Exploring the impact of Socio-Economic Factors, Personality and Physical Activity on Menopausal Symptoms in Midlife Women: A cross-sectional Analysis

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Abstract

Background: The menopausal transition is influenced by various social, psychological, and physical factors. Understanding the influence of these factors, including socio-economic status (SES), personality traits, and physical activity, is essential for improving women's menopausal symptoms and general well-being during this stage.

Aim: This study aims to explore the association between menopausal symptoms and socio-economic status, personality traits, and physical activity in midlife women. To add, the collective influence of said predictors on menopausal symptoms were examined.

Method: Data were derived from the longitudinal MIDUS 3 (Midlife in the United States) study (2013-2014). 211 menopausal women aged 45–55 years (M = 51.9, Sd = 2.6) were included for cross-sectional analysis. First, a correlation analysis was conducted, followed by computing multiple regression analyses to examine the collective influence of the three predictor variables on menopausal symptoms.

Results: The SES Index negatively correlated with menopausal symptoms ($r = -.30$, $p < .001$), suggesting that higher SES is linked to less symptom severity. Neuroticism was associated with increased symptoms ($r = .35$, $p < .001$), while Conscientiousness was linked to reduced irritability ($r = -.15$, $p = .03$). Increased light and moderate leisure activities were associated with reduced overall menopausal symptoms ($r = -.19$, $p = .006$; ($r = -.17$, $p = .02$). The regression analysis showed that while the combined predictors explained 21.5% of the variance in menopausal symptoms ($R^2 = .22$, Adjusted $R^2 = .13$, $F(19, 178) = 2.57$, $p = .0007$), individual predictors like SES, personality traits, and physical activity were not statistically significant.

Conclusion: Overall, individual factors including higher SES, higher levels of conscientiousness and light to moderate leisure activities indicated reduced symptom severity in the correlation analysis. Moreover, also the combined effects of these predictors showed that the model significantly predicted symptoms. However, none of the individual predictors reached statistical significance in the multiple regression analysis, which may reflect that their influence is primarily collective rather than independent. Future research should include and explore a wider range of symptoms, consider hormonal and psychological variables, and employ longitudinal designs to create more individualized and successful treatment plans and improve menopausal women’s overall well-being.

Keywords: menopause, symptoms, women, midlife, physical activity, personality traits, mental health, the biopsychosocial model, socio-economic status

Exploring the impact of Socio-Economic Factors, Personality and Physical Activity on Menopausal Symptoms in Midlife Women: A cross-sectional Analysis

The middle years are marked as the phase between the ages 45 to 60 years, also known as midlife (Ayalon et al., 2014; Toothman and Barrett, 2011). For some, as they reach midlife, a decline in life satisfaction and additional stressors are experienced (Infurna, Staben, Lachman, & Gerstorf, 2021). According to Sharifi et al. (2014), particularly middle-aged women face a higher vulnerability to mental health problem development compared to their male counterparts. Especially loss of self-esteem, increased depressive symptoms and higher levels of suicide define the issues they often must face (Cybulska et al.,2020; Qin et al., 2022). Such symptoms are not to be underestimated and are often caused by a significant transformation that women undergo during this life stage: the menopausal transition (Utian, 2004; O'Neill & Eden, 2017).

The menopausal transition

Menopause is the phase in women's midlife where the menstruation ends, caused by the decreased production of the female sex hormone estrogen (Burger et al., 2002). Usually, women experience menopause between the ages 45 to 54, yet the average age lies at 51 years (Namazi et al., 2019; Ali, Ahmed, & Smail, 2020). This transition and its accompanied symptoms are not just a biological event but is closely connected with psychological and social dimensions, impacting the quality of life and mental health of midlife women (Namazi et al., 2019; Ali, Ahmed, & Smail, 2020).

Physical symptoms include hot flashes, night sweats, mood swings, vaginal dryness, headaches, lack of energy, and further symptoms (Schwarz et al., 2007), and are estimated to be experienced by over 50% of U.S. women (Woods & Mitchell, 2011). Psychological symptoms involve forgetfulness, poorer concentration, insomnia, depression, anxiety, irritability, and fatigue (Ali, Ahmed, & Smail, 2020). These complaints can last for 10 to 15 years, immensely influencing the quality of women's lives (Anderson et al., 2011). Moreover, since life expectancy is increasing, women are likely to experience prolonged periods of menopause (Kalhan et al., 2020) – underlining that high life quality and well-being during their extended years need to be maintained.

Strikingly, vasomotor symptoms affect up to 80% of US women, varying in frequency. For example, hot flashes are one of the most often reported vasomotor menopausal symptoms for which women seek treatment most often (Deecher & Dorries, 2007). On average, menopausal women report 4–5 hot flashes per day – however, some women have as many as 20 per day (Avis, Crawford, & Green, 2018). A follow-up study by The Health and

Employment After Fifty (HEAF) was conducted in 2019, assessing female participants' menopausal symptoms and found that 91.7% of them reported their symptoms being vasomotor with 68.2% having trouble sleeping and 63.6% experiencing psychological complaints (D'Angelo et al., 2022). Barber and Charles (2023) discovered that the majority of women, 77%, experience one or more symptoms they describe as "very difficult" and 10% of women even have left their jobs because of menopausal symptoms, highlighting the severe impact those symptoms can have.

These complaints have often been under-treated and under-reported, leaving many women struggling with significant quality-of-life issues (Barber & Charles, 2023). Although awareness of their impact has risen in the public health agenda - many women still lack adequate information, support, and understanding according to Barber & Charles, (2023). Nonetheless, though complaints are frequent and often severe, women's menopausal experiences vary considerably, including the rate of reporting menopausal symptoms. Women may experience all the symptoms or none (Loutfy et al., 2006). Prior studies that examined what underlies individual differences in the reporting of menopausal symptoms, found that varied experiences of menopausal symptoms among women are influenced by numerous factors (Avis, Brockwell & Colvin, 2005). To wit, the World Health Organization (2022) reported that menopausal women's health status is largely influenced by lifestyle, environmental, and sociocultural factors.

