a complete menstrual cycle during the first year of SMWHS. They rated symptom severity daily on a 1-4 scale (least to most severe) in a health diary for anxiety symptoms (anxiety, out of control, tension, nervousness, panic, and palpitations) and anger symptoms (anger, hostility, impatience, and irritability). A two-way mixed ANOVA was used to test the cycle phase (postmenses/premenses) and reproductive aging stages on each symptom for LRS1, LRS2, and EMT and also for LRS2 versus EMT.

Results: When all three groups were included in the analyses, only anger and irritability differed by menstrual cycle phase and were significantly more severe during premenses than during postmenses. There were no significant effects of reproductive aging stages and no interactions between cycle phases and stages. When analyses focused only on women in LRS2 versus EMT, anger, irritability, and feeling out of control were significantly more severe premenses than postmenses. Women in EMT versus LRS2 experienced more severe irritability, impatience, and out-of-control feelings. There were no significant interaction effects of the cycle phase and reproductive aging stages on any of the symptoms.

Conclusions: Although there were no significant differences in the severity of the arousal or anxiety symptoms when comparing LRS1, LRS2, and EMT, comparison of LRS2 versus EMT ratings revealed significant stage effects on irritability, impatience, and feeling out of control and significant cycle phase effects on anger, irritability, and feeling out of control.

Keywords: Anger, Anxiety, Early menopausal transition, Hostility, Irritability, Late reproductive stage, Menstrual cycle phases, Nervousness, Postmenses, Premenses, Stages of reproductive aging, Tension.

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Investigators have given limited attention to arousal symptoms during the late reproductive and early menopausal transition stages despite multiple efforts focusing on depressed mood. Arousal is a complex construct spanning wakefulness, autonomic function, affect, and emotion.[1] Emotional arousal is commonly studied by analyzing self-reported responses to stimuli eliciting emotions such as anxiety or anger. Measures of these may include participants' feelings expressed as ratings of symptom severity or bother associated with them.[1]

Although studies of women during early menopausal transition (EMT) and late menopausal transition (LT) indicate these stages of reproductive aging are frequently associated with symptoms, only recently have investigators published data from studies including observations from the late reproductive stage (LRS) of reproductive aging indicating that women begin to experience symptoms often associated with the menopausal transition during this time.[2] Women living better participants reported strikingly similar prevalence of symptoms, including night-time awakening, irritability, and sudden anger, during the LRS compared with the early menopausal transition stage (EMT).[3] Although women continue menstruating during the LRS and the EMT stages,

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From the [1]Department of Biobehavioral Nursing and Clinical Informatics, University of Washington, Seattle, WA; and [2]Department of Family and Child Nursing, University of Washington, Seattle, WA.

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Address correspondence to: Nancy Fugate Woods, BSN, PhD, University of Washington School of Nursing, Seattle, WA. E-mail: nfwoods@uw.edu

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there has been limited examination of menstrual cycle phase differences in the severity of symptoms. Moreover, limited findings have been reported from longitudinal studies of women contributing daily symptom data across the menstrual cycle during various stages of reproductive aging.[4]

Mitchell and Woods[4] recently investigated joint effects of menstrual cycle phases and reproductive aging stages on symptom groups common among midlife women participating in the Seattle Midlife Women's Health Study (SMWHS), including dysphoric mood, vasomotor, somatic, neuromuscular, and insomnia symptoms. They found reproductive aging stages [late reproductive stage 1 (LRS1), late reproductive stage 2 (LRS2), and early menopausal transition (EMT)] had no significant effect on any of the symptom groups, although dysphoric mood, neuromuscular, and somatic symptoms differed significantly across menstrual cycle phases, specifically increasing from postmenses to premenses. To date, there have been few studies of anxiety or anger among mildlife women.

