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Association between personality traits and DSM-IV diagnosis of insomnia in perimenopausal women:

Insomnia and personality in perimenopause

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Abstract

Objective—The aim of this study was to determine the role of personality factors in the development of DSM-IV insomnia coincident with perimenopause.

Method—Perimenopausal women (35 with DSM-IV insomnia and 28 with self-reported normal sleep) underwent clinical assessments and completed menopause-related questionnaires, the NEO-FFI, and the Structured Interview for DSM-IV Personality (SID-P). Logistic regressions determined whether personality factors and hot flash-related interference were associated with an insomnia diagnosis concurrent with the menopause transition.

Results—Women with insomnia reported higher neuroticism, lower agreeableness, and lower conscientiousness than controls on the NEO-FFI. Moreover, women with insomnia were more likely to meet DSM-IV criteria for Cluster C personality disorders, particularly obsessive compulsive personality disorder, on the SID-P. Women with insomnia were more likely to have had a past depressive episode and history of severe premenstrual symptoms. Findings from regressions revealed that higher neuroticism and greater interference from hot flashes were associated with insomnia classification even after controlling for history of depression, suggesting that sensitivity to hot flashes and a greater degree of neuroticism are independent contributors toward establishing which women are most likely to have sleep problems during perimenopause.

Conclusions—Findings show the relevance of personality factors, particularly neuroticism and obsessive-compulsive personality, in influencing a woman's experience of insomnia as she goes through the menopause transition.

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perimenopause; menopause; insomnia; personality; traits

INTRODUCTION

Insomnia is one of the most prevalent health conditions, both in general and clinical populations¹ and is estimated to affect between 6 and 22% of adults,^{2, 3} with higher prevalence in women than men.⁴ For women, perimenopause is an especially notable harbinger of subjective sleep difficulties, with sleep complaints reported by upwards of 51% of perimenopausal women.^{5–7} Sleep disturbance is one of the most distressing and impairing menopausal symptoms,⁸ the consequences of which frequently prompt women to seek medical help.⁹ Insomnia has a negative impact on physical and psychological health and quality of life.¹⁰ Given that around 500 million women are age 50 or over by World Health Organization estimate,¹¹ with numbers expecting to reach 1.2 billion by 2030, the economic burden from insomnia and sleep difficulties is high and will become higher.

The mechanism underlying the relationship between the development of insomnia and the transition through menopause remains poorly understood.¹² As women age, many emerging medical syndromes and other age-related factors may contribute to the development of sleep problems, for instance, mood disorders such as depression or anxiety; weight gain and sleep-related disordered breathing, e.g., obstructive sleep apnea; medications; restless legs syndrome or periodic limb movements; and other disorders;^{7, 13, 14} however, as they approach menopause, many women develop sleep difficulties in the absence of a current mood disorder or medical condition. Midlife can also be a time of stressful major life transitions such as divorce, widowhood, or children reaching adolescence,¹⁵ which may negatively impact women's sleep. Studies by Shaver and colleagues found that poor sleep in perimenopausal women was associated with chronic stress, cognitive and emotional arousal, and hot flashes,^{16–18} but conclusions could not be made regarding direction of causality.

Vasomotor symptoms (hot flashes and night sweats) are the most frequently reported menopausal symptoms¹⁹ and may affect up to 85% of menopausal women.²⁰ Nighttime vasomotor symptoms have been posited as a major cause of disturbed sleep in perimenopausal women, with numerous studies showing an association between self-reported vasomotor symptoms and poor subjective sleep quality.⁷ Also, self-reported presence of hot flashes is significantly associated with a DSM-IV diagnosis of insomnia.²⁰ Hot flashes and night sweats are related to decreased quality of life given that they may cause embarrassment, physical discomfort, and sleep disturbance.²¹ Hot flashes can consistently affect women beyond menopause,²⁰ thus untoward effects of chronic insomnia triggered by hot flashes can accumulate over time. Findings from studies relating objectively measured vasomotor symptoms to sleep have been relatively inconsistent,⁷ possibly due to underreporting of subjective hot flash rates compared to objectively measured rates and wide variability due to interpersonal differences in symptom experience.^{19, 22}

Little research attention has been given to the relationship of personality traits and perimenopausal insomnia despite evidence that personality traits influence both the

experience of menopause and insomnia. Studies have suggested that personality attributes such as self-confidence, optimism, and aggression are related to psychological, psychosomatic, and vasomotor menopausal symptoms.^{22, 23} Moreover, higher levels of neuroticism (the general tendency to experience negative affect such as fear, sadness, anxiety, embarrassment, anger, or guilt) have been found to be associated with perceived stress due to menopause.²⁴ In a sample of mostly postmenopausal women (one-third of the sample had a chronic illness), high levels of neuroticism were associated with a 6.1-fold decrease in the vasomotor symptom quality of life domain, a 9.2-fold decrease in the psychological quality of life domain, and an 11.4-fold decrease in sexual quality of life domain whereas greater emotional stability and extroversion were associated with regular exercise and greater interpersonal support.²⁵ While personality traits such as neuroticism have generally been found to have a negative impact on various aspects of menopause, their relationship to perimenopausal insomnia has yet to be addressed.

