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Association of mindfulness and stress with menopausal symptoms in midlife women

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ABSTRACT

Purpose: Midlife women frequently experience stress and menopausal symptoms. Mindfulness is thought to mitigate stress by avoiding emotional reactivity and ruminative thinking. We sought to assess the association of mindfulness and stress on menopausal symptoms among midlife women.

Materials and methods: In this cross-sectional study, women aged 40–65 years completed questionnaires, including the Menopause Rating Scale (MRS), the Perceived Stress Scale-4 (PSS-4), and the Mindfulness Attention Awareness Scale (MAAS). Linear regression was used to assess the impact of mindfulness and stress on menopausal symptoms with use of univariate and multivariable analyses, adjusting for patient characteristics.

Results: In this cohort of 1744 midlife women, higher mindfulness (MAAS) and lower stress (PSS-4) scores correlated independently with lower menopausal symptom (MRS) scores. On multivariable analysis, a significant interaction effect was observed between the MAAS and PSS-4 on the MRS, such that with higher PSS-4 scores, the magnitude of association between the MAAS and lower MRS scores was larger.

Conclusion: Among midlife women, higher mindfulness and lower stress correlated with lower menopausal symptom scores independently. Among women experiencing more stress, the magnitude of association between mindfulness and lower menopausal symptom scores was greater, largely driven by psychological subdomain scores. Mindfulness may mitigate menopausal symptoms among midlife women.

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Introduction

Women in midlife frequently experience stress^{1,2}. Midlife stress may relate to concerns regarding personal health and aging, psychosocial factors, work-related pressures, and worry about elderly parents and teenaged children². The midlife stage also overlaps with the menopause transition, resulting in psychological, physical, and metabolic changes, which in turn correlate with greater perceived stress^{3,4}.

Stress can negatively influence the menopause experience in multiple ways. Greater perceived stress and anxiety can amplify menopausal symptoms^{5–7}, interfere with work performance and relationships⁸, and decrease productivity⁹. Stress is also a risk factor for *de novo* mood problems and worsening of preexisting mood disorders during the menopause transition¹⁰. Further, stress during midlife may be associated with an overall lowered satisfaction with life¹¹. Thus, with the high prevalence of stress, coupled with the fact that 6000 US women enter menopause every day⁹ and with the estimated number of women older than 55 years in 2020 approaching more than 46 million¹², the societal impact of the interaction between stress and menopause cannot be overstated.

In the past few decades, several effective stress management strategies have been developed. One such approach is

mindfulness training¹³. Mindfulness is defined as paying attention on purpose in the present moment and non-judgmentally¹⁴. Although the precise mechanism of action is not fully understood, mindfulness is thought to mitigate stress by avoiding emotional reactivity and maladaptive, negative, and ruminative thinking¹⁵.

Mindfulness can be described as an inherent trait that is the sum of a person's genetic makeup and life experiences. This trait, termed dispositional mindfulness, is not related to previous training in meditation or mindfulness exercises¹⁶. Higher degrees of dispositional mindfulness have been generally linked to better self-care behaviors, physical health outcomes, psychological outcomes, and relationships¹⁷.

Mindfulness also is a skill that can be learned. During mindfulness-based stress reduction (MBSR) training, the most widely used mindfulness training program¹⁸, participants are taught to approach their thoughts and feelings in an accepting, non-reactive manner, thereby developing a healthier relationship with their stress¹⁹. With training, participants frequently report decreased feelings of stress and an increase in perceived quality of life (QOL)²⁰.

The association of mindfulness and stress on menopausal symptoms during midlife is not well known. Although mindfulness training has been used for management of menopause-related symptoms in small studies²¹, this field of

Table 1. Characteristics of cohort seen in Women's Health Clinic between 1 January 2015 and 31 December 2016 ($N = 1744$).

Characteristic	Value ^a
Age (years), mean (SD)	53.4 (6.1)
BMI, mean (SD)	26.8 (6.0)
Race/ethnicity	
White	1624 (93.1)
Black or African American	18 (1.0)
Other/unknown	64 (3.6)
Marital status	
Married	1443 (82.7)
Single	131 (7.5)
Divorced	123 (7.1)
Separated	8 (0.5)
Life partner	7 (0.4)
Widowed	17 (1.0)
Education	
High school or less	127 (7.4)
Some college	485 (28.1)
Four-year college	586 (34.0)
Postgraduate studies	527 (30.6)
Employment	
Employed	1131 (65.3)
Full-time homemaker	244 (14.1)
Retired	178 (10.3)
Other	178 (10.3)
GAD-7	
<5	524 (31.9)
≥5	1120 (68.1)
PHQ-9	
<5	1022 (61.9)
≥5	628 (38.1)
KMSS	
<17	453 (29.1)
≥17	1102 (70.9)

BMI, body mass index; GAD-7, Generalized Anxiety Disorder-7; KMSS, Kansas Marital Satisfaction Scale; PHQ-9, Patient Health Questionnaire-9; SD, standard deviation.

