

**The Moderating Role of Physical Activity in the Relationship between Symptom
Severity and Well-Being in Women during their Menopause**

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Abstract

Introduction: Menopause is a challenging stage in life, characterised by the cessation of the menstrual cycle and associated with menopausal symptoms that might affect women's well-being. Although physical activity is recognised to reduce these menopausal symptoms, its role as a moderating factor is poorly explored. Therefore, this study investigates the association between the severity of menopausal symptoms and well-being while examining whether physical activity moderates this relationship.

Method: This cross-sectional study assessed menopausal symptoms in 53 women using the Menopause Rating Scale and evaluated their well-being through the Mental Health Continuum—Short Form. Physical activity levels were measured through a researcher-constructed item. Data were analysed through regression models to test the relationship between menopausal symptom severity, well-being, and the moderating effect of physical activity on these variables.

Results: The analysis revealed a significant negative association between menopausal symptom severity and well-being ($b = -.41$, $SE = 0.13$, $t = -3.02$, $p = .004$). Psychological menopausal symptoms had a significant negative impact on well-being ($b = -0.40$, $SE = 0.11$, $t = -3.56$, $p < .001$), while somatic, - and urogenital symptoms did not show significant effects. Physical activity did not significantly moderate the relationship between menopausal symptom severity and well-being ($b = -.04$, $SE = .05$, $t = -.80$, $p = .428$).

Conclusion: The study confirmed that menopausal symptoms, particularly psychological symptoms such as depression, anxiety, irritability, and exhaustion, negatively influence well-being. However, physical activity did not moderate this effect. Despite some insignificant results, the widespread prevalence of menopausal symptoms in women and their association with reduced well-being emphasise the need for continued research in this area.

Keywords: Menopausal Symptoms, Somatic, - Psychological, - Urogenital Symptoms, Well-being, Physical Activity

Introduction

The transition to menopause represents a critical life phase characterised by significant hormonal, psychological, and social challenges for women (Süss et al., 2021). *Menopause* is marked by the cessation of women's reproductive abilities, primarily through the end of regular menstrual cycles (World Health Organization [WHO], 2022). This loss of fertility is due to a decline in ovarian function, with reduced production of reproductive hormones like oestrogen and progesterone (Davis et al., 2023; Ragasudha et al., 2021). The onset of this life stage usually occurs between 45 and 55, although the timing naturally varies among women worldwide (WHO, 2022). During menopause, several symptoms such as hot flashes, depression, anxiety and vaginal dryness may arise (Bondarev et al., 2020; WHO, 2022). Notably, research shows that the risk of depression almost doubles for women during menopause (Freeman, 2015). Additionally, some studies have shown that menopausal symptoms are associated with reduced well-being, reflecting the impact of these physical and psychological changes on a woman's life (Mishra, 2020). However, physical activity has been shown to reduce the severity of menopausal symptoms and improve well-being (Mishra, 2020; Mohammed & Mohammed, 2018). Although much of the research on menopausal symptoms has traditionally focused on their impact on mental illness, the broader implications for well-being across different menopausal symptoms have received comparatively less attention (Brown et al., 2015a). Therefore, exploring the interaction between menopausal symptoms, well-being, and physical activity during the menopausal transition is essential.

Symptoms of Menopause

Menopausal symptoms affect 80% to 85% of women (Brown et al., 2015b; Elavsky & McAuley, 2007; Freeman, 2015; O'Neill & Eden, 2017). These symptoms can be broadly categorised into three domains (Joseph et al., 2014). Firstly, *somatic symptoms*, encompassing hot flashes and night sweats, alongside with sleep problems, joint and muscular discomfort (Heineman et al., 2004). Secondly, women may experience *psychological symptoms*, including depressive moods, irritability, anxiety, and mental exhaustion (Heinemann et al., 2004). Lastly, *urogenital symptoms* involve changes that affect the urinary tract and vaginal health, such as dryness, incontinence, and sexual discomfort (Heineman et al., 2014). The severity of all three domains of those symptoms is associated with lower quality of life (Rashad et al., 2007). Furthermore, depression is more frequently observed in women during the menopausal transition than in women during other life stages (Brown et al., 2015b; Glavic, 2019). A cross-sectional study found that almost half of the studied women experienced severe menopausal symptoms, which were significantly positively correlated

with increased levels of anxiety and depression (Mohammed & Mohammed, 2018). While investigating mental illness is essential, it does not ensure complete mental health (Westerhof & Keyes, 2009). Therefore, it is equally essential to explore and enhance mental well-being in menopausal women.

