A Comprehensive Investigation of the Association between Menopause Symptoms and Problematic Eating Behavior in Peri- and Post-Menopause Cisgender Women

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SHORT COMMUNICATION

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ABSTRACT

Midlife individuals assigned female at birth are at risk for problematic eating behavior, associated with negative health outcomes. Little is known about how menopausal symptoms may increase risk in this population. The current study aimed to understand how a comprehensive range of menopause symptoms were globally associated with problematic eating behaviors. 281 cisgender women (176 post-menopause, 105 perimenopause) from the United States aged 40 to 64 were recruited utilizing Prolific, an online survey platform. Participants answered questionnaires about menopause symptoms and problematic eating. Participants were selected using demographic and health information provided in a screener survey. Participants also completed the Eating Disorder Questionnaire (EDE-Q), Women's Health Questionnaire (WHQ), Patient Health Questionnaire-8 (PHQ-8), Generalized Anxiety Disorder-7 (GAD-7), and Pittsburgh Sleep Quality Index (PSQI). Using Structural Equation Modeling, menopause symptoms explained 16.7% of the variance in problematic eating. Higher frequency and severity of anxiety, depression, sleep concerns, cognitive complaints, pain, and vasomotor symptoms was associated with greater frequency and severity of problematic eating behaviors, $\beta = .40$, p < .001. No significant differences between peri- and postmenopausal women emerged. These findings support the association between menopause symptoms and problematic eating in midlife cisgender women and highlight the need for continued investigation.

INTRODUCTION

Emerging research demonstrates that women in midlife are at risk for engaging in problematic eating [1], often defined as eating behaviors and attitudes that increase risk for weight-related health outcomes (e.g., metabolic syndrome, diabetes) and subthreshold eating disorder prognosis [2]. Problematic eating can include behaviors which restrict food intake, behaviors that lead to disinhibition, and also include attitudes concerning one's shape and weight [3]. Problematic eating is also associated with poor mental health symptomatology and numerous health issues (e.g., electrolyte disturbances and dental enamel damage; Yoon et al. 2018) [2]. Despite these risks, limited work has investigated precipitating risk factors for problematic eating among midlife women [4].

One specific factor that increases risk of midlife eating pathology and negative weight- related health outcomes is menopause [1]. Menopausal transition, the cessation of menstruation, is characterized by distinct symptomatology including vasomotor symptoms, cognitive complaints, sleep disturbances, low mood, changes in sexual desire, and pain [5]. Menopause is characterized by distinct stages including pre-menopause, peri-menopause, and post-menopause [6]. Pre-menopause is defined as the stage before the onset of menstrual irregularity in midlife [7]. Peri- menopause is characterized by irregularity of menstrual cycles during a twelve-month time period. Lastly, a woman in post-menopause has not had a menstrual cycle in the last twelve months [7] [8]. Prior research has implicated behavioral and psychosocial factors (i.e., depressive symptoms, sleep) as risk factors for problematic eating behavior in general adult samples [9]; however, these associations are understudied in menopausal samples, despite the plethora of biopsychosocial menopause symptoms.

A growing body of literature has investigated how depressive symptoms in midlife are associated with specific eating behaviors (e.g., fast food consumption, stress eating). The extent to which a comprehensive range of menopause symptoms are associated with problematic eating has yet to be investigated [10], despite 4.8% of women aged 40-60 engaging in problematic eating behaviors [11]. In fact, postmenopausal women report greater dietary restraint and eating disinhibition than premenopausal women [12]. A more comprehensive understanding of how menopause symptoms may increase problematic eating is necessary as midlife women are at risk for resulting negative health outcomes. Additionally, research has primarily focused on eating disorders in midlife rather than sub-threshold problematic eating behaviors [12] [13]. Higher eating disorder prevalence has been found in perimenopausal women compared to premenopausal women [11], with some theories suggesting that hormonal changes in menopause may contribute to eating disorder symptom risk

[14]. Subthreshold disordered eating behaviors are more prevalent than eating disorders among midlife women [15].

Subthreshold eating disorders are problematic in their own right and are associated with many poor health outcomes [16]. As such, a more thorough examination of subthreshold problematic eating behaviors, rather than solely eating disorder diagnoses, is warranted.

