International Journal of Nursing Information (IJNI)
ISSN: 2964-4585 (Online)
Vol. 3, No. 2, pp. 39-46

Non-Pharmacological Interventions Using Deep Breathing Relaxation Techniques on Blood Pressure Reduction in Hypertension Sufferers

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Article Info
Article history:
Received: Sep 20, 2024
Revised: Dec 21, 2024
Accepted: Dec 30, 2024

DOI: 10.58418/ijni.v3i2.117

How to cite this article:
Amir, M. D., Sansuwito, T. B., Herlina, N., & Lawej, A. I. (2024). Non-Pharmacological Interventions Using Deep Breathing Relaxation Techniques on Blood Pressure Reduction in Hypertension Sufferers. *International Journal of Nursing Information*, *3*(2), 39–46. https://doi.org/10.58418/ijni.v3i2.117

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ABSTRACT
Hypertension management generally involves the use of pharmacological drugs. However, pharmacological effects are unavoidable and have the potential to disrupt the quality of life. Therefore, efforts to find alternative non-pharmacological therapies are very important. One of the non-pharmacological techniques that has potential is the deep breathing relaxation technique. This study aimed to evaluate the effectiveness of deep breathing techniques in an effort to reduce blood pressure in hypertension sufferers. This research uesd a quasi-experimental research design. The sample in this study was 68 participants divided into 34 participants in the experimental group and 34 participants in the control group. The results showed a significant effect between the pretest variable and the posttest systolic value in the intervention group and between the pretest variable and the posttest diastolic value in the intervention group. Although deep breathing relaxation techniques cannot replace pharmacological treatment completely, they can be beneficial additional therapy in managing hypertension holistically. Proper education about deep breathing relaxation techniques needs to be given to hypertension sufferers in order to get maximum benefits. In addition, this article contributes to public education efforts to increase awareness of deep breathing relaxation techniques as a preventive measure against hypertension. Future research is recommended to combine deep breathing relaxation techniques with other techniques or to use them alongside pharmacological treatment.

Keywords: Deep Breathing, Non-Pharmacological Therapies, Hypertension Management, Blood Pressure

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1. INTRODUCTION

Hypertension is a major global health concern (Al-Makki et al., 2022; Mills et al., 2020; Zhou et al., 2021). Lee (2024) and Kotwal & Joseph (2023) said that hypertension is often referred to as the "silent killer" because, in many cases, this condition does not show apparent symptoms. Data from the World Health Organization, hypertension affects around 1.13 billion people worldwide, with the prevalence rate continuing to increase with age and lifestyle changes (Islam & Shamsuddin, 2021; Kebede et al., 2022; Ojangba et al., 2023; Sy et al., 2022). Uncontrolled high blood pressure can lead to serious complications, such as stroke (Masenga & Kirabo, 2023). Therefore, efforts to control hypertension are significant to prevent fatal complications.

Hypertension management generally involves using pharmacological drugs, such as diuretics, ACE inhibitors, and calcium antagonists (Hui, 2020; Jones et al., 2024; Ojha et al., 2022). Pharmacological

approaches are often accompanied by effects that can interfere with the quality of life of sufferers. However, pharmacological treatment alone is not enough to control blood pressure effectively. Therefore, efforts to find alternatives or additional non-pharmacological therapies are very important in order to avoid the adverse effects arising from pharmacological drugs (Maniero et al., 2023; Timsina et al., 2023). Optimal hypertension management must involve a holistic approach, including healthy lifestyle changes (Charchar et al., 2024) like a healthy diet, exercise, and stress management (Carey et al., 2022; Valenzuela et al., 2021; Verma et al., 2021). Along with the increasing number of hypertension sufferers, both in developed and developing countries, it is important to find management methods that are not only effective but also safe, affordable, and easily accessible to many people. One of the non-pharmacological techniques that has potential is the deep breathing relaxation technique.

Several previous researchers have provided concrete evidence of the use of non-pharmacological therapy. Research by Pragholapati et al. (2021) has proven that non-pharmacological therapy through expressive writing can reduce the level of depression in 33 elderly. The results of observations by Komann et al. (2019) showed that 14,767 patients made efforts to find strategies to relieve pain after surgery. The results of observations showed that 44.4% (6563 patients) used at least one non-pharmacological therapy method, such as cold compresses. Research by Unnisa et al. (2022) has proven that 86.8% of 348 participants thought that pain management using a non-pharmacological approach was helpful in controlling dysmenorrhea.

