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*Original Article*

# The combination of Slow Deep Breathing (SDB) and Progressive Muscle Relaxation (PMR) to reduce blood pressure in hypertension patients: A case study

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## Abstract

**Background:** Hypertension is a major global health problem and one of the leading causes of death worldwide. Known as a silent killer, hypertension often shows no clear symptoms but can cause serious complications if not properly managed. Non-pharmacological relaxation techniques such as Slow Deep Breathing and Progressive Muscle Relaxation are effective in lowering blood pressure by reducing stress and muscle tension.
**Objective:** This study aimed to determine the effectiveness of the combination of Slow Deep Breathing and Progressive Muscle Relaxation therapy in reducing blood pressure among hypertensive patients.
**Methods:** This research used an indicative case study approach involving one 48-year-old respondent with hypertension living in Sukoanyar Village, Pakis District, Malang Regency. Inclusion criteria included participants aged 30–60 years, diagnosed with hypertension, without respiratory disorders or physical limitations. Exclusion criteria included participants with physical abnormalities that interfered with the exercise intervention or inability to perform relaxation and breathing exercises. The intervention was conducted once daily for approximately 15 minutes over five consecutive days. Blood pressure was measured before and after the intervention.
**Results:** There was a gradual decrease in blood pressure from the first to the fifth day, with an initial measurement of 178/105 mmHg decreasing to 158/87 mmHg after five days of intervention.
**Conclusion:** The combination therapy of Slow Deep Breathing and Progressive Muscle Relaxation was proven effective in reducing blood pressure in hypertensive patients. This intervention is simple, safe, and can be performed independently at home to support blood pressure control. However, due to the short duration of intervention, the results are indicative and do not reflect the long-term therapeutic effect.

## Background

Hypertension, commonly known as high blood pressure, is a condition in which the pressure of blood within the arteries remains persistently elevated above normal levels. Blood pressure is measured in two values: systolic (when the heart pumps blood) and diastolic (when the heart rests) (Fadlilah et al., 2020). According to the American Heart Association (2024), hypertension is characterized by systolic and diastolic readings greater than 130 mmHg and 80 mmHg, respectively.

Data from the World Health Organization (2023) indicate that approximately 1.28 billion adults aged 30–79 years worldwide suffer from hypertension, with two-thirds living in low- and middle-income countries. This finding underlies WHO's global target to reduce the prevalence of hypertension by 33% between 2010 and 2030. In Indonesia, the Ministry of Health (2018) reported that the overall prevalence of hypertension among adults ranges from 30% to 45%. The risk of hypertension increases progressively with age, with prevalence exceeding 60% among individuals aged over 60 years. With a prevalence rate of 34.81%, hypertension ranks as the third leading cause of death in Indonesia, accounting for 6.8% of all mortality causes (Riskesdas, 2018). In East Java, the prevalence of hypertension reached 36.3% in 2018, making it the most common noncommunicable disease (Dinkes Jatim, 2018).

Hypertension, often referred to as a silent killer, is a critical condition that may lead to various diseases, as it damages blood vessels and increases the risk of heart attack, stroke, kidney disease, and ultimately death if untreated (Kurniawati, 2020). Globally, hypertension is considered a major risk factor for

cardiovascular disease and one of the leading causes of mortality. Common signs and symptoms include dizziness or headache, restlessness, facial flushing, neck stiffness, insomnia, shortness of breath, and fatigue (Johanis et al., 2020). Clinical manifestations resulting from elevated blood pressure may include dependent edema, blurred vision, nausea, vomiting, and headache (Mahmuda et al., 2022).

In patients experiencing a rapid rise in blood pressure, hypertensive encephalopathy (brain damage) may occur due to capillary pressure elevation and the movement of fluid into the interstitial space throughout the central nervous system. This condition may result in neuronal damage, coma, and even death (Prameswari et al., 2022). Moreover, in individuals with coronary artery hypertension, atherosclerotic changes may prevent sufficient oxygen supply to the myocardium. Thrombus formation can further obstruct blood flow, leading to myocardial ischemia and infarction due to chronic hypertension and ventricular hypertrophy (Purwono et al., 2022).