The current study investigated the association of biopsychosocial menopause symptoms (i.e., vasomotor symptoms, mental health, sleep, cognitive complaints, sexual desire, and pain) with problematic eating behavior in menopausal women. Specifically, we used a structural equation modeling approach to examine (1) the association between menopausal symptoms and problematic eating behaviors and (2) the interconnectedness of multiple menopause symptoms and problematic eating. Additionally, menopause status (peri- or post-menopause) was examined as a moderating factor.

We hypothesized that poor sleep and low mood would be associated with overall problematic eating behavior and its subcomponents given previous research [17]. Next, we hypothesized that vasomotor symptoms would be associated with overall problematic eating behavior and its subcomponents. Although the association between vasomotor symptoms and problematic eating has not yet been investigated, vasomotor symptoms are associated with weight gain, and are often rated as the most bothersome and distressing menopause symptom [18] [19]. Lastly, the study investigated how menopause symptoms would differentially map onto problematic eating constructs across menopausal statuses.

METHODS

Participants

Midlife individuals assigned female at birth from the United States aged 40 to 64 were recruited through Prolific, an online data collection platform. Given the most common age range for menopausal transition onset is between ages 45 and 55, with an age range of 40 to 64 in the current study we could capture individuals who may have experienced menopause at different ages within

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and/or outside of this window and across menopausal stages. The final sample consisted of 281 cisgender women (176 post-menopause, 105 peri-menopause). Inclusion criteria included identifying one's sex assigned at birth as female, being between the ages of 40-64, and identifying as peri-menopause or post-menopause. Although the demographic survey included a variety of gender identity options for participants to endorse, all participants in the study self- identified as cisgender women. Menopause status was determined through a series of questionnaires regarding menstrual patterns and gynecologic surgeries.

Procedure

The study was approved by Virginia Commonwealth University's Institutional Review Board. Data was collected via Prolific, an online crowdsourcing tool that allows participants to complete online tasks for monetary compensation [20]. Data gathered from Prolific has been found to be diverse, nationally representative, and comparable to other online crowdsourcing tools such as MTurk [20].

Initially, interested individuals were invited to complete a brief demographic and health screener. Individuals who met inclusion criteria were invited to complete additional study measures. During the baseline questionnaire, participants completed a validation check. The check included a question to assess attention (e.g., "For the next question, please ignore the question and respond with "2012"; "What year is it?" (a) 2012, (b), 2013, (c) 2018, (d) 2019)). A total of 42 women did not pass the validation check and were excluded from final analyses.

Participants were compensated for completing both the screener and study measures (\$6.00 USD total).

Measures

Menopause status. Menopausal status was determined based on menstrual patterns and gynecologic surgeries. Specifically, participants were asked to respond to questions: "Have you had a menstrual cycle in the past 12 months?" and "Have you experienced any changes in your menstrual cycle predictability in the last year (e.g., skipped cycles)?" Participants were also asked whether they had undergone hysterectomy or oophorectomy surgical procedures. Women who had undergone a total hysterectomy or a bilateral oophorectomy were defined as surgically menopausal. Women who experienced no menstrual bleeding in the previous year (not due to medication, pregnancy, or severe weight loss) were defined as postmenopausal [7]. Women with a menstrual cycle in the previous twelve months but not in the previous three, or women who had menstrual bleeding in the previous three months, but who had experienced increasing irregularity in cycle length over the past year, were considered peri- menopausal [8]. Women who reported menses in the previous three months, with no increase in irregularity, were defined as premenopausal and were not included in the study, as eating concerns peak during periand postmenopause as compared to premenopause [11].

Demographic and health questionnaire. Once

eligible, participants completed additional demographics questions concerning race/ethnicity, occupational status, marital status, level of education, health status, and health history.

Eating behavior. Eating behavior was measured with The Eating Disorder Questionnaire (EDE- Q; Fairburn and Beglin 1994) [3]. The EDE-Q is a 28-item, self-report measure that assesses eating and body image attitudes, feelings, and behaviors over the past 28-days. The EDE-Q assesses subthreshold eating behaviors, including diagnostic criteria for eating disorders. Items are answered on a 7point Likert scale ranging from 0, 'not one day', to 6, 'every day'. The measure yields a Global score and four subscale scores: Restraint (e.g., "have you been deliberately trying to limit the amount of food you eat to influence your shape or weight"), Shape Concern (e.g., "Have you had a definite fear that you might gain weight?"), Weight Concern (e.g., Have you had a strong desire to lose weight?"), and Eating Concern (e.g., "have you had a definite fear of losing control over eating?"). The Global score is the average of the four subscale scores and can range from 0-38. Higher scores

