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THE EFFECT OF STROKE EXERCISE ON BLOOD PRESSURE IN ELDERLY PATIENTS WITH HYPERTENSION: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT
Hypertension, or high blood pressure, is the leading cause of death worldwide, with essential hypertension accounting for 90-95% of cases. Older people with hypertension are at greater risk of serious complications such as stroke, coronary heart disease, and kidney failure. One form of non-pharmacological intervention that is gaining more attention is anti-stroke exercise. This study aims to determine the effect of stroke sports on blood pressure in the elderly with hypertension. This study used a quasi-experimental design with a pretest and posttest control group design. Two groups were selected: the intervention group, which participated in anti-stroke exercises, and the control group, which did not receive the intervention. The study population was elderly with hypertension who were registered in a health facility or elderly community. The sampling technique used purposive sampling from 30 respondents (15 in the intervention group and 15 in the control group). Data analysis used the Wilcoxon test to determine differences in blood pressure before and after stroke exercises. The Wilcoxon test for the effect of stroke exercises on blood pressure yielded a p-value (0.003 <0.05), indicating differences in blood pressure before and after stroke exercises. The results of the study show that stroke sports are effective in lowering blood pressure in the elderly.

Keywords: blood pressure; elderly; hypertension; stroke exercises

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INTRODUCTION

The prevalence of hypertension globally continues to increase and is one of the biggest public health challenges in the world. According to the World Health Organization's (WHO) latest report of 2023, it is estimated that more than 1.3 billion adults worldwide are living with hypertension, and this figure has increased by about 30% in the last three decades, especially in low- and middle-income countries (Harris, 2023; Kario et al., 2024). The global prevalence of hypertension in adults aged 30–79 years in 2019 stood at around 32%, with the highest proportion found in the Southeast Asia and Western Pacific regions. Prevalence increased from 29% to 32% in Southeast Asia and from 24% to 28% in the Western Pacific between 1990 and 2019 (Kario et al., 2024). About 54% of people with hypertension are diagnosed, 42% are treated, and only 21% have their blood pressure optimally controlled (Kario et al., 2024). This data confirms that hypertension remains an urgent global health problem, with the greatest burden in developing countries and low levels of control.

Based on the 2018 Basic Health Research (Riskesdas), the national prevalence of hypertension in Indonesia reached 34.1% in the population aged ≥18 years, an increase from 25.8% in 2013 (Lubis et al., 2023). Another study that analyzed Riskesdas 2018 data also reported similar figures, confirming that hypertension is a very serious public health problem in Indonesia (Putri et al., 2024; Rukmini et al., 2021). In addition, the prevalence of hypertension in the elderly (≥60 years) in Indonesia reached 32.6% (Rukmini et al., 2021). Riskesdas 2018 data states that the prevalence of hypertension in Central Java Province in 2018 was around 37.5% in the population aged ≥18 years, which is included in the high category among provinces in Indonesia (Ikhlasia et al., 2025;

Oktamianti et al., 2022). Other studies also show that Central Java has a consistently high prevalence rate compared to the national average (Oktamianti et al., 2022).

The prevalence of hypertension in Surakarta City in Riskesdas 2018 was reported to be around 36.2% in the population aged ≥18 years, slightly below the provincial average but still high (Oktamianti et al., 2022). Based on the latest data, the prevalence of hypertension in Surakarta City shows a significant increase. In 2021, 34,917 cases of hypertension were recorded, an increase from 26,870 cases in 2020 (Imroni et al., 2024). Other studies using IFLS-5 data also showed that the prevalence rate in Surakarta and its surroundings ranged from 35–38% (Mashuri et al., 2022). Hypertension is the largest non-communicable disease in Surakarta, reaching 82.25% of the total non-communicable diseases reported in 2022. This data emphasizes the importance of hypertension prevention and control efforts through early detection, appropriate treatment, and healthy lifestyle changes to reduce the burden of hypertension-related diseases in Surakarta City (Diniyah & Sudaryanto, 2024).

Seniors with hypertension are a population group that is particularly vulnerable to cardiovascular complications, including stroke, which is the leading cause of morbidity and mortality in old age. The prevalence of hypertension increases with age, and uncontrolled high blood pressure significantly increases the risk of stroke and heart disease (Gao et al., 2023; Hejazi et al., 2025). Seniors with hypertension have a greater risk of developing serious complications such as stroke, coronary heart disease, and kidney failure. Uncontrolled hypertension can also lead to a decrease in quality of life as well as increase the risk of disability and premature death (Darmawati, 2024). Therefore, blood pressure management in the elderly is a top priority in efforts to prevent primary and secondary cardiovascular diseases (Kazeminia et al., 2020).