Deep breathing exercises are a non-pharmacological therapy that teaches clients how to do deep breathing techniques (Mubin & Livana PH, 2020; Purnamasari et al., 2020). Deep breathing relaxation techniques involve deep breathing exercises to calm the nervous system and reduce body tension (Toussaint et al., 2021). Deep breathing relaxation techniques are one of the relaxation therapies that can make the body calmer (Gholamrezaei et al., 2021) so that the headaches experienced by patients will decrease or disappear. This technique focuses on regulating breathing that can stimulate the body's relaxation response, reduce stress, and improve the balance between the sympathetic and parasympathetic nervous systems (Candrawati et al., 2024).

Magnon et al. (2021) conducted a test of the effectiveness of the deep breathing technique by comparing 22 older and 25 younger. The results of the study showed that, in general, the deep breathing technique was effective in reducing anxiety. The older group felt more benefits than the younger group. Research by Multazam et al. (2023) has used the deep breathing technique to reduce pain after surgery. The results of the study proved that 40 post-operative participants stated that they experienced a significant decrease in pain levels after relaxing using the deep breathing technique. Research by Gopichandran et al. (2024) also proved that this technique is helpful in reducing sleep disturbances and pain in 84 chronic headache patients. Joseph et al. (2022) has filtered from 11,968 studies and evaluated the results of the review. The results show that pain management can be done using Deep Breathing, although it is better than the control group due to the high level of heterogeneity. Supported by research by Gholamrezaei et al. (2022), who conducted deep breathing interventions on 57 volunteers. These studies have proven that breathing relaxation techniques are used to reduce stress, anxiety, and pain management, especially in conditions such as migraines, post-operative recovery, and mental health disorders. The difference in this study lies in the characteristics of the participants or samples. To further prove the effectiveness of relaxation techniques, hypertension sufferers as the target of the deep breathing technique intervention as a novelty. Researchers assume that this activity has a contribution to help lower blood pressure in hypertension sufferers, both mild and moderate hypertension.

This study aimed to evaluate the effectiveness of deep breathing relaxation techniques as a non-pharmacological intervention in lowering blood pressure in people with hypertension. In addition, this article is expected to provide a more in-depth review of deep breathing relaxation techniques as an alternative non-pharmacological therapy in managing hypertension. This article is also expected to contribute to public education efforts to increase awareness of deep breathing relaxation techniques as a preventive measure against hypertension.

2. METHOD

This research used a quasi-experimental research design (Siedlecki, 2020). The sample was 68 participants divided into 34 participants in the experimental group and 34 participants in the control group. The sampling technique used was purposive sampling with special considerations, namely, people who have symptoms of hypertension and are eligible to be samples of this study. Statistical alternative hypothesis (Ha): 1) Providing deep breathing relaxation techniques can significantly change systolic and diastolic in the experimental group; 2) There were significant changes in systolic and diastolic in the control group naturally. The hypothesis is tested using the following steps: 1) Testing classical assumptions through normality and homogeneity; 2) Testing the determination of Ha or Ho that is accepted. If the classical assumption test is not problematic, then use the Paired Sample T-Test. If there is a problem, for example, there is non-normal data, then a non-parametric test is used.

The intervention in the control group was carried out in stages, and the number of participants varied from August 2023 to August 2024 until a total of 68 participants were collected. The period for one

intervention was 5-10 minutes and was carried out 2-3 times a day for eight weeks. The steps of implementation of this research are: 1) First, respondents fill in the consent form; 2) Second, researchers provide a brief explanation of deep breathing techniques; 3) Third, pre-test; 4) Fourth, implementation for eight weeks through the following procedures: a) Researchers ensure that participants are in a calm and comfortable environment; b) Researchers ask patients to place one hand on their chest and one hand on their stomach; c) Participants take a deep breath through their nose for 4 seconds and feel their stomach expand; d) Participants hold their breath for 2–4 seconds; e) Participants exhale slowly through their mouth for 6–8 seconds; f) Participants repeat for 5–10 minutes; g) During the 8 weeks, researchers control the implementation activities; 5) Fifth, post-test; 6) Sixth, the research closes the activity and thanks the participants.

