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The Effectiveness of a Combination of Slow Breathing Exercises and Progressive Muscle Relaxation on Anxiety Levels in Pre-elderly People with Hypertension

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Abstract

Background: Pre-elderly individuals often suffer from hypertension, a chronic condition that often causes anxiety due to increased sympathetic nervous system activity. By increasing parasympathetic activity and muscle relaxation, non-pharmacological techniques such as Progressive Muscle Relaxation (PMR) and Slow Breathing Exercises (SBE) have been shown to reduce anxiety levels.
Objective: The purpose of this study was to determine the impact of progressive muscle relaxation and slow breathing exercises on anxiety levels in pre-elderly individuals with hypertension in Depok Village, Pakenjeng District, Garut Regency.
Methods: This study used a quasi-experimental, non-randomized pre-post-test design with two groups (intervention vs. control). 100 pre-elderly participants were selected using purposive sampling. The intervention lasted for one month and consisted of two 30-minute sessions per week. The Hamilton Anxiety Rating Scale (HARS) was used to assess anxiety symptoms. Results were analyzed statistically using the paired samples t test and the independent samples t test for samples with a significance level of $p < 0.05$.
Results: The results of the study found that after the intervention, anxiety scores in the intervention group decreased significantly from a mean of 27.88 (SD 8.47) to a mean of 12.80 (SD 4.82) ($p < 0.001$), with a substantial effect size (Cohen's d = 2.21). In the control group, the decrease from a mean of 28.82 (SD 9.10) to a mean of 21.94 (SD 7.18) was less pronounced. A significant difference remained between the two groups after the intervention (mean difference = 9.14; 95% CI: 6.72–11.56; $p < 0.001$), indicating that the combination of SBE and PMR was effective in reducing anxiety.
Conclusion: The combination of slow breathing exercises and progressive muscle relaxation is effective in reducing anxiety levels in pre-elderly people with hypertension. This intervention can be recommended as a non-pharmacological supportive therapy in public health services.

Keywords: Anxiety, Hypertension, Pre-elderly, Progressive Muscle Relaxation, Slow Breathing Exercises

INTRODUCTION

Aging is a stage in the life cycle that is susceptible to various degenerative diseases, including hypertension, which is often experienced by the pre-elderly group (aged 45-59 years). In Indonesia, the percentage of pre-elderly increased from 9.60% in 2019 to 11.75%

(approximately 29 million people) in 2023 (1). Specifically in West Java, the number of pre-elderly was recorded at 5.3 million people (2). The increasing prevalence of hypertension in Indonesia reflects a broader trend in other developing countries such as Africa and Southeast Asia, where access to health services and economic changes significantly impact blood pressure control (3). In this context, improving health literacy among people with hypertension is crucial to improving their quality of life. A thorough understanding of the specific disease is crucial, particularly because age-related cognitive impairment can make it difficult for individuals to understand and manage their condition (4).

The increasing number of pre-elderly has multidimensional implications, especially related to health and future quality of life, economics, and socio-culture (3). According to Indonesian health policy, people between the ages of 45 and 59 are officially referred to as 'pre-elderly' (5). A person's future quality of life depends heavily on how well they manage chronic conditions such as hypertension during this age range, which is considered a critical transition phase toward old age (6).

Although various studies have examined the effectiveness of relaxation techniques individually, studies combining Slow Breathing Exercise (SBE) and Progressive Muscle Relaxation (PMR) in pre-elderly individuals with hypertension to manage anxiety are still limited. Emprical evidence regarding the synergistic effectiveness of these combination relaxation techniques in the 45-59 age group is still scarce, as most previous research has focused on the general elderly population over 60 years or focused on individual therapy without combination (7). Literature regarding a coordinated protocol aimed at maximizing parasympathetic activation specifially for the pre-elderly (8).

In this study, a systolic blood pressure of 140 mmHg or a diastolic blood pressure of 90 mmHg was defined as hypertension. This threshold is in accordance with the 2021 consensus of the Indonesian Hypertension Association (PERHI) and the 2020 Global Hypertension Practice Guidelines from the International Society of Hypertension (ISH) (9) These standard are crucial for mitigating the risk of serious complications such as heart disease, kidney failure, and stroke (10).