Anxiety has been defined as "apprehension, tension, or uneasiness stemming from anticipation of danger."[5] The few investigators studying anxiety among midlife women have inquired about symptoms such as "feeling nervous, irritable, or grouchy; trembling; or experiencing heart palpitations."[6,7] Reports of feeling on edge, worrying, experiencing specific fears, and experiencing signs of physiological arousal also have been incorporated in studies of perimenopause.[8] These symptom descriptors do not meet criteria specifying greater symptom frequency and severity for anxiety disorders, such as those established by the American Psychiatric Association (APA) for panic disorder.[5,9]

Freeman et al[10] found that overall, 10% of Penn Ovarian Aging Study participants experienced anxiety. Twenty-four percent reported severe anxiety during the EMT (defined as a difference of ≥ 7 d between 2 consecutive cycle lengths within 12 mo) versus 19% reporting anxiety during "premenopause" (described as regular menstrual cycles in the 22-35 day range, specifying "early premenopause" as a 7-day change in cycle length for 1 cycle).[10] Among women in postmenopause, 16% reported anxiety.[10] No data were provided about symptoms experienced during a specific reproductive aging stage such as LRS1 or LRS2, although women in these stages may have been included in those reported as in "premenopause." Similar to the POAS findings, SWAN investigators found that 24% of participants reported symptoms of psychological distress at baseline (reproductive aging stages not specified), including feeling tense or nervous, irritable or grouchy, and heart pounding.[7] Subsequently, Bromberger et al[11] studied anxiety indicated by symptoms of irritability, nervousness, tension, feeling fearful for no reason, and palpitations. SWAN participants who reported low levels of these symptoms at baseline were more likely to report greater anxiety symptoms during early or late perimenopause (early perimenopause denoted by a change in regularity over the past 12 months, late perimenopause by no period in the past 3 mo) or postmenopause in contrast with premenopause (no change in menstrual cycle patterns). Those with high anxiety at baseline continued to experience high levels of anxiety, but there were no significant effects of MT stages on their anxiety ratings, suggesting that anxiety was chronic among this group. Freeman and Sammel[12] also investigated somatic anxiety measured with the Zung Anxiety Scale, which incorporates symptoms such as rapid heartbeat and flushing, finding a significant relationship between them and hot flashes. In contrast, emotional anxiety symptoms, such as feeling nervous, anxious, or afraid for no reason, were not significantly related to hot flashes. Effects of LRS or MT stages were not examined.

Studies of anger symptoms among midlife women have been limited, likely attributable to social prohibitions against girls and women expressing anger.[13] Anger, defined as antagonism toward someone or something, is an indicator of emotional arousal and has been studied as an emotion, a trait, or an expressive style.[14] Hostility, in contrast to anger, refers to a fear-eliciting emotion, antagonism toward someone or something, and has been likened to being ready for a fight.[15]

Studies of women's own unique perspectives and experiences of anger were not reported until the 1990s when over 500 American women 25-66 years of age with education ranging from 7 to 24 years completed questionnaires about everyday anger in their usual roles.[16,17] Thomas and colleagues identified pervasive themes of women's anger, such as powerlessness, injustice, irresponsibility of others, and vicarious stress linked to the experience of others. In a subsequent qualitative study, the same investigators studied why and how women experienced anger in a Western cultural context, finding that anger suppression was commonly reported.[17]

To date, investigators have given little attention to women's reports of arousal symptoms of anxiety and anger during the LRS or the menopausal transition. In addition, there has been limited examination of menstrual cycle phase differences in these symptoms during the LRS and EMT stages based on prospective daily symptom ratings.[18,19] Such data could illuminate the relationship between symptoms varying by menstrual cycle phases and reproductive aging stages. Our goal was to enlarge understanding of this period of reproductive aging by considering the effects of the menstrual cycle phases and reproductive aging stages (LRS and EMT) on individual symptoms of anxiety and anger.

Dysphoric mood factor symptoms reported previously[4] included nervousness, panic, irritability, mood swings, depressed mood, difficulty concentrating, and forgetfulness. Although some of the arousal symptoms were included in this factor (nervousness, panic, irritability, mood swings), it is not clear whether these symptoms or the depressed mood and cognitive symptoms included in this factor accounted for cycle phase differences. In an effort to clarify the effects of the menstrual cycle phase and reproductive aging stage on arousal symptoms, we examined individual symptoms often reported as indicators of anxiety and anger.

Research questions included:

1. Does the severity of each of the anxiety symptoms (anxiety, out of control, tension, nervousness, panic, and palpitations) or anger symptoms (anger, hostility, impatience, and irritability) differ across menstrual cycle phases (follicular/postmenses vs. luteal/premenses) when accounting for stages of reproductive aging (LRS1, LRS2, and EMT)?.
2. Are there interactive effects between reproductive aging stages (LRS1, LRS2, and EMT) and menstrual cycle phases (postmenses and premenses) on anxiety or anger symptoms?.