Recently, non-pharmacological methods for controlling hypertension have gained prominence, with relaxation techniques emerging as among the most popular. Such techniques regulate the hypothalamic response to parasympathetic nerves, thereby reducing heart rate, blood pressure, and respiratory rate, as well as oxygen consumption and muscle tension (Mulyati, 2021). One effective approach is Progressive Muscle Relaxation (PMR), which helps lower blood pressure among hypertensive patients (Basri et al., 2022). PMR is a deep muscle relaxation method that does not require imagination or suggestion but focuses on identifying tense muscles and intentionally releasing the tension to achieve relaxation (Toussaint et al., 2021).

The Slow Deep Breathing (SDB) technique, another relaxation strategy, influences the autonomic nervous system and helps regulate blood pressure. It can serve as a non-pharmacological alternative therapy, physical exercise, or supportive treatment for hypertensive patients (Mauliddiyah, 2021). This technique increases intrathoracic pressure and enhances oxygen delivery to tissues. Chemoreceptors and baroreceptors function as sensors that detect changes in blood pressure; they are highly sensitive to fluctuations in oxygen levels and play essential roles in blood pressure regulation (Dewi et al., 2022).

The mechanisms of Slow Deep Breathing and Progressive Muscle Relaxation contribute to hypertension control through complex physiological pathways. Slow Deep Breathing triggers a relaxation response, decreases heart rate and blood pressure, and promotes nitric oxide production, leading to vasodilation (Swastini, 2021). Progressive Muscle Relaxation reduces muscle tension and stress, which further assists in lowering blood pressure. The combination of both therapies effectively activates the relaxation response, alleviates stress, and stabilizes blood pressure. Regular practice of this combined therapy can help hypertensive patients achieve better blood pressure control, reduce hypertension-related symptoms, and improve overall quality of life. These techniques form an integral component of a comprehensive hypertension management strategy (Azwaldi et al., 2022).

A study by Pathan et al. (2023) demonstrated that combining Slow Deep Breathing and Progressive Muscle Relaxation significantly reduced systolic and diastolic blood pressure among hypertensive patients at King Saud University Hospital. The combined therapy acts on both the nervous and muscular systems to relieve tension and stress, both of which can elevate blood pressure. Deep breathing promotes a calmer autonomic response, while PMR releases muscular stiffness, contributing to blood pressure reduction (Rofiqi, 2023). Therefore, this study aims to investigate the effect of the combined Slow Deep Breathing and Progressive Muscle Relaxation techniques on blood pressure reduction among hypertensive patients.

## Methods

### *Study Design*

This study employed a descriptive design with a case study approach to provide a detailed description of the implementation of Evidence-Based Nursing Practice using a combination of Slow Deep Breathing (SDB) and Progressive Muscle Relaxation (PMR) in reducing blood pressure among patients with hypertension. The intervention was conducted over five consecutive days, with daily monitoring of blood pressure before and after the intervention. The

study was carried out in Sukoanyar Village, Pakis District, Malang Regency.

*Sampling and Setting*

The study used a purposive sampling technique to select participants who met the inclusion criteria: adults aged 30–60 years diagnosed with hypertension, without respiratory disorders or physical limitations. Exclusion criteria included participants with physical abnormalities that hindered exercise performance, inability to perform relaxation or breathing exercises, and noncooperative behavior.

The study involved one participant, coded as Mrs. S., a 48-year-old woman with a high school education and occupation as a farmer. Her Body Mass Index (BMI) was 25.7, classified as overweight. She was physically active due to her occupation but did not restrict salt intake in her diet. She did not smoke and demonstrated good adherence to antihypertensive medication.

*Instruments*

The instruments used in this study consisted of both physical and procedural tools designed to support the implementation of the relaxation therapy. The physical setting included a quiet, cool, and comfortable room that minimized environmental distractions to optimize the relaxation process. A relaxation chair equipped with adequate back and leg support was provided to ensure the participant's comfort during the intervention. A digital sphygmomanometer was utilized to measure and monitor systolic and diastolic blood pressure accurately before and after each session. In addition, a structured relaxation guide was developed based on the Progressive Muscle Relaxation (PMR) protocol, which included 14 specific movement sequences targeting major muscle groups such as the hands, biceps, shoulders, facial muscles, jaw, neck, back, chest, abdomen, and legs. These procedures were complemented by the Slow Deep Breathing (SDB) technique guide, which instructed the participant to inhale slowly through the nose, hold the breath for three seconds, and exhale gradually through the mouth. Together, these instruments ensured standardized implementation, consistency in intervention delivery, and reliable blood pressure measurement throughout the study period.