3. RESULTS AND DISCUSSION

This section contains the results and discussion of the research presented from the implementation of the research carried out in August 2023 to August 2024 with a sample of 68 people with symptoms of hypertension. The study's results will describe the characteristics of the respondents, the univariate analysis of pre and post-variables and the bivariate analysis of variables. A paired sample t-test was used to test the hypothesis in this study.

3.1. Results

Table 1

Description of Respondent Characteristics Based on Age and Gender

Characteristic	Frequencies	Percentage
Age		
26-35	9	13.23
36-45	10	14.71
46-55	28	41.18
56-65	21	30.88
Gender		
Male	24	35.29
Female	44	64.71

Based on Table 1 in the study on breathing relaxation techniques to lower blood pressure in hypertensive patients, the majority of respondents were in the 46-55 year age category, which was 41.18%. This age range is included in the adult phase, which often faces work pressure, unhealthy lifestyles, and other risk factors that can trigger hypertension. In addition, most respondents were women, with 44 people (64.71%). This is in line with several studies showing that women tend to be diagnosed with hypertension more often, especially after menopause, due to hormonal changes that affect blood vessel elasticity. Research by Desta et al. (2024) has reported that out of 126 participants, 88.1% were women diagnosed with hypertension. This report is supported by Sumartini & Miranti (2019), who state that 60% of elderly participants tend to be hypertensive women. The high percentage of women in this study may also reflect their higher awareness of the importance of health management, including participation in intervention programs such as breathing relaxation techniques. Thus, these characteristics provide a specific picture of the group represented in this study while supporting breathing relaxation techniques' effectiveness in lowering blood pressure. Table 2 below is the result of the normality test. Because the respondents are below 100, the normality assumption in this study uses Shapiro-Wilk.

Table 2

Shapiro-Wilk Results on Systolic and Diastolic Blood Pressure Pretest-Posttest

Group	Shapiro-Wilk for Experiment Data				Shapiro-Wilk for Control Data			
	Statistic	df	Sig.	Normality	Statistic	df	Sig.	Normality
Pre-test (Systolic)	0.913	34	0.112	Yes	0.909	34	0.098	Yes
Post-test (Systolic)	0.902	34	0.074	Yes	0.927	34	0.192	Yes
Pre-test (Diastolic)	0.955	34	0.533	Yes	0.911	34	0.104	Yes
Post-test (Diastolic)	0.900	34	0.069	Yes	0.934	34	0.255	Yes

Table 2 shows the sig value for systolic blood pressure data before and after the intervention; the value is more than 0.05. Table 2 shows the sig value for systolic blood pressure data before and after the

control group; the value is more than 0.05. Table 2 shows the sig value for diastolic blood pressure data before and after the intervention; the value is more than 0.05. Table 2 shows the sig value for diastolic blood pressure data after and before the control group; the value is more than 0.05. Because all values are more than 0.05, it can be stated that all data have a normal distribution.

Table 3
Levene Results on Systolic and Diastolic Blood Pressure Pretest-Posttest

Group	Levene Statistic	Sig.	Homogenous
Data Pre-test and Post-test Systolic	3.619	0.782	Yes
Data Pre-test and Post-test Diastolic	2.933	0.689	Yes

Table 3 shows the results of the Levene test for pretest and posttest data for systolic and diastolic blood pressure show a significance value greater than 0.05. This indicates that the variance between the pretest and posttest data groups, both for systolic and diastolic blood pressure and the experimental and control blood pressure groups, is homogeneous. Assuming that the homogeneity of variance is met, further statistical analysis, such as the paired t-test, can be carried out more validly to test the average difference between the pretest and posttest data. This homogeneity of variance is important in ensuring that changes in blood pressure after an intervention, such as a breathing relaxation technique, can be analyzed without statistical bias caused by uneven data variability.

