Promoting mental and sleep health in menopausal women: the effectiveness of yoga and brain gymnastics interventions

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Abstract

Menopausal women frequently experience anxiety and sleep disturbances, which negatively impact their mental well-being and overall quality of life. Non-pharmacological approaches such as yoga and brain gymnastics offer accessible, safe, and low-cost strategies to address these issues. This study aimed to assess the effectiveness of yoga and brain gymnastics in promoting mental and sleep health among menopausal women. A quasi-experimental pretest-posttest design was conducted involving 100 menopausal women, divided into yoga and brain gymnastics intervention groups. Yoga sessions were held three times a week for 60 minutes over four weeks, while brain gymnastics was conducted for 15–20 minutes at the same frequency. Anxiety and sleep quality were measured using the State-Trait Anxiety Inventory (STAI) and Pittsburgh Sleep Quality Index (PSQI). Data were analyzed using paired and independent t-tests. Both interventions significantly reduced anxiety and improved sleep quality ($p<0.05$). Yoga showed a greater reduction in STAI (35%) and PSQI (40%) scores compared to brain gymnastics (22% and 25%, respectively). Comparative analysis indicated yoga was significantly more effective ($p<0.05$). Yoga and brain gymnastics effectively promote mental and sleep health in menopausal women, with yoga demonstrating superior benefits as a holistic intervention.

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Introduction

Menopause is a natural phase in a woman's life marked by the permanent cessation of menstruation due to the decline in ovarian function. According to the World Health Organization (WHO), menopause typically occurs between the ages of 45 and 55, and by 2030, an estimated 1.2 billion women will be over the age of 50, with the majority (80%) residing in developing countries. In Indonesia, menopause generally begins between the ages of 40 and 50.[1] The term "menopause" derives from the Greek words for "month" and "cessation," and medically refers to the complete end of menstrual cycles. This phase is characterized by a significant decrease or absence of estrogen production, which can cause symptoms that disrupt a woman's daily life.[2]

One of the primary health concerns during menopause is the increased risk of sleep disorders, such as sleep-onset insomnia and Obstructive Sleep Apnea (OSA), although menopausal status has not been directly linked to issues like Restless Leg Syndrome (RLS) or REM sleep Behavior Disorder (RBD).[3] Hormonal changes, particularly the decrease in estrogen and progesterone, can lead to a variety of symptoms, including hot flashes, night sweats, insomnia, memory impairment, fatigue, decreased libido, vaginal dryness, dyspareunia, and psychological issues like anxiety and depression.[4] Sleep disturbances and chronic anxiety not only reduce quality of life but are also associated with long-term health risks such as cardiovascular disease, diabetes, obesity, and stroke.[5,6]

In light of these concerns, managing anxiety and sleep disorders among menopausal women is a key priority to safeguard their overall health and quality of life. Pharmacological options, particularly Hormone Replacement Therapy (HRT), have demonstrated

notable efficacy in reducing menopausal complaints. Nevertheless, extended use of HRT has been linked to a higher likelihood of adverse outcomes, such as breast malignancies, cardiovascular complications, and hepatic or renal dysfunction.[7] As a result, a considerable number of women turn to non-pharmacological approaches in search of safer options. Among these, interventions centered on physical activity are some of the most commonly adopted strategies. Yoga an integrative practice that combines bodily postures, controlled breathing, and meditation has been demonstrated to support hormonal regulation, enhance relaxation, and foster mental well-being.[8]

Brain gymnastics, or brain gym, consists of simple coordinated movements aimed at stimulating brain activity, enhancing cognitive function, and reducing stress and emotional tension.[9] Previous research has highlighted that both interventions are effective in enhancing sleep quality and alleviating anxiety among menopausal women.[10]

Despite growing evidence supporting yoga and brain gym individually, limited research has directly compared their effectiveness in addressing menopause-related anxiety and sleep disorders. Therefore, this study aims to analyze and compare the effectiveness of yoga and brain gymnastics in reducing anxiety and improving sleep quality among menopausal women at the Nagaswidak Health Center, Palembang, South Sumatra, Indonesia.