Emerging research has honed in on specific personality traits associated with insomnia. A common finding is that higher neuroticism and perfectionism-related traits are associated with insomnia symptoms.²⁶ In recent studies it has been documented that a psychological profile of higher neuroticism, rumination and internalization, with a poorer coping ability on the Minnesota Multiphasic Personality Inventory, 2nd edition (MMPI-2) characterized incident chronic insomnia,²⁷ and that in young and middle-aged good sleepers, increased level of neuroticism and maladaptive stress coping strategies were associated with a vulnerability towards developing stress-related insomnia.²⁸ Neuroticism and a ruminative personality style have been shown to account for the relationship between the onset of depression in previously psychiatrically healthy adults following the onset of sleep disturbance, highlighting the negative consequences of the interaction of personality traits and sleep and the need for early assessment and intervention.²⁹ The aims of this study were to characterize the menopausal symptom and personality profiles of women who met DSM-IV criteria for insomnia during perimenopause compared to perimenopausal women reporting no sleep problems. Further, we used logistic regression models to determine whether personality factors and vasomotor symptoms were associated with an insomnia diagnosis concurrent with the menopause transition. We hypothesized that greater neuroticism and prevalence of obsessive-compulsive personality traits would be related to a diagnosis of insomnia during perimenopause. To our knowledge, this is the first study investigating the association between personality traits and insomnia disorder in the context of perimenopause.

METHODS

Participants

The sample of participants in this study were 35 perimenopausal women with current DSM-IV diagnosis of insomnia (with onset of insomnia occurring during perimenopause) without previous history of insomnia, and 28 age-matched perimenopausal control women with a self-reported history of normal sleep. Participants were recruited from communities in the greater San Francisco Bay area through flyers, announcements, ads, or word of mouth. The study was reviewed and approved by SRI International's Institutional Review Board. All

participants provided written informed consent, and received a modest stipend for study participation. Subjects in this study were participating in a larger study on subjective and objective measures of sleep disturbance during the menopause transition.

Procedure and Measures

Telephone Screening—A total of 199 perimenopausal women aged between 41 – 56 years old underwent an initial telephone screen, which included the Menopause Screening Questionnaire, a validated screening questionnaire that asks women if they had 10 menopausal symptoms, including hot flashes, night sweats, mood swings, and sleep difficulties within the past week and to rate symptoms severity (0 = not present; 1 = minimal; 2 = mild; 3 = moderate; 4 = extreme).³⁰ Inclusion criteria included menopausal transition according to the Stages of Reproductive Aging Workshop criteria,³¹ i.e., menstrual cycle lengths that differed by more than 7 days from normal (early menopause transition); amenorrhea interval of > 60 days (late menopausal transition). In this study, amenorrhea for a period of 12 months or more (postmenopausal) was an exclusion. From the Menopause Screening Questionnaire, respondents had to have reported moderate to extreme sleep difficulties to be included in the insomnia group, or absent/minimal sleep difficulties to be considered in the control group. Additional inclusion criteria for both groups were body mass index of 32 kg/m² or lower, intact uterus and at least one ovary. Exclusions were use of hormone therapy or hormonal contraception for the previous 3 months, hypertension or arrhythmias, long-term medication use, or current antidepressant use.

Of the 199 screened, 104 met exclusion criteria and 17 women dropped out prior to their initial visit, typically due to time constraints, lack of interest, or failure to return calls to schedule an appointment. Forty-three potential insomniacs and 35 potential controls came to the laboratory to provide written informed consent and complete clinical assessments and questionnaires.

Psychiatric and Medical History Assessment—Participants were administered the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID),³² including a customized module assessing history of premenstrual symptoms³³, and an interview about medical history by trained clinicians. In addition, participants were questioned about their sleep in a customized module querying DSM-IV criteria for insomnia based on sleep history assessment guidelines.³⁴ Based on the SCID assessment, all women in the perimenopausal insomnia group (PMI) had to meet criteria for diagnosis of current insomnia. Specifically, women had to present with a prominent disturbance in sleep characterized by difficulty falling asleep, maintaining sleep, early morning awakening, and/or a feeling of non-restorative (poor quality) sleep, which occurred at least three times per week for at least a month and which caused clinically significant distress or impairment; the sleep disturbance was coincident with the onset of the menopause transition, and was not accounted for by another mental disorder, a breathing-related sleep disorder, periodic limb movement disorder (e.g., restless legs syndrome), or narcolepsy (based on self-reported absence of symptoms typical of these sleep disorders). Based on the SCID, women in the perimenopausal control group (PMC) were confirmed to have absent or minimal sleep difficulties. All participants must have had no lifetime history of DSM-IV insomnia prior to

perimenopause or current Axis I disorders (other than nicotine dependence; or insomnia in the PMI group). Fifteen potential participants were excluded during the SCID for history of sleep apnea (n = 3); restless legs syndrome (n = 1); history of strokes (n = 1); history of current gynecological problems unrelated to menopause (n = 1); did not meet criteria for insomnia (n = 5), current depression (n = 3), current alcohol abuse (n = 1).