indicate higher eating disorder psychopathology. The binge eating score was determined as the average number of times women endorsed eating a large quantity of food and a loss of control when eating. In order to conduct analyses, binge eating item responses were recoded to mirror the Likert Scale used for remaining EDE-Q items. For example, if a woman responded that she ate "what other people would regard as an unusually large amount of food given the circumstances" approximately 6 out of the past 28 days, this response would be recoded as a "2" on the 0 to 6 Likert scale. Thus, the binge eating score was the average of recoded Likert responses to three binge eating items. The EDE-Q has demonstrated adequate reliability and validity [3]. The EDE-Q four subscale scores and binge eating score were used for analyses. The total internal consistency of the EDE-Q for the current sample was Cronbach's α = .887.

Menopause symptoms. Menopause symptoms were measured with the Women's Health Questionnaire (WHQ; Hunter 2000) [21], a 36-item questionnaire assessing nine domains of physical and emotional health rated on fourpoint scales (0 = no, not at all, 3 = yes, definitely). The WHQ was developed to evaluate changes experienced during the menopause transition and includes nine domains: depressed mood (6 items), somatic symptoms (7 items), anxiety/fears (4 items), vasomotor symptoms (2 items), sleep problems (3 items), sexual behavior (3 items), menstrual symptoms (4 items), memory/concentration (3 items), and attractiveness (3 items). The current study utilized the vasomotor (e.g., "I suffer from night sweats"), sexual behavior (e.g., "I have lost interest in sexual activity"), memory/concentration (e.g., "my memory is poor"), and somatic (e.g., "I suffer from backache or pain in my limbs") scales given their primacy as complaints during the menopause transition. The WHQ demonstrates good validity and reliability [21] and the total internal consistency of the WHQ for the current sample was Cronbach's α = .923. Notably, although the WHQ does include items related to depressed mood, anxiety, and sleep, the current study assessed mental health via the 'mental health' variables below.

Mental Health. Measures of depression and anxiety were included in the current study as manifest factors contributing to the larger latent factor, menopause symptoms in place of WHQ items.

Patient health questionnaire-8 (PHQ-8). The 8item Patient Health Questionnaire (PHQ-8; Kroenke et al. 2009) [22] is a self-report measure assessing depression in the past two weeks. Each item is rated from 0 to 3 (0= Not at all, 3= Nearly every day) to such items as, "Little interest or pleasure in doing things." Total scores range from 0 to 24 with a score greater than or equal to 10 on the PHQ-8 corresponding with clinically significant depression. The PHQ- 8 has been established as a reliable and valid measure [22] and had an internal consistency for the current sample of α = .886.

Generalized anxiety disorder-7 questionnaire (GAD-7). The GAD-7 [23] is a self-reported questionnaire for generalized anxiety disorder (GAD). The GAD-7 has seven items, which measure various symptoms of GAD. Individuals rate the frequency of anxiety symptoms in the last two weeks on a Likert scale ranging from 0-3 (0 = not at all, 3= nearly every day). Items are summed to provide a total score with higher scores indicating higher levels of anxiety. Scores range from 1-21 with scores of 15-21 indicating severe anxiety. The measure demonstrates high validity and reliability [23] and had an internal consistency for the current sample of α = .907.

Sleep. A measure of sleep was included in the current study as a manifest factor contributing to the larger latent factor, menopause symptoms.

Sleep was assessed via the Pittsburgh Sleep Quality Index (PSQI; Buysse et al. 1989) [24], a self-rated questionnaire that assesses sleep quality and disturbances over a 1-month time interval. Nineteen individual items generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Component scores can be used to calculate a global score of sleep quality. This measure has acceptable internal consistency ($\alpha = 0.83$) and test-retest reliability ($\alpha = 0.85$). It has concurrent validity with polysomnography recordings and displays discriminant validity in its ability to differentiate between good and poor sleepers [24]. The total internal consistency of the PSQI for the current sample was Cronbach's $\alpha = .760$.

Analyses

A structural equation model (SEM) was created using AMOS [25] to examine the association between menopausal symptoms and problematic eating in midlife women. A two-step structural equation modeling strategy was used. First, the measurement model provided an assessment of convergent and discriminant validities of the latent factor "menopause symptoms" and the degree to which the indicator variables captured or "fit" the latent factor. Next, the structural model estimated how the latent factor of "menopause symptoms" was directly related to problematic eating (Figure 1).