*Intervention*

The intervention combined Progressive Muscle Relaxation (PMR) and Slow Deep Breathing (SDB) techniques administered once daily in the morning for approximately 15 minutes over five consecutive days. PMR was performed following 14 structured steps focusing sequentially on muscle tension and relaxation from the hands, arms, and shoulders to facial, neck, back, abdominal, and leg muscles.

Following PMR, the SDB technique was conducted by instructing the participant to inhale slowly through the nose until the abdomen expanded, hold the breath for three seconds, and then exhale gradually through the mouth while relaxing the body and clearing the mind. The participant was asked to close her eyes and focus on calm breathing sensations.

*Data Collection*

Data collection began with participant assessment and eligibility screening based on inclusion and exclusion criteria. After informed consent was obtained, the researcher administered the SDB–PMR combination therapy daily. Blood pressure measurements were recorded before and after each intervention using a digital sphygmomanometer.

Data collection lasted five days, with continuous observation and evaluation of blood pressure changes to assess the effect of the intervention on hypertension control.

*Data Analysis*

Data were analyzed descriptively by comparing the participant's pre- and post-intervention blood pressure readings across the five-day intervention period. The observed trend in systolic and diastolic pressure was used to evaluate the physiological response to the combined relaxation therapy. The findings were interpreted in relation to previous studies (e.g., Wulandari et al., 2023), which also demonstrated significant reductions in blood pressure among hypertensive adults following similar interventions.

*Ethical Considerations*

Ethical principles were strictly observed throughout the study. The participant received a full explanation of the study's purpose,

procedures, benefits, and potential risks. Informed consent was obtained before participation. The researcher ensured anonymity and confidentiality by excluding identifiable personal data and allowing the participant to withdraw at any time without consequences. The study followed ethical standards emphasizing autonomy, confidentiality, beneficence, and non-maleficence. All research procedures were conducted according to hypertension nursing care protocols, focusing on non-pharmacological interventions to improve the patient's quality of life.

## Results

Progressive Muscle Relaxation (PMR) therapy conducted for five consecutive days, the physiological outcomes of the participant, Mrs. S. (48 years old), were carefully evaluated. Blood pressure measurements were taken before and after each intervention session using a digital sphygmomanometer to assess the immediate and cumulative effects of the combined relaxation techniques, as summarized in Table 1.

**Table 1.** Measurement of Blood Pressure Before and After Intervention

| Test | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| Pre Test | 178/105 | 178/105 | 176/103 | 170/98 | 165/93 |
| Post Test | 178/105 | 176/103 | 170/98 | 165/93 | 158/87 |

Based on the results presented in Table 1, a reduction in blood pressure was observed on the second day, although the change was not yet substantial. From the third to the fifth day, a more significant decrease in blood pressure was recorded. At the initial assessment on the first day, the respondent's blood pressure was 178/105 mmHg. No change was noted on the first day after the intervention. On the second day, a slight reduction occurred, with blood pressure decreasing from 178/105 mmHg to 176/103 mmHg. By the fifth day, a more notable improvement was observed, with blood pressure decreasing from 165/93 mmHg to 158/87 mmHg after the combined therapy.

These findings indicate that the combination of Slow Deep Breathing and Progressive Muscle Relaxation had a measurable effect on the respondent's blood pressure. The intervention appeared to stimulate physiological relaxation, which contributed to the reduction in both systolic and diastolic pressures. The results of this case study are indicative, suggesting that the combined relaxation therapy has potential as a complementary non-pharmacological approach to managing hypertension and should be further validated through larger-scale studies.