Yet, up until now, there is still very limited knowledge regarding what exact factors are responsible for making each woman's menopausal experience different (Freeman et al., 2007), or which factors put women at risk for experiencing severe complaints. Therefore, a need for better understanding of the differences in the expression of menopausal symptoms is needed, to improve the management of such symptoms and possibly reduce suffering for women at this life stage. Thus, this study aims to fill knowledge gaps by investigating how the factors of SES, personality traits, and physical activity are associated with the experience/severity of menopausal symptoms.

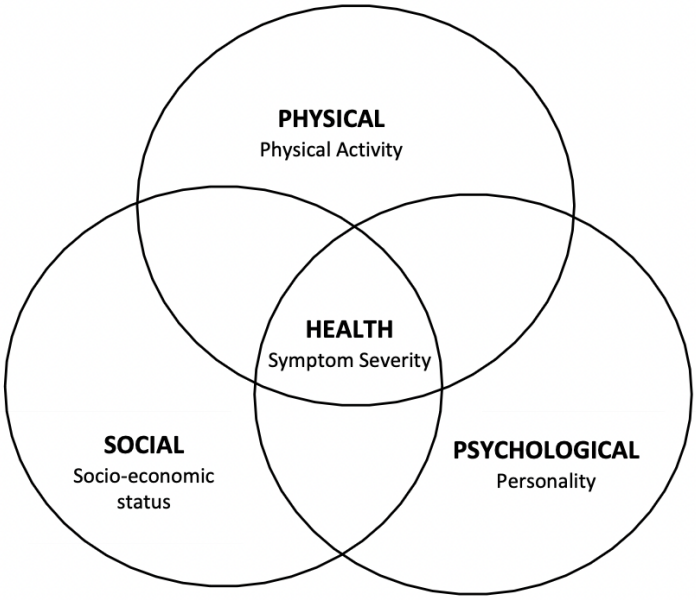
The Biopsychosocial Model

Since a comprehensive understanding of these influences remains limited, further exploration through a holistic lens such as the Biopsychosocial Model is called for (Engel, 1977). The Biopsychosocial model, depicted in Figure 1, suggests considering biological, psychological, and social factors to understand one's health– in this case, understanding menopausal complaints (Symptom Severity). The model suggests that consideration of all three factors is necessary for understanding and treating menopausal symptoms (Robinson

Kurpius, Hassert, & Nicpon, 2017). For example, a biological factor such as physical activity interacts with psychological aspects, like personality, as well as with social factors such as socio-economic status. Despite some understanding of the individual impacts of said 3 factors, studies examining them are limited. Most studies focus on separate components of the menopause experience, lacking a multidimensional approach that can provide a fuller understanding and better management of menopausal symptoms. In addition to that, current literature often fails to account for how intersections of SES, personality, and physical activity collectively influence menopausal symptoms. This neglect limits the development of tailored interventions and strategies that address the needs of diverse populations. Thus, this study aims to fill these gaps by examining how these factors are connected and influence menopausal experiences.

Figure 1

The biopsychosocial Model of Health



Relation between Socio-Economic Status and Menopausal symptoms

As stated by Shafiei et al., 2019, "socio-economic status (SES) is a symbol of social determinants of health which has a dominant influence on population health," and counts as one of the 'social' factors as described above in the example of the biopsychosocial model.

Socio-economic status (SES) refers to the social and economic position of an individual or group in relation to others, typically measured by factors such as income, education, and occupation, as according to the American Psychological Association (APA, 2024). SES impacts access to healthcare, quality of nutrition, stress levels, and overall lifestyle, which can significantly influence menopausal experiences (Namazi, 2019). When

the financial position and independence of a woman improves, the quality of life during menopause improves as well, since access to education, health care, support, and advisory services increases as well as one's self-esteem (Mirhaghjou et al., 2016). In contrast, women with lower SES may have greater stressors and limitations in obtaining healthcare, education, support services, and other important resources (McMaughan, Oloruntoba, & Smith, 2020; American Psychological Association, 2017), contributing to differences in the experience of menopausal symptoms.

To add, research suggests that a lower SES, but also childhood poverty, is associated with experiencing menopause sooner (Abdollahi et al., 2013). Despite existing research on the broad impacts of SES on menopausal experience and health, there remains a need for more refined investigations into how specific aspects of SES, such as income, education, and occupation, interact with other factors to influence menopausal symptoms. Thus, further examination provides an opportunity to explore these disparities and more detailed aspects of specific subgroups that may have not been thoroughly investigated before.

Relation between the Big 5 Personality Traits and Menopausal Symptoms

Another factor that may be of influence in the experience of menopausal symptoms, is a woman's personality. The Big 5 Personality Traits Model groups 5 distinct characteristics that form our personality: neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness, which influence our behavior, expectations, and abilities. (Costa & McCrae, 1999). A study by Huang (2017) concluded that the psychological dimension of one's health is substantially influenced by personality traits. In addition, it is known that personality affects our perception and management of symptoms (Hunter & Chilcot, 2013). Up until now, studies have found some indications of a relationship between certain personality traits and menopausal symptoms, but only neuroticism and extraversion were assessed and found significant of all big five factors. (Włodarczyk, 2021; Brown, 2009). Moreover, a study by Esmaeilzadeh et al. (2020), examining associations between personality traits with the severity of menopausal symptoms and depression levels, found a positive association between high levels of neuroticism and menopausal symptoms, suggesting that women with higher levels of neuroticism experience more severe menopausal symptoms due to heightened emotional responses.

Nonetheless, until now, little is known about all "five-factor" traits in association with menopausal symptoms. Especially, Openness, Conscientiousness, and Agreeableness have only been sparingly examined. Existing research reveals that women with infrequent symptoms of menopause were typified by higher levels of extraversion, agreeableness, and

conscientiousness. Nonetheless, further exploration and enhanced knowledge about how personality differences can play an influential role in reporting symptoms, their control, and effective treatment, may advance the treatment prognosis (Ghorbani et al., 2016). Thus, a better understanding is needed to assist in better management of symptoms.