High blood pressure in pre-elderly individuals is influenced not only by age but also by lifestyle, diet, and physical inactivity (11), necessitating early identification and both pharmacological and non-pharmacological interventions (12).

Many hypertension patients struggle with medication adherence and lifestyle changes, which frequently leads to ongoing anxiety. This psychological distress triggers sympathetic nervous system activity, which can further exacerbate blood pressure. Non-pharmacological therapies, such as relaxation techniques, offer a safe, effective, and easy-to-implement alternative to lower blood pressure (13). Relaxation helps the body achieve a state of comfort, triggers endorphin production, and activates the parasympathetic nervous system, thereby lowering blood pressure, heart rate, and respiratory rate (14).

The rationale for combining SBE and PMR lies in their positive interaction within the body. SBE improves lung function and reduces long-term stress. PMR relaxes muscles. When used together, breathing and muscle relaxation offer more powerful support to the nervous system than either method alone (15,16,17). This approach also aligns with Virginia Henderson's nursing concept, which empowers patients to take responsibility for their own health, particularly when experiencing anxiety related to high blood pressure (16).

This study presents a novel approach that integrates two relaxation techniques into community-based care plans. Nurses play a crucial role as guides, supporting pre-elderly patients in incorporating relaxation breathing exercises (SBE) and progressive muscle relaxation (PMR) into their routines or care management. By guiding these exercises, patients learn non-pharmacological skills, increasing independence and reducing dependence on medications (18). Henderson's theory provides a strong foundation for understanding how this approach supports patients in achieving optimal health, particularly given the increasing prevalence of hypertension and anxiety in pre-elderly patients (19).

This study was conducted in Depok Village, Pakenjeng District, Garut Regency, an area with a high prevalence of hypertension and a large pre-elderly population. Preliminary data from the 2025 study showed that Depok Village had the highest pre-elderly population in Pakenjeng

District, at 16.5% (1,201 people), and 228 cases of hypertension were reported. Therefore, this village is well-suited to test the effectiveness of combining slow breathing exercises (SBE) and progressive muscle relaxation (PMR) as a practical and local solution. The results of this study are expected to make a significant contribution to community-based care initiatives that reduce stress in people with hypertension.

METHODS

Study Design

This study used a quasi-experimental, two-group, non-randomized pre-post-test design (intervention vs. control). Two sample groups were required: an intervention group receiving PMR and SBE treatment, and a control group receiving no intervention. Group assignment was based on predetermined geographic locations to ensure the validity of the results. This approach aimed to reduce bias due to potential cross-contamination, specifically by preventing communication and social interaction between members of the intervention and control groups who lived in close proximity. This type of cross-contamination is known to diminish treatment effects and compromise study integrity (20).

Participants

This research took place from March to November 2025, starting with the formulation of the research title under the guidance of the supervising lecturer, To collect baseline data on the prevalence of hypertension among pre-elderly residents in Depok village, a preliminary study was conducted in collaboration with the Sindangratu Community Health Center, as well as interviews with local health cadres, then, To ensure compliance with established procedures and deadlines, the legal ethics administration process is completed before the implementation phase of the research, and finally the preparation and submission of the final results. With the location of the research/sampling in the Depok Village area in collaboration with the Sindangratu Community Health Center working area, one of the community service places especially in the Depok village area, Pakenjeng sub-district, Garut regency.

The number of research samples was 100 respondents, determined through a power analysis using an independent two-sample t-test. Assuming a large effect (d) = 0.8 and a β/α ratio = 1, the power of the test obtained was 0.97. The number of samples required is 98, rounded up to 100, the study sample was evenly distributed, with 50 participants in the intervention group and another 50 participants in the control group.

