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Effects of Jacobson Relaxation Exercises and Deep Breathing Exercises on Post Menopausal Stress and Quality of Life

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Abstract

Purpose. Post-menopausal women have increased stress and decreased well-being as a result of hormonal imbalance, physical discomfort, and mood change. Jacobson relaxation and deep breathing exercises, though identified to decrease stress, their efficacy in post-menopausal women has seldom been studied. This study aims to find the impact of Jacobson Relaxation Exercises (JRE) and Deep Breathing Exercises (DBE) on reducing stress and improving the quality of life among post-menopausal women.

Material & Methods. The study was carried out among 48 participants by simple random sampling through a lottery method and was split into two groups of 24 participants each. Group A & B received JRE & DBE for 30 minutes, four times a week for four days respectively. Stress level was assessed by Perceived Stress Scale, and quality of life was assessed by Menopausal Rating Scale.

Results. Our study found that patients with post-menopause who received deep breathing exercise therapy (Group A) and Jacobson relaxation exercises (Group B) both showed significant improvement, with only small differences between the groups. Among them, those who underwent deep breathing exercises showed better improvement. The members of Group B had larger gains in their PSS scores compared to those in Group A, with Group A averaging 16.42 and Group B averaging 11.00. Furthermore, Group B also showed greater improvement in the MRS, with an average of 10.58 static stands, while Group A had an average of 19.13. These results were later confirmed by effect size measurements, which revealed strong effects with estimated Cohen's d values of 3.951 and 2.822 for PSS and MRS, respectively, in Group A. In contrast, Group B had paired sample effect sizes of 3.997 for PSS and 3.744 for MRS. While both interventions led to statistically significant improvements ($p<0.001$), the greater mean differences and effect sizes suggest that deep breathing exercise is a more effective method for enhancing balance and mobility in patients with diabetic neuropathy.

Conclusions. The study found that deep breathing and Jacobson relaxation exercises led to comparable improvements in participants, with no statistically significant difference between the two groups. Despite this, deep breathing exercises showed promising results in enhancing stress and quality of life. As a non-invasive intervention, deep breathing exercise appears to be an effective option for addressing stress and quality of life in individuals with post menopause.

Keywords: Emotional Instability, Menopausal Rating Scale, Perceived Stress Scale.

Introduction

Menopause, defined as 12 consecutive months without menstruation, is the cessation of ovulation, which usually occurs in the fourth or fifth decade. As women reach post menopause, ovarian function decreases, resulting in a significant (95%) decrease in oestrogen production (Mohamadi, Ramalingam, & Nirmala, 2024). A poll conducted in India found that 75% of women experience anxiety during menopause. It also disclosed that 83% of females experience natural menopause between 45 and 55 years old, and 5%

experience late menopause. Also, 77% of post-menopausal females experienced stress that negatively impacts their marital life (Batra & Shiju, 2019).

The menopausal transition is usually marked by symptoms that begin during perimenopause. The majority of these symptoms, such as stress, insomnia, and mood swings can, however, continue even after menopause and may extend into postmenopausal life (Thenmozhi et al., 2022). Post-menopause is characterized by loss of ovarian function, which leads to a significant decrease in oestrogen and progesterone levels. Hormonal change triggers a cascade of physiological changes affecting different bodily systems (Santoro, 2008). Postmenopausal syndrome is characterized by clinical features of hot flushes, sleep disturbance, night sweats, genitourinary symptoms/sexual dysfunction, vaginal atrophy, and mood abnormality (Kalra et al., 2022). Frequent hot flushes in postmenopausal women negatively impact quality of life by causing sleep disturbances, fatigue, and emotional distress. The discomfort also causes irritability, anxiety, and social withdrawal. Frequent night sweats also interfere with daily functioning. All these combined deteriorate physical and mental health (Gunasekaran, 2020).