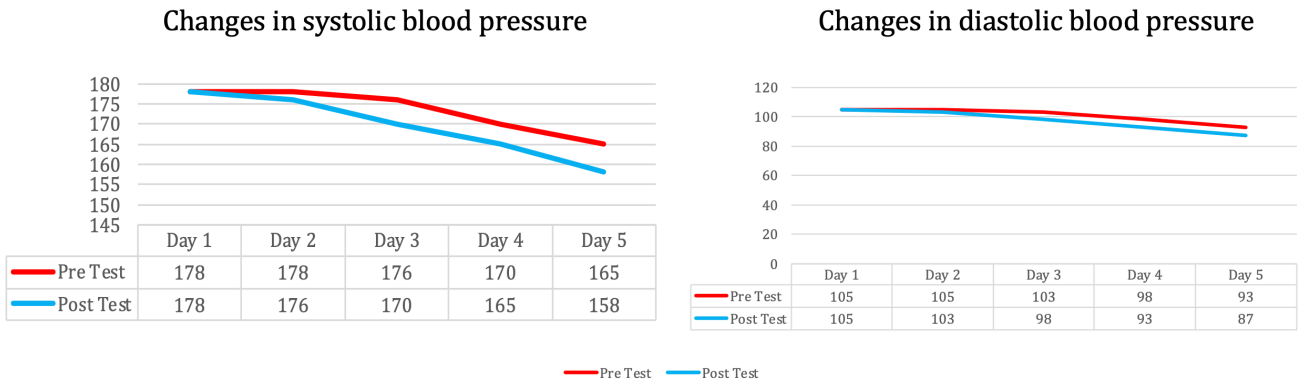


**Figure 1.** Changes in Systolic and Diastolic Blood Pressure Before and After the Combined Slow Deep Breathing and Progressive Muscle Relaxation Therapy

The figure 1 illustrates the trend of systolic and diastolic blood pressure changes over five consecutive days of intervention. The red line represents pre-test (before intervention) blood pressure values, while the blue line represents post-test (after intervention) measurements. Both graphs show a progressive decline in blood pressure following the combined relaxation therapy.

In the left panel, systolic blood pressure decreased steadily from 178 mmHg on Day 1 to 165 mmHg on Day 5 before intervention, and from 176 mmHg to 158 mmHg after intervention. In the right panel, diastolic blood pressure also showed improvement, declining from 105 mmHg to 93 mmHg before intervention and from 103 mmHg to 87 mmHg after intervention.

The graphical results demonstrate a clear downward trend in both systolic and diastolic blood pressure after five consecutive days of combined Slow Deep Breathing (SDB) and Progressive Muscle Relaxation (PMR) therapy. The reduction became more prominent from Day 3 to Day 5, suggesting a cumulative relaxation effect on the cardiovascular system. These findings indicate that the intervention successfully enhanced parasympathetic activation, reduced sympathetic tone, and improved vascular compliance, leading to lower blood pressure levels. The observed pattern aligns with previous evidence supporting the effectiveness of combined breathing and muscle relaxation techniques as non-pharmacological strategies for hypertension management.

## Discussion

The findings of this study revealed a decrease in blood pressure in Mrs. S following the implementation of the combined Slow Deep Breathing (SDB) and Progressive Muscle Relaxation (PMR) therapy. This intervention was simple to perform at home and demonstrated effectiveness in lowering blood pressure. According to Dewi et al. (2022), slow deep breathing aims to reduce stress, decrease muscle tension, improve cardiovascular function, and enhance both physical and mental well-being. Additionally, slow deep breathing helps relieve anxiety, promote calmness, and induce relaxation. The physiological mechanism of slow deep breathing involves an increase in tidal volume, which activates the Hering–Breuer reflex. This activation decreases chemoreflex activity and increases baroreflex sensitivity, leading to reduced sympathetic activity and consequently a decrease in blood pressure (Putri & Sumarni, 2021).

The intervention was carried out in the morning, consistent with Ali and Putra (2022), who stated that cortisol secretion follows a diurnal pattern, peaking between 06.00 and 08.00 a.m. Lowering cortisol levels contributes to relaxation, blood pressure stabilization, and improved sleep regulation. This physiological response results in balanced hemodynamics, smooth blood circulation, and an overall relaxed state (Ramadina et al., 2022). During the combined SDB and PMR therapy, the relaxation process helps elongate muscle fibers and send calming impulses to the brain, thereby reducing neural activity. Consequently, heart rate, respiratory rate, blood pressure, and oxygen consumption decrease, while peripheral skin temperature and brain relaxation activity increase (Saputra et al., 2022).