Materials and Methods

Study design, setting, and sampling

This study used a quasi-experimental pretest-posttest design to evaluate the effectiveness of yoga and brain gymnastics in reducing anxiety and improving sleep quality in menopausal women. This study was conducted at the Nagaswidak Community Health Center in Palembang City, Indonesia, involving two intervention groups: the first, a yoga intervention, and the second, a brain gymnastics intervention, both of which were carried out for 4 weeks. Before the intervention, anxiety levels were measured using the STAI questionnaire, and quality measurements were carried out using the PSQI questionnaire. After a four-week intervention, anxiety levels and sleep quality were measured again using the same instruments.

Participants

The study included postmenopausal women aged 45 to 55 years who experienced anxiety and sleep disturbances, were not taking medication for anxiety and sleep disturbances, and did not have physical disabilities that could limit movement for yoga and brain gymnastics.

Intervention

This study received ethical approval from the Medical and Health Research Ethics Commission, Faculty of Medicine, Sriwijaya University, under certificate number 044-2024, with the research permit issued in November 2023. Participants were selected through purposive sampling, with inclusion criteria consisting of menopausal women aged 45 to 55 years who resided in the Nagaswidak Health Center service area, Palembang City, South Sumatera, reported symptoms of anxiety and poor sleep quality, were not currently taking medication for these conditions, and had no physical limitations that would hinder participation in yoga and brain gym activities.

Following participant recruitment, baseline data were collected using two validated instruments, namely the State-Trait Anxiety Inventory (STAI) for assessing anxiety levels and the Pittsburgh Sleep Quality Index (PSQI) for evaluating sleep quality. A total of 100 eligible participants were then non-randomly assigned to two intervention groups. The first group, consisting of 50 participants, took part in yoga sessions held twice a week over a four-week period, totaling 12 sessions conducted from June 4th to June 29th, 2024. The second group, also comprising 50 participants, received brain gym interventions with the same frequency and duration, conducted from July 9th to August 3rd, 2024.

All intervention sessions were led by certified instructors and held in a quiet, well-ventilated room within the health center, ensuring a comfortable environment and minimal external distractions. Upon completion of the 12 intervention sessions, post-intervention assessments of anxiety and sleep quality were carried out using the same instruments (STAI and PSQI) to evaluate and compare the effectiveness of each intervention.

Data collection

Data on the characteristics of respondents who underwent yoga and brain gym interventions from 100 respondents are contained in a questionnaire that includes data on name, age, highest education, work experience, marital status, and number of children. Data on anxiety levels and sleep quality were measured before the intervention and after 12 yoga and brain gym interventions, obtained based on the results of filling out the STAI questionnaire, while data on respondents' sleep quality were obtained based on the results of filling out the PSQI questionnaire.

Measurement of anxiety levels and sleep quality

The instrument used to measure anxiety in menopausal women is the STAI instrument created by Charles D. Spielberger. The STAI questionnaire consists of 2 parts, namely Situational Anxiety and Dispositional Anxiety. The first part is the STAI Y-1 self-evaluation questionnaire form, which contains 20 questions that reflect how a person feels "at that moment", while the second part is the STAI Y-2 self-evaluation questionnaire form, which contains 20 questions that indicate how a person feels "usually or in general".[11] In contrast to state anxiety, which is transient and occurs when a person is exposed to a stimulus that could cause harm, trait anxiety (Y1) is the overall or typical state of an individual when they are anxious or when their anxiety is persistent. The stability of personality variations in the propensity to experience anxiety is the main focus of trait anxiety. While trait anxiety (Y2) is primarily focused on the stability of personality variations in the propensity to feel worried, state anxiety (Y1) is transient and occurs when a person is exposed to a stimuli that could cause harm.[12] The instrument for measuring sleep quality is the Pittsburgh Sleep Quality Index (PSQI) instrument. The PSQI questionnaire measures sleep quality consisting of 19 questions on seven assessment components, namely subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction.[13-15]

Statistical analysis

In this study, statistical analysis was conducted to evaluate the effectiveness of yoga and brain gymnastics in reducing anxiety and improving sleep quality in menopausal women. The analysis was conducted through three main stages: first, data normality test using SPSS software with the Kolmogorov Smirnov test with a $p>0.05$, which means the data is normally distributed. Second, group difference analysis (pretest *vs*. posttest) was conducted using a paired t-test. Third, analysis of differences between groups (yoga

vs. brain gymnastics) was conducted using an independent t-test.