Given the limited research on arousal symptoms, individual symptoms were examined in these analyses as opposed to composite scales.

METHODS

Design and sampling

Data reported here were collected from participants in the population-based Seattle Midlife Women's Health Study of the menopausal transition and early postmenopause described in detail elsewhere.[18] During their first year of participation in the study, women kept a health diary each day for 45-80 days or 1-2 cycles. Eligibility requirements for the parent study were 35-55 years of age, not pregnant, intact uterus, at least 1 ovary, at least 1 menstrual period in the past 12 months, and ability to read and understand English. For these analyses, women were eligible if they met classification criteria based on menstrual calendar data for the late reproductive stage, referred to here as LRS1 and LRS2 (STRAW −3a and −3b) or early menopausal transition stage (EMT).[20-22] Criteria excluded those taking hormones of any kind. A total of 301 women were eligible and kept the health diary for at least 1 menstrual cycle in year 1 of the SMWHS.

Procedure

Data from the first year of the parent study were utilized in the analyses reported here. Sources of the data were health diary recordings provided daily for one complete menstrual cycle, plus daily menstrual calendars and a health questionnaire.

Women eligible to participate provided informed consent and were instructed by a trained Registered Nurse interviewer about how to keep the health diary and menstrual calendar. Participants completed health diary data at the end of each day and rated the severity of symptoms for the past 24 hours. They were contacted by phone after 2 weeks to answer any questions about data collection. A blank menstrual calendar was provided at baseline for completion during year 1. (For the parent longitudinal study, this procedure was repeated at the beginning of every calendar year of participation for completion during the following year.) Any occurrence of bleeding (B) or spotting (S) was recorded. The calendars were returned at the start of the following year and reviewed for completeness. The health questionnaire for year 1 was administered in person by a trained Registered Nurse interviewer. Of the 366 women who kept a daily health diary for at least one complete menstrual cycle and a menstrual calendar during the first year of the parent study, 301 met the criteria for either LRS1, LRS2, or EMT.

Measures

Stages of reproductive aging

The stages of reproductive aging used in these analyses (LRS1, LRS2, and EMT) were based on staging criteria applied to data obtained from both the menstrual calendars (collected annually) and from responses about specific menstrual cycle changes in the health questionnaire administered at baseline, for example, changes in the amount of flow. Using menstrual calendar data from women who were not using any estrogen or progesterone preparation, calendar data for each year were classified as late reproductive stage 1 (LRS1), late reproductive stage 2 (LRS2), early transition (ET), late transition (LT), or PM (postmenopause) based on staging criteria developed by Mitchell et al[20] as well as responses to questions devised by Mitchell in a questionnaire about menstrual cycle changes. These criteria were subsequently incorporated into the STRAW criteria[21] and validated by the ReStage collaboration.[22-24] The LRS was divided into 2 substages: LRS1 (STRAW −3b) characterized by regularly occurring menstrual cycles (fewer than 7 d variation in consecutive cycle length within 12 consecutive months) documented in daily menstrual calendars and no changes in menstrual flow, menstrual duration or cycle length in the past 12 months documented in the yearly health questionnaire. LRS2 (STRAW −3a) was also characterized by regularly occurring menstrual cycles. In addition, in the yearly health questionnaire, women in LRS2 noted subtle changes in menstrual cycle length (increases or decreases), a change in number of days of flow (more or fewer), and/or a change in the amount of flow (more or less).[22] The early menopausal transition stage (EMT, STRAW −2), identified from menstrual calendars, was defined as irregular menstrual cycles with a difference of ≥ 7 days in consecutive cycles with no skipped period.[20-22,24]

Cycle phases

Postmenses days included +6 to +10, counting forward from day 1 of the menstrual cycle. Premenses days included days −1 to −5, counting back from the final day of the same menstrual cycle.

Arousal symptom selection

Ten symptoms indicating arousal formed the basis of these analyses. These symptoms included those associated with anxiety and anger in the literature about both emotions and the menopausal transition.[7-11,14,17] Anxiety symptoms included anxiety, out-of-control feelings, tension, nervousness, panic, and palpitations. Anger symptoms, including anger, hostility, impatience, and irritability symptoms, were rated daily from 0 to 4 (not at all to extremely severe).