The final sample included 35 PMI women who met DSM-IV criteria for a diagnosis of current insomnia (i.e., had no other known concurrent disorder attributing to the insomnia) and 28 PMC women. Six PMIs (17%) and 1 PMC (4%) reported difficulty falling asleep (reporting sleep latency > 30 min), 30 PMIs (86%) and 4 PMCs (14%) reported experiencing nocturnal awakenings, 17 PMIs (49%) and 5 PMCs (18%) reported early morning awakening, and 22 PMIs (63%) and 2 PMCs (7%) reported non-restorative sleep. The median number of nights of problematic sleep per week was 3.5 nights for PMI women and 1.5 nights for control women reporting sleep complaints. Control women reported no impairment or distress associated with mild sleep complaints.

Clinicians conducting the SCID also queried about current significant life stressors, such as unemployment, relationship difficulties, or legal problems, and assigned a Global Assessment of Functioning (GAF) rating score.³² GAF scores were on a scale of 100 to 0 (a hypothetical continuum of mental health-illness with lower scores reflecting poorer functioning) and were based on the participants' overall reports on the SCID of their current psychological, social, and occupational functioning excluding impairment due to physical or environmental limitations. Participants also completed the Beck Depression Inventory, 2nd edition (BDI-II).³⁵

Personality Assessment—To assess personality traits and disorders, clinicians administered the Structured Interview for DSM-IV Personality Disorders (SIDP)³⁶ to all participants except 1 PMC woman. This instrument has high inter-rater reliability, low transparency, and good diagnostic clarity.^{37, 38} For a complete description of the background and administration of the SIDP, see Sassoon et al.³³ Cluster A personality disorders assessed were: paranoid, schizoid, and schizotypal personality disorders. Cluster B personality disorders assessed were: antisocial, borderline, histrionic, and narcissistic personality disorders. Cluster C personality disorders assessed were: avoidant, dependent, and obsessive-compulsive personality disorders. The provisional personality diagnoses of depressive personality disorder and negativistic personality disorder, summarized in Appendix B of DSM-IV, were analyzed in this study as Cluster C personality disorders, given theoretical underpinnings and empirical findings of their association with other Cluster C disorders (for Depressive Personality Disorder, see Philips et al.³⁹; for Negativistic Personality Disorder, see McCann⁴⁰). Clinicians conducting the SCID and SIDP assessments were blind to study hypotheses.

Participants (all but 2 controls) completed the well-validated NEO-Five Factor Inventory (NEO-FFI),⁴¹ a 60-item questionnaire which measures 5 domains of adult personality: neuroticism, extroversion, openness, agreeableness, and conscientiousness. Participants respond to each item on a five-point scale representing their level of agreement to statements describing general tendencies, e.g., “I like to have a lot of people around me” or “I don’t like

to waste my time daydreaming”. The five NEO-FFI personality domain scales measure dimensions of normal personality. In this study both raw scores and T-scores (raw scores transformed to standardized scores with mean of 50 and standard deviation of 10 based on means and SDs from the NEO-FFI published norms for women provided in the user manual⁴¹) were obtained. T-scores ranging from 45 to 55 are considered “average”. Higher neuroticism reflects a general tendency to experience greater emotional instability and psychological distress. People with higher neuroticism have poorer control, cope with stress more poorly than those with lower scores, and have higher risk for psychiatric problems.⁴¹ Those with lower scores are calmer, more relaxed, and more even-tempered. Higher extroversion scores are associated with being more upbeat, energetic, sociable, and optimistic while lower scores are associated with being more introverted or reserved. Higher openness scores reflect a broader curiosity, desire for variety, a more active imagination, and greater independence of judgment while lower scores reflect tendency toward being more conservative or conventional, and preferring the familiar. Higher agreeableness is associated with greater altruism, empathy, and cooperativeness while lower scores relate to greater antagonism, egocentrism, interpersonal skepticism, and competitiveness. Finally, higher conscientiousness reflects greater determination, reliability, and purposefulness while lower scores reflect greater tendency toward being lackadaisical, disorganized, or hedonistic.

Assessment of Menopausal Symptoms—Participants completed the Greene Climacteric Scale,⁴² a 21-item validated questionnaire that measures the presence and severity of menopausal symptoms on a 4-point scale, yielding scores for three main symptom domains: psychological, somatic, and vasomotor and a single item about loss of interest in sex (libido). Total scores were calculated by summing all symptom scores (range from 0 – 63).⁴³ In addition, scores for each item were categorized as present (score of 1 – 3) or absent (0). Participants also reported the number of hot flashes/night sweats experienced, on average, in a 24-hour period. They rated the impact of hot flashes on daily activities such as work, social activities, sleep, sexuality, and overall quality of life using the psychometrically valid 10-item Hot Flash Related Daily Interference Scale. Items were rated on a likert scale from 0–10, with higher scores representing greater interference.⁴⁴ Total scores (range from 0 – 100) as well as the individual score on the sleep item (range from 0 – 10) from this scale were used in analyses.