Results

Univariate analysis

Table 1 shows that the demographic data of the respondents indicate that the majority of respondents are aged 50-54 years, with 63 respondents (63%), the highest education level of the respondents is mostly high school, with 55 respondents (55%), and the majority of respondents do not work, with 63 respondents (63%). Additionally, the majority of respondents are married, with 79 respondents (79%), and most respondents have 3 children, with 28 respondents (28%).

The level of anxiety (Y1) before the yoga exercise intervention was mostly moderate anxiety at 42 (84%), after the intervention it was mostly mild anxiety at 38 (76%; Figure 1).

The level of anxiety (Y2) before the yoga exercise intervention was mostly moderate anxiety, at 44 (88%), after the intervention it was mild anxiety at 48 (96%; Figure 2).

Sleep quality before the intervention 50 respondents (100%) experienced poor sleep quality, after the intervention 50 respondents (100%) experienced good sleep quality (Figure 3).

The level of anxiety before the brain gymnastics intervention was mostly moderate anxiety, at 34 (68%), after the intervention

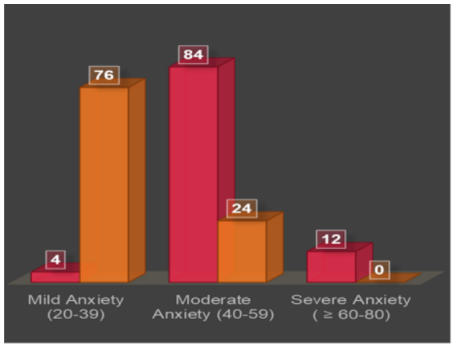

Figure 1. Anxiety level (Y1) score before and after yoga exercise intervention.

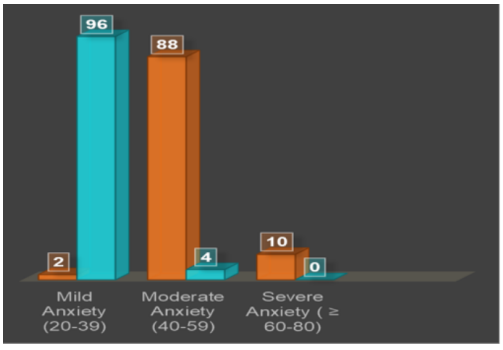

Figure 2. Anxiety level (Y2) score before and after yoga exercise intervention.

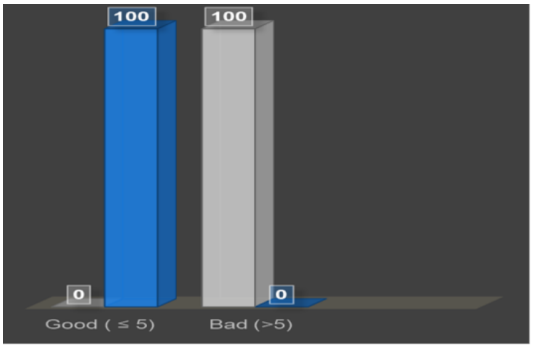

Figure 3. Sleep quality score before and after yoga exercise intervention.

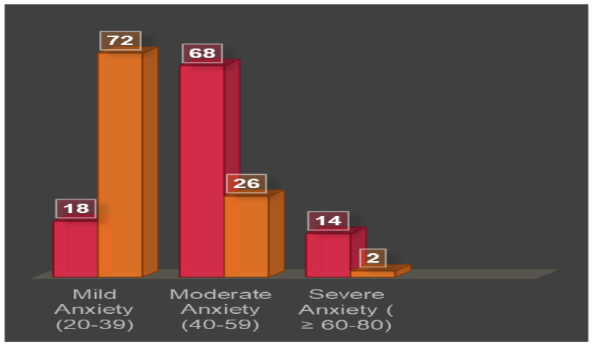

Figure 4. Anxiety level score before and after brain gym intervention.

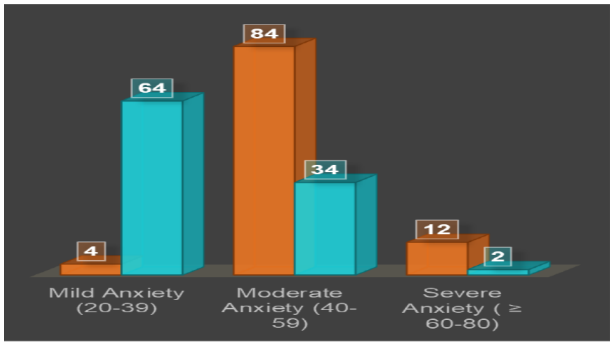

Figure 5. Anxiety level (Y2) score before and after brain gym intervention.