The following criteria were used to assess goodness of fit for the models: ratio of chi- square to degrees freedom of less than 2.0; traditional fit indices, including the comparative fit index (CFI) goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), incremental fit index (IFI), and Tucker-Lewis index (TLI), higher than .90 which would indicate adequate fit; and a root mean square error of approximation (RMSEA) of .08 or less would indicate adequate fit [26]. Lastly factor loadings above 0.30 were determined to be adequate fit for the models [26]. An invariance test was then conducted to determine if the model differed between groups and posthoc tests were used to determine which specific paths differed between menopause status groups.

RESULTS

Descriptive Results

Of the 281 cisgender women who participated in the study, 176 were post-menopause and 105 were perimenopause (see Table 1). On average, participants were 51.95 years old (SD = 6.56), white (84.3%), married (49.3%), highly educated (59.0% reported attending at least some college), and mothers (73.8%). Participants rated their physical health as 1.92 out of 4 (SD = 0.96), suggesting fairto-good self-perceived health. A small number (4.1%) of women reported being on a hormone replacement therapy (HRT) treatment regimen. In the post-menopause group, 42 women (14.5%) reported having a hysterectomy, and 30 (10.4%) reported having an oophorectomy. Overall, women were generally overweight (mean BMI = 29.57 +/- 7.97) with 39.9% of the sample in the "obese" range (e.g., BMI > 30). Women in the peri-menopause group had slightly higher BMI (30.55 +/- 8.98) compared to the post-menopause group (29.07 +/- 7.32), although the difference was not statistically significant, t(279) = -1.49, p = .135.

Association of Menopause Symptoms with Problematic Eating Behavior

Table 2 provides an overview of all target variables. Prior to running the measurement and structural models, variables were assessed to determine if they met criteria for SEM analyses. Vasomotor symptoms, eating concerns, and binge eating yielded slight skewness and kurtosis. A Mardia's coefficient of 5.68 (with a critical ratio of 4.35) suggested that the variables were multivariate kurtotic. All other variables indicated normality. A series of transformations were employed sequentially from least to most severe (square root, base 10, and then inverse square root), and the transformations generally resulted in larger skewness and kurtosis coefficients. Thus, the raw data were retained, and the models should be interpreted in light of their potential to generate smaller path coefficients or worse fit statistics compared with more normal distributions.

Measurement Model

The initial measurement model assessed the fit of seven indicators on the latent factor "menopause symptoms." The χ 2 test for the model was statistically significant, χ 2(7, N = 295) = 100.86, p < .001, suggesting that the model failed to fit the data. However, χ 2 can be influenced by large sample sizes [26]. The indices of IFI, CFI,

and GFI were in the good range at .89, .90, .90, .91, respectively. However, NFI, RFI, TLI, and AGFI were in the less than adequate range at .89, .83, .85, and .81. RMSEA (.14) was in the poor range. Following inspection of factor loadings, six of the seven factors loaded highly onto the latent factor at .35 or greater. The factor of sexual behavior was determined to fit poorly with a factor loading of .25 on the latent factor of menopause symptoms and was thus removed from the model.

Additionally, the error terms of depression and anxiety, and pain and vasomotor symptoms, were correlated to strengthen model fit, as supported by theoretical evidence connecting mood and somatic symptoms [6]. Following these adjustments, the NFI, IFI, CFI, and GFI for the second measurement model were all in the good range at .96, .97, .97, .96, respectively. The RFI, TLI, and AGFI were in the adequate range at .91, .93, and .89. Lastly, the RMSEA (.10) was in the fair range. Upon final examination of the model, the manifest variables loaded adequately to highly (2 > .35 and all p-values < .001) onto their latent constructs. Factor correlations ranged in magnitude from .01 to .49, indicating that there was sufficient discriminant validity among the latent constructs to proceed with the structural model. Taken together, the fit indices for the measurement model suggested adequate model fit.

Full SEM Model

In the first full SEM, menopause symptoms explained 16.9% of the variance in problematic eating, (β = .40, p < .001). Additionally, all menopause symptoms and problematic eating variables were statistically significant. The fit indices for this model generally suggested adequate or good fit, although the AGFI, RFI, and RMSEA suggested slightly less than adequate fit (Table 3).

To improve the model, the error terms between eating concerns and binge eating were correlated, as previous research has highlighted a connection between eating-related concerns and binge eating behavior [15]. The second full SEM including the structural model (Figure 2) explained 16.7% of the variance in problematic eating. The standardized path loadings and correlations all remained similar. The fit indices for the second model were improved compared to the first model and suggested adequate or good fit (Table 3). In the final model, the path between menopause symptoms and problematic eating was β =.40, p < .001, indicating a significant, positive association between reported frequency and severity of both menopause symptoms and problematic eating behaviors.