Analyses

Symptom severity data for 5 postmenses/follicular days (+6 through +10) and 5 premenses/luteal days (−1 through −5) were selected for these analyses. Women with fewer than two postmenses or premenses days during cycle 1 were excluded from the analyses.

Mean severity scores for each of the anxiety and anger symptoms for each cycle phase were calculated for each eligible woman. A 2-way mixed analysis of variance (ANOVA) robohttps://statistics.laerd.com/spss-tutorials/three-way–anova-using-SPSS-statistics.php using SPSS 19 was used to determine the main effects of reproductive aging stages (LRS1, LRS2, and EMT) and menstrual cycle phase (postmenses and premenses) on the severity of each of the 10 symptoms. Subsequently, a two-way Mixed ANOVA was repeated focusing on the main effects of LRS2 and EMT. Simple effects tests were not indicated since there were no significant interactions in the two-way mixed ANOVA.

RESULTS

Sample characteristics

The parent study (SMWHS) enrolled 507 women who completed a health questionnaire in person administered by a trained registered nurse interviewer. Of those 507, 362 women kept a health diary for at least one complete menstrual cycle. Of these 362 women, 61 were not eligible for one of the three reproductive stages of interest. Of the 61 ineligible women, 20 were classified as being in either Late Stage (n = 17) or in postmenopause (n = 3). In addition, 31 were taking a form of oral estrogen and/or progestin, precluding assigning them a reproductive aging stage, 4 kept no calendar, and 5 experienced symptoms such as bleeding fibroids that interfered with assigning them a reproductive aging stage.

A total of 301 women completed health diaries providing data for a three-group analysis. Sixty-five women were classified as in LRS1, 172 women were in LRS2 and 64 women were in EMT. All 301 women provided data for the postmenses and premenses of the same menstrual cycle.

The 301 eligible women had an average age of 41.1 years (SD = 4.0, range 35-53.3 y). A majority were partnered (70%), employed (86%), and White (78.7%). The sample included African Americans (9.0%), Asian/Pacific Islanders (9.3%), and Hispanic, American Indian, and mixed race (3.0%), representative of the underlying population. Participants were well educated with a mean of 15.75 years of education (SD = 2.7) and middle income levels (mean of $37,200, SD = $15,600) in 1990-1992 when each woman started the study.

Reproductive aging stage and cycle phase effects on arousal symptom severity

Three-group analysis

Each of the 10 arousal symptoms was analyzed separately using a two-way mixed ANOVA for the effects of the reproductive aging stage (LRS1, LRS2, and EMT) and cycle phase (postmenses and premenses) on symptom severity. The symptoms were grouped as either symptoms of anxiety (anxiety, feeling out of control, tension, nervousness, panic, or palpitations) or symptoms of anger (anger, hostility, impatience, irritability). Of the 10 arousal symptoms, only anger severity ($F = 4.02$, $df = 1$, $P = 0.046$), and irritability severity ($F = 13.999$, $df = 1$, $P < 0.001$) were significantly affected by the cycle phase. In both instances, premenses severity was higher than postmenses severity (Table 1 and Figs. 1 and 2). The reproductive aging stage had no significant main effect on the severity of any of the 10 arousal symptoms. There were no significant interaction effects between the reproductive stage and the cycle phase. (Table 1)

Two-group analysis

To gain further understanding of the cyclic nature of arousal symptoms once menstrual cycle changes had begun, a 2-group analysis (LRS2 and EMT) was performed with each of the 10 arousal symptoms. A 2-way mixed ANOVA was done to determine the effects of LRS2 and EMT stages and menstrual cycle phase on the same set of 10 arousal symptoms. The sample size was 236 women (LRS2 = 172, EMT = 64). Sample characteristics were very similar to the three group samples. The same two anger symptoms, anger, and irritability, were affected significantly by the menstrual cycle phase in this two-group analysis, similar to the three-group analysis (cycle phase effect on anger was significant, $F = 5.09$, $df = 1$, $P = 0.025$; cycle phase effect on irritability was significant, $F = 9.22$, $df = 1$, $P = 0.038$). For both anger symptoms, premenses severity was higher than postmenses severity (Table 1; Figs. 1 and 2). In addition, reproductive aging stages significantly affected irritability ($F = 4.44$, $df = 1$, $P = 0.036$) (Fig. 2) and impatience ($F = 5.165$, $df = 1$, $P = < 0.001$) (Fig. 3). Symptom severity was significantly higher during EMT than during LRS2 for both symptoms. For the two-group analysis of the six anxiety symptoms, feeling out of control was significantly affected by both cycle phase ($F = 6.33$, $df = 1$. $P = 0.013$) and reproductive aging stage ($F = 4.45$, $df = 1$, $P = 0.036$) (Fig. 4). Premenses severity was significantly higher than postmenses severity, and EMT severity was higher than LRS2 severity. There were no significant interaction effects between the reproductive aging stage and cycle phase for any of the 10 arousal symptoms.