While most women experienced vasomotor symptoms, menopause also impacted various organ systems, including the urogenital, psychogenic, and cardiovascular systems (Peacock et al., 2023). Postmenopausal women are at high risk of developing complications such as osteoporosis, cardiovascular disease, and metabolic disease due to hormonal imbalance (Monteleone et al., 2018). Chronic stress negatively impacts one's health. It can induce high blood pressure and heart rate, headaches, stomach reflux, depression/anxiety, and, in the long run, an increased risk of heart disease (Chinweuba et al., 2018). Furthermore, menopausal women often experience a decline in quality of life (QOL), characterized by reduced vitality, impaired physical functioning, and emotional instability (Freeman et al., 2005). Six essential quality of life dimensions have been enumerated by the World Health Organization, i.e., physical health, psychological well-being, independence, social relationships, spirituality, and the environment (McGregor, 2009; McCormick, 2020). There had been an upsurge in the evaluation and development of pharmacological and non-pharmacological interventions for vasomotor symptoms. One of the non-pharmacological approaches for the management of hot flushes during menopause was performing diaphragmatic breathing exercises (Bentley et al., 2023).

Deep breathing exercises can reduce stress by promoting parasympathetic tone, which balances excessive sympathetic activity, and can affect neuronal circuit dynamics, cognition, and emotion. Breathing exercises alleviate menopausal symptoms on three levels: biological, emotional, and cognitive (Deb & Gurumayum, 2021). Studies have demonstrated that breathing exercises can help to lower anxiety, improve anger management, reduce blood pressure, boost immunity and alleviate the intensity of stress and hot flushes (Tavoian & Craighead, 2022). Jacobson's relaxation exercises, where the alternate tension and relaxation of muscles are performed, is particularly beneficial in anxious patients with muscle tension, thereby eliminating physiological discomfort (Suganthirababu, 2024; Mozumder, 2022).

Although previous studies have demonstrated the benefits of deep breathing exercise and Jacobson relaxation exercise in managing stress, limited research specifically targets postmenopausal women. Moreover, the effects of these interventions remain underexplored, warranting further investigation into their potential for improving quality of life in this population. The aim of this study was to analyse and compare these approaches in order to maximise therapeutic options.

Material and methods

Study Design & Participants

All 48 participants were given a clear explanation of the study, and their informed consent was collected. They were then randomly assigned to two groups using a simple random sampling through a lottery method: Group A (24 people) and Group B (24 people). To minimize selection bias, the randomization process was conducted with assessor blinding. The sample size for the present research was computed using G Power 3.1 software. A priori power analysis was conducted with the parameters provided as: A significance level (α)=0.05, a power (1-β)=0.95, and an anticipated effect size (Cohen's d)=0.54, according to previous research in post-menopause. This yielded an estimated sample size of 126 participants. Due to participant dropouts and exclusions, the final analysed sample consisted of 48 participants. Eligible participants underwent a pre-test evaluation. Group A received Jacobson relaxation exercise for 4 days a week with 2 sets per muscle groups, and the tension duration will be 5 seconds while relaxation duration will be 10 seconds. Each muscle group will be trained in Group A four times weekly, and Group B received deep breathing exercise for 2 sets, 5 repetitions, and rest time will be 2 minutes between each sets for four days a week. Both interventions were carried out for four weeks. To assess their effectiveness, post-treat-

ment results were measured using the perceived stress scale and the menopausal rating scale.

Participants enrolled in the study were women aged between 45 and 55 years with moderate stress levels, as indicated by PSS (Perceived Stress Scale) scores of 14-26. All participants had experienced amenorrhoea for more than a year. Women who are presented with physical and psychological symptoms such as hot flushes, sweating, and stress. Additionally, participants exhibited a Menopausal Rating Scale range between 12-35 (mild to moderate).

Participants were excluded if they had undergone pre or peri menopausal stage. Other exclusion criteria included participants who had hormonal changes due to prior surgical treatments for any reason, such as hysterectomy or oophorectomy, and women with mental health disorder. Individuals who had undertaken regular physical exercise or other stress management treatments outside of the study framework were also eliminated to control for an even playing field for all subjects and non-adherence to the intervention schedule, due to time, physical incapacitation, or lack of consent.

Outcome Measures

Perceived Stress Scale

The Perceived Stress Scale is a commonly used instrument designed to assess an individual's perception of stress in everyday life. It comprises 10 items, each rated on a five-point scale ranging from 0 to 4. The cumulative score spans from 0 to 40, with higher scores reflecting increased stress levels. The Perceived Stress Scale (PSS) proved to be a reliable measure, as revealed through the tests. The measure showed very good internal consistency, Cronbach's alpha values were between or greater than 0.71 and 0.91. The measure also displayed good test-retest reliability, the Intraclass Correlation Coefficient (ICC) for the PSS-10 was also above 0.75 most of the time. In terms of convergent validity, the measure measured subjective stress adequately, as there were significant correlations with similar concepts, and accurately represent the level of subjective stress (Carlson & Hoyle, 1993).