^aValues presented as number (percentage) of patients unless specified otherwise.

research is in its infancy. The present cross-sectional study was designed to evaluate the associations among mindfulness, stress, and menopause-related symptoms in midlife women and to evaluate the role of mindfulness and stress as variables associated with menopausal symptom scores. We hypothesized that mindfulness and stress will be associated with menopause symptom scores in women presenting to a tertiary care women's center.

Methods

Study design and participants

In the present study, women were enrolled when they presented to the Women's Health Clinic at Mayo Clinic, Rochester, MN, USA between 1 January 2015 and 31 December 2016. We included women between age 40 and 65 years who provided consent for the use of their health records for research. Only the initial visit information was included for the participants who were seen more than once.

Women provided basic demographic information and completed the Menopause Rating Scale (MRS), the Perceived Stress Scale-4 (PSS-4), and the Mindfulness Attention Awareness Scale (MAAS) questionnaires at their clinical visit. This information was entered electronically in the Data Registry on Experiences of Aging, Menopause, and Sexuality. Women who did not provide complete information on these relevant questionnaires were excluded from the study.

Table 2. Summary statistics for the MAAS, PSS-4, and MRS and its subdomains.

Scale/subdomain	Summary value
MAAS mean score	
Mean (SD)	4.4 (0.9)
Median (IQR)	4.5 (3.8–5.1)
Range	1.0–6.0
PSS-4 total score	
Mean (SD)	5.1 (3.5)
Median (IQR)	5.0 (2.0–7.5)
Range	0.0–16.0
MRS	
Total score	
Mean (SD)	13.9 (7.5)
Median (IQR)	13.0 (9.0–18.0)
Range	0.0–44.0
Psychological symptoms	
Mean (SD)	4.5 (3.7)
Median (IQR)	4.0 (2.0–7.0)
Range	0.0–16.0
Somato-vegetative symptoms	
Mean (SD)	5.3 (3.0)
Median (IQR)	5.0 (3.0–7.0)
Range	0.0–16.0
Urogenital symptoms	
Mean (SD)	4.1 (2.8)
Median (IQR)	4.0 (2.0–6.0)
Range	0.0–12.0

IQR, interquartile range; MAAS, Mindfulness Attention Awareness Scale; MRS, Menopause Rating Scale; PSS-4, Perceived Stress Scale-4; SD, standard deviation.

The Mayo Clinic Institutional Review Board approved this study.

Instruments

Menopause Rating Scale

The MRS is a comprehensive survey of menopause-specific health-related information. This is a reliable instrument for measuring the impact of menopause symptoms on women's QOL²². The MRS is an 11-item scale encompassing the domains of psychological (i.e. depressed mood, anxiety, irritability, and exhaustion; maximum score, 16), somato-vegetative (i.e. hot flashes, heart racing, insomnia, and joint pains; maximum score, 16), and urogenital (i.e. sexual problems, bladder problems, and vaginal dryness; maximum score, 12) symptoms. Women grade each item from 0 to 4 (0, not present; 1, mild; 2, moderate; 3, severe; and 4, very severe). The total subscale score is the sum of each item in the subscale, and the total score is the sum of the various total subscale scores, ranging from 0 to 44. Higher MRS scores indicate more severe menopause-related symptoms and greater QOL impairment. An MRS score of 17 or greater indicates severe impairment of menopause-related QOL²³.

Perceived Stress Scale-4

The PSS is a psychological instrument for measuring a person's perception of stress in the previous month and the degree to which life's situations are perceived as stressful²⁴. This global measure of stress has 14 items and has been tested in multiple settings²⁵. The PSS-4 scale has four items, using items 2, 6, 7, and 14 from the 14-item PSS. The brevity of PSS-4 lends it to more time-effective use in appropriate