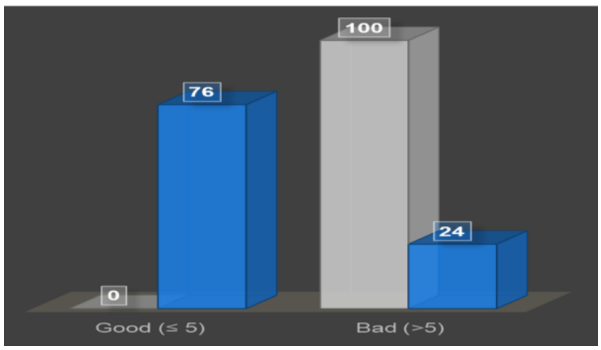

Figure 6. Sleep quality score before and after brain gym intervention.

most were mild anxiety at 36 (72%; Figure 4).

The level of anxiety (Y2) before the brain gymnastics intervention was mostly moderate anxiety, 42 (84%), after the intervention mostly mild anxiety, 32 (64%; Figure 5).

Sleep quality before the intervention 50 respondents (100%) experienced poor sleep quality, after the intervention 38 respondents (76%) experienced good sleep quality (Figure 6).

Bivariate analysis

The average anxiety level before and after the yoga intervention was 46.80 before and 26.36 after, with $p<0.05$, according to the dependent t-test results. This indicates that there is a significant difference in the anxiety levels of menopausal women before and after the yoga intervention (Table 2).

There is a significant difference in the anxiety level (Y2) in menopausal women before and after the yoga intervention, according to the results of the dependent t-test, which showed that the average anxiety level (Y2) was 45.14 before and 25.36 after the yoga intervention. The p-value was less than 0.05 (Table 3).

With a p-value of less than 0.05, the dependent t-test results indicated that there was a significant difference in the sleep quality scores of menopausal women before and after the yoga exercise intervention. The average sleep quality score between before and after the yoga exercise intervention was 9.62 before the intervention and 3.74 after (Table 4). Based on the results of the paired sample t-test, it was found that the anxiety levels before and after the brain gym intervention had an average anxiety level of 47.06 before the intervention and 33.50 after the intervention, with a p-value of less than 0.05, indicating a significant difference in anxiety levels in menopausal women before and after the brain gym intervention (Table 5).

The average anxiety levels before and after the brain gym intervention were 48.88 and 33.60, respectively, according to the results of the paired t-test. The p-value was less than 0.05, indicating a significant difference in the anxiety levels of menopausal women before and after the brain gym implementation (Table 6).

There is a significant difference in the sleep quality scores of menopausal women before and after the brain gym intervention, according to the dependent t-test results, which showed that the average sleep quality score was 9.74 before the intervention and 4.50 after it. The p-value was less than 0.05 (Table 7).

Displays the findings of the independent t-test study to determine how yoga and brain exercise therapies affected menopausal women's anxiety levels and sleep quality. According to data analysis using the independent t-test, there were significant differences between the yoga and brain exercise interventions in terms of addressing menopausal women's anxiety levels. The yoga intervention had a mean value of 26.10 with a Standard Deviation (SD)

Table 1. Description of respondent characteristics.

No	Respondent characteristics	F	Percentage (%)
1.	Age		
	40-44	0	0
	45-49	22	22
	50-54	63	63
	55-59	15	15
	60-64	0	0
	65-69	0	0
2.	Highest education		
	No school completed	0	0
	Kindergarten	0	0
	Elementary School (SD)	13	13
	Junior High School (SMP)	23	23
	Senior High School (SMA)	55	55
	Diploma	9	9
	Bachelor's Degree (SI)	0	0
	Master's Degree (S2)	0	0
	Doctorate Degree (S3)	0	0
3.	Work Experience		
	Not working	63	63
	Less than 1 year	0	0
	1-5 years	6	6
	6-10 years	19	19
	More than 10 years	12	12
4.	Marital status		
	Single	0	0
	Married	79	79
	Widowed	16	16
	Divorced	5	5
5.	Number of children		
	No children	0	0
	1 child	6	6
	2 children	23	23
	3 children	28	28
	4 children	20	20
	5 children or more	23	23

of 4.334, while the brain exercise intervention had a mean value of 33.78 with an SD of 7.957 and a p-value of 0.003 ($p<0.05$). In contrast, the yoga intervention's mean score for improving sleep quality was 3.74, SD 1.006 (Table 8).