Relation between Physical activity and Menopausal symptoms

During the menopausal transition, physical activity is a crucial element in maintaining health, offering functional and mental health benefits (Sternfeld & Dugan, 2011). Scientific studies and reviews examining the role of physical activity on mental health and well-being suggest a positive association between physical activity, overall life satisfaction, and reducing the risk of depression and anxiety (Sternfeld, 2011; Mahindru et al., 2023; An et al., 2020), which are common symptoms for menopausal women. As physical fitness brings these positive impacts it is especially important for women navigating menopausal symptoms and life pressures (Ylitalo et al., 2013; Murray et al., 2011). It also enhances physical health, thereby alleviating some of the biological impacts of menopause (Zhao, Niu, & Liu, 2022). Despite its potential importance, a survey by Women in Sport (2018) found that 30% of women reported reduced physical activity since starting menopause. Hence, as women undergo menopause, the decline in physical activity reveals a crucial time for promoting health. As for now, studies have investigated the effect of low, moderate, and high physical activity on menopausal symptoms, in which the focus mainly lies on the level of certain sport activities of women and lacks to consider how daily small activities in one's free time may benefit middle-aged women. For example, a study by Wu et al. (2023) measured the impact of physical activity with exercise-like activities on menopausal symptoms in Chinese women. This form of measurement for physical activity is typical for most studies in this area. Thus, this study aims to fill this research gap by examining daily leisure activity levels' influence on menopausal symptoms in midlife women.

Research Question

The purpose of this study is to examine how socio-economic status, personality, and physical leisure activity are associated with menopausal symptoms individually and collectively. Thus, the following research questions are examined:

1. To what extent is socio-economic status (SES) associated with severity and experience of menopausal symptoms in midlife women?
2. How are the Big Five personality traits, particularly extraversion, agreeableness, openness, and conscientiousness, associated with the severity of menopausal symptoms in midlife women?

3. How are different physical leisure activity intensities associated with the severity and types of menopausal symptoms in midlife women?
4. How are socio-economic status, personality traits, and physical activity collectively related to the severity of menopausal symptoms in midlife women?

Methods

Design

In this paper a Cross-sectional Analysis is performed, utilizing the results of the Midlife in the United States Study (MIDUS III) as the Dataset. MIDUS III was chosen as the primary dataset for this analysis due to its comprehensive collection of variables relevant to the study's objectives, particularly its measurement of physical activity, as well as of personality traits and socio-economic status indicators compared to MIDUS I and MIDUS II. As the name reveals, MIDUS III is the third wave of a longitudinal study in which data was collected between 2013 and 2014 and was lastly updated and revised in September 2021 (NIH, 2021). Participants were aged between 42–92 years (m = 64, Sd = 11) at the start of the study in 2013, and 55 % of the sample were women. It is a follow-up study of MIDUS I (1995 until 1997) and MIDUS II (2004 until 2006), in the U.S.A. (MacArthur Foundation, 2024). The study examined various health-related variables such as health, psychological well-being, and social factors to explore the dynamics of aging. The data was funded by the National Institute of Aging (NIA) and is openly accessible on the NIA website. For the follow-up waves II and III data collection was largely repeated for all relevant variables to ensure the most current and accurate participant data, with additional questions in selected areas (ICPSR, 2023; Ryff & Davidson, 2023). Storage and accessibility of data are given by the Respiratory of the University of Michigan (ICPSR, http://www.icpsr.umich.edu/). The sample consists of individuals in their midlife, living in the United States, and in total, the dataset consists of 3294 participants. The measurements include over 20,000 different variables while applying data documentation initiative (DDI) standards.

Participants

The participants for the *Midlife in the United States* Study (MIDUS III) were selected through national probability sampling by using random-digit-dialing (RDD), to ensure a random and representative sample within the US population (ICPSR, 2024). Moreover, ethical approval from the independent institutional review board of the University of Wisconsin-Madison was received. After approval, the data was tested and adjusted for proper inclusion of minority groups and ethnicities, as well as socioeconomic and age divisions. This

ensured adequate representativeness of the data throughout the USA (NIA, 2021). In total, 3294 participants were sampled in the MIDUS III via telephone screening to identify individuals willing to participate again. The inclusion criteria for the current study were [1] indicating having the sex female, [2] being between the ages 45 and 55 (at Wave 3), [3] having relevant data on socio-economic status, personality traits, and their physical activity levels in the MIDUS III dataset, and [4] experiencing menopause. All participants not fitting these criteria or having missing values were excluded. In total, 211 participants were eligible and formed the final sample. The average age of the final sample was 52 (M = 51.96, Sd = 2.62).

Procedure

Participants of the MIDUS III study were required to indicate their demographic data, like age, material status, or gender, in a 30-minute interview via phone. In addition, self-administered questionnaires (SAQ) were sent to the participants through postal delivery, which included a variety of scales to assess subjective well-being, to fill in afterward. After completing the survey, participants were asked to share feedback and thoughts on a provided sheet and were finally asked to send back the SAQs including feedback in the original envelope. For encouragement, a compensation of sixty dollars was offered for completing all questionnaires. For the current study, these measures of the SAQ are used in a cross-sectional manner to examine the research questions.

Relevant variables for the current study

Descriptive Statistics

Measures of age, marital status, and education were utilized as descriptive variables for the sample. These sociodemographic variables were collected through a self-administered questionnaire, in which the participants were asked to indicate their age with the year they were born. For the current study, the age was summarized with mean and standard deviation, in two age groups (45-50 to 51-55). Their marital status was presented as either married (coded as 1) or separated/divorced/widowed/never married (coded as 2). In addition, the female sample was characterized by indicating the frequencies (n) and percentages (%) for the relevant variables, education levels, poverty status, self-rated financial situation, personality traits (agreeableness, extraversion, neuroticism, openness, and conscientiousness), and for light, moderate, and vigorous leisure activities. Further descriptions of the categorization and coding of these variables can be found below. Light, moderate, and vigorous leisure activities and the five personality traits were computed and displayed with the number of scores (n) and the belonging percentages (%) that were above the original study (MIDUS 3) means. This

was done to summarize all relevant, and potentially influential variables and to compare averages to benchmarks from the original MIDUS 3 study to provide a comprehensive profile of the participants (n = 211).

Onset of Menopause

To assess if Menopause had set in or not the question "Do you know if your menstrual period[s] stopped for any of the following reasons – menopause?" was used (ICPSR, 2024). Women could indicate "yes" or "no", thereby, separating women being in menopause from those who are not, since only menopausal women are included in the current study. To improve coherence and readability in this research the variable will be called "menopause" and indicates that the participant has entered the menopausal stage.