Data Analysis

Statistical analyses were performed using PASW Statistics 18 (SPSS Inc., Chicago, Illinois, USA). *P*-values of .05 or less were considered statistically significant; all tests were two-tailed except for a one-tailed test where greater prevalence of obsessive compulsive personality traits was expected in PMIs. Differences in continuous sociodemographic and clinical data, and in Green Climacteric Scale total score, between PMIs and PMCs were examined with independent Student’s *t*-tests. Data with limited ranges or non-normal distributions were analyzed with Mann-Whitney *U* tests. In *t*-tests where the assumption of equal variances was violated according to Levene’s Test, degrees of freedom were adjusted and corrected *t*-test results are reported. Chi-square tests were used to determine differences in proportions between the two groups for categorical variables, e.g., menopause symptoms prevalence and personality disorder prevalence; Fisher’s exact tests were used on categorical

variables in instances where the expected count of a cell in the analysis was less than 5. Family-wise Bonferroni corrections within each symptom scale were applied to analyses of proportional differences between groups on the Greene Climacteric Scale. Preliminary correlational analyses revealed that several personality traits were intercorrelated on the NEO-FFI within both groups, thus a MANOVA with follow-up ANOVAs compared differences in personality traits between perimenopausal women with insomnia and controls. Spearman's rho correlations examined association between personality traits identified by SIDP with those obtained with the NEO-FFI. Finally, binary logistic regression was used, first, to determine what proportion of participants could be correctly classified as insomniacs or controls based on significant NEO-FFI personality trait domains from the MANOVA. A hierarchical logistic regression model was then used to investigate the contributions of significant NEO-FFI trait domains and hot flash-related interference to a diagnosis of insomnia.

RESULTS

Sociodemographic and Clinical Characteristics of the Participant Groups

PMI and PMC women were comparable in age, ethnicity, years of education, as well as in employment status, and had a similar number of social supports/close friends (Table 1). Parity was also similar between the groups. PMI women were more likely to be divorced than PMC women, ($P = .007$). There were no significant differences between groups in current body mass index, stage of menopause, or menstrual cycle phase at the clinical assessment. Significantly more PMI women had consulted a physician due to their menopausal symptoms, typically because of insomnia, than PMC women, ($P = .03$).

By SCID, 44% of PMI women reported experiencing a major depressive episode in their lifetime compared with 17.9% of PMC women, ($P = .02$) (Table 1). Moreover, PMI women were more likely to have met a provisional diagnosis of premenstrual dysphoric disorder (PMDD) based on their retrospective report of their premenstrual symptom lifetime history than PMC women, ($P = .01$). Groups were comparable on other DSM-IV psychiatric disorder prevalences, e.g., history of substance abuse, nicotine dependence, and anxiety disorders. Also on the SCID, a comparable proportion of PMI women (49%) and PMC women (46%) reported experiencing at least one current significant life stressor, e.g., financial hardship, unemployment, legal problem, relationship problems. PMI women were functioning at a poorer level on the Global Assessment of Functioning Scale than PMC women, ($P < .001$). PMI women reported a significantly greater level of current depression symptomatology on the BDI-II than PMC women, ($P < .001$).

Menopausal Symptoms in PMI and PMC women

Analyses were conducted to determine whether PMI women differed from PMC women in their reports of menopausal symptoms; these comparisons are shown in Table 2. Overall, PMI women experienced more bothersome menopausal symptoms on the Greene Climacteric Scale than PMC women, ($P < .001$), even upon removing the item relating to sleep disturbance, ($P < .001$). PMI women reported greater menopausal symptoms severity on all three symptom subscales, (Psychiatric: $P < .001$; Somatic: $P < .004$; Vasomotor: $P < .$

001). Among the psychiatric symptoms on the Greene Climacteric Scale, PMI women were more likely to report irritability, difficulty concentrating, feeling tired or lacking energy, feeling depressed or unhappy, and, as expected, difficulty sleeping, than PMC women. PMI women were also more likely to report experiencing hot flashes, as well as night sweats, than PMC women on the Greene Climacteric Scale.

While significantly more PMI women (94%) reported experiencing hot flashes and/or night sweats (combined) than PMC women (50%) (Table 3), ($P < .001$), a subanalysis of only those PMI women and PMC women who reported flashes/sweats showed that both groups reported experiencing approximately 2 flashes/sweats in a 24 hour period (Table 3). Among those with hot flashes/night sweats, PMI women scored higher on the Hot Flash Related Daily Interference Scale than PMC women, ($P = .002$), and reported greater hot flash-related interference on the sleep item than PMC women, ($P < .001$).

Personality Traits and Personality Disorder Clusters in PMI and PMC Women

MANOVA revealed a significant difference in personality profile as measured by the NEO-FFI trait domain raw scores between PMI women and PMC women, ($P = .01$) (Table 4). Post-hoc univariate ANOVAs revealed significant differences between the groups in three of the five trait domains, namely, neuroticism, ($P = .001$); agreeableness, ($P = .03$); and conscientiousness, ($P = .05$). Results, including group means on the trait domains, are summarized in Table 4. There were no differences on the NEO-FFI factors due to stage of menopausal transition (early vs. late) within either group. Even when NEO-FFI trait domain raw scores were transformed into T-scores based on means and standard deviations from the female normative sample, a personality profile difference between PMI women and controls remained, ($P = .03$).