Status Differences

Lastly, an invariance analysis was employed in order to determine whether the SEM differed by menopause status. Five sets of comparisons between a constrained and an unconstrained model were of interest: measurement weights, structural weights, structural covariances, structural residuals, and measurement residuals.

All five sets of comparisons were non-significant (all ps > .17), suggesting that there were no group differences in the association between menopause symptoms and problematic eating. Although the perimenopause group did have higher factor loadings on menopause symptoms and problematic eating constructs and had a slightly higher unique association between menopause symptoms and problematic eating (i.e., 0.44 for peri versus 0.37 for post), this difference was not significant. Therefore, both post-menopause women and perimenopause women can be described by the SEM.

Follow-Up Analysis: Independent Samples T-Test

Independent sample t-tests were conducted to determine if mean differences existed between each menopause symptom and each problematic eating construct used in the final SEM model across menopausal statuses. Results demonstrated that peri-menopausal cisgender women endorsed a significantly higher frequency of vasomotor symptoms (M = 2.37, SD = .99) than post-menopausal cisgender women (M = 2.10, SD = 1.07, t[279] = -2.10, p = .037) with no difference in other symptomatology between groups.

DISCUSSION

Overall, this study found that greater endorsement of both frequency and severity of a constellation of menopause symptoms was positively associated with higher frequency and severity of problematic eating behaviors in turn. Depressive symptoms, anxiety, sleep, cognitive complaints, pain, and vasomotor symptoms best "mapped onto" the experience of menopause symptoms in the current sample. Furthermore, these six menopause symptoms were significantly associated with problematic eating, composed of restraint, eating concerns (e.g., fear of losing control of eating), weight concerns (e.g., desire to lose weight), shape concerns (e.g., fear of weight gain), and binge eating. Higher endorsement of each menopause symptom was positively associated with increased reported frequency and severity of each problematic eating construct respectively.

These results support previous work connecting individual menopause symptoms and eating behaviors. Specifically, sleep disturbance is linked to impaired hormonal regulation of hunger and satiety and decreased impulse control [27]. Furthermore, higher endorsement of both frequency and severity of depressive symptoms and anxiety have been linked to more emotion-driven eating, increased consumption of energy dense foods, and a greater overall intake of food [10] [28]. Further, a smaller body of research suggests an association between vasomotor symptoms and weight [19]. Lastly, the current analysis supports pain and cognitive complaints as menopause symptoms that are linked to problematic eating behavior. For example, pain is often managed via emotionfocused strategies which can lead to binge eating and/or increased food consumption [29]. Additionally, restraint and disinhibited eating have also been linked to cognitive depletion [29].

Although sexual functioning was not significantly associated with menopause in the current sample, it is possible that sexual behavior was better captured through other measured menopause symptoms in the current sample. Future work could investigate whether sexual functioning is independently associated with eating behavior in menopause.

It is likely that a combination of menopausal symptoms impact quality of life rather than each symptom working in isolation. As such, the current study aspired to demonstrate the complexity surrounding the connection between menopause symptoms and eating behavior.

Similarly, the construct of problematic eating consisted of subcomponents within the current analyses. Using a structural equation modeling approach, we were able to assess the concurrent associations between clusters of symptoms of menopause and problematic eating to account for the multiple, co-occurring, complex associations across these two constructs. Previous work has shown that menopausal women endorse multiple, rather than a single type, problematic eating behaviors [4]. The current results support this finding by demonstrating that each of the five problematic eating in the model and were associated with the aforementioned cluster of menopausal symptoms.

Only vasomotor symptoms were rated significantly higher for peri-menopause women in comparison to postmenopause women, consistent with previous research [6], although both groups endorsed mild anxiety, depressive symptoms, poor sleep, cognitive complaints, vasomotor symptoms, and mild to moderate ratings of pain. Also, the current sample endorsed greater problematic eating behavior (M = 2.02) compared to a general population sample of adult women (M = 0.93) [30]. Results demonstrate that both menopause symptoms and problematic eating are important to address in midlife uterus owners regardless of menopause status.