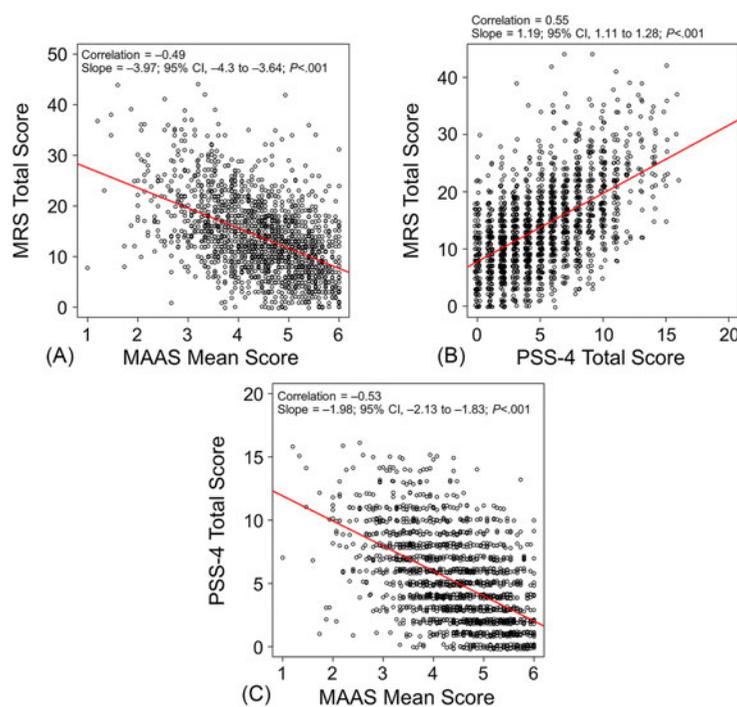


Figure 1. Relationship between mindfulness, stress, and menopausal symptoms. (A) MRS and MAAS scores. (B) MRS and PSS-4 scores. (C) PSS-4 and MAAS scores. CI, confidence interval; MAAS, Mindfulness Attention Awareness Scale; MRS, Menopause Rating Scale; PSS-4, Perceived Stress Scale-4.

Table 3. Multivariable linear regression analysis of the association of the MAAS and PSS-4 on the MRS adjusting for patient characteristics.

Variable	Estimate (95% CI) ^a	p-Value
MRS total		
PSS-4 total score	0.84 (0.46, 1.21)	<0.001
MAAS mean score	-1.16 (-1.75, -0.56)	<0.001
PSS-4 × MAAS ^b	-0.09 (-0.18, -0.01)	0.03
MRS psychological symptoms		
PSS-4 total score	0.58 (0.42, 0.74)	<0.001
MAAS mean score	-0.48 (-0.73, -0.23)	<0.001
PSS-4 × MAAS ^b	-0.06 (-0.09, -0.02)	0.001
MRS urogenital symptoms		
PSS-4 total score	0.09 (0.03, 0.14)	0.002
MAAS mean score	-0.49 (-0.67, -0.31)	<0.001
MRS somato-vegetative symptoms		
PSS-4 total score	0.02 (0.03, 0.08)	0.44
MAAS mean score	-0.39 (-0.56, -0.20)	<0.001

CI, confidence interval; MAAS, Mindfulness Attention Awareness Scale; MRS, Menopause Rating Scale; PSS-4, Perceived Stress Scale-4.

^aModels adjusted for age, race/ethnicity, education, anxiety, depression, and relationship satisfaction.

^bInteraction between PSS-4 and MAAS.

settings. The normative data for interpreting PSS-4 were compiled first in the United States²⁶ and later in England²⁵, and the psychometric properties of this instrument have been found to be acceptable. With use of the PSS-4, a respondent grades each item from 0 to 4 (0, never; 1, almost never; 2, sometimes; 3, fairly often; and 4, very often). Total scores for the PSS-4 range from 0 to 16, with higher scores indicating greater stress.

Mindfulness Attention Awareness Scale

The MAAS is a 15-item scale that measures the frequency of mindful states in day-to-day life²⁷. The scale was designed to measure mindfulness as present-centered attention and awareness in everyday experience. This capability was

recognized to vary within and between persons and was considered learnable with practice²⁸. The MAAS instrument is considered applicable regardless of an individual's personal experience with meditation²⁸.

The MAAS uses both general and situation-specific statements to assess mindfulness and is scored on a 6-point Likert scale (rating from 1, almost always to 6, almost never). A mean score is calculated. Higher MAAS scores correlate positively with more openness, awareness, positive affect, and well-being and correlate negatively with anxiety, stress, rumination, and neuroticism²⁷.