A subanalysis of only women with hot flashes/night sweats showed that PMI women with hot flashes/night sweats had significantly higher NEO-FFI neuroticism raw scores and T-scores than did PMC women with flashes/sweats, ($P = .02$ and $P = .01$, respectively) (Table 3). In fact, PMC women with flashes/sweats ($n = 13$; raw score Mean = 11.1 ± 6.6 ; T-score mean = 37.6 ± 8.7) had comparable neuroticism scores to PMC without flashes/sweats ($n = 13$; raw score Mean = 10.5 ± 6.6 ; T-score mean = 38.9 ± 11.0), ($P = .8$ and $P = .7$, respectively). However, among PMI women reporting hot flashes/night sweats, neuroticism was not significantly correlated with hot flash-related interference or number of flashes/sweats. No other NEO-FFI trait was significantly correlated with number of flashes/sweats within either the PMI or the control group.

Analysis of the SIDP interview revealed that PMI women (37%) were more likely to have a personality disorder than PMC women (4%), ($P = .002$). PMI women (23%) had higher prevalence of Cluster C personality disorders compared to PMC women (0%), ($P = .008$) (Table 5). The high prevalence of Cluster C disorders was attributable to Obsessive-Compulsive Personality Disorder (OCPD), the most commonly occurring personality disorder in our PMI sample, occurring in approximately 14% of the PMI women. PMI women (17%) were also more likely to meet criteria for Cluster B personality disorders than PMC women (0%), ($P = .03$), however, no one particular disorder could account for high prevalence. PMI women with more Cluster C traits had higher neuroticism, ($P = .002$), and

lower agreeableness, ($P = .02$), on the NEO-FFI. Greater number of Cluster B traits was associated with lower conscientiousness, ($P = .05$), and was modestly associated with higher neuroticism, ($P = .09$), among PMI women. Prevalence of Cluster A personality disorders was low, diagnosed in one woman in the PMI group and one woman in the PMC group.

Neither hot flash interference total score, nor hot flash-related interference with sleep, were significantly correlated with number of Cluster B or C personality disorder traits in either PMI or control women. Additionally, number of hot flashes/night sweats was not significantly correlated with number of Cluster B or C personality disorder traits in either PMI or control women. Binary logistic regression was used to predict group membership (PMI or PMC) from personality domains on the NEO-FFI. Of the three NEO-FFI personality trait domains that were significantly different between PMIs from PMCs, i.e., neuroticism, agreeableness, and conscientiousness, neuroticism was the only independent predictor of group membership, [$Wald(1) = 5.45, p = .02; \beta = .12, S.E. \beta = .05$]. The overall model, [$\chi^2(3) = 13.77, N = 61, p = .003, Cox \& Snell R^2 = .20$], correctly classified 63.9% of participants. A hierarchical logistic regression model controlling for past history of a depressive episode was used to investigate the relative contributions of neuroticism and hot flash-related interference to classification as PMI or PMC. This overall model correctly classified 80.3% of the participants, [$\chi^2(3) = 34.10, N = 61, p < .001, Cox \& Snell R^2 = .43$]. Even after controlling for past history of a depressive episode, both neuroticism level, [$Wald(1) = 6.06, p = .01; \beta = .15, S.E. \beta = .06$] and level of hot flash-related interference, [$Wald(1) = 6.43, p = .01; \beta = .17, S.E. \beta = .07$], significantly predicted group membership.

DISCUSSION

Insomnia disorder is common among perimenopausal women, and is especially problematic given that it can cause clinically significant stress, impairment in social, occupational, or other areas of function, and creates a substantial economic burden. Our results show the relevance of personality traits, particularly neuroticism and obsessive-compulsive personality, in influencing a woman's experience of insomnia as she goes through the menopause transition.

In this study, we documented that PMI women were more likely to have had a depressive episode and were more likely to meet criteria for past premenstrual dysphoric disorder (only a provisional diagnosis was made since assessment was retrospective). Insomnia and depression, though frequently comorbid, are distinguishable although a history of depression is a risk factor for future insomnia and vice versa.⁴⁵ Freeman and colleagues reported a significant decrease in premenstrual syndrome with age, and found that women with premenstrual syndrome were more likely to report menopausal hot flashes, depressed mood, and poor sleep 5 years later.⁴⁶ Our findings corroborate the association of premenstrual symptoms and poor sleep and extend them to women with history of severe premenstrual symptoms and a diagnosis of insomnia in perimenopause.

Using the Green Climacteric Scale, we found a different menopausal symptom profile among women with insomnia and their counterparts without insomnia. Higher prevalences of psychiatric and vasomotor symptoms were found in PMI women than in PMC women,

and symptoms were judged to be more distressing by PMI women. PMI women reported greater depressive symptomatology on the BDI-II than control women; however, their scores were not of clinical significance, as their scores were reflective of a “minimal” level of depression.

PMI women reported poorer occupational and social functioning, and a higher divorce rate despite having similar current stressors and number of social supports. Findings support those of Terauchi et al¹² who showed a strong association of psychiatric, and to a lesser degree somatic, symptoms in peri- and post-menopausal Japanese women with sleep complaints, albeit not diagnosed with insomnia per se. Results also concur with those of Troxel et al⁴⁷ who found that midlife women cohabiting with a partner had better objective sleep quality than unpartnered women, and with those by Kuh et al¹⁵ showing divorce as a risk factor for midlife psychological distress, further substantiating a link between relationship status, mental health concerns, and insomnia in midlife women.