Menopausal symptoms

The measure of menopausal symptoms included the use of a questionnaire based on the work of Rossi (2004). This questionnaire included a list of potential menopausal symptoms. From this list, five specific symptoms were selected for the current study: insomnia, heavy sweating, painful intercourse, hot flashes, and irritability. These five symptoms were chosen due to their widespread occurrence in menopausal women (Harvard Health Publishing, 2017). In addition, these five symptoms encompass various domains related to menopause, including vasomotor symptoms (hot flashes), psychosocial symptoms (irritability), physical symptoms (heavy sweating and insomnia), and sexual changes (painful intercourse). This approach ensures that the most reported and impactful symptoms are evaluated. The women were asked to rate how often they experienced each of the five menopausal symptoms in the past 30 days. The women responded on a six-point scale (1 = almost every day, 2 = several times a week, 3 = once a week, 4 = several times a month, 5 = once a month, 6 = never). For the current study, the items were not reverse scored. To generate an Index score (Menopausal Symptom Index), the mean of the 5 menopausal symptoms was calculated, providing a measure that reflects the overall severity of symptoms experienced. The menopausal symptom scale score showed an overall Cronbach's Alpha of .65, indicating moderate reliability. This suggests that the items have a reasonable internal consistency but may not be highly reliable for some applications. The categorization of participants experiencing minor or severe menopausal symptoms was based on predefined thresholds, ranging from 1 (more complaints) to 6 (less complaints), meaning that higher scores indicate fewer complaints. Scores 1 to 3 were classified as severe complaints (experience symptoms once week or more). Scores ranging from 4 to 6 were classified as minor complaints (experience symptoms several times per month or less). To generate the

total scores for all symptoms combined, the mean scores of the five menopausal symptoms, categorized in minor and severe, were computed directly without any recoding.

Socio-economic status

For the assessment of the Socio-Economic Status (SES) of women in midlife, four different indicators were used: *educational level*, coded as 1 = low (no graduation), 2 = intermediate (High school graduate/no degree), 3 = high (bachelor degree or higher); *poverty status*, coded as 1 = household income below 150% of household poverty guidelines (poverty) and 2 = household income above 150% of household poverty guidelines (no poverty); and *self-rated financial situation,* assessed with the question "Using a scale range from 0 to 10" where 0 means "the worst possible financial situation" and 10 means "the best possible financial situation," how would you rate your financial situation these days", which was re-coded into three categories; 0–3 = poor (coded as 1), 4–7 = average (coded as 2), 8–10 = good (coded as 3). In addition, a sum score of a self-rated financial situation (1= poor, 2 = average, 3= good), and educational level (1 = low, 2= intermediate, 3= high) was created (Forbes & Krueger, 2019). These dichotomous variables along with poverty status were combined to create a general SES index, ranging from 3 (lowest) to 8 (highest). By combining these variables, the SES index offers a more comprehensive understanding on the influence of the socioeconomic position on menopausal symptoms, compared to considering each variable in isolation (Adler & Stewart, 2010). The construction of the SES index follows established practices in socioeconomic research. For example, similar composite measures have been used in studies such as by Wheeler, Czarnota, and Jones (2017), where multiple indicators are combined to create a measure of SES. Nonetheless, the alpha value of .61 suggests that while there is some level of consistency among these variables, it is not particularly strong.

Personality Traits

To measure the Personality Traits the self-administered adjectival measures of the Big Five Inventory (John et al., 1991) was used in the MIDUS 3 (Prenda & Lachmann, 2001). Participants were asked to indicate the extent to which each of 25 adjectives described themselves, using a scale ranging from 1 (not at all) to 4 (a lot). The adjectives (5 for each personality trait) were moody, worrying, nervous, and calm for *neuroticism*; outgoing, friendly, lively, active, and talkative for *extraversion*; creative, imaginative, intelligent, curious, broad minded, sophisticated, and adventurous for *openness*; organized, responsible, hardworking, and careless, for the *conscientiousness variable*; and helpful, warm, caring, softhearted, and sympathetic for *agreeableness*. To ensure interpretive consistency across all variables in the analysis, the personality trait scores were reverse-coded. This adjustment was

made to align the directionality of the scales with that of the menopausal symptoms, where higher scores represent lower levels of symptoms.

Physical Activity

Physical Activity levels were assessed with a self-report questionnaire which measured participants' frequency of certain physical activities during leisure time, differentiating for activities categorized as low leisure physical activity, moderate leisure physical activity, and vigorous leisure physical activity. These were again differentiated and reported for summer and winter months, each. These variables were taken from Midlife in the United States (MIDUS 3), 2013-2014 and are based on the EAT-III, the GUTS seasonal measurement tool, emphasizing to report each activity by season (summer and winter) to improve accuracy (Godin & Shepard, 1985; Sallis et al., 1993). However, since the leisure activity levels for winter and summer months highly correlated, a mean score for summer and winter months was computed for each activity category (low, moderate, vigorous).

For measurement, participants were asked to rate the frequency of certain activities, such as for moderate activity (with "bowling or using a vacuum cleaner" as examples), and vigorous activity (with "running or lifting heavy objects long enough to work up a sweat" as examples) with scoring 1 = *several times a week or more*; 6 = *never* (Rector et al., 2019). So higher scores are indicating fewer of those activities (light, moderate or vigorous).

Data Analysis

For the preparation and analysis of the cross-sectional study, the programming language R (RStudio) was used. To start, participants not fitting the criteria were filtered out to form the final dataset. Next, Pearson correlations were computed to examine significant associations between the independent variables and the dependent variable to test the proposed hypotheses. Significance of $p < .05$ and a confidence interval of 95% were set for all tests. To add, reliabilities of the scales was investigated using Cronbach's Alpha.

Further, a multiple regression analysis was performed to assess the unique contribution of each predictor to the variation in the dependent variable (menopausal symptoms) and their collective influence on the menopausal symptom experience.

Results

In Table 1 the basic characteristics of the sample participants are presented. The average age of the final sample was 52 (M = 52, Sd = 2.6). 63.5% were married and 36.5% single/divorced or widowed.