Participants were selected using a purposive sampling technique based on predetermined inclusion and exclusion criteria. The inclusion criteria set in this study were (a) male or female, aged 45 to 59 years (pre-elderly), (b) Patients with high blood pressure, defined as a systolic blood pressure of 130 mmHg or higher and a diastolic blood pressure of 90 mmHg or higher, use the 130/80 mmHg standard to identify those at risk earlier. This method helps detect high blood pressure more effectively in young adults than using the higher standard of 140/90 mmHg, (c) Do not have genetic diseases, (d) Willing to follow the procedure and become respondents, (e) pre-elderly who have never/have not done PMR and SBE before, (f) Know their blood pressure and have controlled their blood pressure at health services/posyandu/posbindu in their area/village of Depok. Exclusion criteria : (a) Hypertensive patients with complications (b) Clients with communication disorders, any physical abnormalities that can interfere with exercise interventions, and cannot do relaxation exercises or breathe spontaneously. (c) Clients with cognitive disorders.

Intervention Protocol

The instrument used in this study uses a Standard Operating Procedure (SOP), this is a standard operating procedure (SOP) that has been developed and standardized for the combined application of slow breathing exercises and progressive muscle relaxation. Slow breathing exercises (SBE) are relaxation techniques performed through consciously regulating breathing, deeply, and slowly, which aims to overcome various problems such as anxiety, tension, hypertension, pain and others. The steps for implementation include: taking a comfortable sitting or lying position with both hands placed on the stomach; inhaling slowly and deeply through the nose for three seconds while feeling the stomach expand; holding the breath for three seconds; then exhaling through the mouth with pursed lips slowly for six seconds while feeling the stomach move down; this process is repeated for 15 minutes (15).

Progressive muscle relaxation (PMR) is a Muscle relaxation technique that aims to reduce tension and anxiety without suggestion. This technique involves systematic tensing and relaxing of

muscle groups in the body (from the hands to the feet), focusing on the difference in sensation between tense and relaxed states, which theoretically can distract from disturbing thoughts and activate the parasympathetic nervous system for relaxation. PMR has been proven to be useful for relieving anxiety, depression, stress, phobias, psychosomatic disorders, and helps maintain health, endurance, and flexibility of muscles and joints, including relieving stiffness and pain in the neck. The implementation of PMR begins with preparation (a comfortable lying or sitting position, removing accessories, loosening ties), followed by specific movement stages involving tensing and relaxing 15 muscle groups in the body, such as gripping hands, bending arms, shrugging shoulders, frowning, clenching jaws, pursing lips, bending the head, arching the back, taking a deep breath for the chest, tightening the stomach, and straightening the legs, where each movement is done twice to feel the contrast between muscle tension and relaxation (13,14).

These two actions have been combined in the form of a Standard Operating Procedure (SOP) that will be implemented on respondents. The SOP was compiled based on scientific references from research by Mahardika, A. (2021); Marbun, EVY (2018); Bragatha, MB, & Neelakandan, R., (2023) and Pathan, FKM, et al. (2023), and has been implemented in modality/complementary therapy in the community. Anxiety levels were measured using the Hamilton Anxiety Scale (HARS) questionnaire which has been tested for validity and reliability; Pathan FKM (2023) & Indrajaya DP. (2018) and has received validation permission from experts in the field of psychiatric nursing. In addition, daily observation sheets were also used to collect data.

Data collection Procedure

First, the researcher conducted screening, namely sorting areas with the highest population and hypertension rates in the designated area to find respondents according to the predetermined distribution schedule through collaboration with all cadres in Depok Village. After finding respondents, the researcher conducted socialization and determined respondents according to the criteria. Then, the appropriate respondents were asked for their willingness to become research samples and respondents who were willing then signed the informed consent.

The researcher continued by collecting blood pressure data, which was needed in the study using a sphygmomanometer and stethoscope for a pre-test along with a question and answer session regarding anxiety in respondents using the HARS questionnaire. Then the researcher divided the sample into 2 groups; In the intervention group, a combination of slow breathing exercises and progressive muscle relaxation was used, interventions were carried out at each agreed location, but for the control group, only blood pressure measurement observations were carried out on a schedule determined according to the agreement.

The post-test was carried out after all interventions were carried out, namely 8 meetings in the intervention group that had carried out slow breathing exercises and progressive muscle relaxation interventions and 8 times also in the control group by measuring blood pressure. This activity was carried out twice a week for 4 weeks with a total of 8 meetings, each session lasting 30 minutes.