In this study, PMI women reported higher neuroticism on the NEO-FFI, and lower agreeableness and conscientiousness, than women without sleep complaints. Of the five NEO-FFI traits, neuroticism was found to be most strongly related to insomnia group status. These findings suggest that a personality profile involving neuroticism may prime certain women to experience significant insomnia during perimenopause. Our findings also suggest that low levels of neuroticism could be protective against developing insomnia during perimenopause. Neuroticism may also influence the appraisal of other perimenopausal symptoms in addition to insomnia. PMI women reported greater interference from psychological, vasomotor, and physical symptoms than PMC women. Certainly the experience of physical symptoms in those with high neuroticism has been linked to somatization,⁴⁸ and high neuroticism has been found to be associated with increased psychological reactivity to stressors.⁴⁹ In the context of the approach to menopause, higher levels of neuroticism are associated with rating menopause as stressful²⁴ and may negatively influence the experience of symptoms associated with the menopause transition.

A personality profile of perimenopausal insomnia is further supported by our findings of greater prevalence of impairing SID-P personality traits, yielding greater prevalence of DSM-IV personality disorder diagnoses, particularly those of Cluster C (anxious or fearful styles) and Cluster B (emotional, dramatic, erratic/inconsistent styles). The high prevalence of Cluster C personality disorders in PMI women was, in part, attributed to the high prevalence of OCPD and was associated with greater neuroticism. Recent studies have shown relationships between personality traits/disorders and insomnia particularly those of Clusters C and B. Obsessive compulsive personality disorder and the OCPD trait of perfectionism have been associated with difficulties in falling asleep and other sleep disturbance^{50–53} in student and general adult samples. Persons with borderline personality disorder have been found to have a poorer overall quality of sleep, and traits have been linked to sleep duration, sleep latency, subjective sleep quality, and also to daytime dysfunction.^{54–57} Current findings are consistent with those documented in the literature, and extend findings to women with diagnosed insomnia, onset of which is specifically during perimenopause.

Findings from regressions revealed that, irrespective of a history of depression, not only was neuroticism a significant predictor of PMI classification, so too was life interference from hot flashes, suggesting that greater sensitivity to hot flashes and greater degree of neuroticism are independent contributors toward establishing which women are most likely to perceive sleep as problematic during perimenopause. Night sweats and feeling tired/lacking energy were the climacteric symptoms most frequently reported by PMI women, disturbing 94% of PMI women; night sweats would thus be easy to implicate as one of the main contributors to insomnia. Indeed, a large body of evidence supports an association between perceived hot flashes and poor perceived sleep (see review by Joffe and colleagues⁷). However, night sweats were also reported by 52% of PMC women, and was second only to feeling tired/lacking energy in PMC women. PMI women and controls both reported experiencing an average of two flashes/sweats every 24 hours. Thus, in the women who reported experiencing vasomotor symptoms, the difference between groups was not in the number of events, rather it was in the amount of subjective distress associated with the disturbances, with PMI women being more subjectively bothered by the hot flashes. These findings are consistent with those of others showing that hot flashes are not necessarily associated with sleep disturbance unless they are bothersome.⁵⁸

While PMC women with and without hot flashes/night sweats had similar levels of neuroticism, PMI women experiencing hot flashes/night sweats had higher trait neuroticism (on NEO-FFI) compared to PMC women with hot flashes/night sweats. This finding supports those of Thurston and colleagues who found that negative affect, a construct related to neuroticism, was a strong predictor of “hot flash bother” and that women who were symptomatic for hot flashes but not bothered by them had low levels of negative affect.⁵⁹ However, among the PMI women with vasomotor symptoms in our study, neuroticism was not related to level of interference from the hot flashes/sweats, nor was it related to number of these symptoms. Possibly, some mediating or moderating factor other than neuroticism that is unique to the PMI women causes more bother due to hot flashes. In fact, insomnia itself may affect perceived bother of vasomotor symptoms.⁵⁹ Our findings need to be considered in light of study limitations. Our study is cross-sectional, therefore, direction of causality cannot be determined. To what degree personality traits (such as neuroticism or obsessive-compulsive perfectionism) elicit a predisposition towards a sensitivity to perimenopausal symptoms including poor sleep and to what degree insomnia may exacerbate perimenopausal symptoms that may be related to poor sleep (such as night sweats, low energy, and poor concentration) -- or the reverse -- remain unclear. It is possible that there may be a synergistic effect where neuroticism/personality disorder traits and menopausal symptoms (e.g., hot flashes/night sweats) are aggravated by insomnia which in turn further impact symptoms and personality, thus, traits and symptoms may be part of a negative feedback loop involving poor sleep and daytime dysfunction. Future studies involving longitudinal designs may be able to better address these questions, and consider other possible confounding factors not addressed here. The measures used in our study were all subjective and we therefore cannot determine whether women with perimenopausal insomnia also show greater physiological sleep disturbance and physiological hot flashes than controls. There is often low concordance between physiological and subjective

measures of both sleep quality⁶⁰ and hot flashes,⁶¹ suggesting that subjective and objective measures may tap into different constructs.

While neuroticism scores of insomniacs fell in the average range, those of controls were in the low range which may limit or possibly even underestimate generalizability. It is important to remember that all of these women initiated their own participation in this rigorous observational research study which may lead to selection bias. Indeed, PMC women had higher levels of agreeableness and lower neuroticism than those of the NEO-FFI female normative sample. While PMI women had lower levels of agreeableness/conscientiousness and had higher neuroticism than controls, perhaps this personality profile may be even more extreme (i.e., even higher neuroticism, lesser agreeableness, lesser conscientiousness) in perimenopausal women with insomnia who decline to participate in a demanding research study.