Table 1

Characteristics of the female respondents (N =211)

Sample characteristic	Categories	M (SD)	N	%
Age		52 (2.6)		
	45-50		54	25.6
	51-55		157	74.4
Marital Status, (Recoded)				
	Married (0)		134	63.5
	Single/Divorced/Widowed (1)		77	36.5

Note. N = number of participants, % = percentage of sample, M = mean, SD = standard deviation

Table 2 presents descriptive statistics on the menopausal symptoms of the women in the sample. Analyses showed that most women experienced more severe menopausal symptoms (59.9%), and 40.1 % suffered from minor symptoms. Insomnia and intercourse pain were predominantly reported as severe, affecting 81.5% and 84.1% of women in this sample. This indicates that these symptoms are more intense compared to others. In contrast, hot flushes were more sparingly reported, with 58.5% of women experiencing this symptom less frequently.

Table 2

Descriptive scores of menopausal symptom severity of the female sample (N = 211)

Menopausal symptom	n (%)	M
Sweat frequency (range)		3.7
Minor (4-6)	115 (54.4)	
Severe (1-3)	96 (45.6)	
Irritability		3.9
Minor (4-6)	112 (53.3)	
Severe (1-3)	99 (46.7)	
Hot flushes		3.4
Minor (4-6)	123 (58.5)	
Severe (1-3)	88 (41.5)	
Insomnia		1.8
Minor (4-6)	39 (18.5)	
Severe (1-3)	172 (81.5)	
Intercourse pain		2.3
Minor (4-6)	34 (15.9)	
Severe (1-3)	177 (84.1)	
Total score (range)		3.6
Minor (4-6)	85 (40.1)	
Severe (1-3)	126 (59.9)	

Note. Scores on the severity of the menopausal symptoms originally range from 1-6, with higher scores indicating fewer complaints. Scores ranging 1 to 3 = severe complaints (experience symptoms once week or more), and scores ranging 4 to 6 = minor complaints (experience symptoms several times per month or less). To generate total scores for all symptoms combined, the mean of the 5 menopausal symptoms, differentiated in minor and severe, was calculated.

In Table 3, the statistics of the participants' characteristics and the main predictor variables are presented to provide an overview of the sample's sociodemographic, psychological, and behavioral profiles. The educational attainment of the participants shows that a majority were high school graduates (51.7%), with a substantial proportion also holding college degrees (41.7%). Only 6.6% had no graduation. The socioeconomic status indicators reveal that 88.2% of the participants were above the poverty threshold, while 11.8% were categorized as facing poverty. The assessment for financial situation indicated that most

women rated their situation as average (51.7%) or good (36.5%), with a smaller group indicating that they are enduring poor financial conditions (11.8%). As for personality traits, the most common were neuroticism and agreeableness. Specifically, for each, 60.7% of participants reported being above-average in these traits, followed by extraversion (54.5%), conscientiousness (50.2%), and openness (46.9%). In relation to physical activity, the data indicate the following distribution of above-average leisure activity: 29.4% reporting light leisure activities (LLA), 39.3% moderate activities (MLA), and 40.3% in vigorous physical activities (VLA).

Table 3

Description of the formed female sample (N = 211) from the MIDUS III study

Variable	Categories	n	%	M (SD)
SES Index (3-8)		211		6.4 (0.9)
Educational level				
	No graduation (1)	14	6.6	
	High school graduate (2)	109	51.7	
	College graduate (3)	88	41.7	
Poverty status				
	Poverty (1)	25	11.8	
	No poverty (2)	186	88.2	
Financial situation				
	Poor (1)	25	11.8	
	Average (2)	109	51.7	
	Good (3)	77	36.5	
Personality Trait				
	Neuroticism [1-4]			2.1 (0.6)
	Extraversion [1-4]			3.1 (0.6)
	Openness [1-4]			2.9 (0.5)
	Agreeableness [1-4]			3.4 (0.5)
	Conscientiousness [1-4]			3.4 (0.5)
Physical Activity				
	Light Leisure activity [1-6]			2 (1.5)
	Moderate Leisure activity [1-6]			2.9 (1.8)
	Vigorous Leisure activity [1-6]			3.6 (1.9)

Note. The mean (M) and standard deviation (SD) represent the values of the MIDUS 3 sample (N = 3294).

Relationship between menopausal symptoms and Socio-Economic Status (SES)

In Table 4, the Pearson correlation analysis between menopausal symptoms and various measures of SES are presented. It revealed several significant correlations between socioeconomic factors and menopausal symptoms. Educational Level showed a moderate negative correlation with the Menopausal Symptom Index ($r = -.30$, $p = .001$), suggesting that higher academic standing is associated with reduced menopausal symptoms. Financial Situation presented a moderate negative correlation with Irritability ($r = -.26$, $p < .001$) and a

weaker correlation with the Menopausal Symptom Index (r = -.20, p = .003), suggesting that monetary difficulty is related to heightened irritability and higher symptom severity. Similar to the Financial Situation, the assessment for Total Income showed a moderate negative correlation with Irritability (r = -.17, p = .02) and weaker for the Menopausal Symptom Index (r = -.21, p = .002), revealing that a higher income level is associated with lower irritability and fewer symptoms. Further, the SES Index showed moderate negative correlations with Sweat Frequency (r = -.27, p < .001), Irritability (r = -.27, p < .001), Hot Flashes (r = -.19, p = .008), and the Menopausal Symptom Index (r = -.30, p < .001), highlighting that higher socioeconomic standing is linked to fewer and less severe menopausal symptoms.

Table 4

Pearson correlation between menopausal symptoms and various measures of SES (N = 211)

Menopausal symptom	Educational level r (p-value)	Financial situation r (p-value)	Total income r (p-value)	SES Index r (p-value)
Sweat frequency	-.11 (.003)	-.20 (.004)	-.21 (.002)	-.27 (<.001)
Irritability	-.19 (.04)	-.26 (<.001)	-.17 (.02)	-.27 (<.001)
Hot flushes	-.15 (.006)	-.11 (.11)	-.11 (.13)	-.19 (.008)
Insomnia	-.07 (.49)	-.19 (.006)	-.14 (.04)	-.16 (.02)
Intercourse pain	-.14 (.27)	.03 (.66)	-.10 (.16)	-.08 (.24)
Index	-.30 (.001)	-.20 (.003)	-.21 (.002)	-.30 (<.001)

Note. Index = Menopausal Symptom Index (range = 1-6)