Well-being and Menopausal Symptoms

The conventional view that identifies mental health with the absence of mental illness is criticised by Westerhof and Keyes (2009). As an alternative, they developed the *Two-Continua Model of Mental Health*, which assumes that mental health and mental illness are connected but distinctive dimensions. According to this model, positive mental health includes the absence of mental illness and the presence of well-being (Westerhof & Keyes, 2009). Mental *well-being* is a multifaceted concept containing *emotional well-being*, such as happiness and life satisfaction, *psychological well-being*, which includes individual functioning and self-actualisation, and *social well-being*, which reflects an individual's value to society (Westerhof & Keyes, 2009). Correspondingly, mental health goes beyond the absence of mental illnesses (Westerhof & Keyes, 2009).

This perspective on mental health might be particularly relevant to the study of menopause and its associated symptoms, as it highlights that women can face challenges that are not categorised as mental illnesses but which may impact their well-being (Rindner et al., 2017). The focus of most research on menopausal symptoms has examined their effects on mental illness (Brown et al., 2015a; Brown et al., 2015b). In contrast, studies on the relationship between menopausal symptoms and mental well-being are less common, which is crucial for a holistic understanding of mental health (Brown et al., 2015a; Brown et al., 2015b). Accordingly, Süß et al. (2021) emphasised the importance of promoting positive mental health and maintaining emotional stability during significant life transitions such as menopause. This approach strengthens resilience and serves as a protective factor against the challenges associated with menopause. Evidence supports this perspective, suggesting that while many women struggle with psychological issues such as depression and anxiety during menopause, others report positive effects, including newfound freedom and personal growth (Brown et al., 2015b).

Contrary to the potential positive aspects of menopause, research findings indicate that the interference of menopausal symptoms can significantly predict lower levels of happiness, life satisfaction, and overall mental well-being (Mishra, 2020; Sosa-Ortega et al., 2022). Kishida and Elavsky (2017) found that although women did not always report lower overall life satisfaction due to severe menopausal symptoms, they did experience significant daily

fluctuations in well-being. Specifically, on days when symptoms were more severe, their well-being noticeably decreased. Additionally, Lee and Lee (2022) explored how menopausal symptoms mediated the relationship between self-efficacy and well-being, underscoring a complex interplay between symptom experiences and well-being. Mishra (2020) and Sosa-Ortega et al. (2022) similarly documented the negative impacts of menopausal symptoms on mental well-being. Specifically, significant negative correlations between various menopausal symptoms and life satisfaction were determined, with psychological symptoms showing a moderate correlation, while somatic and sexual symptoms had weak correlations (Sosa-Ortega et al., 2022).

Despite these findings relating to life satisfaction, limited research shows that the relationship between menopausal symptoms and well-being varies across different symptom dimensions. Among the few studies, psychological symptoms have been found to impact mental health more than somatic and urogenital symptoms (Glavic, 2019). The effect of psychological symptoms on well-being is less examined, but research showed that nearly half of the women with psychological menopausal symptoms experienced mild or moderate depression (Rindner et al., 2017), suggesting a potential link between the severity of psychological symptoms and reduced well-being. Thus, the severity of menopausal symptoms may negatively affect women's well-being, while different types of symptoms might impact well-being to varying degrees (Rindner et al., 2017). Recognising these distinctions is crucial not only for academic understanding but also for effectively tailoring treatments to improve well-being among menopausal women. By identifying if somatic, - psychological or urogenital symptoms influence well-being the most, healthcare providers can develop more targeted interventions that address these critical symptoms. For example, research has shown that cognitive behavioural therapy addresses and enhances especially psychological symptoms by improving mood fluctuations and quality of life (Li et al., 2019; Spector et al., 2024). Therefore, identifying the most significant symptom types allows the creation of targeted strategies, ensuring more women receive the necessary support during menopause.

Physical Activity in Relation to Menopausal Symptoms and Well-being

Exploring factors that may influence how menopausal symptoms affect well-being could provide important insights into effective interventions. *Physical activity* is recognised for its positive effects on menopausal symptoms and well-being. Literature suggests that engaging in physical activity enhances mental health and leads to a more positive experience of menopause (Brown et al., 2015b; Bondarev et al., 2020; Bondarev et al., 2021; Hybholt, 2022). Wu et al. (2023) concluded that moderate to high physical activity levels correlate with

less severe menopausal symptoms. Thus, moderate- to high levels of physical activity could be a protective factor against the intensity of symptoms (Wu et al., 2023). Supporting this, another cross-sectional study showed a U-shaped pattern in the association between physical activity and menopausal symptoms, with the moderate activity group having the least symptoms, followed by the high activity group and the low activity group (Kim et al., 2014). However, another study highlighted that physical activity consistently enhances mental well-being among middle-aged women, showing positive effects regardless of physical performance levels (Bondarev, 2021). Furthermore, research highlights that physical activity can effectively address various menopausal symptoms, including psychological, urogenital, and somatic symptoms (Dabrowska-Galas, 2019; Elvasky & McAuey, 2007). Although several studies underscore the beneficial effects of physical activity on menopausal symptoms and overall well-being, further research is required to fully comprehend its role as a potential moderating factor in this relationship.