While the transition into menopause is not something women have control over, and its significance as a life transition in middle age can be anxiety-provoking, cognitive therapy for those presenting with insomnia during perimenopause might prove beneficial. Cognitive therapy for insomnia has been shown to be highly effective⁶² and may be especially helpful in easing psychiatric menopausal symptoms (for example, addressing negative associations with sleep or hot flashes/night sweats⁶³ and/or addressing impairing cognitions and behaviors associated with perfectionism⁶⁴). Moreover, both pharmacological^{65, 66} and non-pharmacological⁶⁷ treatments in midlife women have been shown to be effective in reducing insomnia and vasomotor symptoms. Our findings that insomniacs were more likely to report a lifetime history of severe premenstrual symptoms (i.e., provisional past premenstrual dysphoric disorder), and that perimenopausal insomnia is related to increased neuroticism and increased prevalence of maladaptive personality traits, extend our previous findings that severe premenstrual syndrome is associated with increased prevalence of character pathology, particularly obsessive compulsive disorder,³³ and lead us to speculate that those with particularly distressing premenstrual symptoms may be predisposed to eventually experience clinically significant insomnia as well as other distressing perimenopausal symptoms in midlife vis-à-vis a neurotic personality style.

CONCLUSIONS

In summary, women with insomnia during perimenopause were more sensitive to menopausal symptoms, e.g., night sweats, hot flashes, and depression, than were women without insomnia. Further, women who developed insomnia during perimenopause had a higher degree of neuroticism, a higher prevalence of impairing personality traits than those without insomnia, and a history of greater sensitivity to severe premenstrual symptoms than women without insomnia. Our findings show the relevance of personality factors, particularly neuroticism and obsessive-compulsive personality, in influencing a woman's experience of insomnia as she goes through the menopause transition.

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Table 1

Demographic data for perimenopausal women with a diagnosis of insomnia (PMIs) and perimenopausal control women (PMCs)

Demographic and Background Variables	PMIs (n = 35)	PMCs (n = 28)	P
Age	49.2 (2.9)	49.2 (2.8)	1.0
Ethnicity (% Non-Cau.)	11; 31.4%	6; 21.4%	.4
Education (yrs)	16.2 (2.1)	16.3 (2.3)	.8
Currently employed	28; 80.0%	20; 71.4%	.4
Relationship status			.008 ^b
Single	3; 8.6%	4; 14.3%	
Married	19; 54.3%	22; 78.6%	
Divorced/Separated	12; 34.3%	1; 3.6%	
Unknown	1; 2.9%	1; 3.6%	
Parity (% with children)	23; 65.7%	22; 78.6%	.3
Body mass index	23.6 (3.3)	24.2 (3.7)	.5
Number of close friends/social supports	4 [3, 5]	4 [2, 6]	1.0
Major Depression history	16; 45.7%	5; 17.9%	.02
Any anxiety disorder history	3; 8.6%	3; 10.7%	1.0
Substance abuse/dependence history	2; 5.7%	0%	.5
Nicotine dependence history	3; 8.6%	3; 10.7%	1.0
Premenstrual Dysphoric Disorder history	7; 20.0%	0%	.01
Current stage of menopause			.6
Early menopause transition	27; 77.1%	20; 71.4%	
Late menopause transition	8; 22.8%	8; 28.6%	
Current menstrual cycle phase			.7
Follicular	16; 45.7%	11; 39.3%	
Luteal	13; 37.1%	10; 35.7%	
> 40 days since period	6; 17.1%	7; 25.0%	
Saw doctor for menopause symptoms ^a	16; 45.7%	5; 18.5%	.03
Axis IV: % reporting current life stressor(s)	17; 48.6%	13; 46.4%	.9
Axis V: Global Assessment of Functioning	64.3 (6.3)	81.6 (6.5)	<.001
Beck Depression Inventory-II (max score = 40)	8 [3.8, 11.0]	1 [0, 6.0]	<.001

Continuous data are presented as mean (SD) and, when non-normal, medians [25th quartile, 75th quartile]; categorical data are presented as n, %.

Continuous data were analyzed by t-test or Mann-Whitney U; categorical data were analyzed by χ^2 or Fisher's Exact tests.

^a n = 27 for PMCs

^b This p-value reflects the significance of the chi-square utilizing only two levels of relationship status (Married and Divorced/Separated)

Table 2

Comparison of Green Climacteric Scale scores and menopausal symptom prevalence in women with a diagnosis of insomnia (PMIs) and control women (PMCs)