Relationship between menopausal symptoms and Personality Traits

In Table 5, correlations are displayed between menopausal symptoms and personality traits. The most noteworthy result is the significant positive correlation of Neuroticism with several menopausal symptoms. There was a moderate and statistically significant positive correlation between Neuroticism and sweat frequency (r = .27, p < .001), and a strong correlation with irritability (r = .48, p < .001), suggesting that individuals with higher levels of Neuroticism report increased sweat frequency and irritability. In addition, Neuroticism correlated with hot flushes (r = .18, p = .01) and insomnia (r = .18, p = .008), though these associations were not as strong. The menopausal symptom index showed a moderate positive correlation with Neuroticism (r = .35, p < .001), revealing that higher levels of Neuroticism

are associated with higher menopausal symptom severity. Conversely, Conscientiousness exhibited a small but significant negative correlation with irritability (r = -.15, p = .03), suggesting that higher Conscientiousness is associated with lower irritability. Despite this, Agreeableness, Extraversion, and Openness showed weak and non-significant correlations with menopausal symptoms, implying that these traits do not considerably influence menopausal symptoms.

Table 5

Pearson correlation of personality traits of women with menopausal symptoms (N = 211)

Menopausal symptom	Agreeableness r (p-value)	Extraversion r (p-value)	Neuroticism r (p-value)	Conscientiousness r (p-value)	Openness r (p-value)
Sweat frequency	-.09 (.20)	-.09 (.21)	.27 (p<.001)	-.08 (.25)	-.08 (.22)
Irritability	-.11 (.10)	-.09 (.19)	.48 (p<.001)	-.15 (.03)	-.11 (.12)
Hot flushes	-.09 (.17)	-.05 (.47)	.18 (.01)	.02 (.80)	-.09 (.18)
Insomnia	.04 (.57)	.04 (.61)	.18 (.008)	-.17 (.02)	.07 (.30)
Intercourse pain	.08 (.27)	.04 (.57)	.06 (.36)	.07 (.28)	.03 (.67)
Index	-.08 (.26)	-.06 (.35)	.35 (<.001)	-.06 (.38)	-.09 (.22)

Note. Index = Menopausal Symptom Index (range = 1-6)

Relationship between menopausal symptoms and Physical Activity levels

In Table 6, the Pearson correlation analysis of the three different Physical leisure activity indicators and menopausal symptoms is presented. Light leisure activity was significantly negatively correlated with irritability (r = -.18, p = .008), hot flushes (r = -.19, p = .006), and the overall menopausal symptom index (r = -.19, p = .006), implying that increased light leisure activities are associated with reduced severity of these symptoms. However, sweat frequency, insomnia, and intercourse pain demonstrated weak, non-significant correlations with light leisure activity. Regarding moderate leisure activity, a modest negative correlation with irritability was observed (r = -.17, p = .02), suggesting that increased participation in moderate physical leisure activities may alleviate irritability, similar to light leisure activity. Alternatively, vigorous leisure activity revealed largely weak negative correlations with the symptoms, underscoring that its impact on said symptoms is less evident.

Table 6

Pearson correlation analysis on the influence of light, moderate, and vigorous *leisure activity on menopausal symptoms (N = 211)*

Menopausal symptom	Light Leisure Activity r (p-value)	Moderate Leisure Activity r (p-value)	Vigorous Leisure Activity r (p-value)
Sweat frequency	-.13 (.06)	.03 (.66)	.05 (.48)
Irritability	-.18 (.008)	-.17 (.02)	-.02 (.79)
Hot flushes	-.19 (.006)	-.01 (.94)	-.03 (.64)
Insomnia	-.02 (.83)	-.07 (.32)	.04 (.06)
Intercourse pain	-.04 (.56)	.06 (.37)	-.13 (.06)
Index	-.19 (.006)	-.03 (.70)	-.04 (.61)

Note. Index = Menopausal Symptom Index (range = 1-6)

Multiple regression analysis of the predictors on Menopausal Symptoms

After conducting the Pearson correlation analysis, a multiple regression analysis was performed (see Table 7) to further understand how SES, Personality, and Physical Activity, along with their interactions, collectively influence menopausal symptoms. The results of the analysis showed that the built model explained 21.5% of the variance in menopausal symptoms ($R^2 = 0.215$). The F-statistic of 2.565 ($p = .0007$) reflected that the combination of predictors significantly contributes to the model's ability to explain variance in menopausal symptoms. This means that at least one of the predictors is likely to be associated with variations in menopausal symptoms when considered together, even though individual predictors may not be statistically significant on their own. For example, SES was not a significant predictor of menopausal symptoms when considered independently, ($B = .39$, $p = .51$) in this analysis. In addition, none of the personality traits (p-values ranging from .18 to .73) or physical activity levels (p-values ranging from .10 to .57) showed statistical significance. The interaction terms also do not show significant results, suggesting that the combined effects of SES with personality traits or physical activity levels do not significantly impact menopausal symptoms. The residual standard error was 4.85, and residuals ranged from -18.18 to 8.39, demonstrating variability but no extreme values. These findings suggest while the model indicates some collective significance of the predictors, the individual predictors and their interactions do not show strong associations with menopausal symptoms, meaning they may not be strongly influencing menopausal symptoms in this sample.

Table 7

Multiple Regression Analysis of Predictors on Menopausal Symptoms (N = 211)

Predictors	Estimate	SE	t-value	p-value
Intercept	11.66	12.38	.94	.35
SES	.39	.59	.66	.51
Agreeableness	-1.85	2.82	-.66	.51
Neuroticism	1.87	2.08	.90	.37
Conscientiousness	1.14	3.27	.35	.73
Extraversion	3.87	2.89	-1.34	.18
Openness	-1.14	2.98	-.38	.70
Light Activity	-2.08	1.27	-1.64	.10
Moderate Activity	-.72	1.24	-.58	.57
Vigorous Activity	-1.07	1.20	-.90	.37
SES × Agreeableness	.09	.17	.54	.59
SES × Extraversion	-.19	.17	-.14	.26
SES × Neuroticism	-.00	.11	-.00	.99
SES × Conscientiousness	-.14	.17	-.84	.40
SES × Openness	-.01	.17	-.06	.96
Activity × Agreeableness	-.05	.26	-.21	.83
Activity × Extraversion	-.08	.26	-.32	.75
Activity × Neuroticism	.05	.21	.24	.81
Activity × Conscientiousness	.43	.28	1.51	.13
Activity × Openness	.13	.24	.54	.59

Note. Residual standard error = 4.85, Multiple R-squared = 0.22, Adjusted R-squared = 0.13, F-statistic = 2.57 on 19 and 178 DF, p-value = .0007.