Menopausal Rating Scale

The Menopausal Rating Scale (MRS) measures the severity of menopausal symptoms at three levels: somatic, psychological, and urogenital. Each symptom is graded on a 5-point scale from 0 (no symptoms) to 4 (the maximum possible number of symptoms). The score in total varies from 0 to 44, with higher scores indicating increased symptom severity. This measure assists to monitor and assess impact of menopause and treatment outcomes. The MRS was reliable and valid in evaluating menopausal symptoms. The MRS exhibited excellent construct validity in the current study. It achieved Kendall's tau-b value of 0.75 (95% CI: 0.71-0.79), suggesting sufficient correlation between all individual items of the scale. With regard to the reliability of this instrument, the values of the internal consistency coefficients were between 0.6 and 0.9, indicating a good level of internal consistency for the overall score, and the three constituent domains. Likewise, the test-retest reliability for the total score was 0.77 to 0.96 and this value reflects scale stability over time (Brown & Gerbarg, 2005).

Procedure

Jacobson' relaxation exercise group (4 weeks of intervention – 4 days a week for 30 mins)

Jacobson' relaxation exercise was a simple yet effective technique aimed at relieving tension associated with anxiety. This practice involved gradually tensing and then relaxing various muscle groups throughout the body, with a strong emphasis on fully releasing the tension during the relaxation phase.

1. Found a Comfortable Position – Participants either sat or lay down in a quiet space with minimal distractions.

2. Feet – They curled their toes downward, tightening the muscles in their feet. They held the tension for five seconds before slowly relaxing for ten seconds, focusing on the sensation of the tension melting away.

3. Lower Legs – The muscles in their calves were tightened for five seconds, followed by a gentle release for ten seconds, allowing them to notice the feeling of relaxation.

4. Hips & Glutes – The subjects contracted muscles in their hips and buttocks, held the contraction for five seconds, and then released and noted how the tension slowly left their body.

5. Core – They tensed up on their abdomen and chest, held for five seconds, and then loosened for ten seconds, focusing on the pleasure as their muscles unfurled.

6. Shoulders – They raised their shoulders toward their ears, tensing them for five seconds. They then slowly relaxed for ten seconds, letting the tension dissipate.

7. Face – Participants scrunched up their faces by squeezing their eyes shut and tensing their jaws. They held this for five seconds before gradually releasing the tension over ten seconds, feeling the tightness dissolve.

8. Hands – They clenched their fists tightly, holding for five seconds, and then slowly opened their hands, relaxing for ten seconds as the tension disappeared.

Deep breathing exercise group (4 weeks of intervention – 4 days a week for 30 mins).

Participants were asked to lie flat on the floor or bed, bending their knees and resting their head. Another pillow could be placed under the knees for additional comfort and support. One hand was placed on the top of the chest, while the other hand was placed around two inches below the ribcage an area where the movement of the diaphragm can usually be detected during breathing. The next stage of the program was to lead participants to breathe lightly through the nose, with the goal of lifting the hand positioned on the abdomen without moving the hand on the chest as much as possible. To exhale, they were told to pucker the lips and blow out slowly through the mouth, making sure that exhalation would take about twice the duration of inhalation.

Statistical Analyses

All analyses were performed using IBM SPSS Statistics (Version 29); descriptive and inferential statistics were calculated here. All statistical testing was conducted with a confidence level of 95 %. In the analysis, the average and standard deviations were calculated for the scores of the Perceived Stress Scale (PSS) and Menopausal Rating Scale (MRS) tests, collected before and after the intervention. Paired t-tests were used to compare within the group changes over the study, while independent t-tests were performed to compare the results between the groups after intervention.

Results

Our study demonstrated that postmenopausal patients with diabetic neuropathy in both the deep breathing exercise group (Group A) and the Jacobson relaxation group (Group B) showed significant improvements ($p<0.001$). Notably, deep breathing exercises yielded greater mean differences and larger effect sizes, indicating superior efficacy in improving stress and quality of life.