Table 4
Paired Sample T-test

	Group	t	Sig.
Pair 1	Experiment Data Pre-test and Post-test Systolic	3.704	0.000
Pair 2	Control Data Pre-test and Post-test Systolic	1.019	0.493
Pair 3	Experiment Data Pre-test and Post-test Diastolic	3.821	0.011
Pair 4	Control Data Pre-test and Post-test Diastolic	1.025	0.320

Table 4 shows the Sig. Pair 1 and Pair 3 values <0.05, Ha accepted, meaning that deep breathing relaxation techniques can significantly change systolic and diastolic in the experimental group. Sig. Pair and Pair 2 values > 0.05, Ha rejected, meaning that no significant changes in systolic and diastolic in the control group naturally.

3.2. Discussion

Deep breathing relaxation techniques offer several advantages over pharmacological treatments (Jarrah et al., 2022). Besides eliminating the need for medications, which often have adverse effects, these techniques empower individuals with hypertension to take greater control of their health. Given that hypertension frequently presents without obvious symptoms (Horne et al., 2023), many individuals may remain unaware of their condition until it is identified through routine screening. Therefore, it is essential for individuals to learn simple, natural methods for managing blood pressure, one of which is deep breathing relaxation techniques.

The results of the study Table 4 show a significant effect between the pretest and post-test values of systolic blood pressure in the intervention group (Pair 1). The decrease in systolic blood pressure observed after the breathing relaxation technique intervention indicates that this method is effective in helping to control blood pressure in hypertensive patients. Supported by Hasina et al., (2024) on 62 participants and emphasized that this intervention most likely helps relax the muscles of the blood vessel walls, reduces peripheral vascular resistance and improves overall cardiovascular system function. Physiological mechanisms support this decrease during breathing relaxation, such as decreased sympathetic nervous system activity and increased parasympathetic activity (Noble & Hochman, 2019). These effects directly affect the decrease in systolic blood pressure, often the main parameter in assessing cardiovascular risk.

In addition, the results of the study Table 4 show that there is a significant effect between the pretest and posttest values of diastolic blood pressure in the intervention group (Pair 3). The decrease in diastolic blood pressure after the intervention shows that the breathing relaxation technique not only has an impact on the contraction phase of the heart (systolic) but also the relaxation phase (diastolic). Supported by Boutouyrie et al. (2021), this decrease in diastolic blood pressure is very important because high diastolic pressure can be a major risk factor for target organ damage, such as the kidneys, brain, and heart. The effectiveness of the breathing relaxation technique on diastolic pressure indicates the potential use of this method as part of non-pharmacological management in patients with hypertension. This also shows that this intervention reduces blood pressure temporarily and can potentially improve blood pressure regulation in the long term.

In contrast, in Table 4, the control group, there was no significant effect between the pretest and posttest values of systolic and diastolic blood pressure. This suggests that without intervention, changes in blood pressure tend to be minimal or insignificant despite natural variations in blood pressure measurements. These results underscore the importance of structured interventions such as breathing relaxation techniques in lowering blood pressure. The control group that did not receive intervention reflects the natural state of blood pressure in hypertensive patients without additional treatment, which often remains high or even increases due to various risk factors such as stress, lifestyle, or non-compliance with treatment.

The absence of a significant effect in the control group also suggests that the decrease in blood pressure in the intervention group was not the result of external factors but rather a specific result of the breathing relaxation technique. These findings strengthen the validity of the study results and suggest that breathing relaxation techniques are a reliable intervention for managing hypertension, especially in patients who have limited access to or tolerance to pharmacological therapy. Relevant research by Robaiyani et al. (2024), this technique is also relatively easy to perform, does not require special equipment, and can be applied in various settings, thereby improving patient compliance in the long term.

The effectiveness of deep breathing relaxation techniques on systolic and diastolic blood pressure in the intervention group can also be associated with participating and consistently following the intervention protocol. Increased compliance with this technique can provide more optimal results, as seen in the intervention group's significant decrease in blood pressure. In line with research by Yau & Loke, (2021), deep breathing can lead to reduced systolic and diastolic blood pressure. Also, Candrawati et al. (2024) said that deep breathing exercises are more effective at reducing stress than basic relaxation techniques. In contrast, the control group that did not receive the intervention likely did not experience significant changes in behaviour or lifestyle, so their blood pressure remained stable or even increased. This suggests that the success of the intervention depends not only on the method itself but also on the level of patient involvement in carrying out the intervention consistently.