Discussion

This study aimed to examine the impact of socio-economic status, personality traits and physical activity on menopausal symptoms in midlife women. The results of the univariable analyses revealed weak but significant relationships between severe menopausal

symptoms and lower SES, higher levels of neuroticism and lower levels of conscientiousness. Further, it was observed that increased light and moderate physical leisure activities showed a protective effect in menopausal symptom experience.

For SES, specifically, higher educational and better financial resources were associated with reduced menopausal symptoms, including irritability and overall symptom severity. Regarding the SES Index, negative correlations with sweat frequency, irritability, and hot flashes suggest that women with elevated socioeconomic standing tend to experience less severe menopausal symptoms, highlighting the importance of socioeconomic factors in influencing menopausal experiences. This implies that SES is a critical factor in shaping women's experiences during menopause. These findings align with previous research, which emphasize that SES is key factor influencing health outcomes, including those linked to menopause (Shafiei et al., 2019; Namazi et al., 2019). Specifically, it was revealed that higher educational attainment and better financial conditions demonstrated a decrease in menopausal symptoms, including irritability and the overall severity of symptoms. This aligns with the general understanding that those with a higher socioeconomic standing tend to have better access to resources, such as healthcare and education, which may potentially diminish the consequences of menopausal symptoms (American Psychological Association, 2024; Mirhaghjou et al., 2016). However, other factors, such as health-related behaviors may also contribute to this association. For example, women with higher SES may be more likely to adopt health-promoting behaviors (O'Neil et al., 2020), such as regular exercise, reducing mood swings or maintaining a healthier diet, positively impacting hormone levels. Further confirming this, the negative correlations between the symptoms sweat frequency, irritability, and hot flashes and the SES Index, may potentially indicate that better healthcare access, healthier lifestyles, and less stress, likely provides a protective benefit during menopause (McMaughan et al., 2020). This highlights the need to view SES not merely as a fixed measure but as an evolving factor that influences individuals' health at various stages throughout life. Thus, addressing SES disparities is crucial for improving menopausal health outcomes. Public health interventions could improve such education, healthcare, and financial resources for women, especially for those from disadvantaged socio-economic backgrounds.

Moving on, the analysis revealed that certain personality traits influence the menopausal experience. Especially neuroticism played a significant role, increasing irritability levels and greater sweat frequency, hot flashes, and insomnia. This suggests that menopausal symptoms are typically more severe in women who are more neurotic. In contrast, higher conscientiousness levels were associated with reduced irritability, while the

other Big 5 personality traits, including agreeableness, extraversion, and openness, showed no significant effect, indicating little influence on menopausal symptom severity. These findings offer valuable insights into the impact of personality traits, particularly neuroticism and conscientiousness on symptom experience during the menopausal stage. The strong influence of neuroticism on increased irritability, sweat frequency, hot flashes, and insomnia, highlights the significant impact that personality can have on the menopausal experience. This may be due to the fact that women with higher levels of Neuroticism may perceive and react to menopausal changes more negatively, potentially enhancing their symptom severity or their judgement on them. This aligns with existing literature which reveal that neuroticism increases proneness to stress and negative emotional reactions, intensifying the experience of physical and psychological symptoms during menopause (Grochans et al., 2018). The link between Neuroticism and menopausal symptoms is also confirmed in research by Esmaeilzadeh et al., 2020, which suggests that this trait influences both psychological responses, like irritability, and physical symptoms, such as sweat frequency and hot flashes. This highlights the interconnectedness of psychological and biological processes during menopause and supports the need for holistic symptom management approaches. Thus, women with high neuroticism levels may benefit from stress management and other tailored interventions to reduce this negative impact.

On the other hand, conscientious individuals, who tend to be more organized, disciplined, and health conscious (Casòliva Cabana, 2024, para. 3), may engage in behaviors that reduce stress and enhance well-being, thereby possibly reducing the intensity of menopausal symptoms. This aligns with previous research showing that higher conscientiousness is linked to better health outcomes, including lower levels of chronic stress and healthier lifestyle choices (Hill et al., 2011). This protective role of conscientiousness emphasizes that women who possess this trait may find menopause easier to manage. To add, it highlights the value of educating women during this stage about self-management techniques, especially for the ones' that don't possess this protective trait. No significant links for Agreeableness, Extraversion, or Openness were found, suggesting these traits may have little to no influence on the menopausal experience. Nonetheless, these traits may have subtler effects not captured by the study, emphasizing that not all personality traits have a similar impact on menopausal symptoms. Broadly, the results underline the role of personality in menopause and support the biopsychosocial model, which is also confirmed by a study of (Hunter & Smith, 2017). The model integrates psychological, biological, and social factors in

influencing health outcomes (Engel, 1977). This understanding can help healthcare providers tailor more personalized approaches to managing menopausal symptoms.

Transitioning to another aspect, engagement in light and moderate physical leisure activities was linked to a decrease in certain menopausal symptoms. Particularly, light leisure activity was strongly correlated with decreased irritability, hot flashes, and overall symptom severity. This indicates that even mild physical activities can help reduce menopausal suggesting that even low-intensity physical activities can help reduce menopausal suffering. A further finding supporting this advantage of physical activity, was the negative correlation of moderate leisure activities. However, rather a tendency was observed for moderate activities, only showing a strong and significant correlation with irritability. Vigorous leisure activities on the other hand, had weak and mainly negative, yet non-significant associations, suggesting a weak influence on menopausal symptoms. These results provide strong evidence that leisure activities, even mild ones, significantly reduce menopausal symptoms in midlife women. This highlights the value of regular exercise or activities, even at low intensity, in coping with said symptoms and may offer a non-pharmacological way to improve life quality during this transitional phase. The observed relationship between light physical activity and reduced irritability and hot flashes is consistent with the increasing research that highlights the benefits of exercise on mental well-being. Prior studies have shown that physical activity can improve mood, lower anxiety and improves well-being overall. Such benefits are especially important during menopause, when women are especially susceptible to mood swings and psychological distress (Sternfeld & Dugan, 2011; Mahindru et al., 2023). These findings are supported by this study's observations, which show that even low-intensity activities like stretching or casual gardening can make a meaningful difference in easing the physical and psychological consequences of menopause. Furthermore, the idea that regular physical activities at different intensities may be beneficial, is further supported by the modest negative correlation between moderate physical activity and irritability, though the effects were not as strong as those of light activity. Nonetheless, they still suggest that women who engage in activities like brisk walking, cycling, or swimming may experience some relief from menopausal symptoms. In contrast, vigorous physical activity had no effects on menopausal symptoms, possibly due to its lower stress-relief properties compared to lighter activities (Elavsky & McAuley, 2007).