Study Rationale

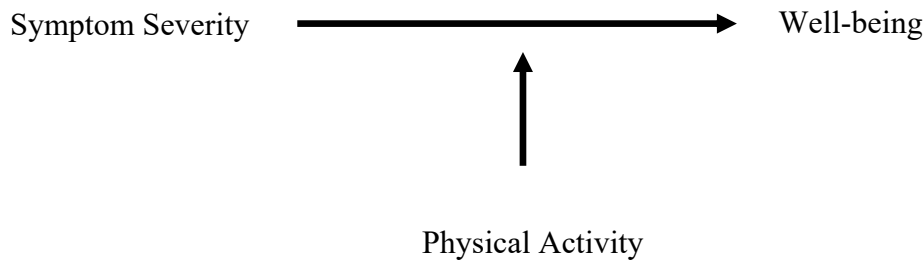
This research aims to explore how menopausal symptom severity is associated with well-being and whether physical activity moderates this relationship. Building on the evidence that menopausal symptoms generally have a negative impact on well-being (Kishida & Elavsky, 2017; Mishra, 2020), this study will further focus on how different symptoms- somatic, psychological, and urogenital- affect well-being. Prior research suggests that psychological symptoms have the strongest impact on well-being (Glavic, 2019). Additionally, physical activity is suggested to reduce the severity of menopausal symptoms, which subsequently enhances well-being (Bondarev et al., 2020). Consequently, the following hypotheses have been formulated:

H1: Menopausal symptom severity is negatively associated with well-being.

H2: Somatic-, psychological-, and urogenital symptoms each independently have a negative association with well-being.

H3: Psychological symptoms have the strongest negative association with well-being compared to somatic-, and urogenital symptoms.

H4: Physical activity moderates the relationship between menopausal symptom severity and well-being during women's menopause (Figure 1).

Figure 1*Visualisation of Moderation Model***Methods****Study Design**

This research was part of an ongoing annual longitudinal study involving several researchers with quarterly assessments. The current study focused on a cross-sectional analysis based on data from a single measurement moment. Thus, only relevant variables for the study were described. Ethical approval was provided by the University of Twente's Ethics Committee within the Faculty of Behavioural, Management and Social Sciences under the approval number 231487.

Participants

Participants were recruited through convenience and snowball sampling from various community settings, including educational institutions, workplaces, and social media platforms (Instagram, n.d.; WhatsApp, n.d.). For this study, only women who stated they were currently in menopause and spoke Dutch, German or English were included. The final sample comprised 53 women. The women's ages ranged from 43 to 63 years ($M = 53.75$, $SD = 4.87$). Most of the participants were Dutch and highly educated, with the majority of women employed part-time. Table 1 visualises all socio-demographic data.

Table 1*Socio-demographic Data of the Participants $N = 53$*

	n	%
Nationality		
Dutch	35	66
German	10	19

Turkish	6	11
Other	2	4
Education Level		
Primary School	2	3
Secondary School	2	4
Vocational Secondary Education	8	15
Bachelor's Degree	20	38
Master's Degree or PhD	21	40
Job Status		
Full-Time	19	36
Part-Time	22	42
Homemaker/stay-at-home parent	5	9
Student	1	2
Retired	6	11
Marital Status		
Married/ Registered Partnership	31	59
Divorced/separated	14	26
Widowed	1	2
Never been married	7	13

Materials

Screening

A screening question was used to obtain a relevant sample. The Participants were asked a question constructed by the researcher ("Do you think you are currently in menopause?"). The response options were "Yes," "No," or "I do not know." Only women who answered "Yes" were included in the study sample.

Symptom Severity

The Menopause Rating Scale (MRS), developed by Heinemann et al. (2004), was used to assess the menopausal symptoms of the participants in this study. This comprehensive instrument, which was validated for its accuracy in capturing the wide range of menopausal symptoms, includes 11 items categorised into three domains: somatic (4 Items), psychological (4 Items), and urogenital (3 Items). Participants rated their current symptoms on a 5-point Likert scale from 0 (*none*) to 4 (*severe*). Somatic symptoms included items such as the

severity of "hot flushes" or "sweating", psychological symptoms encompassed items such as "depression" or "anxiety", and urogenital symptoms contained items like "vaginal dryness" or "sexual problems". Higher mean scores indicated more severe symptoms. The scale proved to have strong reliability with a Cronbach's alpha of .82 (Heinemann et al., 2004; Khatoun et al., 2018). This was supported by the current study ($\alpha = .82$), indicating good reliability. The questionnaire is visualised in Appendix A.