DISCUSSION

Participants experienced greater severity of anger, irritability, and feeling out of control during premenses than postmenses and more severe irritability, impatience, and feeling out of control symptoms during EMT than LRS2. When women's ratings in LRS1, LRS2, and EMT were compared, there were significant cycle phase effects only on anger and irritability. There were no significant effects of reproductive aging stages, likely attributable to the small differences observed between the LRS1 and

TABLE 1. Symptom severity (means and SD) by reproductive aging stage and menstrual cycle phase for 10 arousal symptoms

	M (SD)					
Symptom	**Late reproductive stage 1 N = 65 Postmenses[a]**	**Late reproductive stage 1 N = 65 Premenes[b]**	**Late reproductive stage 2 N = 172 Postmenses[a]**	**Late reproductive stage 2 N = 172 Premenses[b]**	**Early menopausal transition N = 64 Postmenses[a]**	**Early menopausal transition N = 64 Premenses[b]**
Anger						
Anger	0.34 (0.54)	0.37 (0.48)	0.33 (0.54)	0.49 (0.68)	0.49 (0.63)	0.53 (0.82)
Hostility	0.22 (0.43)	0.19 (0.35)	0.16 (0.41)	0.26 (0.57)	0.26 (0.57)	0.36 (0.73)
Impatience	0.49 (0.69)	0.57 (0.73)	0.43 (0.57)	0.53 (0.72)	0.71 (0.87)	0.69 (0.97)
Irritability	0.49 (0.70)	0.67 (0.65)	0.43 (0.58)	0.69 (0.82)	0.72 (0.83)	0.80 (0.94)
Anxiety						
Anxiety	0.66 (0.71)	0.69 (0.79)	0.62 (0.73)	0.67 (0.83)	0.83 (0.86)	0.82 (0.94)
Out of control	0.24 (0.50)	0.22 (0.51)	0.13 (0.30)	0.23 (0.56)	0.27 (0.66)	0.37 (0.87)
Tension	0.64 (0.81)	0.64 (0.71)	0.54 (0.76)	0.63 (0.89)	0.68 (0.83)	0.78 (0.98)
Nervousness	0.37 (0.62)	0.32 (0.50)	0.30 (0.60)	0.35 (0.66)	0.44 (0.82)	0.52 (0.95)
Panic	0.13 (0.36)	0.10 (0.30)	0.13 (0.34)	0.16 (0.46)	0.19 (0.46)	0.27 (0.57)
Palpitations	0.15 (0.46)	0.14 (0.34)	0.10 (0.34)	0.13 (0.44)	0.08 (0.20)	0.12 (0.38)

M, mean score.
[a]Postmenses = follicular phase days +6 through +10.
[b]Premenses = luteal phase days −1 through −5.

LRS2 stages in mean symptom severity scores that were not statistically significant.

Understanding symptom patterns during LRS2 and EMT requires consideration of chronological aging, reproductive aging, and hormonal changes among women who are still menstruating and whose symptoms thus may vary in severity across menstrual cycle phases. Menstrual cycle phase effects on selected symptoms were found in these analyses for anger, irritability, and feeling out of control. Examining studies of premenstrual symptoms (including symptoms such as irritability, impatience, anger, and feeling out of control) provides a basis of comparison for our findings as women in LRS and EMT both continue to menstruate, albeit with greater irregularity among those in the EMT. In our studies of women age 40 and older, experiencing prior PMS symptom patterns (premenses > postmenses) persisted from when women were younger (18-45 y of age).[25] In studies of women during the menopausal transition, Freeman et al[26,27] observed that Penn Ovarian Aging Study (POAS) partici-