In addition to highlighting the need for individualized exercise recommendations in menopausal therapy, this suggests that light to moderate exercises are more beneficial for relieving symptoms. According to research, public health initiatives should support frequent

mild to moderate physical activities, such as yoga, walking or similar light leisure activities, to reduce menopausal symptoms and enhance general health (Ylitalo et al., 2013). The multiple regression analysis revealed that SES, personality traits, and physical activity collectively play a role in shaping menopausal symptoms, although their individual roles are minor and less impactful than predicted. This would suggest that menopausal experiences are unlikely to be strongly influenced by any single factor among these variables. However, this contrasts with the results of the correlation analyses, which yielded clear and expected outcomes. The subtle contributions of the three predictors may indicate overlapping influences or shared variance which may mask their independent effects in this regression analysis. Next to that, this could point to the presence of moderating or mediating variables not included in the analysis, such as hormonal fluctuations, stress levels, or cultural factors, which might better explain menopausal symptoms. Interestingly, even though the predictors as a group showed significance, their individual and combined interactions did not stand out, hinting at the possibility that their effects might operate indirectly or be overshadowed by other unmeasured factors. These findings point out the complexity of menopausal symptoms and invite further exploration - such as hormonal changes, lifestyle, or stress, that may better explain the differing experiences of menopause.

Strengths and Limitations

Some strengths and noteworthy limitations are present in this study. A strength is that during the data collection process of MIDUS III, the sample was evaluated and adjusted to ensure proper representation of minorities and ethnic groups, as well as adequate socioeconomic distribution (ICPSR, 2023), improving the study's reliability, validity, and generalizability. This may make the findings applicable not only to the USA but also to European countries with similar demographic profiles. A further strength is the study’s inclusive approach, as it considers women at all menopausal stages. Although this may also pose as a limitation, as this study does not allow for detailed comparisons between stages, it focuses on the more general impact of the three predictors on menopausal symptoms.

As for limitations, the study relied solely on self-reported physical activity, which may lead to a bias or inaccurate measurements of exercise frequency and intensity, which could impact the strengths of the associations that were found, particularly for vigorous activities, since associations were weak (Olds et al., 2019; Elavsky & McAuley, 2007). In addition, women's individual mindsets and attitudes about menopause - which are known to affect symptom severity, management, and general quality of life. (Kwak, Park, & Kang, 2014) – were not considered, possibly overlooking critical factors that influence symptom severity.

Further, some critical menopausal symptoms, such as impaired memory, lack of concentration, nervousness, bone & joint complaints, urine control problems, and weight gain, were not included due to a high number of participants not reporting them, possibly due to misinterpretation of symptoms or other factors.

Lastly, the study did not consider women using Hormone Replacement Therapy (HRT), which might alleviate menopausal symptoms and may have impacted the reporting of symptom severity in this study. Thus, this may affect how accurate the study conclusions are. The last limitation is the cross-sectional design of this study, as it does not allow to make causational interpretations regarding the direction of the relationship (Rindfleisch et. al., 2008). As a result, though associations with the three predictors and menopausal symptoms were observed, it remains unclear whether these factors directly impact symptom severity or if other factors may be at play.

Directions for future Research

Future research should consider more menopausal symptoms which have not been included in the study, such as vaginal dryness, urine control problems and weight gain. This would provide a more nuanced understanding of all menopausal symptoms and their correlation with SES, personality, and physical activity. Additionally, examining other potential influencing factors, such as hormonal levels, lifestyle choices, and psychosocial stressors, could refine our understanding of how these various factors interact to affect menopausal experiences. Further, future research should employ longitudinal designs to possibly assist in explaining the causal relationships and offer a more thorough understanding of long-term interactions between these factors.

In addition, future research should give precedence to exploring women's own mindsets and beliefs about menopause, as these psychological factors are crucial for a detailed insight of the menopausal experience and would include an emotional dimension that may shape how women perceive and cope with menopausal symptoms. Research has consistently shown that perceptions and attitudes toward menopause impact symptom severity, management, and quality of life (Kwak, Park, & Kang, 2014), influencing their symptom responses, help-seeking behaviors, and compliance with interventions. Thus, further exploring these aspects may lead to more effective, personalized management approaches.

Moreover, for future practice, interventions should be tailored to address both physical and psychological aspects of menopause. As an example, personalized support programs that consider individual attitudes and beliefs, personality, and individual educational level in general and regarding menopause could improve treatment adherence. Additionally,

implementing awareness campaigns that enhance knowledge and coping strategies might reduce the burden of symptoms. Incorporating psychological support and stress management into treatment may alleviate menopause's impact and improve women's overall well-being.

Conclusion

This cross-sectional study aimed to explore the effects of socio-economic status (SES), personality traits, and physical activity on menopausal symptoms among midlife women. While individual factors including higher SES, conscientiousness, as well as light to moderate leisure activities indicated reduced symptom severity, the combined effects of these predictors were not statistically significant. These findings emphasize the complex nature of menopause and implies that the combined effects of SES, personality, and physical activity may be more intricate than originally assumed. Nonetheless, the individual, isolate effects of the predictors highlight the need for a holistic approach, meaning that incorporating the Biopsychosocial Model to better understand and manage menopausal symptoms is recommended. Future research should address these complexities by including a wider variety of symptoms, explore additional influencing factors (HRT, hormonal fluctuations, medication use etc.), consider psychological aspects (mindset, attitudes, beliefs) and employ longitudinal designs to clarify causative relationships. This may assist in developing more effective and personalized management strategies, ultimately improving the quality of life for women experiencing menopause.

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