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The effect of slow deep breathing on lowering blood pressure in the elderly with hypertension: A systematic review

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Abstract

Background: Increasing age causes an increase in blood pressure in the elderly which results in the emergence of various infectious to degenrative diseases, one of which is hypertension. Hypertension is an increase in systolic blood pressure exceeding 140 mmhg and diastolic 90 mmhg. One of the efforts in handling hypertension is with non-pharmacological therapies such as slow deep breathing exercises that play a role in stimulating the work of parasympathetic nerves and inhibiting sympathetic nerves to lower blood pressure in hypertensive elderly.
Purpose: To determine the effect of slow deep breathing on lowering blood pressure in elderly with hypertension.
Method: *Systematic* review approach by analyzing selected literature from various sources. Article searches were conducted through online databases, namely *ProQuest, ScienceDirect* and *Goggle Scholar*. The results of the article selection obtained 8 articles that met the criteria and were analyzed and critiqued using the JBI instrument ... Quality assessment is based on the PRISMA *(Preferred Reporting Items for Systematic Reviews and Meta-Analyzes)* checklist.
Results: Slow deep breathing is a nonpharmacological therapy that is proven to be able to reduce blood pressure in elderly people with hypertension.
Conclusion: The role of slow *deep* breathing (SDB) is proven to be effective in helping reduce blood pressure in the elderly with hypertension.

Keywords: Elderly; Hypertension; Slow Deep Breathing.

INTRODUCTION

The aging process is closely related to health changes experienced by individuals as they age. The aging process is a natural process that cannot be avoided and is characterized by various physiological, psychological, and social changes that affect a person's quality of life (Dari & Irfan, 2023). Basically, the aging process affects various aspects of health, including an increased risk of chronic diseases, decreased body function, and mental health (Aryana, 2021).

Physical changes experienced by the elderly are closely related to heart health, especially hypertension. As we age, there is a decrease in heart and blood vessel function, including decreased elasticity of the artery walls, which contributes to an increased risk of hypertension (Adam, 2019). This aging process is characterized by various structural and physiological changes, which usually include hardening of the arteries (arteriosclerosis) and increased peripheral resistance, which directly affects blood pressure (Adam, 2019; Damayanti, Sabar, Lestari, Nurarifah, & Sukmawati, 2022).

Hypertension is a health condition characterized by persistent high blood pressure, measured by

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systolic pressure ≥ 140 mmHg and diastolic pressure ≥ 90 mmHg. Hypertension is a chronic condition that has serious consequences such as heart disease, stroke, and kidney failure, making it one of the leading causes of death worldwide (Soesanto & Marzeli, 2020; Linggariyana, Trismiyana, & Furqoni, 2023).

Hypertension can be said to be a "silent killer" because it often does not show prominent symptoms until it is too late, causing a delay in diagnosis (Tamsila, Salma, & Lestari, 2023). The prevalence of hypertension worldwide is increasing significantly, in 2025 it is estimated that around 29% of adults worldwide will experience hypertension (Soesanto, 2021; Linggariyana et al., 2023). According to the latest report from WHO, hypertension has affected around 1.3 billion people worldwide, and its prevalence increases with age (Linggariyana et al., 2023).

Basic health research in 2018 showed an increase in the incidence of hypertension with a prevalence of around 34.1% (Nursofiati, Perdana, Mariananingsih, & Isnur, 2023; Oktarina & Ayu, 2024). This increase confirms that almost one in three adults in Indonesia has the potential to have hypertension, which reflects a fairly large public health burden.

Recent research shows that geriatric factors play an important role in the increase in the incidence of hypertension. The incidence of hypertension is estimated to reach 60% in elderly adults, with the increasing number of elderly people, the burden of hypertension in society will be even heavier (Soesanto & Marzeli, 2020).

Hypertension management is a process that includes various approaches, both pharmacological and non-pharmacological. Hypertension or high blood pressure requires serious attention because it can cause serious complications if not treated properly. Among the existing treatment efforts, education, lifestyle changes, and self-management are fundamental in managing this condition (Suprayitno & Huzaimah, 2020; Amalia & Soesanto, 2024).