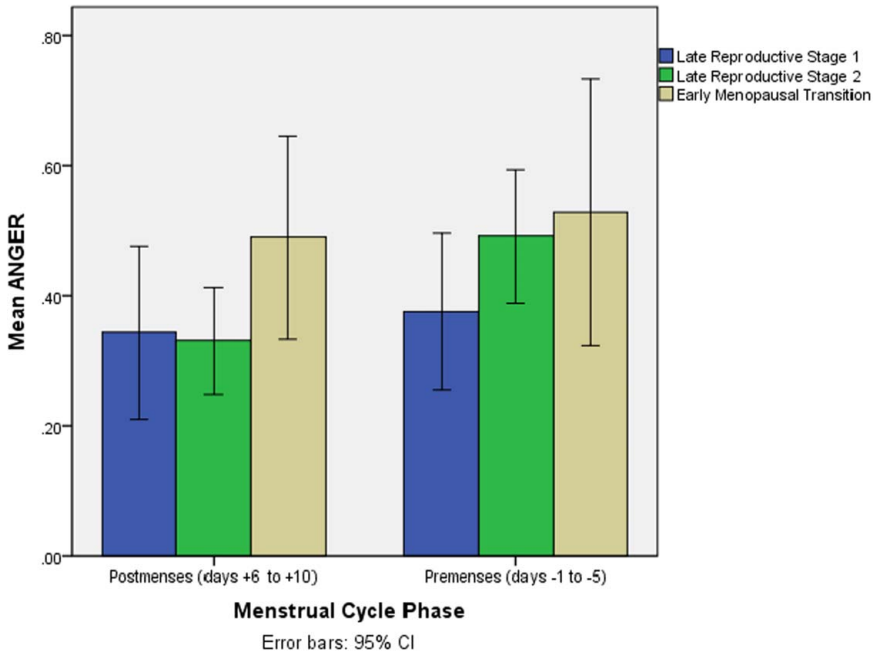

FIG. 1. Anger: menstrual cycle phase effects.Two-group analysis results: LRS2 versus EMT cycle phase effect F = 5.09, *df* = 1, *P* = 0.025. EMT, early menopausal transition; LRS2, late reproductive stages 2.

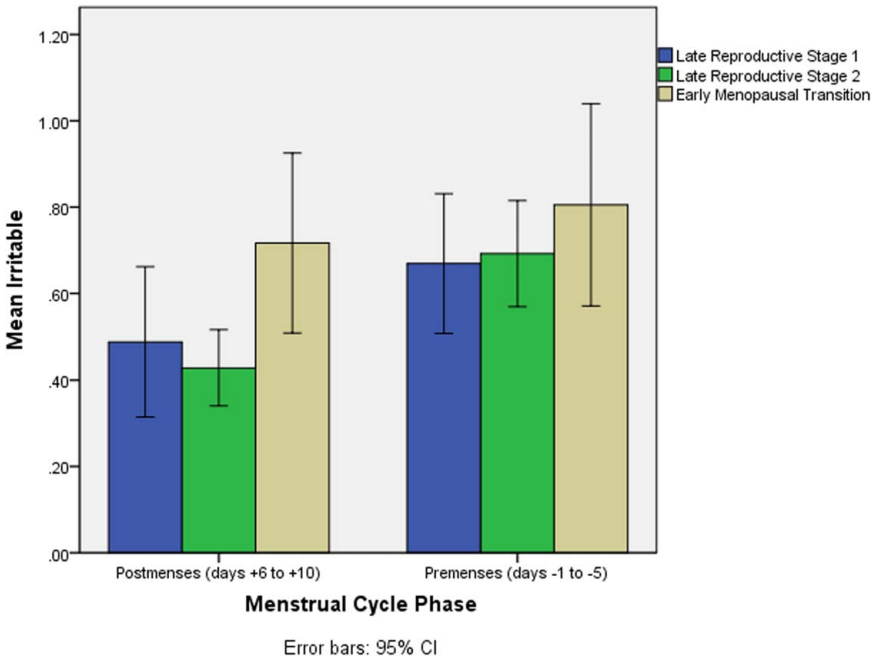

FIG. 2. Irritable: menstrual cycle phase effects.Two-group analysis results: LRS2 versus EMT cycle phase effect F = 9.22, *df* = 1, *P* = 0.038. Reproductive stage effect F = 4.44, *df* = 1, *P* = 0.036. EMT, early menopausal transition; LRS2, late reproductive stages 2.