There are several strengths of the current study. This is the first study to conceptualize the overall experience of menopause symptoms as a predictor of problematic eating and provide understanding of how a breadth of menopausal biopsychosocial factors are linked to problematic eating behavior. Indeed, a variety of biopsychosocial menopausal domains should be considered when identifying problematic eating intervention targets. Nonetheless, there are also limitations to address. First, we were not able to measure biological factors of menopause including hormone levels (i.e., estrogen) which could have been a moderating factor of the observed associations. Future studies should attend to the impact of both hormone levels and hormone replacement therapy use on the association between menopausal symptoms and problematic eating behavior. Further, menopausal status was only captured through participant self-report, which may be subject to recall bias. We also did not exclude individuals who experienced menopause due to medical conditions or medication use. Although the current study focused mainly on problematic eating in peri and postmenopause, future research may consider investigating the nuances of problematic eating among premenopausal women.

As the study utilized an online data collection platform, data collection was limited to women in midlife with access to internet. As a result, there may be differences with our sample compared to the general population of midlife women. For example, although 14.5% of our menopause sample reported having a hysterectomy, population-based rates for a similar age range (40-64) ranged from 13.2% to 34.3% [31]. Levels of obesity were also slightly lower in the current sample (i.e., 39.9%) compared with the national average of midlife cisgender women in 2016 (i.e., 44.7%) [32]. Additionally, as postmenopausal women were a small majority in the current sample, sample size discrepancies may have influenced results with the post-menopause group more powered to detect an effect. We also grouped all peri-menopause women together rather than differentiating early and late peri- menopause [6]. Future research with a larger sample is need to differentiate the differences across peri-menopause stage. Further, the majority of our sample was white (84.3%) and cisgender (100%), limiting our ability to investigate menopause symptoms and problematic eating in a more ethnically, racially, and gender-diverse group [19].

CONCLUSION

In summary, the current study provides evidence that menopause symptoms are significant predictors of

problematic eating across perimenopausal and postmenopausal cisgender women. Indeed, greater endorsement of menopause symptoms was associated with more problematic eating behavior. These findings highlight the need for continued examination of the associations among menopause symptoms and problematic eating behaviors to (1) expand our understanding of risk factors for developing problematic eating in this population and (2) to discover potential interventions to decrease engagement in these behaviors.

Declaration of Conflicts of Interest

Dr. Dautovich reports personal fees from the National Sleep Foundation associated with her role as an Environmental Fellow outside of the submitted work. No other author has conflicts of interest to declare.

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PEER REVIEW

Not commissioned. Externally peer reviewed.

TABLES

Table 1: Demographic Information for Overall Sample, Post-, and Peri-Menopause Groups.

| | Overall | | Post- | Menopause | Peri-Menopause | |
|----------------------------------|---------------|------|---------------|-----------|----------------|------|
| | Count | % | Count | % | Count | % |
| Age (<i>M, SD</i>) | (51.95, 6.56) | | (54.92, 3.39) | | (46.80, 1.85) | |
| Race/Ethnicity | | | | | | |
| White | 252 | 84.3 | 149 | 83.7 | 92 | 86.6 |
| Black | 19 | 6.4 | 14 | 7.9 | 4 | 3.8 |
| Asian | 10 | 3.3 | 3 | 1.7 | 5 | 4.7 |
| Hispanic/Latino | 5 | 1.7 | 4 | 2.2 | 1 | 0.9 |
| Middle Eastern/North African | 1 | 0.3 | 1 | 0.6 | 0 | 0 |
| Native Hawaiian/Pacific Islander | 1 | 0.3 | 1 | 0.6 | 0 | 0 |
| American Indian/Alaska Native | 6 | 2.0 | 2 | 1.1 | 4 | 3.8 |
| Other | 2 | 0.7 | 2 | 1.1 | 0 | 0 |
| Prefer not to answer | 2 | 0.7 | 2 | 1.1 | 0 | 0 |
| Sexual Orientation | | | | | | |
| Straight | 203 | 70.2 | 137 | 76.5 | 66 | 62.3 |
| Bisexual | 17 | 5.9 | 8 | 4.5 | 9 | 8.5 |
| Lesbian | 3 | 1.0 | 3 | 1.7 | 0 | 0 |
| Queer | 1 | 0.3 | 0 | 0 | 1 | 0.9 |
| Pansexual | 3 | 1.0 | 1 | 0.6 | 2 | 1.9 |
| Asexual | 8 | 2.8 | 4 | 2.2 | 4 | 3.8 |
| Prefer not to answer | 1 | 0.3 | 0 | 0 | 1 | 0.9 |
| Education | | | | | | |
| Less than HS | 1 | 0.3 | 1 | 0.6 | 0 | 0 |
| HS or equivalent | 34 | 11.7 | 21 | 11.9 | 12 | 11.4 |
| Some college | 66 | 22.8 | 41 | 23.3 | 25 | 23.8 |
| Associates | 47 | 16.2 | 31 | 17.6 | 16 | 15.2 |
| Bachelors | 77 | 26.6 | 42 | 23.9 | 34 | 32.4 |
| Masters | 38 | 13.1 | 25 | 14.2 | 12 | 11.4 |
| Doctorate | 8 | 2.8 | 6 | 3.4 | 2 | 1.9 |
| Professional | 13 | 4.5 | 9 | 5.1 | 4 | 3.8 |
| Marital Status | | | | | | |
| Married | 143 | 49.3 | 83 | 47.2 | 59 | 56.2 |
| Common-Law | 9 | 3.1 | 6 | 3.4 | 3 | 2.9 |
| Separated | 14 | 4.8 | 9 | 5.1 | 4 | 3.8 |