Non-pharmacological intervention therapy that has been proven effective in lowering blood pressure in people with hypertension is slow deep breathing, a non-pharmacological strategy to lower blood pressure. This method focuses on regulating the breathing rhythm to be deeper and slower, which has been shown to provide a relaxing effect and can reduce stress, one of the triggers for increased blood pressure (Musta'in, Wulandari, Yuniarti, & Irawan, 2023; Fitriyah, Fernandez, Samudera, Arifin, & Wulandari, 2019).

Slow deep breathing can improve baroreflex function, which is the body's response to changes in blood pressure. When someone breathes deeply and slowly, it will stimulate the baroreceptors in the large arteries. This stimulation will send signals to the autonomic nervous system to reduce sympathetic activity which is responsible for the "fight or flight" response and increase parasympathetic activity which plays a role in relaxation and lowering blood pressure (Musta'in et al., 2023; Herawati, Mat Ludin, Ishak, & Farah, 2023).

The results of the study in Cempaka Room 3, Karanganyar Regional Hospital stated that slow deep breathing was proven to be effective in lowering blood pressure, with the results showing a significant decrease in blood pressure after the intervention. This makes it a valuable alternative for managing hypertension (Rosyida, Purwanti, & Wahyuni, 2024).

This is also in line with research at the Jati Village Integrated Post, Gatak District, Sukoharjo Regency, which stated that slow deep breathing intervention can reduce systolic blood pressure by 12.14 mmHg and diastolic blood pressure by 10.77 mmHg, with a p value <0.05 indicating the statistical significance of the change (Musta'in et al., 2023).

RESEARCH METHOD

The method in this study uses a systematic review by analyzing literature that has been selected from various sources. Article searches are carried out through online databases, namely ProQuest, ScienceDirect and Google Scholar. The keywords used in this article search are Hypertension and slow deep breathing and low blood pressure and elderly.

Article searches are obtained by reading carefully and thoroughly. The quality of the article is criticized using the JBI instrument. Quantitative research methods on selected articles with RCT and Quasi-Experimental designs. The results of the article selection obtained 8 appropriate articles (3 international articles and 5 national articles. Quality assessment is based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes) checklist.