Well-being

To evaluate participants' mental well-being in this study, the 14-item Mental Health Continuum – Short Form (MHC-SF) developed by Keyes et al. (2008) was utilised. This instrument assessed three distinct dimensions of well-being: emotional well-being (3 Items), social well-being (5 Items), and psychological well-being (6 Items), which reflected the individual's experience over the preceding month. For instance, emotional well-being was assessed with questions like "How often did you feel happy?". Social well-being was evaluated with items such as "How often did you feel that the way our society works makes sense to you?". Lastly, psychological well-being was measured by queries like "How often did you feel your life had a sense of direction or meaning?" (Keyes et al., 2008). Participants responded to these items on a 6-point Likert scale ranging from 0 (*never*) to 5 (*almost always*). Higher mean scores reflected higher levels of mental well-being. The MHC-SF demonstrated strong psychometric reliability, evidenced by its high internal consistency and low measurement error (Lamers et al., 2010). The current study's reliability was ($\alpha = .90$), indicating excellent reliability. The scale is displayed in Appendix B.

Physical activity

An additional item was created to assess the level of physical activity. This was measured by asking the participant about the exercise frequency ("How often do you exercise?"). Participants were asked to indicate their exercise habits, choosing between the options *almost daily* (1) to *never* (5). Answer items were reverse-coded to imply that higher scores indicated higher physical activity levels.

Procedure

Data was collected between January 2024 and April 2024. The study questionnaire was hosted on the online platform Qualtrics (Qualtrics XM—Experience Management Software, 2024). The questionnaires were accessible in Dutch, German, or English. At the start of the survey, participants received a welcome message, information regarding the study and confidentiality (Appendix C). They were briefed on the study's objectives and their rights as participants. Further, they agreed to the informed consent before proceeding with the

survey (Appendix D). The MHC—SF was presented first, followed by the Physical Activity Item and, lastly, the MRS Scale. Respondents had the possibility of withdrawing from the study at any time. Completing the questionnaire took approximately 30 to 45 minutes.

Data Analysis

The statistical analysis was conducted in Rstudio (Version 2024.04.2+764). The data preparation included error checking and excluding incomplete responses. The descriptive statistics were calculated for the demographic data and study variables. Subsequently, psychometric assumptions verified the model's reliability and validity. The Shapiro-Wilk test indicated normality for the MRS scale ($W = .96, p = .099$) and the MHC-SF scale ($W = .96, p = .108$). Residual plots showed no patterns, suggesting linearity. Additionally, homoscedasticity was affirmed by the Breusch-Pagan test ($BP(1) = .09, p = .814$). Lastly, the Durbin-Watson statistic ($DW = 2, p = .201$) confirmed the absence of autocorrelation. Afterwards, correlations were calculated between the study variables. Three regression analyses were performed to test the three hypotheses. For the first hypothesis, a linear regression with menopausal symptom severity (MRS) as the independent variable and well-being (MHC-SF) as the dependent variable was implemented. Secondly, another linear regression analysis was performed using the subscales of the MRS, somatic-, psychological-, and urogenital symptoms as predictor variables and well-being (MHC-SF) as the dependent variable. Lastly, a moderation analysis using a linear regression model was conducted with symptom severity (MRS) as the independent variable, well-being (MHC-SF) as the dependent variable, and physical activity as the moderator. The interaction between physical activity and menopausal symptom severity (MRS) was calculated.

Results

Descriptive Statistics and Pearson Correlations

Table 2 presents the descriptive statistics and the Pearson correlations among all variables. Correlations between MRS subscales and MHC-SF were negative and moderate, while urogenital symptoms were not associated with well-being. The correlations between all variables with Physical Activity are not significant.

Table 2*Descriptive Statistics and Pearson- Correlations for Study Variables (N= 53)*

Variable	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Total MRS	2.36	1.14	-								
2. Somatic	2.53	1.17	.84**	-							
3. Psychological	2.3	1.05	.85**	.58**	-						
4. Urogenital	2.19	1.20	.67**	.39**	.34**	-					
5. Total MHC- SF	3.06	1.14	-.39**	-.32**	-.51	-.01	-				
6. Emotional	3.13	1.21	-.33*	-.25*	-.52**	.07	.87**	-			
7. Social	2.74	1.19	-.30*	-.34*	-.35*	.03	.86**	.64**	-		
8. Psychological	3.31	0.99	-.39**	-.25**	-.50**	-.10	.91**	.72**	.64**	-	
9. Physical Activity	3.68	1.20	-.04	-.02	.11	-.00	.00	-.02	.02	.01	-

*Note. *p < .05, **p < .01*

Hypothesis testing

H1: Menopausal symptom severity is negatively associated with well-being.