pants' reports of PMS declined with age. Moreover, Dennerstein's reports from Melbourne Midlife Women's Health Project participants indicated increasing severity of PMS symptoms until age 35, which decreased thereafter.[28]

Effects of reproductive aging stages on symptoms such as anger, irritability, impatience, and feeling out of control have not received much attention in prior research, aside from POAS and SWAN study participants' reports

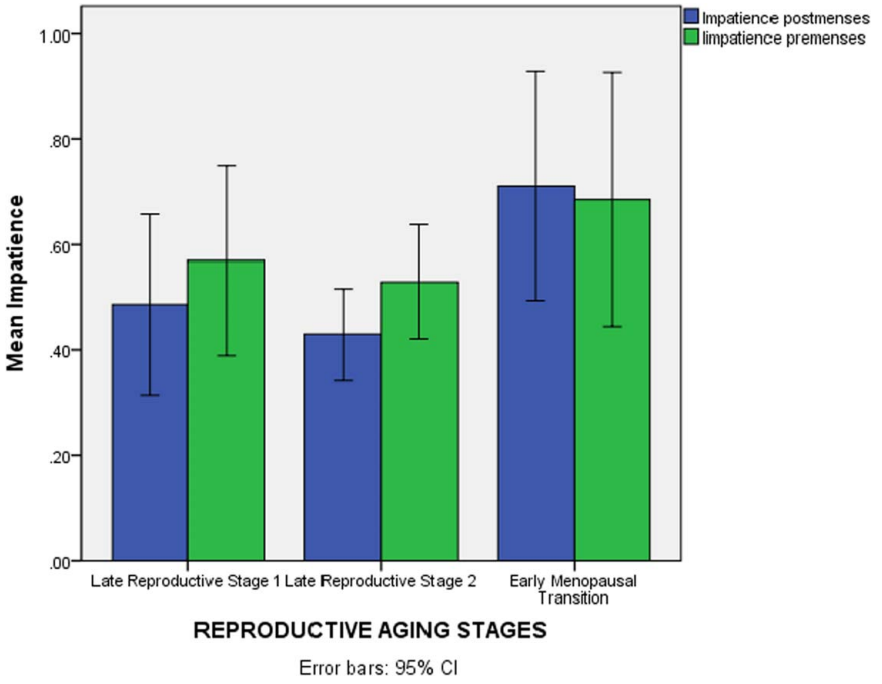

FIG. 3. Feeling out of control: menstrual cycle phase effects.Two-group analysis results: LRS2 versus EMT cycle phase effect F = 6.33, *df* = 1, *P* = 0.013. Reproductive stage effect F = 4.45, *df* = 1, *P* = 0.036. EMT, early menopausal transition; LRS2, late reproductive stages 2.