Menopausal Symptoms	PMIs (n = 35)	PMCs (n = 28)	P
Greene Climacteric Scale			
Psychiatric Symptoms Scale Score	8 [5.0, 11.0]	2 [1.0, 4.8]	<.001
Heart beating quickly/strongly	9; 25.7%	4; 14.3%	.3
Feeling tense/nervous	22; 62.9%	8; 28.6%	.007
Difficulty sleeping	34; 97.1%	11; 39.3%	<.001 ^a
Excitable	20; 57.1%	7; 25.0%	.01
Attacks of panic	9; 25.7%	1; 3.6%	.03
Difficulty concentrating	27; 77.1%	11; 39.3%	.002 ^a
Feeling tired/lacking energy	33; 94.3%	15; 53.6%	<.001 ^a
Loss of interest in most things	8; 22.9%	3; 10.7%	.3
Feeling unhappy/depressed	15; 42.9%	2; 7.1%	.002 ^a
Crying spells	10; 28.6%	5; 17.9%	.3
Irritability	29; 82.9%	11; 39.3%	<.001 ^a
Somatic Symptoms Scale Score	2 [1.0, 4.0]	1 [0, 2.8]	.004
Feeling dizzy/faint	10; 28.6%	3; 10.7%	.08
Pressure/tightness in head/body	12; 34.3%	4; 14.3%	.07
Body feeling numb/tingling	8; 22.9%	6; 21.4%	.9
Headaches	22; 62.9%	9; 32.1%	.02
Muscle/joint pain	26; 74.3%	12; 42.9%	.01
Loss of feeling in hands/feet	3; 8.6%	2; 7.1%	1.0
Breathing difficulties	1; 2.9%	0%	1.0
Vasomotor Symptoms Scale Score	2 [2.0, 4.0]	0.5 [0, 2.0]	<.001
Hot flashes	26; 74.3%	11; 39.3%	.005 ^a
Sweating at night	33; 94.3%	13; 46.4%	<.001 ^a
Loss of interest in sex (libido)	24; 68.6%	14; 50.0%	.1
Greene Total Score (max score = 63)	14.5 (6.6)	6.1 (4.4)	<.001

Continuous data are presented as mean (SD) and, when non-normal, medians [25th quartile, 75th quartile]; categorical data are presented as n, %.

Continuous data were analyzed by t-test or Mann-Whitney U; categorical data were analyzed by χ^2 or Fisher's Exact tests.

^a significant with family-wise Bonferroni correction applied

Table 3

Comparison of hot flashes/night sweat and NEO-FFI data in those perimenopausal women with a diagnosis of insomnia (PMIs) and perimenopausal control women (PMCs) who reported experiencing hot flashes/night sweats

Hot flash characteristics and neuroticism scores for women reporting hot flashes/night sweats	PMIs n = 33	PMCs n = 14	P
% reporting hot flashes and/or night sweats out of the original group	33/35; 94.3%	14/28; 50.0%	<.001
# of hot flashes/night sweats in 24 hrs.	1 [0, 2.0]	1 [0, 2.5]	.7
Hot Flash Related Daily Interference Total Score max score = 100	13 [1.5, 38.5]	0.5 [0, 2.8]	.002
Hot Flash Related Daily Interference Sleep Interference Score max score = 10	5 [1.0, 8.0]	0 [0, 2.0]	<.001
NEO-FFI Neuroticism Raw Score^a	18.3 (9.4)	11.1 (6.6)	.02
NEO-FFI Neuroticism T-Score^a	46.7 (11.5)	37.6 (8.7)	.01

^a n = 13 for PMCs

Categorical data are presented as proportion, %; hot flash data are presented as medians [25th quartile, 75th quartile], NEO-FFI scores are presented as mean (SD).

Categorical data were analyzed by Chi-square; hot flash-related continuous data were analyzed by Mann-Whitney U, NEO-FFI scores were compared by t-test.

Table 4

NEO-FFI domain scores for perimenopausal women with a diagnosis of insomnia (PMIs) and perimenopausal control women (PMCs)

NEO-FFI Domain	Raw Score Mean	SD of Raw Score Mean	T-score Mean ^a	SD of T-score Mean	Follow-up <i>p</i> ^b
Neuroticism					
PMIs (n = 35)	18.20	9.12	46.60	11.20	.001
PMCs (n = 28)	10.77	6.49	38.27	9.72	
Extroversion					
PMIs	30.63	6.10	54.17	10.37	.7
PMCs	31.31	5.56	55.42	9.59	
Openness					
PMIs	33.31	5.73	60.40	9.05	.1
PMCs	30.92	5.40	56.65	9.16	
Agreeableness					
PMIs	35.89	5.41	54.54	11.35	.03
PMCs	38.65	4.02	60.38	8.41	
Conscientiousness					
PMIs	34.63	6.24	49.43	10.69	.05
PMCs	37.77	5.69	54.73	9.90	

^a T-score Mean reflects a transformation of the Raw Score Mean to standardized scores based on the total distribution of scores from the NEO-FFI female normative sample.

^b p-values are from follow-up t-tests from the Omnibus MANOVA (Raw Score Means): $F(5, 55) = 3.15, p = .01$.

Table 5

Comparison of SIDP personality disorder prevalence in perimenopausal women with a diagnosis of insomnia (PMIs) and perimenopausal control women (PMCs)

Personality Disorders	PMIs (n = 35)	PMCs (n = 27)	<i>P</i>
Cluster A Personality Disorders	1; 2.9%	1; 3.7%	1.0
Cluster B Personality Disorders	6; 17.1%	0%	.03
Cluster C Personality Disorders	8; 22.9%	0%	.007
Obsessive-Compulsive PD	5; 14.3%	0%	.05

Data are presented as n, %; p-values are from Fisher's Exact tests