Discussion

This study demonstrated that both yoga and brain gym interventions were effective in reducing anxiety and improving sleep quality in menopausal women. However, yoga showed a significantly greater effect compared to brain gym, as indicated by a lower p-value in the post-intervention assessment. These results align with the hypothesis that non-pharmacological interventions targeting both physiological and psychological dimensions can alleviate menopause-related symptoms such as anxiety and sleep disturbances. The superior effectiveness of yoga in this study may be attributed to its holistic approach, which incorporates physical

Table 2. Results of dependent t-test pre and post anxiety levels of yoga exercise intervention.

Anxiety level (Y1)	Pre		Post		Mean Pre	SD Post	p
	f	%	f	%			
Mild anxiety (20-39)	2	4	38	76			
Moderate anxiety (40-59)	42	84	12	24			
Severe anxiety (≥ 60-80)	6	12	0	0			
Total	50	100	50	100	46.80	26.36	0.000

Table 3. Results of the dependent t-test pre and post anxiety levels of the yoga exercise intervention.

Anxiety level (Y1)	Pre		Post		Mean Pre	SD Post	p
	f	%	f	%			
Mild anxiety (20-39)	1	2	48	96			
Moderate anxiety (40-59)	44	88	2	4			
Severe anxiety (≥60-80)	6	10	0	0			
Total	50	100	50	100	45.14	25.36	0.000

Table 4. Results of dependent t-test pre and post sleep quality of yoga exercise intervention.

Sleep quality	Pre		Post		Mean Pre	SD Post	p
	f	%	f	%			
Good (≤ 5)	0	0	50	100			
Bad (> 5)	50	100	0	0			
Total	50	100	50	100	9.62	3.74	0.000

Table 5. Results of the dependent t-test pre and post anxiety levels of brain gym intervention.

Anxiety level (Y1)	Pre		Post		Mean	SD Pre	p Post
	f	%	f	%			
Mild anxiety (20-39)	9	18	36	76			
Moderate anxiety (40-59)	34	68	13	24			
Severe anxiety (≥60-80)	7	14	1	0			
Total	50	100	50	100	47.06	33.50	0.000

Table 6. Results of the dependent t-test pre and post anxiety levels of brain gym intervention.

Anxiety level (Y1)	Pre		Post		Mean Pre	SD Post	p
	f	%	f	%			
Mild anxiety (20-39)	1	4	32	76			
Moderate anxiety (40-59)	42	84	17	24			
Severe anxiety (≥60-80)	7	12	1	0			
Total	50	100	50	100	48.88	33.60	0.000

postures, breathing exercises, and meditation. These components are known to activate the parasympathetic nervous system, regulate the hypothalamic-pituitary-adrenal axis, and promote the release of neurotransmitters such as Gamma-Aminobutyric Acid (GABA) and melatonin, thereby reducing anxiety and enhancing sleep quality.[16,17] In contrast, brain gym primarily focuses on cognitive stimulation through coordinated movements that support neural activation across hemispheres and emotional regulation, which may help with focus and mood, but do not directly trigger physiological relaxation in the same way as yoga.[18,19]

These findings are in line with a growing body of evidence highlighting the effectiveness of yoga in improving psychological and physiological outcomes among women. A quasi-experimental study by Fara *et al.*[20] demonstrated that yoga significantly enhanced sleep quality in menopausal women. Similarly, Wang *et al.*[21] found that yoga not only improved sleep and reduced anxiety but also contributed to lowering blood pressure and alleviating depressive symptoms. A meta-analysis by Hao *et al.*[22] further confirmed these results, reporting significant reductions in Pittsburgh Sleep Quality Index (PSQI) scores among women practicing yoga. Additional evidence from studies involving other populations such as breast cancer patients,[23] elderly individuals,[24] and pregnant women[25] further supports the role of yoga in enhancing sleep quality and mitigating anxiety across diverse groups.