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RESEARCH RESULTS

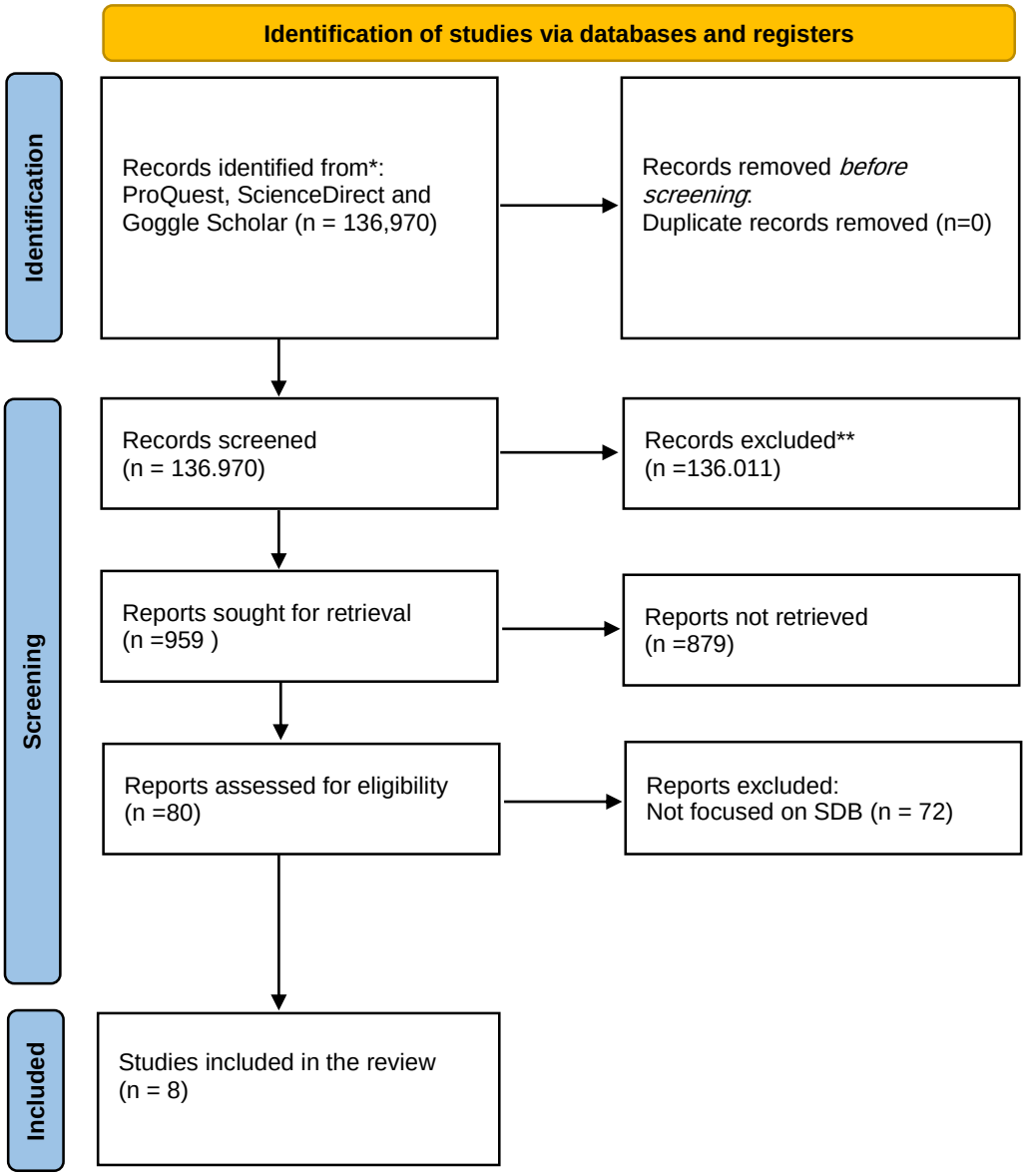


Figure Flow Prism Diagram

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Table Summary of Review Articles

(Author, Year) (Country)	Purpose	Method	Results
(Ubolsakka-Jones et al, 2017) (Thailand)	Testing whether slow breathing exercise can reduce resting systolic blood pressure (sBP) as well as blood pressure response to static handgrip exercise in patients with isolated systolic hypertension (ISH), which is common in the elderly.	Prospective randomized trials (RCT)	The group that performed slow breathing exercise with weights for 30 minutes daily for 8 weeks experienced significant reductions in several blood pressure and heart rate parameters. Specifically, the systolic blood pressure (sBP) of this group dropped from 139 mmHg to 129 mmHg, with a significant decrease of 10 mmHg (P ≤ 0.004). In addition, pulse pressure (PP) also decreased from 67 mmHg to 56 mmHg, which was also significant (P ≤ 0.002).Meanwhile, the control group showed no decrease in systolic blood pressure or other blood pressures.
(Modesti et al, 2015) (Italy)	Assess whether guided slow breathing has an effect on lowering blood pressure and improving autonomic control in hypertensive patients.	Randomized controlled trial (RCT)	Slow deep breathing exercises proved effective in decreasing systolic blood pressure (P < 0.05), diastolic blood pressure also had a significant decrease (P < 0.05), renal resistance (RRI) showed a decrease (P < 0.001), baroreflex sensitivity (BRS) increased significantly and heart rate variability (HRV) also showed a significant increase (P < 0.01). Whereas, the control group (listening to music) did not show significant changes.
(Yuenyongchaiwat et al., 2024) (Thailand)	Explore the effect of slow breathing exercises on cardiovascular parameters (including blood pressure, heart rate), cardiac autonomic modulation (including heart rate variability or HRV), and neuroendocrine responses	Randomized controlled trial (RCT)	The group undergoing the slow breathing exercise program for 30 minutes per day, 5 days a week showed some positive changes after 4 weeks of slow breathing exercise, there was a significant decrease in systolic blood pressure (SBP) by 8 mmHg (P = 0.031) and diastolic blood pressure (DBP) also decreased by 10 mmHg (P < 0.001), heart rate (HR) decreased by 8 bpm (P = 0.004), cortisol levels in saliva also decreased by 0.35 ng/ml (P = 0.002)