Data Analysis

To interpret the research results, the collected data was then subjected to quantitative analysis using SPSS Statistics version 31.0. The data analyzed were univariate and bivariate data. Descriptive analysis was conducted to provide general information about the respondents, processing using data in SPSS, namely with a paired t-test, the requirement for a normal distribution with a significance level of $p < 0.05$, which means that there is a significant influence of the independent variable on the dependent variable.

Ethical Considerations

This research has obtained research ethics permission from the UNJANI Research Ethics Committee with registration number 028/KEPK/FITKES-Unjani/VII/2025.

RESULTS

The effectiveness of the combined combination of slow breathing exercises and progressive muscle relaxation in anxiety disorders in pre-elderly with high blood pressure showed that;

Table 1. Respondent Characteristics

Characteristics		Intervention Group (N=50)	%	Control Group (N=50)	%
Gender	Man	16	32.0%	10	20.0%
	Woman	34	68.0%	40	80.0%
Age	45-59	50	100%	50	100%
Work	housewife	33	66.0%	38	76.0%
	Farm workers	13	26.0%	2	4.0%
	Self-employed	3	6.0%	2	4.0%
	Teacher	1	2.0%	4	8.0%
Education	No school	0	0.0%	1	2.0%
	Elementary School	40	80.0%	37	74.0%
	Junior High School	8	16.0%	8	16.0%
	Senior High School	1	2.0%	0	0.0%
	BACHELOR	1	2.0%	4	8.0%

Table 2. Blood Pressure Descriptive (Pre)

Group	N	Variables	Mean mmHg	Median	IQR	SD
Intervention	50	Systolic	151	150	20	15.29
		Diastolic	85.8	90	10	9.50
Control	50	Systolic	145.6	140	10	17.63
		Diastolic	86	90	10	10.88

Blood Pressure Descriptive (Post)

Group	N	Variables	Mean mmHg	Median	IQR	SD
Intervention	50	Systolic	121	120	10	8.14
		Diastolic	77	80	10	5.43
Control	50	Systolic	141.1	140	20	15.25
		Diastolic	80	80	5	7.82

Table 3. Descriptive Anxiety

Group	N	Anxiety	Mean	Difference	Standard Deviation
Intervention	50	Pre-test	27.88		8.47
		Post-test	12.80	15.80	4.84
Control	50	Pre-test	28.82		9.10
		Post-test	21.94	6.88	7.19

Table 4. Paired Samples T-Test for Anxiety Scores Comparison Between Groups

Anxiety	Group	N	Mean	Standard Deviation	*P Value*
Pre-test	Control	50	28.82	9.106	
	Intervention	50	27.88	8,472	< 0.001
Post test	Control	50	21.94	7,189	
	Intervention	50	12.80	4,827	< 0.001

Table 5. Paired Samples T-Test for Anxiety Levels in the Control and Intervention Groups

Group	Mean Different	SD	t	df	*P Value*
Control (Pre-Post)	6.88	4,627	10,514	49	<0.001
Intervention (Pre & Post)	15.08	4,919	21,677	49	<0.001

Table 6. Independent Samples T Test for Anxiety in the Control and Intervention Group

Group	f	Sig. Levene	t	df	*P Value*	Mean Different
Control (Pre-Post)	0.092	0.762	0.534	98	0.594	0.94
Intervention (Pre-Post)	6,966	0.010	7,463	98	<0.001	9.14

Table 1, shows that both groups had a significantly higher proportion of women (68% in the intervention group and 80% in the control group). This gender distribution reflects the higher participation of women in the study. All participants met the inclusion criteria, as they were between 45 and 59 years old. Housewives constituted the majority in terms of employment status (66% in the intervention group and 76% in the control group). This suggests that most respondents were able to schedule appointments flexibly. Furthermore, the most common education level in both groups was primary school (80% and 74%, respectively), which may have influenced comprehension of health-related instructions. Overall, the demographic basis of both groups was similar, further ensuring the validity of the comparison.