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| Divorced | 59 | | 20.3 | 44 | 25.0 | 15 | 14.3 |
|--------------------------|-----|------|------|-----|------|----|------|
| Widowed | 6 | | 2.1 | 6 | 3.4 | 0 | 0 |
| Single (never married) | 53 | | 18.3 | 28 | 15.9 | 24 | 22.9 |
| | | | | | | | |
| Children | | | | | | | |
| None | 76 | 26.2 | | 48 | 27.3 | 28 | 26.7 |
| One | 52 | 17.9 | | 41 | 23.3 | 10 | 9.5 |
| Two | 82 | 28.3 | | 43 | 24.4 | 38 | 36.2 |
| Three | 42 | 14.5 | | 28 | 15.9 | 14 | 13.3 |
| Four or More | 32 | 11.0 | | 16 | 9.1 | 15 | 14.3 |
| Work Status | | | | | | | |
| Employed Full-Time | 91 | 31.4 | | 49 | 27.8 | 40 | 38.1 |
| Employed Part-Time | 50 | 17.2 | | 31 | 17.6 | 19 | 18.1 |
| Homemaker | 36 | 12.4 | | 16 | 9.1 | 19 | 18.1 |
| Retired | 23 | 7.9 | | 23 | 13.1 | 0 | 0.0 |
| Self-Employed | 42 | 14.5 | | 26 | 14.8 | 16 | 15.2 |
| Student | 2 | 0.7 | | 1 | 0.6 | 1 | 1.0 |
| Unable to Work | 22 | 7.6 | | 19 | 10.8 | 3 | 2.9 |
| Unemployed (Looking) | 14 | 4.8 | | 9 | 5.1 | 5 | 4.8 |
| Unemployed (Not Looking) | 4 | 1.4 | | 2 | 1.1 | 2 | 1.9 |
| | · · | | | | | • | |
| No | 208 | 71.7 | | 132 | 75.0 | 75 | |
| Yes | 75 | 25.9 | | 44 | 25.0 | 30 | |

| BMI (<i>M</i> , <i>SD</i>) | (29.57, 7.97) | | (29.07, 7.32) | | (30.55, 8.98) | | | |
|--|---------------|--------------|---------------|--------------|------------------|----|------------------|--|
| < 18.5 ("underweight") | | 6 | 2.1 | 4 | 2.3 | 2 | 1.9 | |
| 18.5–24.9 ("healthy") | | 89 | 31.7 | 57 | 32.6 | 31 | 30.1 | |
| 25–29.9 ("overweight") | | 74 | 26.3 | 45 | 25.7 | 27 | 26.2 | |
| ≥ 30 ("obese") | | 112 | 39.9 | 69 | 39.4 | 43 | 41.7 | |
| Physical Activity (min/week; M, SD) | (| 108.12 | 2, 128.57) | | (108.82, 135.10) | | (108.10, 119.29) | |
| Hysterectomy | 42 | | 14.5 | 42 | 14.5 | 0 | 0.0 | |
| Oophorectomy | 30 | | 10.4 | 30 | 10.4 | 0 | 0.0 | |
| Hormone Replacement Therapy | 12 | | 4.1 | 10 | 5.7 | 2 | 1.9 | |
| Weight loss Rx for health reasons | 101 | | 34.8 | 61 | 34.7 | 40 | 38.1 | |
| Weight loss Rx to reduce central obesity | 71 | | 24.5 | 42 | 23.9 | 29 | 27.6 | |
| Mental Health Treatment (current) | 54 | | 18.6 | 34 | 19.3 | 19 | 18.1 | |
| Mental Health Treatment (ever) | 150 | | 51.7 | 96 | 54.5 | 53 | 50.5 | |
| Mental Health Disorder (ever) | 137 | | 47.2 | 86 | 48.9 | 50 | 47.6 | |
| Self-Reported Health (M, SD) | (| (1.92, 0.96) | | (1.90, 0.97) | | | (1.92, 0.94) | |
| Poor | 17 | | 5.9 | 11 | 6.3 | 6 | 5.7 | |
| Fair | 80 | | 27.6 | 52 | 29.5 | 28 | 26.7 | |
| Good | 108 | | 37.2 | 65 | 36.9 | 43 | 41.0 | |
| Very Good | 79 | | 27.2 | 48 | 27.2 | 28 | 26.7 | |