The results of the linear regression model revealed that menopausal symptom severity was significantly negatively associated with well-being ($b = -0.41$, $SE = 0.13$, $t(51) = -3.02$, $p = .004$). Menopausal symptoms also explained a significant proportion of variance in well-being scores ($R^2 = 0.15$, $F(1,51) = 9.17$, $p = .004$). Thus, H1 is accepted.

H2: Somatic, psychological, and urogenital symptoms each independently have a negative association with well-being.

Overall, the predictors of the second model accounted for a significant variation in well-being scores ($R^2 = 0.30$, $F(3, 49) = 7.01$, $p < .001$). However, the results indicated that only psychological symptoms were significantly negatively associated with well-being. The associations of somatic symptoms and urogenital symptoms with well-being were not statistically significant (see Table 3). Thus, H2 is rejected.

H3: Psychological symptoms have the strongest negative association with well-being compared to somatic, - and urogenital symptoms.

The linear regression analyses demonstrated that psychological menopausal symptoms have the strongest negative association with well-being, compared to somatic, - and urogenital symptoms (see Table 3). Consequently, H3 is accepted.

Table 3

Results of linear regression model- Effects of different MRS Dimension on well-being Score

	Estimate	Standard Error	t- value	p-value
Intercept	3.83	0.31	12.32	<.001**
Somatic symptoms	-0.08	-0.14	-0.61	0.542
Psychological symptoms	-0.40	0.11	-3.56	<.001**
Urogenital symptoms	0.17	0.11	1.58	0.121

*Note. * $p < .05$, ** $p < .01$*

H4: Physical activity moderates the relationship between menopausal symptom severity and well-being during women’s menopause.

The third regression was overall statistically significant ($R^2 = 0.18$, $F(3, 49) = 3.69$, $p = .018$). However, Physical activity alone was not significantly associated with well-being. Moreover, no moderation effect was found by physical activity (see Table 4). Hence, H3 is rejected. In Figure 2, the results of the moderation effect are visualised.

Table 4

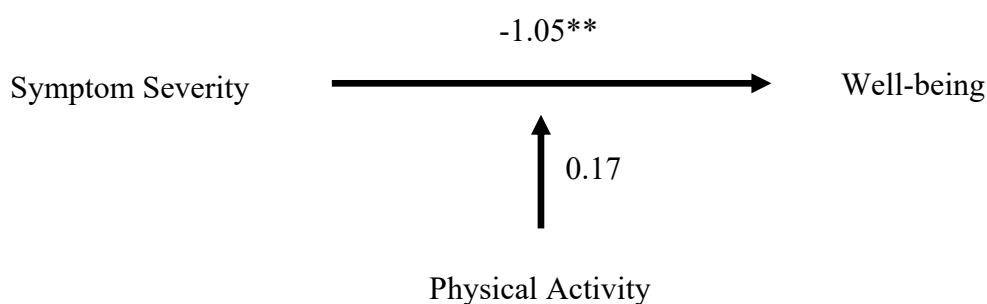
Results of the moderation analysis – physical activity as moderator between menopausal symptom severity and well-being

	Estimate	Standard Error	t- value	p-value
Intercept	5.52	1.21	4.56	<.001**
MRS	-1.05	0.49	-2.14	.037
Physical Activity	-0.41	0.32	-1.29	.205
MRS*Physical Activity	0.17	0.13	1.37	.177

*Note. *p < .05, **p < .01*

Figure 2

Visualisation of Moderation Effect



*Note. *p < .05, **p < .01*

Discussion

The present study investigated the relationship between menopausal symptoms and well-being during menopause while focusing on the moderating role of physical activity. The results imply that psychological symptoms are significantly negatively associated with well-being, while somatic, - and urogenital symptoms show no significant association. Additionally, physical activity does not moderate this relationship.