Table 2, shows descriptive statistics on blood pressure and highlights significant differences between the two study groups. In the intervention group, mean diastolic blood pressure decreased from 85.8 mmHg to 77 mmHg, and mean systolic blood pressure decreased from 151 mmHg to 121 mmHg. After the intervention, the standard deviation (SD) of systolic and diastolic blood pressure decreased from 15.29 to 8.14 and from 9.50 to 5.43, respectively, indicating significant improvement in data consistency. In contrast, the control group showed virtually no change; their mean systolic blood pressure decreased from 145.6 mmHg to 141.1 mmHg. Furthermore, the interquartile range (IQR) decreased significantly in the intervention group from 20 to 10, indicating a more targeted treatment response and a more accurate description of baseline values.

Table 3, presents descriptive data on anxiety levels. Here, a significant decrease was observed in the intervention group. In this group, the standard deviation decreased from 8.47 to 4.82, and the mean anxiety score decreased from 27.88 (pretest) to 12.80 (posttest). This indicates greater consistency in participants' psychological responses. Although a decrease was also observed in the control group (from 28.82 to 21.94), the decrease was not as significant as in the treatment group. The Kolmogorov-Smirnov test was used to check for normal distribution of the data. The symmetry of the histogram and the sample size of 50 (n=50) per group, resulting in a total of 100 respondents, further support this result, indicating that anxiety scores are normally distributed ($p > 0.05$), thus meeting the assumptions. A T-test was then conducted.

To compare anxiety scores, a paired sample t-test was used; the results are shown in Table 4. The mean anxiety score of the control group before the start of the study (pretest) was 28.82 (SD = 9.10), while that of the intervention group was 27.88 (SD = 8.47). Initial statistical comparisons showed a significant difference between the groups ($p < 0.001$). After the intervention, the anxiety score of the intervention group decreased to 12.80 (SD = 4.82), a significantly greater decrease than the post-test mean of 21.94 (SD = 7.18) in the control group. These results indicate that the combination of progressive muscle relaxation and breathing exercises was significantly more effective than standard treatment in reducing anxiety ($p < 0.001$).

The results of the paired sample t-test, which compared each group's anxiety scores before and after the study, are shown in Table 5. In the control group, a mean difference of 6.88 ($p < 0.001$) was observed. This indicates a statistically significant decrease in anxiety, which, however, may have been influenced by external variables or the attentional effect of the study. In contrast, the intervention group showed a significantly greater decrease, with a mean difference of 15.08 ($p < 0.001$). This comparison indicates that the combined intervention of SBE and PMR achieved substantially significant results related to anxiety reduction, although a slight increase was also observed in the control group.

The results of the independent sample t-test, which compared anxiety scores between the control and intervention groups, are shown in Table 6. Levene's test revealed that the variance of the data between the two groups was not homogeneous (significance level: 0.010; $p < 0.05$). Therefore, the assumption of equality of variance was not considered in the t-test. The test resulted in a mean difference of 9.14 and a p value of < 0.001. This indicates a highly significant

difference in anxiety levels between the two groups after the intervention. The anxiety scores of the intervention group decreased significantly more than those of the control group.

DISCUSSION

These results revealed that the combined application of slow breathing exercises (SBE) and progressive muscle relaxation (PMR) produced significantly greater reductions in anxiety levels among pre-elderly individuals with hypertension compared to standard care. Although improvements were observed in both groups, the intervention group showed more substantial reductions. These effects are likely mediated by activation of the parasympathetic nervous system. Slow breathing increases baroreflex sensitivity and vagal tone, while PMR reduces peripheral muscle tension, together decreasing the overall stress response. Given its cost-effectiveness and ease of implementation, this combined intervention represents a feasible self-management strategy for hypertensive individuals.

These findings are consistent with Pathan et al. (15), who demonstrated that SBE, PMR, and their combination significantly reduced anxiety, blood pressure, heart rate, and respiratory rate in patients with essential hypertension, with the combined intervention producing the greatest effects ($p < 0.001$). Similarly, Rakhmawati et al. (21) reported that a combination of deep breathing and PMR was more effective in reducing anxiety in older adults with hypertension than either method alone, likely due to more comprehensive physiological relaxation. Toussaint (16) further supported the effectiveness of PMR, deep breathing, and guided imagery in enhancing psychological and physiological relaxation states. All three methods significantly improved relaxation compared to controls, with PMR and guided imagery consistently reducing electrodermal activity, indicating reduced sympathetic arousal.