These findings have significant clinical implications for hypertension management. Deep breathing relaxation techniques can be integrated as part of a holistic approach (Duane et al., 2021), particularly for patients who require non-pharmacological methods. Additionally, this technique can serve as an effective complement to pharmacological therapy (Joseph et al., 2022), especially for patients with difficult-to-control blood pressure despite medication. Combining these interventions may help reduce the need for antihypertensive drugs, thereby lowering the risk of side effects and improving patients' quality of life.

This study also highlights the importance of regular blood pressure monitoring to evaluate the effectiveness of interventions. In the long term, deep breathing relaxation techniques can help enhance people's awareness (Penzenstadler et al., 2022) of the importance of managing their blood pressure (Tavoian & Craighead, 2023). Therefore, clear education on the benefits and proper implementation of breathing relaxation techniques is essential to ensure patients perform them correctly and achieve optimal benefits. Additionally, support from healthcare professionals and family members plays a crucial role in motivating patients to adhere to this intervention consistently.

This study has several limitations that should be considered. One of the main limitations is the sample size, which may be too small to generalize the findings to a broader population. Additionally, the duration of the intervention may influence the results. Studies with a longer duration could provide a clearer understanding of the long-term effects of breathing relaxation techniques on blood pressure. Other factors, such as the severity of hypertension, comorbid conditions, and participants' lifestyles, may also impact the results. Therefore, further analysis is needed to understand their influence better. Moreover, although deep breathing relaxation techniques have shown effectiveness, their impact remains relatively small. Thus, this method should be combined with other interventions to enhance its overall effectiveness.

Participants' motivation and beliefs may influence the success of deep breathing relaxation techniques in the intervention group in terms of its benefits. Participants who are more motivated and confident in the effectiveness of this technique are more likely to commit to practicing it consistently, which can positively impact the study results. Therefore, according to Toussaint et al. (2021), it is important to develop supporting strategies to enhance the effectiveness of this technique. For example, it can be combined with other approaches or implemented alongside pharmacological treatment.

These findings also open opportunities for further research on the effects of breathing relaxation techniques on other cardiovascular risk factors, such as blood lipid levels, insulin resistance, and stress levels. Future studies can help explore the physiological mechanisms underlying the effects of this technique and evaluate its impact on different population groups, including patients with more severe hypertension or older adults. Thus, the results of this study not only provide empirical evidence of the effectiveness of breathing relaxation techniques but also serve as a foundation for developing more comprehensive interventions in hypertension management.

Overall, this study confirms that deep breathing relaxation techniques have the potential to serve as an effective non-pharmacological intervention for managing blood pressure in individuals with hypertension. The significant reduction in systolic and diastolic blood pressure in the intervention group

demonstrates the effectiveness of this method. In contrast, the absence of significant changes in the control group underscores the importance of active interventions in hypertension management. By integrating deep breathing relaxation techniques into hypertension management programs, people are expected to achieve better blood pressure control, reduce the risk of cardiovascular complications, and improve overall quality of life.

4. CONCLUSION

Non-pharmacological approaches through deep breathing relaxation techniques are a safe and effective therapeutic option to help lower blood pressure in people with hypertension. Techniques such as diaphragmatic, slow, and rhythmic breathing have been shown to reduce systolic and diastolic blood pressure, reduce stress, and improve the quality of life of hypertensive patients. These techniques can be implemented independently with proper education and medically guided training. Although deep breathing relaxation techniques cannot replace pharmacological treatment in some cases, they can be beneficial additional therapy in managing hypertension holistically. This study has several limitations that need to be considered. One of the limitations is the sample size, which may not be large enough to generalize the findings to a broader population. Additionally, although the deep breathing relaxation technique demonstrates effectiveness, its impact is not substantial. Therefore, it should be combined with other methods to enhance its effectiveness. Future research is recommended to combine deep breathing relaxation techniques with other techniques or to use them alongside pharmacological treatment.

ACKNOWLEDGEMENTS

Thank you to all parties who have contributed to this research.

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