Firstly, the results of this research confirmed that overall menopausal symptom severity is negatively associated with well-being, indicating that experiencing more severe menopausal symptoms leads to lower well-being. These findings align with previous research that has documented the negative impacts of menopausal symptoms on mental well-being (Kishida & Elavsky, 2017; Lee & Lee, 2022; Mishra., 2020). This relationship is particularly relevant as it contributes to the broader discourse on well-being across the lifespan, emphasising the need for targeted intervention. Research provides evidence that well-being throughout life follows a U- shaped development, with the lowest point in well-being during middle age (Blanchflower & Oswald, 2008). Apart from menopausal symptoms, middle-aged women face increased psychological and environmental stress due to significant life changes such as children's independence, retirement, and parental loss, which exacerbate feelings of self-identity loss and fragility, further diminishing well-being (Lee & Lee, 2022). Consequently, identifying the specific impact of menopausal symptoms from other midlife stressors could provide important insights for the development of effective interventions. Nevertheless, this study has demonstrated that menopausal symptoms have a significant impact on well-being, highlighting the need for interventions that specifically target these symptoms and improve the well-being of women in midlife.

The results of the second hypothesis indicated that psychological symptoms are significantly negatively associated with well-being. In contrast, the associations of somatic,- and urogenital symptoms with well-being are not statistically significant. This is not aligned with previous studies that have shown an effect of each dimension of menopausal symptoms on mental health (Rashad et al., 2007). A potential explanation for the non-significant effect of somatic symptoms is that, although they are common, the psychological symptoms are more notable due to their significant impact on the quality of life during menopause (Glavic, 2019). Additionally, the development of different symptoms over time during menopause could explain why no influence of somatic,- and urogenital symptoms on well-being was found. Supporting this, a longitudinal study conducted over six years by Rindner et al. (2020) observed that while the severity of somatic,- and urogenital symptoms generally decreased,

psychological symptoms increased over the same time period. This idea is further substantiated by the finding of Joseph et al. (2014), showing that women who experience a longer duration of menopause tend to report that some types of symptoms are perceived as less severe. This reduced perception of severity could be due to a better adaptation over time (Joseph et al., 2014), potentially diminishing the impact of some symptoms on overall well-being. This can lead to the assumption that the somatic,- and urogenital symptoms of menopause have less of an impact on women's general well-being as they become more accustomed to them.

However, it is confirmed that psychological symptoms have the strongest negative association with well-being. This finding is consistent with previous research, which highlighted that psychological symptoms have a significant impact on lower quality of life compared to somatic, - and urogenital symptoms (Glavic, 2019). This implies that enhancing well-being during menopause may not require addressing all types of menopausal symptoms. Instead, increasing well-being is influenced by improving psychological symptoms. Hence, interventions during menopause should focus on psychological symptoms rather than somatic, - or urogenital symptoms. Glavic (2019) underscores the critical impact of psychological symptoms on mental health, suggesting that women who score high in the psychological dimension on the MRS should also be screened for depression. This measure should be helpful for adapting treatment plans to address mental health (Glavic, 2019). Given these findings, prioritising psychological symptoms in interventions is crucial to enhance well-being during menopause effectively.

Furthermore, no significant moderating effect of physical activity was found in the relationship between the severity of menopausal symptoms and well-being. These findings do not align with previous research in this field (Bondarev, 2020; Bodarev, 2021; Hybholt, 2022; Wu et al., 2023). This discrepancy may arise because the current study solely examined the frequency of physical activity rather than its intensity, which has been shown to impact the effectiveness of managing menopausal symptom severity (Kim et al., 2014; Wu et al., 2023). Engaging in moderate- to high levels of physical activity has been associated with less severe menopausal symptoms (Wu et al., 2023). For example, engaging in vigorous activities for at least 20 minutes on three or more days per week or daily walking for at least 30 minutes may effectively mitigate menopausal symptoms (Wu et al., 2023). Therefore, the rejection of the hypothesis could be connected to the reason that the intensity of physical activity was not investigated. However, there is also evidence that physical activity consistently improves mental health and reduces menopausal symptoms, regardless of physical performance level

(Bondarev, 2021). This apparent contradiction between the existing research and this study emphasises the possibility that other factors may influence this relationship, such as the type of activity, its frequency, or the individual health status of the participants. Therefore, a closer examination of the concept of physical activity itself may be required.

Strengths and Limitations

One of the primary strengths of this study is the use of well-validated instruments, specifically the MRS and MHC-SF. The high internal consistency of the questionnaires ensures reliable measurements of menopausal symptom severity and well-being in this research. Another strength is the examination of multiple dimensions of menopausal symptoms, including somatic-, psychological-, and urogenital symptoms in relation to well-being. This multidimensional approach allows for a more comprehensive understanding of which menopausal symptoms impact well-being the most, rather than viewing menopausal symptoms as one construct. This allows for more differentiated insights that can lead to more targeted interventions. Additionally, providing the questionnaire in Dutch, German, and English potentially enhanced the study's accessibility and inclusivity, aiming to engage a more diverse group of respondents.