Although brain gym was observed to be less effective than yoga in this study, its potential benefits remain noteworthy. Prior studies have shown that brain gym can improve sleep quality and attention span in menopausal women,[26] while also reducing anxiety among students[27] and hospitalized children.[28] The structured movement patterns incorporated in brain gym are believed to stimulate neuroplasticity, harmonize interhemispheric brain activity, and regulate stress-related pathways. However, in contrast to yoga, brain gym does not include meditative and breathing components, which play a central role in influencing autonomic balance and hormonal regulation.[29]

Beyond yoga and brain gym, other non-pharmacological interventions have also demonstrated significant benefits. Aerobic exercise interventions[30-32] have consistently been associated with better sleep outcomes and reduced psychological distress in menopausal women. Similarly, progressive muscle relaxation[33] and mindfulness-based approaches[34] have shown efficacy in reducing anxiety and improving sleep quality. Collectively, this evidence underscores the importance of physical activity and mind–body interventions as feasible and effective strategies for managing menopausal symptoms.

These results have practical implications for public health and clinical practice, especially in resource-limited settings where non-pharmacological, low-cost, and easily implementable interventions are needed. Yoga, in particular, may be recommended as a first-line complementary therapy for menopausal women experiencing anxiety and sleep disorders. However, this study has several limitations. The non-random assignment of participants may introduce bias, and the short intervention period limits the generalizability of long-term effects. Future studies with randomized controlled designs, longer follow-up, and objective sleep measures (*e.g.*, actigraphy) are recommended to validate and expand on these findings.

Strengths and limitations

This study offers several important strengths, including the use of a rigorous quasi-experimental design with well-balanced participant characteristics between groups, enhancing internal validity and comparability. The interventions yoga and brain gym were delivered with standardized durations and frequencies, and outcomes were assessed using validated instruments (STAI for anxiety and PSQI for sleep quality), ensuring measurement reliability. The direct comparison between two non-pharmacological strategies adds practical value, particularly for community-based mental health initiatives aimed at menopausal women. Furthermore, the focus on culturally adaptable and cost-effective approaches highlights the potential for scalable and sustainable implementation in diverse populations. However, the study also has limitations that must be acknowledged. The relatively small sample size and short intervention period constrain generalizability and limit insights into long-term outcomes. The use of self-reported measures introduces the potential for response bias, and the absence of a control group and follow-up assessments restricts the ability to evaluate sustained effects and rule out placebo influences. Future research with larger, more heterogeneous samples, inclusion of objective physiological indicators, and extended follow-up periods is recommended to strengthen the robustness and applicability of these findings.

Table 7. Results of the dependent t-test pre and post sleep quality of brain gym intervention.

Sleep quality	Pre		Post		Mean	SD	p
	f	%	f	%	Pre	Post	
Good (≤ 5)	0	0	38	76			
Bad (> 5)	50	100	12	24			
Total	50	100	50	100	9.74	4.50	0.000

Table 8. Results of the analysis of the difference between yoga exercise and brain gym intervention on anxiety levels and sleep quality in the work area of Nagaswidak Health Center, Palembang, 2024.

No	Measured Variable	Intervention	Mean	SD	95% CI	p
1	Anxiety level	yoga exercise intervention	26.10	4.334	5.128-10.232	0.003
		Brain gym intervention	33.78	7.957	5.137-10.223	
2	Sleep quality	Yoga exercise intervention	3.74	1.418	0.272-1.248	0.012
		Brain gym intervention	4.50	1.006	0.271-1.249	

Conclusions

This study highlights the practical value of incorporating structured yoga and brain gym interventions as non-pharmacological approaches to support the mental and physical well-being of menopausal women. Both interventions were effective in reducing anxiety and improving sleep quality, with yoga demonstrating a slightly greater impact. These findings suggest that community health centers and primary care providers can integrate such accessible, low-cost, and culturally adaptable strategies into routine health promotion programs for menopausal women. By empowering women with self-regulation techniques through movement-based therapies, healthcare systems can contribute to enhancing quality of life during the menopausal transition. Future efforts should consider broader implementation and long-term follow-up to sustain and expand the benefits of these interventions in diverse populations.

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