Statistical analysis

Unless otherwise specified, data are presented using mean (standard deviation [SD]) for continuous variables and frequency (percentage) for categorical variables. Linear regression was used to assess the associations of mindfulness and stress on menopausal symptoms on both univariate analysis and multivariable analysis, adjusting for other patient characteristics, including age, race, education, anxiety (Generalized Anxiety Disorder-7), depression (Patient Health Questionnaire-9), and relationship satisfaction (Kansas Marital Satisfaction Scale). All statistical tests were two-sided, and the threshold statistical significance was set at $p < 0.05$. All analyses were conducted using SAS statistics software version 9.4 (SAS Institute Inc.).

Results

In total, 2939 women were seen in the Women's Health Clinic from 1 January 2015 through 31 December 2016. Of these patients, 1744 women aged 40–65 years completed the

Table 4. Impact of the MAAS on the MRS (total and psychological domain) for given values of the PSS-4.

PSS-4 value	Change in MRS for 1-point increase in MAAS score
Total score	
0	-1.16
4	-1.53
8	-1.90
12	-2.27
16	-2.64
Psychological symptom score	
0	-0.48
4	-0.71
8	-0.94
12	-1.17
16	-1.40

MAAS, Mindfulness Attention Awareness Scale; MRS, Menopause Rating Scale; PSS-4, Perceived Stress Scale-4.

MRS, PSS-4, and MAAS questionnaires and were included in the analysis. We excluded 709 women because of age, 200 because of a lack of research authorization, and 286 because of incomplete information.

The mean (SD) age of participants was 53.4 (6.1) years (Table 1). More than 90% of the women were white, and more than 80% were married. The total mean (SD) MRS score was 13.9 (7.5); subscale-specific mean (SD) MRS scores were 5.3 (3.0), 4.5 (3.7), and 4.1 (2.8) for somato-vegetative, psychological, and urogenital domains, respectively (Table 2). The mean (SD) PSS-4 score was 5.1 (3.5); the mean (SD) MAAS score was 4.4 (0.9).

On univariate analysis, the MRS total score was negatively associated with the MAAS mean score (Figure 1(A)) and positively associated with the PSS-4 score (Figure 1(B)). A woman scoring 1.0 point higher on the MAAS scored on average 3.97 points lower on the MRS (95% CI, -4.30 to -3.64; $p < 0.001$). A woman scoring 1.0 point higher on the PSS-4 scored on average 1.19 points higher on the MRS (95% CI, 1.11 to 1.28; $p < 0.001$). A negative association was observed between the MAAS score and the PSS-4 score (Figure 1(C)). A woman scoring 1.0 point higher on the MAAS scored 1.98 points lower on the PSS-4 (95% CI, -2.13 to -1.83; $p < 0.001$).

On multivariable analysis adjusting for patient characteristics, a significant interaction effect was seen between the MAAS score and the PSS-4 score on the MRS score (Table 3). Participants reporting no stress (PSS-4 score of 0) had an MRS score that was 1.16 points lower for every 1.0 point higher on the MAAS score, while participants with very high stress (PSS-4 score of 16) had an average MRS score that was 2.64 points lower with every additional point higher on the MAAS score (Table 4).

In terms of individual MRS domains, there was a significant interaction effect of the MAAS score and the PSS-4 score on the MRS psychological domain score (Table 3). Participants reporting no stress (PSS-4 score of 0) had an MRS psychological domain score that was 0.48 points lower for every additional point higher on the MAAS, while those with high stress (PSS-4 score of 16) had an MRS psychological domain score that was 1.40 points lower for every additional point higher on the MAAS (Table 4).

There was no significant interaction effect between MAAS score and total PSS-4 score on the somato-vegetative and

urogenital domain scores ($p = 0.86$ and $p = 0.12$, respectively). Although there was no significant interaction, the main effects of both the MAAS score and the PSS-4 score were still significantly associated with MRS urogenital domain score (both $p < 0.01$). For the MRS somato-vegetative domain, the main effect of the MAAS score was significant ($p < 0.001$); however, the PSS-4 score was not associated with the MRS somato-vegetative domain score ($p = 0.44$) (Table 3).

Discussion

This cross-sectional study assessed the association of mindfulness and perceived stress on menopausal symptoms among midlife women. In this study of more than 1700 women seen at a tertiary care women's clinic, higher mindfulness and lower perceived stress correlated independently with lower menopausal symptom scores. There was a significant interaction effect between mindfulness and stress on overall and psychological menopausal symptom scores. Although mindfulness correlated with lower menopausal symptom burden across all levels of stress, the magnitude of association became larger as the self-reported stress increased.