Note. All health concerns refer to a current diagnosis unless otherwise specified.

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| | Overa (<i>N</i> = 23 | all 81) | Post-Menopause (N = 176) | | Peri-Menopause (N = 105) | | |
|----------------------|--------------------------|------------|-----------------------------|------|-----------------------------|------|-------|
| Variable | Mean | SD | Mean | SD | Mean | SD | Range |
| EDE-Q Total | 2.02 | 1.32 | 2.02 | 1.33 | 1.95 | 1.29 | 0–6 |
| Restraint | 1.75 | 1.70 | 1.77 | 1.75 | 1.64 | 1.62 | 0–6 |
| Eating Concerns | 1.07 | 1.10 | 1.02 | 1.12 | 1.05 | 1.03 | 0–6 |
| Shape Concerns | 2.83 | 1.74 | 2.87 | 1.73 | 2.76 | 1.75 | 0–6 |
| Weight Concerns | 2.41 | 1.65 | 2.43 | 1.63 | 2.35 | 1.68 | 0–6 |
| Binge Eating | 0.85 | 1.37 | 0.82 | 1.33 | 0.89 | 1.45 | 0–6 |
| Depressive Symptoms | 7.90 | 5.94 | 7.68 | 5.89 | 8.35 | 6.04 | 0–24 |
| Anxiety | 6.54 | 5.63 | 6.18 | 5.68 | 7.10 | 5.56 | 0–20 |
| Sleep | 8.96 | 4.67 | 8.80 | 4.72 | 9.24 | 4.62 | 0–20 |
| Pain | 2.25 | 0.71 | 2.20 | 0.72 | 2.31 | 0.67 | 1–4 |
| Cognitive Complaints | 2.30 | 0.80 | 2.25 | 0.82 | 2.36 | 0.78 | 1–4 |
| Vasomotor Symptoms | 2.21 | 1.04 | 2.10 | 1.07 | 2.37 | 0.99 | 1–4 |
| Sexual Behavior | 2.42 | 0.65 | 2.45 | 0.66 | 2.28 | 0.61 | 1–4 |

Table 2: Mean and Standard Deviations Scores of Each SEM Predictor and Outcome Variable for OverallSample and Each

 Menopause Status Group.

Note: Depression was calculated with the PHQ-8; Anxiety was determined via the GAD-7; Sleep was determined using the Global Sleep Score of the PSQI; Pain, cognitive complaints, vasomotor symptoms, and sexual behavior were calculated with the WHQ subscales of Somatic Symptoms, Memory and Concentration, Vasomotor Symptoms, and Sexual Behavior, respectively; Binge eating score was recoded to mimic the scoring of the four EDEQ subscales.

Table 3

Full Model Fit Indices

| | SEM 1 | SEM 2 |
|---------|-----------|-----------|
| | | |
| CMIN/DF | 159.95/41 | 108.15/40 |
| GFI | 0.91 | 0.94 |
| AGFI | 0.86 | 0.90 |
| NFI | 0.92 | 0.94 |
| RFI | 0.89 | 0.92 |
| IFI | 0.94 | 0.96 |
| TLI | 0.91 | 0.95 |
| CFI | 0.94 | 0.96 |
| RMSEA | 0.09 | 0.08 |
| AIC | 209.95 | 160.15 |
| BIC | 302.13 | 256.014 |

FIGURES



Figure 1: Theoretical structural equation model of the relation between menopause symptoms and problematic eating.



Figure 2: Final model for structural equation model analysis.