Despite its strengths, this study has several limitations that should be acknowledged. First, the sample size was relatively small, comprising only 53 women. This limited number of participants increases the risk of a Type II error, where the study might fail to detect an effect that exists (Nayak, 2010). The predominance of highly educated women in the sample, with about 78% having a bachelor's or master's degree, does not represent the experiences of less educated women. An additional limitation relates to the sampling methods used. Convenience sampling may lead to biases, as participants are selected according to availability and willingness (Emerson, 2021). Moreover, the main disadvantage of snowball sampling is that it depends on the initial participants' network. The sample may end up being composed of individuals connected to each other, limiting the diversity and representativeness of the sample (Etikan & Bala, 2017).

Furthermore, self-reported menopausal status can be inaccurate because menstruation might stop for reasons other than menopause, such as medical treatments or hysterectomy, leading to misclassification and reduced study validity (Yap et al., 2022). In addition, the study's measurement of physical activity is based on a single item, which was not part of a validated scale. The question only indicated the frequency of exercise and omitted essential details such as duration, intensity, and type of exercise, which might have varying impacts on menopausal symptoms and well-being (Hybholt, 2022; Skrzypulec et al., 2010; Wu et

al.,2023). Moreover, this question relies on participants' subjective interpretation of what constitutes 'physical activity', which can vary widely across individuals (Kim et al., 2020). This subjectivity and the potential for social desirability bias further undermine the measurement's validity. Without a validated and objective tool, it is challenging to ensure consistency and comparability of the data across studies and populations (Kim et al., 2020; Prince et al., 2008). Furthermore, cross-sectional studies gather data at a single point in time, which allows for identifying associations among variables but does not establish causal relationships (Wang & Cheng, 2020). Because all data is collected simultaneously, it is challenging to ascertain if one variable directly influences another or if observed associations are due to other changing factors over time (Wang & Cheng, 2020). Thus, it cannot provide the longitudinal perspective to outline cause and effect.

Suggestions for Future Directions

Future research should enhance the generalisability of findings on menopausal symptoms, well-being, and physical activity by including a more diverse sample of women from various educational backgrounds. Research indicates that education affects the experience of menopausal symptom severity (Fallahipour et al., 2022). Some studies suggest that highly educated women report more symptoms due to greater health awareness (Joseph et al., 2014). Conversely, other studies indicate that educated women experience fewer symptoms, as they have better access to medical advice and adopt healthier lifestyles, including increased physical activity (Chedraui et al., 2007). These conflicting findings suggest that the relationship between education and menopausal symptoms is complex and requires further investigation. Therefore, stratified sampling could help achieve a more representative sample, enhancing a diverse range of women from various educational backgrounds and cultural contexts. This technique gives researchers more control over the composition of their samples, thereby increasing the population coverage (Rahman et al., 2022).

Furthermore, future research should improve the validity of the screening on menopausal status. Applying standardised and validated methods for assessing menopausal status - such as more accurate screening procedures, significantly improves the accuracy of the data and ensures that the results are more valid (Yap et al., 2022). In addition, how physical activity is conceptualised and operationalised should be reconsidered. Employing more detailed methods, such as more comprehensive and reliable physical activity questionnaires, could provide more accurate insights. Randomised controlled trials (RCTs) for future research could reliably determine whether interventions, such as physical activity

programmes, directly affect menopausal symptoms and well-being. By controlling for confounding factors, RCTs would allow making more causal inferences (Listl et al., 2016). Future research could also consider a mixed-method approach incorporating qualitative methods such as interviews or focus groups. This method could provide deeper insights into the subjective experiences of menopause and personal interpretations that may be overlooked in self-reported quantitative data (Prince et al., 2008; Wasti et al., 2022).

Conclusion

This study investigated the relationship between the severity of menopausal symptoms and well-being, focusing on the potential moderating role of physical activity. The findings reveal that severe menopausal symptoms are associated with lower well-being, particularly showing the strongest and only significant association between psychological menopausal symptoms and well-being. However, no significant moderating effect of physical activity on the relationship between menopausal symptoms and well-being was observed. Nevertheless, further research is essential to improve the understanding of the dynamics between menopausal symptoms, well-being, and physical symptoms, facilitating targeted interventions to improve women's experiences of menopause.

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Appendices

Appendix A

Menopause Rating Scale (MRS)

Which of the following Symptoms apply to you at this time ?