Stress during midlife is multifactorial. Although some studies indicate that midlife stress is mostly related to perceived health, psychosocial factors, and role overload², other studies suggest that perceived stress also correlates with bothersome menopausal symptoms³. The present study demonstrated a positive correlation of perceived stress with menopausal symptom burden, which aligns with some of the existing literature³. Further, we found variability in the interaction effects between stress and menopausal symptoms on various domains of MRS. This correlation was most evident in the MRS psychological domain but was not statistically significant in the MRS somato-vegetative domain. This is a notable finding, given the fact that hot flashes and night sweats are the most commonly reported symptoms at menopause. Aligned with our observation, previous studies have demonstrated that distress and vasomotor symptom correlation may be accounted for by personality factors that mediate symptom awareness, rather than vasomotor symptoms per se²⁹⁻³¹. A previous study by our group demonstrated that the psychological symptoms, rather than the vasomotor symptoms, affected women's view of menopause negatively, which is consistent with the observation that specific menopause-related symptoms may have a variable impact on women³².

Mindfulness and menopausal symptom burden were negatively correlated in this study, most notably in the MRS psychological domain, a finding consistent with the limited existing literature on mindfulness training for midlife women with menopause-related symptoms^{21,33}. In a pilot study of 23 women, an 8-week MBSR intervention showed a 39% reduction in vasomotor symptoms, a 28% reduction in median menopause-specific QOL scores, and reduced stress³⁴. In a larger sample of 110 perimenopausal and postmenopausal women, the total reduction in menopausal symptom bother

was 21.62% with MBSR compared with 10.50% for the wait-listed control group²¹. Despite the small difference in the two groups for menopausal symptom bother, MBSR participants had significant improvements in QOL ($p=0.02$), subjective sleep quality ($p=0.009$), anxiety ($p=0.005$), and perceived stress ($p=0.001$). The North American Menopause Society, in its 2015 position statement on non-hormonal treatment strategies for vasomotor symptoms, included MBSR as a potential treatment strategy³⁵.

In the present study, mindfulness and stress interacted in their effects on overall and psychological menopausal symptoms, such that the effect of mindfulness on lowering menopausal symptom scores was more robust with higher stress scores. This is consistent with the current understanding of the interplay between mindfulness and stress. Mindfulness is thought to mitigate stress by decreasing emotional reactivity and maladaptive, negative, and ruminative thinking¹⁵. With mindfulness practice, thoughts and feelings are approached in an accepting non-reactive manner, which facilitates a healthier relationship with stress¹⁹. A study involving community-dwelling US adults aged 50–85 years demonstrated that mindfulness was positively related to mental health, and the negative effect of life stress was weakened for those with higher levels of mindfulness³⁶. Among individuals with multiple sclerosis, mindfulness correlated with better QOL³⁷. Similarly, mindfulness correlated with fewer symptoms for individuals with insomnia^{38,39}. Additionally, in multiple studies of health professionals in Singapore⁴⁰, India⁴¹, and Australia⁴², mindfulness was associated with reduced psychological stress and improved self-care. Mindfulness also has been shown to correlate with positive behaviors and outcomes, positive affect¹⁷, reduction in cognitive decline⁴³, and lower depressive symptoms⁴⁴.

The present study is distinctive in its assessment of the associations among mindfulness, stress, and menopause-related symptoms in a large sample of midlife women, showing a strong signal for the potential role of mindfulness in mitigating menopausal symptoms, particularly for women experiencing higher stress. Although additional studies are needed, training in mindfulness could be an important tool for women with bothersome menopausal symptoms.

This study has limitations. Participants were predominantly white, married, educated, and employed, thereby limiting the generalizability of the findings. The cross-sectional design limits conclusions to associative rather than causative correlations among mindfulness, stress, and menopause-related symptoms in midlife women. The tertiary care setting of this clinical cohort of participants is also a limitation. Future studies in community-based settings involving more ethnically and racially diverse populations are needed to confirm these associations.

In conclusion, this study showed a positive correlation between higher mindfulness and lower menopausal symptom scores in symptomatic midlife women, and this correlation was more robust in women experiencing higher stress. Although additional studies are needed, training in mindfulness may be a promising option for menopausal symptom management in midlife women.

Conflict of interest S.S.F. is a consultant for Mithra Pharmaceuticals SA and Procter & Gamble, Corp. On behalf of all authors, R.S. certifies that the authors have no affiliation with, or financial involvement in, any organization or entity with a direct financial interest in the subject matter or materials discussed in the manuscript (e.g. employment, consultant services, stock ownership, honoraria). The spouse of R.S. is owner of the Global Center for Resiliency and Wellbeing.

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