Table 1 presents the comparison of Perceived Stress Scale (PSS) scores within Group A and Group B from pre-test to post-test. In Group A, the mean PSS score declined from 19.00 (SD=5.135) at pre-test to 16.42 (SD=3.335) at post-test. This reduction was statistically significant ($t=19.3555$, $p<.001$), confirming a measurable decrease in perceived stress. In Group B, the decline was more pronounced, with mean scores dropping from 19.94 (SD=1.54) to 11.00 (SD=3.70), a change that was highly significant ($t=32.581$, $p<.001$). The results establish that the intervention substantially reduced stress levels in both groups, with Group B exhibiting a markedly greater reduction compared to Group A.

Table 2 presents the comparison of Menopausal Rating Scale (MRS) scores within Group A and Group B from pre-test to post-test. In Group A, the mean MRS score decreased from 22.14 (SD=7.553) at pre-test to 19.18 (SD=7.770) at post-test. This reduction was statistically significant ($t=13.823$, $p<.001$), indicating measurable improvement in menopausal symptoms. In Group B, the mean MRS score declined sharply from 24.00 (SD=2.94) at pre-test to 10.58 (SD=3.280) at post-test, with a highly significant result ($t=18.344$, $p<.001$). These findings confirm that both groups exhibited improvements, with Group B demonstrating substantially greater reduction in menopausal symptom severity.

Tables 3 and 4 present the post-intervention values of Perceived Stress Scale (PSS) and Menopausal Rating Scale (MRS) scores for Groups A and B. In Group A, the mean PSS score was 16.42 (SD=3.33) and the mean MRS score was 19.18 (SD=7.77), with a statistically significant difference between these scores ($t=5.681$, $p<.001$) and an effect size of $d\approx0.38$. Group B demonstrated lower mean scores on both the PSS (11.00, SD=3.27) and MRS (10.58, SD=3.66), also with a significant difference ($t=4.872$, $p<.001$) and an effect size of $d\approx0.12$. The lower scores and greater effect sizes in Group B suggest that the intervention was more effective in reducing perceived stress and menopausal symptoms compared to Group A.

Table 1. Comparison of PSS within Group A & Group B

Groups	Pre-Test Mean±SD	Post-Test Mean±SD	t value	*p* value
Group A (N=24)	19.00±3.135	16.42±3.335	19.3555	<.001
Group B (N=24)	19.29±4.154	11.00±3.270	19.583	<.001

Note: PSS, Perceived Stress Scale, SD, Standard Deviation

Table 2. Comparison of MRS within Group A & Group B

Groups	Pre-Test Mean±SD	Post-Test Mean±SD	t value	*p* value
Group A (N=24)	22.13±7.753	19.13±7.770	13.823	<.001
Group B (N=24)	24.50±5.890	10.58±3.658	18.340	<.001

Note: MRS, Menopausal Rating Scale, SD, Standard Deviation

Table 3. Comparison of Group-A post-test between PSS and MRS

Post test	Mean	SD	t value	*p* value
PSS	16.42	3.335	5.681	<.001
MRS	19.13	7.770	4.872	<.001

Note: PSS, Perceived Stress Scale, MRS, Menopausal Rating Scale, SD, Standard Deviation

Table 4. Comparison of Group-B post-test between PSS and MRS

Post test	Mean	SD	t value	*p* value
PSS	11.00	3.270	5.681	<.001
MRS	10.58	3.658	4.872	<.001

Note: PSS, Perceived Stress Scale, MRS, Menopausal Rating Scale, SD, Standard Deviation