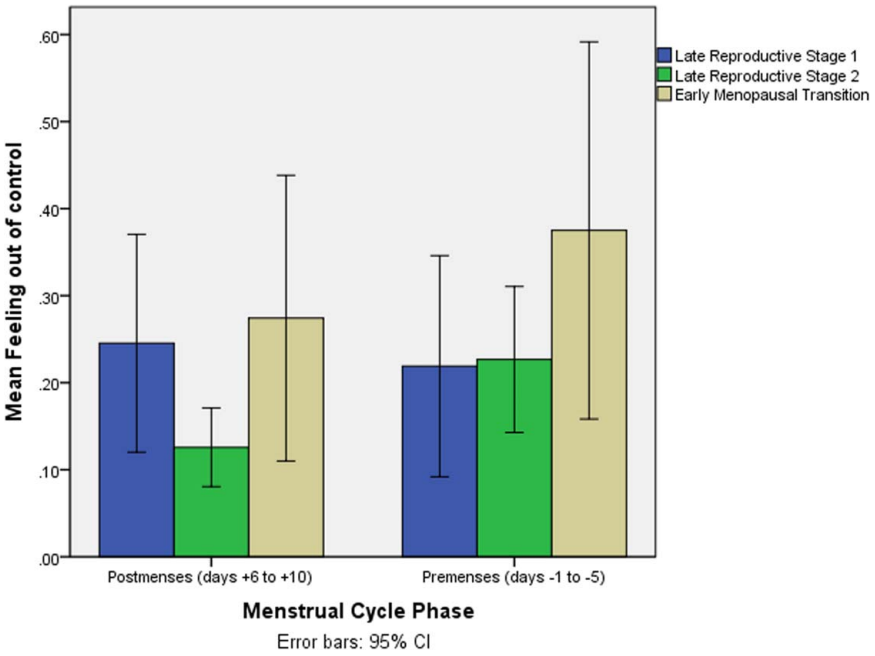

FIG. 4. Impatience: reproductive aging stage effects.LRS2 vs EMT reproductive stage effect F = 5.165, *df* = 1, *P* < 0.001. EMT, early menopausal transition; LRS2, late reproductive stages 2.

of anxiety during the menopausal transition and early postmenopause.[10,11] SWAN participants' experiences of anxiety varied with their experiences at baseline. Those with high anxiety experienced little change as they progressed through the menopausal transition, although those with lower levels of anxiety reported increased anxiety over time.[11] POAS participants' reports of anxiety increased significantly during the early menopausal transition (defined as having 7 d change in menstrual cycle length for at least 2 cycles).[10]

Progression through the stages of reproductive aging, like menstrual cycle phase changes, is associated with hormonal changes. Over the stages of reproductive aging, urinary estrone levels obtained from Seattle Midlife Women's Health Study participants rose from the LRS to EMT, dropping within a year before the final menstrual period, then declining thereafter.[18] Reports from SWAN indicated a similar pattern of estradiol plotted against years before and after the FMP.[29]

In our prior studies of women with premenstrual symptoms, those with a more gradual estradiol drop premenses experienced more severe symptoms of emotional turmoil, including hostility, anger, feeling out of control, anxiety, mood swings, irritability, and impatience.[25] Women with a more gradual estradiol drop premenses also had higher cortisol and epinephrine levels and lower norepinephrine levels during the premenses phase.[25] Hale's studies of women with luteal out-of-phase (LOOP) cycles in which they experienced erratic levels of estradiol with a second rise in estradiol after ovulation during the mid and late luteal phases prompt consideration of this mechanism in eliciting symptoms such as those examined here.[30] Although studies of estradiol variability by Freeman et al[26] revealed that women with PMS were vulnerable to estradiol fluctuation, and Joffe et al[31] and Gordon et al[32] found that estradiol variability was related to depressed mood symptoms and enhanced emotional sensitivity to social stimuli when stressed, to date no findings of the relationship of estradiol variability to arousal symptoms, for example, anxiety, during the menopausal transition have been reported. POAS participants with higher follicle-stimulating hormone levels (but not estradiol) reported more severe irritability and mood swings but not more anxiety.[33]

Limitations of the analyses presented here include the limited representation of racial and ethnic groups: a majority (78%) of participants were White and well educated. In addition, administration of the health diary daily during the first year of the study limited inclusion of women in the late menopausal transition and early postmenopausal stages, likely a function of the mean age of participants at recruitment (M = 41.1, SD = 4.0 y). Although women progressed to LMT and early postmenopause later in the study, there were only 17 whose menstrual cycles met the criteria for LMT during year 1 of the study when these symptom data were collected.

CONCLUSIONS

Although there were no significant differences in severity of the anger or anxiety symptoms women reported when comparing ratings during LRS1, LRS2, and EMT, restricting comparison of symptom ratings to LRS2 versus EMT revealed significant reproductive ag-

ing stage effects on irritability, impatience, and feeling out of control. As women transitioned from the late reproductive stage to the menopausal transition, they experienced increasing severity of these arousal symptoms. We also found significant cycle phase effects: anger, irritability, and feeling out of control increased significantly from postmenses to premenses. We found evidence of changing arousal symptom severity as a function of both menstrual cycle phases and stages of reproductive aging stages when comparing ratings from the LRS2 and EMT stages of reproductive aging stage for feeling out of control. Because these analyses focused on women who were continuing to have menstrual cycles (LRS2 and EMT), it is not possible to conclude that arousal symptoms do not vary with later stages of reproductive aging when their cycles become markedly irregular, for example, LMT. Future analyses that include arousal measures from LMT and PM, as well as LRS and EMT, will be necessary to address the effects of later stages of reproductive aging.

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