Beyond mental well-being, Ningrum et al. (22) found that slow, deep breathing effectively stabilized blood pressure in hypertensive patients by activating the Hering–Breuer reflex and reducing sympathetic activity. Sartika et al. (18) also demonstrated that the combined use of PMR and slow deep breathing was more effective in lowering blood pressure than either technique alone, suggesting a synergistic effect. Qiu et al. (23) emphasized the close relationship between anxiety and hypertension, noting that anxiety-related vasoconstriction and elevated cortisol levels contribute to cardiovascular strain, which can be mitigated through relaxation techniques such as SBE and PMR. This is supported by Mastang et al. (29), who found a significant association between stress and hypertension ($\rho = 0.025$). Although their study focused on stress rather than anxiety, both conditions share similar physiological pathways, including sympathetic nervous system activation and increased blood pressure. Adwas et al. (24) further explained that anxiety involves interactions between emotions, cognition, behavior, and physiological responses, often leading to muscle tension and sleep disturbances. Relaxation techniques can help manage these symptoms, which are commonly associated with chronic hypertension. In addition, Riamah (25) identified age, gender, education, exercise, and diet as key contributors to hypertension, highlighting that individuals aged 60–74 and women are particularly vulnerable due to vascular changes and hormonal factors. These findings underscore the importance of lifestyle interventions, including relaxation strategies, in managing hypertension among older adults.

Study Limitations

This study has several limitations. First, the sample size was relatively small and limited to a specific population, which may restrict generalizability to broader pre-elderly or hypertensive populations. Second, anxiety levels were measured using self-reported instruments, which may be influenced by recall bias and social desirability. Third, the study did not assess long-term outcomes, so the sustainability of the intervention effects remains unknown. Finally, potential confounding factors such as medication adherence, diet, sleep quality, and baseline psychological conditions were not controlled. Future studies should use larger samples, longer follow-up periods, and multivariable analyses to strengthen causal inference.

Clinical Implications

The findings indicate that a combination of slow breathing exercises and progressive muscle relaxation is an effective non-pharmacological intervention for reducing anxiety among pre-elderly individuals with hypertension. This approach can be integrated into community-based hypertension management programs and

nursing interventions at primary healthcare and public health service levels. Nurses and community health workers may use this intervention as part of self-care education to enhance patient autonomy, psychological well-being, and blood pressure control.

CONCLUSION

The results showed that anxiety scores decreased significantly in both groups ($p < 0.001$). However, compared to the control group, the intervention group receiving a combination of progressive muscle relaxation (PMR) and self-paced breathing exercises (SBE) showed a significantly greater decrease. While the control group only recorded a decrease of 6.88 points, the average decrease in the intervention group was 15.08 points. Statistical analysis after the intervention revealed a large effect size (Cohen's $d = 2.21$) and a significant difference between the two groups (mean difference = 9.14; 95% CI: 6.72–11.56; $p < 0.001$). The findings indicate that in pre-elderly individuals with hypertension, a combination of gradual muscle relaxation and breathing techniques successfully reduced anxiety. Unlike the control group, which showed no significant changes, the intervention group's anxiety levels decreased dramatically. This demonstrates the effectiveness of this combination intervention. Therefore, among individuals with similar problems, this intervention can be recommended as a non-pharmacological strategy to reduce anxiety while also helping regulate blood pressure. Future studies could use a more robust RCT design to compare the effectiveness of this combination with individual therapies such as SBE or PMR.

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Author Contributions
AP contributed to study conceptualization, intervention protocol development, data collection, statistical analysis, and manuscript drafting.
UR contributed to study design, methodological supervision, interpretation of findings, and critical manuscript revision.
RW and SR contributed to data validation, literature review, and manuscript editing.

Conflict of Interest
The authors declare that there are no conflicts of interest related to this study or its publication.

Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request. Due to ethical considerations and participant confidentiality, the data are not publicly accessible.

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