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(Author, Year) (Country)	Purpose	Method	Results
	(especially salivary cortisol) in individuals with hypertension.		and cortisol levels in saliva also decreased by 0.35 ng/ml (P = 0.001). 0.001), heart rate (HR) decreased by 8 bpm (P = 0.004), cortisol levels in saliva were also reduced by 0.35 ng/ml (P = 0.002) and heart rate variability (HRV) increased significantly, with an increase of 6.4 ms (P = 0.030).
(Ramayanti, 2024) (Indonesia)	Knowing the effect of slow deep breathing therapy on hypertension levels in the elderly	Quasi Experiment	A 4-week slow deep breathing therapy intervention was found to be effective in lowering participants' blood pressure. Of the 7 people who previously suffered from stage 1 hypertension, 6 people experienced a decrease in blood pressure. Meanwhile, out of 7 people who experienced prehypertension, 5 people experienced a decrease in blood pressure. The results of the analysis using the Wilcoxon test showed a significance value (P-value) of 0.003.
(Widarti et al., 2024) (Indonesia)	Knowing the effect of slow deep breathing exercises on blood pressure in elderly women with hypertension.	Quasi Experiment	After a 4-week slow deep breathing therapy intervention, with exercises performed 12 times in the morning, there was a decrease in participants' blood pressure. Systolic blood pressure dropped to 129 mmHg from 140 mmHg previously, and diastolic blood pressure dropped to 78 mmHg from 90 mmHg previously.
(Yuniarti & Safitri, 2024) (Indonesia)	Find out the effect of slow deep breathing exercises on reducing systole and diastole blood pressure in elderly people suffering from hypertension.	Quasi Experiment	After being given the intervention for 4 days, with the exercise performed in the morning, the systolic pressure dropped to 146.55 mmHg which showed an average decrease of 8.64 mmHg and diastolic pressure, which before the exercise was 90.14 mmHg, dropped to 83.61 mmHg, with an average decrease of 6.52 mmHg. Paired T-Test results showed a significance value (P = 0.000), which is smaller than 0.05.

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(Author, Year) (Country)	Purpose	Method	Results
(Husna & Johan, 2020) (Indonesia)	Knowing the effect of slow deep breathing exercises on blood pressure of elderly people suffering from hypertension at PSTW Sabai Nan Aluih Sicincin, Padang Pariaman Regency.	Quasi Experiment	After a 7-day intervention (about 15 minutes per session) with slow deep breathing exercises, there was a significant reduction in blood pressure. The average systolic blood pressure dropped to 154.28 mmHg from the previous 192.38 mmHg, with an average difference of 38.09 mmHg. Meanwhile, diastolic blood pressure also decreased, with the average being 86.19 mmHg from 104.29 mmHg previously, which means an average decrease of 18.10 mmHg.
(Khotimah et al., 2024) (Indonesia)	To determine the effect of *slow deep* breathing exercise *(*SDB) on lowering blood pressure in elderly people suffering from hypertension in Karangdowo Village, Sumberrejo District, Bojonegoro Regency.	Quasi Experiment	After the intervention of slow deep breathing exercises for 4 weeks, with sessions conducted twice a day for 15 minutes per session, an average decrease in blood pressure was found, the average dropped to 1.52 from the previous 2.33**.** The Wilcoxon signed-rank test results showed a P value = 0.000 (p < 0.05) and a Z value = -4.669 (Z count > Z table), indicating that the decrease was significant.