The long-term effects of hypertension if not treated immediately can lead to an increased risk of stroke, heart attack, and kidney damage. Hypertension that is not treated immediately can lead to various serious complications that affect various organs of the body. Here are some of the possible impacts such as heart disease, kidney failure, vision impairment, cognitive impairment and stroke: Hypertension increases the risk of stroke by causing narrowing and damage to blood vessels in the brain, which can disrupt the flow of blood and oxygen to the brain (Watung, 2024). Effective hypertension management is necessary, not only through pharmacological therapy but also through non-pharmacological approaches such as lifestyle changes and physical activity. Regular physical activity can help improve the elasticity of blood vessels, reduce peripheral vascular resistance, and optimize heart function. One form of physical activity that has been shown to be beneficial in managing blood pressure is anti-stroke gymnastics, which is designed to improve flexibility, balance, and cardiovascular function safely and effectively for the elderly. One form of non-pharmacological intervention that is getting more and more attention is anti-stroke gymnastics. This gymnastics is designed to improve flexibility, balance, as well as cardiovascular function, which contributes to lowering blood pressure (Sumarni et al., 2021). Research shows that regular physical activity can improve vascular endothelial function, decrease peripheral resistance, as well as increase the release of nitric oxide (NO), which plays a role in vasodilation and lowering blood pressure (Lee et al., 2022). In addition, anti-stroke gymnastics can also activate the parasympathetic nervous system, which helps to lower sympathetic activity and reduce systolic and diastolic blood pressure (Kim et al., 2022).

Non-pharmacological interventions, particularly physical exercise, have been recognized as an effective strategy for lowering blood pressure in the elderly with hypertension. Various meta-analyses and randomized clinical trials in recent years have shown that physical exercise, whether aerobic, resistance, or combination, significantly lowers systolic and diastolic blood pressure in this

group (Hejazi et al., 2025; Li et al., 2024; Ruangthai & Phoemsapthawee, 2019). Combination exercise, which combines aerobic and resistance exercise, has been shown to provide a greater reduction in blood pressure compared to one type of exercise alone (Li et al., 2024; Ruangthai & Phoemsapthawee, 2019). In addition to lowering blood pressure, physical exercise also provides additional benefits such as increased antioxidant capacity, decreased inflammation, and improved lipid profile, all of which contribute to a reduced risk of cardiovascular complications in hypertensive elderly (Hejazi et al., 2025; Ruangthai & Phoemsapthawee, 2019). Recent studies have also highlighted the importance of intensity, duration, and adherence to exercise programs to achieve optimal results (Li et al., 2024; Zhang et al., 2025).

In particular, stroke exercise or anti-stroke exercise, which is a form of structured physical exercise, has been studied and proven to be effective in lowering blood pressure in the elderly with hypertension. This program usually consists of heating, core, and cooling stages, and can be adapted according to the physical abilities of the elderly (Hejazi et al., 2025; Wahyuni et al., 2017) The effectiveness of these exercises is further enhanced when combined with health education and social support (Wahyuni et al., 2017; Wang et al., 2019a). Thus, a deep understanding of the effect of stroke exercise on blood pressure in the elderly with hypertension is essential to support secondary prevention strategies and improve the quality of life of the elderly population. Recent studies from reputable international journals in the last 5–8 years have consistently confirmed that structured physical exercise is a safe, effective, and integrable intervention in daily clinical practice for the management of hypertension in the elderly (Hejazi et al., 2025; Kazeminia et al., 2020b; Li et al., 2024; Ruangthai & Phoemsapthawee, 2019; Wang et al., 2019a).

Various studies have shown the benefits of physical activity on blood pressure, there is still a research gap in understanding the specific physiological mechanisms that occur due to anti-stroke gymnastics on blood pressure in hypertensive patients. Some previous studies have focused on the effects of aerobic exercise in general on blood pressure (Nurdesia et al., 2022). Studies that specifically evaluate the effects of anti-stroke gymnastics on blood pressure parameters are still limited. In addition, there have not been many studies that use a longitudinal data-driven approach to look at the long-term effects of anti-stroke gymnastics on the blood pressure of hypertensive patients.

Joyotakan Village is located in the southern part of the city of Surakarta under the guidance of the Surakarta Kratonan Health Center. The number of residents, especially in RT 6 RW 2, is 48 families with a total of 142 residents Based on a preliminary survey on the elderly, especially in RW 02 on February 10, 2025, it was found that 54.54% of the elderly suffer from hypertension by 60.90%, diabetes mellitus 30.10%. The results of the study found that 31.81% of the elderly said they were easily angry, and 31.80% complained of stress easily if they had problems. From the anamnesis process or interviews carried out, it is also known that most of the elderly have sleep disorders. Based on the results of an interview conducted by the author on February 15, 2025 with 10 elderly people suffering from hypertension in Joyotakan Village, it was stated that they had been taking medication to lower their blood pressure. 4 patients said they routinely checked their blood pressure and 6 patients said they rarely checked their blood pressure. All patients said that so far they have only reduced salty foods, all patients have not known about anti-stroke gymnastics. This study aims to further explore the effect of anti-stroke gymnastics on blood pressure in hypertensive patients. The novelty of this study are to provide stronger scientific evidence regarding the effectiveness of anti-stroke gymnastics as a non-pharmacological intervention in the management of hypertension. In addition, this research can also contribute to the development of more structured and evidence-based exercise programs in health facilities and elderly communities who are at high risk of hypertension and its complications.