0-None, 1- Mild, 2- Moderate, 3- Severe

1. Hot flushes, sweating (episodes of sweating)
2. Heart discomfort (unusual awareness of heartbeat, heart skipping, heart racing, tightness)
3. Sleep problems (difficulty in falling asleep, difficulty in sleeping through, waking up early)
4. Depressive mood (feeling down, sad, on the verge of tears, lack of drive, mood swings)
5. Irritability (feeling nervous, inner tension, feeling aggressive)
6. Anxiety (inner restlessness, feeling panicky)
7. Physical and mental exhaustion (general decrease in performance, impaired memory, decrease in concentration, forgetfulness)
8. Sexual problems (change in sexual desire, in sexual activity and satisfaction)
9. Bladder problems (difficulty in urinating, increased need to urinate, bladder incontinence)
10. Dryness of vagina (sensation of dryness or burning in the vagina, difficulty with sexual intercourse)
11. Joint and muscular discomfort (pain in the joints, rheumatoid complaints)

Appendix B*Mental Health Continuum- Short Form*

The next questions are about your well-being and purpose in life. Indicate what applies most to you. There are no right or wrong answers.

0-Never, 1- Rarely, 2- Sometimes, 3- Regularly, 4- Often, 5- Almost always

In the past 4 weeks, how often did you feel...

1. happy?
2. interested in life?
3. satisfied?
4. that you had something important to contribute to society?
5. that you belonged to a community (like a social group, your neighborhood, your city)?
6. that our society is becoming a better place for people?
7. that people are basically good?
8. that the way our society works makes sense to you?
9. that you liked most parts of your personality?
10. good at managing the responsibilities of your daily life?
11. that you had warm and trusting relationships with others?
12. that you have experiences that challenge you to grow and become a better person?
13. confident to think or express your own ideas and opinions?
14. that your life has a sense of direction or meaning to it?

Appendix C

Welcome Message, Study Information and Confidentiality

Introduction

Welcome to this **first questionnaire** of the SPICE-up your life study!

Completing this questionnaire will take approximately 30 - 45 minutes. In addition to some questions about your well-being, purpose in life, your needs and your lifestyle, a large part of this first questionnaire will be about the transition to menopause (in short: the menopause).

These questions may not seem to apply to you, but we are interested in the opinions and experiences of people of different ages and genders. For example, the second questionnaire (around May) will focus more on fatherhood, motherhood and your family ties.

If you are unable to complete the questionnaire in one go, that is not a problem. Once you click on the arrow to go to the next page, your answers are saved, and you can continue where you left off another time. Therefore, keep the email with the link to this questionnaire until you have completed the survey. **Thank you very much** for your time to participate in this study!

The study

If you are at least 18 years old and if you are able to complete the surveys in English, German or Dutch, you can participate in the study. A total of 4 surveys will be send to you, which will take approximately 30-45 minutes to complete each time. The suveys will be send in January, May and September 2024 and January 2025.

Confidentiality

Before you can start, you will be asked to give informed consent. Your data will be collected entirely online and treated confidential. All materials will be identified by an assigned participant number. Your email address is used for correspondence about this study (sending the new surveys and if indicated the study results). During the research period, your data will be treated with great confidentiality and only be accessible by the main researcher Dr. Marijke Schotanus-Dijkstra. Participation in this study is voluntary. If you decide to participate, you will be asked to agree to the informed consent. After that, you are still free to withdraw at any time and without giving a reason for your withdrawal.

Appendix D*Informed consent*

I consent voluntarily to be a participant in this study and understand that. I can refuse to answer questions and. I can withdraw from this study at any given time, without having to give a reason.

I understand that the information I provide will be kept confidential.

I understand that personal information collected about me that can identify me will not be shared beyond the study team.

I understand and consent to the conclusions drawn based on my provided data to be reported in this research project and agree that my information can be used in research outputs.

I give permission for the anonymous data collected throughout this study to be used by other researchers based on the research output. The researchers will not contact me for additional permission to use this information.

By clicking “yes” below, I indicate that I understand my rights and agree to participate in this study. I have read and confirm all the above mentioned information. I agree voluntarily to participate in this study.

Yes

No

Appendix E

AI- Statement

During the preparation of this work, the author occasionally used DeepL for some translations and optimisations, as English is not the author's native language. Grammarly and the Word spelling function were used for grammar checking and spelling checks. Scribbr and Mendeley for managing references and helping to ensure APA citations. Consensus was sometimes used as a research aid to provide inspiration and additional insights into research. ChatGPT by OpenAI was occasionally used to optimise some formulations and resolve issues encountered in RStudio. However, this was done explicitly to optimise the author's original ideas and provide suggestions and inspiration through examples. After using these tools and services, the author reviewed and edited the content as needed and takes full responsibility for the content of the work.