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DISCUSSION

The results of the literature review analysis that slow deep breathing is effective and proven to reduce blood pressure in people with hypertension. This statement is supported by the results of a study conducted in Thailand which showed that slow deep breathing exercises with effective loads lower systolic blood pressure (sBP) and pulse pressure (PP) in patients with isolated systolic hypertension (ISH). The group that underwent slow breathing exercise for 8 weeks experienced a 10 mmHg decrease in sBP, from 139 mmHg to 129 mmHg, and a decrease in PP from 67 mmHg to 56 mmHg. However, there was no significant change in diastolic blood pressure (dBP), which remained at 73 mmHg, and heart rate (HR), which only slightly decreased from 68 bpm to 67 bpm. The significant reduction in sBP suggests that slow breathing exercise plays a role in reducing the metaboreflex response that causes an increase in blood pressure during exercise, but its effect on peripheral vascular resistance that affects dBP appears to be limited. Although the exercise was effective in reducing sBP, there were no major changes in dBP and HR, which suggests that slow breathing focuses more on controlling systolic blood pressure and not on regulating vascular tone that affects diastolic pressure (Ubolsakka-Jones, Sangthong, Khrisanapant, & Jones, 2017). The results of this study suggest that slow breathing exercises may be an effective non-pharmacological therapy in managing hypertension, especially in elderly patients with ISH.

A study in Italy showed that daily slow breathing exercises for 30 minutes can have a significant impact on the modulation of the autonomic nervous system in patients with mild hypertension. The group that performed slow breathing exercises showed a significant decrease in systolic (sBP) and diastolic (dBP) blood pressure as well as an increase in baroreflex sensitivity and heart rate variability (HRV). The increase in parasympathetic tone, as indicated by positive changes in HRV and BRS, suggests that slow breathing is effective in improving sympathovagal balance, which is very important for blood pressure control (Modesti, Ferrari, Bazzini, & Boddi, 2015). However, this study also showed that the effect was more pronounced in short-term blood pressure, while the long-term effects and its influence on renal vascular resistance have not been fully explored. Other limitations include the use of non-invasive measurement methods and the absence of serum catecholamine measurements to further verify sympathetic activity. Overall, the results of this study suggest that slow breathing may be an effective non-pharmacological therapy alternative for treating mild hypertension, although further research is needed to understand its long-term effects.

In addition, a study in Thailand, where the group that performed slow breathing exercises for 4 weeks (5 days a week) for 30 minutes per day, had positive changes in systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and salivary cortisol levels in participants compared to the control group. In addition, the exercise also improved cardiac autonomic function, as measured by heart rate variability (HRV), especially in the high-frequency (HF) component, indicating increased parasympathetic nervous system function. However, while there was a significant reduction in blood pressure, the results also showed that although there was a positive effect on HRV observed, there was little change in indicators of oxidative stress as measured by salivary cortisol. This suggests that although slow breathing can modulate autonomic balance, its effects in reducing oxidative stress in people with hypertension may not be as strong as its effects on heart rate and blood pressure variability (Yuenyongchaiwat, Changsri, Harnmanop, Namdaeng, Aiemthaisong, Pongpanit, & Pariyatkaraphan, 2024). Overall, this study suggests that slow breathing exercises may be an effective alternative for hypertension management, especially in improving cardiac autonomic function, although its effects on oxidative stress need further investigation.

Another study on slow deep breathing therapy conducted for 4 weeks with 15 respondents, there was a decrease in blood pressure in hypertensive participants, from 7 people who previously suffered from stage 1 hypertension, to 6 people experiencing a decrease in blood pressure. Meanwhile, of the 7 people who experienced prehypertension, 5 people also experienced a decrease in blood pressure, with a value (p-value) of 0.003. This therapy is carried out less than 10 times per minute and a longer expiratory phase, focusing on breathing regulation that provides

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a relaxing effect on the body. This relaxation plays a role in reducing blood vessel tension, increasing oxygenation, and reducing blood viscosity, all of which contribute to lowering blood pressure (Ramayanti, 2024). Although this therapy has been shown to be effective, this study also shows limitations, such as the small sample size, which may affect the representation of the results in a wider population. Therefore, further studies with larger samples and longer periods are needed to evaluate the long-term efficacy of this therapy. Nevertheless, these findings suggest that slow deep breathing may be a safe and effective non-pharmacological alternative in the management of hypertension in the elderly, helping to lower blood pressure without significant side effects.