The observed blood pressure reduction was also influenced by the respondent's medication adherence, as she consistently took amlodipine 10 mg twice daily. Medication adherence plays a crucial role in successful hypertension management (Sundari et al., 2024). In general, the longer an individual has lived with a disease, the better their understanding of the condition becomes, and adherence reflects the patient's motivation to recover and maintain health (Setiani & Nurdin, 2021).

The respondent's educational background, being a high school graduate, also contributed to better health awareness. This finding is supported by Dhirisma and Moerdhanti (2022), who reported that respondents with a high school education had the highest proportion of good knowledge about hypertension (47.2%), compared to only 8.6% among those with a junior high school education. This indicates that lower educational attainment is associated with higher hypertension risk. Similarly, Sagalulu et

al. (2023) emphasized that individuals with higher education are more capable of understanding, filtering, and applying health information correctly, thereby avoiding behaviors that increase the risk of hypertension (Mardiono et al, 2024).

Age also plays a key role in the occurrence of hypertension. As individuals age, physiological changes in the blood vessels, heart, and hormonal regulation contribute to elevated blood pressure (Indrasari et al, 2025 & Sari et al, 2024). After the age of 45, arterial walls tend to thicken due to collagen deposition in the muscular layer, resulting in vessel narrowing and stiffness that increase blood pressure. This is consistent with Susanti et al. (2024), who found a correlation between age and hypertension incidence among adults aged 40–60 and elderly individuals aged 60–80 years. Aging is associated with endothelial dysfunction and increased arterial stiffness, particularly in systolic hypertension among older adults (Yunus et al., 2021).

Progressive Muscle Relaxation (PMR) is a non-pharmacological technique involving alternating muscle tension and relaxation. This therapy helps reduce muscle stiffness, anxiety, pain, and blood pressure (Rusnoto et al., 2022). Its physiological mechanism operates through the parasympathetic nervous system. When the body is in a relaxed state, parasympathetic activity increases, reducing the production of epinephrine and cortisol. This leads to decreased cardiac output and the release of acetylcholine, promoting vasodilation and smoother blood circulation, ultimately lowering blood pressure (Listiana & Faradis, 2021).

Many individuals with hypertension lack sufficient knowledge about their condition and are unaware of appropriate non-pharmacological management strategies besides seeking hospital treatment (Agustina & Pradana, 2022). This prompted the researcher to introduce a combined SDB–PMR therapy to hypertensive patients as a self-management technique for unstable blood pressure. In line with Abbasiah et al. (2023), the combination of SDB and PMR has been shown to be effective in reducing blood pressure among hypertensive patients.

The results of this study suggest that the SDB–PMR combination therapy can be integrated into independent nursing care interventions. Nurses can adopt this relaxation-based approach as a simple, non-pharmacological intervention that requires no special equipment. The incorporation of this combined therapy enhances the holistic and comprehensive nature of nursing services, focusing not only on pharmacological management through antihypertensive medication but also on promoting relaxation to achieve blood pressure control and improve patients' quality of life.

## Conclusion and Recommendation

This study demonstrated that the combination of Slow Deep Breathing (SDB) and Progressive Muscle Relaxation (PMR) is effective in reducing blood pressure among patients with hypertension. The five-day intervention produced a gradual decline in blood pressure, decreasing from an initial reading of 178/105 mmHg to 158/87 mmHg. The therapeutic effect of this intervention is achieved through stimulation of the parasympathetic nervous system, stress reduction, decreased muscle tension, and improved blood circulation. Although the findings are indicative and cannot be generalized due to the single-case design, they provide valuable insights for advancing knowledge and serve as a foundation for more comprehensive future research.

This approach is not only safe and easy to perform independently at home but also contributes positively to the physical and psychological well-being of hypertensive patients. Future studies are recommended to extend the intervention duration—both in the number of days and session length—while involving a larger sample size and exploring combinations with other non-pharmacological therapies to strengthen the evidence base for nursing practice.

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## Declaration of conflict of interest
The authors declare no competing interests.

## Declaration on the Use of AI
No AI tools were used in the preparation of this manuscript.

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