Discussion

This study evaluated the effectiveness of two rehabilitation approaches: deep breathing exercises (Group A) and Jacobson's relaxation exercises (Group B). Both groups experienced significant improvements in stress levels and overall quality of life, with p-values below .001, demonstrating strong statistical significance. However, deep breathing exercises were especially effective in alleviating somatic, psychological, and urogenital symptoms when compared to Jacobson's relaxation method. In our study Jacobson's relaxation exercise involves the sequential tensing and relaxing of muscle groups, has been shown to reduce sympathetic nervous system activity and enhance parasympathetic tone, leading to decreased stress and enhancement of quality of life. This may align with earlier studies, where participants exercising Jacobson relaxation technique showed improvement in emotional and psychological functioning (Trimurthula et al., 2020). While in postmenopausal women, modest, but beneficial changes for Jacobson's relaxation exercises were found, greater beneficial changes were found when compared to deep breathing exercises. One investigation into the effects of Jacobson's Relaxation Exercise (JRE) on depression in diabetics demonstrated that after 8 weeks of manipulation, subjects presented with a significant decrease in depression scores, which suggests JRE could be beneficial in treating mental health within the comorbidity population (Margi, et al., 2020). The effects in lowering stress were proposed to be mediated by reduced cortisol levels following the practice of relaxation. In addition, the daily performance of Jacobson' relaxation technique has also been found to be related to significant decreases in mean systolic blood pressure and mean diastolic blood pressure in hypertensive patients (Manzoni et al., 2008). Conversely, deep breathing exercises promote parasympathetic activation, which reduces cortisol levels as well as enhances the autonomic nervous system equilibrium. The breathing group had lower anxiety values, coping ability was better and stress decreased prominently with participants in both groups (Bakır et al., 2024). These findings are in accordance with previous observations that slow diaphragmatic breathing improves oxygenation, reduces mental fatigue, and increases emotional calmness (Pattyn et al., 2024).

The most prevalent symptoms in most women were hot flushes, sleep disturbances, muscle and joint pain, stress, irritability, anxiety, physical and mental fatigue. On average, these symptoms were scored 2 to 3 on the MRS scale. At the end of the 4-week intervention period, there was a significant improvement of these symptoms, especially compared to the Jacobson relaxation technique (which added somatic, psychological, and urogenital symptoms) the group practicing the deep breathing exercise reported the highest improvements (Jerath et al., 2006). A significant improvement in the patient's social functioning and self-confidence was an advantage of the study. Women said they were more in control of their emotions and better able to socialize. This is consistent with prior findings that relaxation responses have the potential to enhance relationships and general social well-being. This is consistent with previous studies showing that deep breathing exercise can promote better interpersonal relationships and social satisfaction.

There are several limitations that may affect the study of Jacobson's relaxation exercises and deep breathing techniques on the levels of stress and quality of life in postmenopausal women. The small sample size is an issue, also because it will be difficult to extrapolate the findings to the general population and the short time spent on the technique may not have represented the ultimate staying power of these relaxation techniques. Self-reported stress and quality of life were used as outcome measures in the study, which could have introduced report bias and subjectivity. In addition, the existence of other possible unmeasured confounders, such as non-dietary, survival use of drugs, lifestyle, sleep, health status, among participants from external sources could have led to uncontrolled confounding. Variance

in adherence and motivation to do the relaxation exercises every week might also have been biasing the findings. Nonetheless, larger or a more representative sample should be considered in future research to ensure generalizability. Intervention time and follow-up are needed to verify that the advantages are maintained over the long term.

We advocate for the inclusion of objective physiological indicators (e.g., cortisol, blood pressure, or HRV) to overcome the potential biases of self-reported measures and improve the performance of stress assessment procedures. Standardization of intervention protocols and a good explanation or supervision for the participants are necessary to make sure that relaxation techniques are correctly and consistently practiced.

Researchers should also consider comparing Jacobson relaxation and deep breathing exercises with other stress-reduction methods such as yoga, meditation, or cognitive-behavioral therapy to determine relative effectiveness. The integration of digital tools, such as mobile applications or reminder systems, may help improve adherence and engagement. Finally, it is beneficial to assess the impact of these interventions on specific dimensions of quality of life such as emotional well-being, physical health, and sleep quality to provide a more comprehensive evaluation of their effectiveness.

Conclusion

Our study found that both deep breathing and Jacobson relaxation exercises led to comparable improvements in participants, with statistically significant difference between the two groups. Despite this, deep breathing exercises showed promising results in enhancing stress and quality of life. As a non-invasive intervention, deep breathing exercise appears to be an effective option for addressing stress and quality of life in individuals with post menopause.

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Supplementary Information

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Ethical approval and consent to participate
Participants were signed a written informed consent before the participation. Participants signed a written informed consent before intervention. The study was approved by the Institutional Scientific Review Board under reference number 049/10/2024/ISRB/UGSR/SCPT.

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