Slow Deep Breathing therapy after being given for 4 weeks (12 times every morning) there was a decrease in blood pressure in hypertensive patients where systolic blood pressure dropped to 129 mmHg from the previous 140 mmHg, and diastolic blood pressure dropped to 78 mmHg from the previous 90 mmHg (Widarti, Hermawati, & Wahyuni, 2024). The mechanism of action of Slow Deep Breathing (SDB) is by increasing the sensitivity of the arterial baroreflex and then increasing the rate of baroreceptor activation which will have an impact on several factors including reducing sympathetic nerve impulses and vasodilation of peripheral blood vessels which will lower blood pressure (Utama, 2023). However, this study has limited samples that may affect the generalization of the results. However, the results of this study indicate that Slow Deep Breathing can manage hypertension in the elderly, helping to lower blood pressure without side effects. A quasi-experimental study of one group pre-test post-test on 21 elderly respondents after undergoing slow deep breathing exercises for 7 days (duration of about 15 minutes per session) found a decrease in blood pressure. The average systolic blood pressure dropped to 154.28 mmHg from the previous 192.38 mmHg, with an average decrease of 38.09 mmHg and diastolic blood pressure also decreased, with an average of 86.19 mmHg from the previous 104.29 mmHg, which means an average decrease of 18.10 mmHg with a systolic p-value of 0.000 and for diastolic 0.002 (Husna & Johan, 2020).

In line with research in Karangdowo Village, Sumberrejo District, Bojonegoro Regency, which shows that SDB is one of the interventions that can provide benefits for the management of hypertension in the elderly, with significant results in lowering blood pressure. After the Slow Deep Breathing (SDB) exercise intervention was carried out for 4 weeks, with sessions carried out 2 times a day for 15 minutes per session on 33 respondents, there was a decrease in average blood pressure. Average blood pressure dropped to 1.52 from the previous 2.33. The results of the Wilcoxon signed-rank test showed a P value = 0.000 ($p < 0.05$) and a Z value = -4.669 (Z count> Z table), which indicated that the decrease was significant. With a P value less than 0.05 (Khotimah, Aris, Majid, Rahmawati, Putri, & Fitrianti, 2024).

Also supported by research in Garu Hamlet, Podoroto Village, Kesamben District, Jombang Regency, which stated that after being given an intervention for 4 days, with physical exercise done once a day in the morning, systolic blood pressure dropped to 146.55 mmHg. This shows an average decrease of 8.64 mmHg. Likewise, diastolic blood pressure which before exercise was 90.14 mmHg, and after the intervention decreased to 83.61 mmHg, with an average decrease of 6.52 mmHg. The results of the Paired T-Test showed a significance value (P=0.000) which was less than 0.05 (Yuniarti & Safitri, 2024).

The slow deep breathing exercises that have been applied in all articles have a positive impact on reducing blood pressure, where all measurements use a calibrated tensiometer as a measuring instrument before and after. The working principle of each slow deep breathing therapy has similarities, namely that it can lower blood pressure in elderly hypertensive patients, but there are differences between these journals, namely in the duration of therapy, place, number of respondents, respondent criteria and research design.

CONCLUSIONS

Slow deep breathing exercise (SDB) is proven to be effective in reducing blood pressure in elderly people with hypertension.

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SUGGESTIONS

Nurses can include SDB as part of the routine care program for hypertensive patients. Hospitals or health centers can develop standard protocols to involve SDB in hypertension management programs, including providing education to patients and families on how to perform slow deep breathing exercises correctly. There is a need for education about slow deep breathing therapy for hypertensive patients and their families as an alternative to non-pharmacological hypertension management.

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