METHOD

The research design used was quasi-experimental with a pretest and post test control group design approach. There were two groups, namely the intervention group that participated in anti-stroke gymnastics and the control group that did not receive the intervention. The population in this study is elderly people with hypertension who are registered in health facilities or elderly communities. Samples were taken by Purposive sampling technique, with a minimum number of 30 respondents (15 in the intervention group and 15 in the control group based on the calculation of different test samples). The inclusion criteria are the elderly aged ≥60 years, have hypertension diagnosed by medical personnel, can do light to moderate physical activity, and are willing to participate in gymnastics. The exclusion criteria in this study were the elderly with severe comorbid diseases such as heart failure, severe mobility disorders or unwillingness to participate in interventions until they were discouraged. The indicators to be measured are systolic and diastolic blood pressure before and after the intervention. The instruments used are digital sphygmomanometers to measure blood pressure, observation sheets to record measurement results. Blood pressure measurements will be taken before gymnastics, after 4 weeks and after 8 weeks of intervention. The results are recorded in the blood pressure measurement table.

The data analysis technique uses a data normality test before applying an inferential statistical test. If the data is distributed normally, then use the paired sample t-test. If it is not normal, use the non-parametric Mann-Whitney and Wilcoxon tests. The Paired Sample t-test is used to test for differences in blood pressure before and after the intervention in the intervention group. An Independent Sample t-test to compare differences in blood pressure between the intervention group and the control group after treatment. Interpretation of results If the p-value < 0.05, then there is a significant difference before and after the intervention. If the results show a significant decrease in blood pressure in the intervention group compared to the control, then it can be concluded that anti-stroke gymnastics is effective in lowering blood pressure in the elderly with hypertension. The research will be carried out for the proposed time for approximately 6 months, starting from the preparation of proposals, revision of proposals, research contracts, field research, processing of results and publication in the Sinta journal. In this study, the head researcher will be fully responsible for the implementation of the research process up to the results of research and journal publications. Members are tasked with assisting in the research process, for example assisting in blood pressure measurement before and after the administration of stroke exercises, the implementation of therapy and documentation during the implementation of activities. This research has gone through the ethical testing stage and has been declared suitable for research.

RESULT

This study was conducted to determine the effect of stroke exercise on blood pressure in the elderly with hypertension in Joyotakan Village, Surakarta with the following results:

Table 1.
Distribution of the frequency of age of those with hypertension

Age (year)	Age classification	Sum f	Sum %
60yrs-74yrs	Elderly	22	73
75 -89 yrs	Old age	8	27
> 90 yrs	Highly advanced	0	0

Based on table 1, it shows that the age of the elderly who experience hypertension is mostly elderly with a total of 22 people (73%).

Table 2.

Frequency distribution of the sexes with hypertension

Gender	f	%
Man	7	23
Woman	23	77

Based on table 2, it shows that the gender of the elderly who experience hypertension is mostly women with a total of 23 people (77%) and men 7 people (23%).

Table 3.
Distribution of blood pressure frequencies before being given treatment stroke exercises (*Pre test*)

Blood pressure (mmHg)	Classification	Pre-Test f	%
< 120 and < 80	Usual	0	0
120-139 and 80-89	Pre-Hypertension	0	0
140-159 and 90-99	Hypertension degree I	20	67
≥ 160 and ≥ 100	Hypertension grade II	7	23
> 180 and > 110	Hypertension of the third degree	3	10

Based on table 3, it shows that before being given treatment (stroke exercise), the majority of respondents were with degree I hypertension of 20 people (67%). Degree II hypertension was 7 people (23%) and degree III hypertension was 3 people (10%).

Table 4.
Distribution of blood pressure frequency after stroke exercise treatment (*Post-Tests*)

Blood pressure (mmHg)	Classification	Post-Tests F	%
< 120 and <80	Usual	13	43
120-139 and 80-89	Pre-Hypertension	9	30
140-159 and 90-99	Hypertension degree I	5	17
≥ 160 and ≥ 100	Hypertension grade II	3	10
> 180 and > 110	Hypertension of the third degree	0	0

Based on table 4, blood pressure after being given stroke exercise. After the stroke exercise, normal blood pressure was 13 people (43%), pre-hypertension was 9 people (30%), grade I hypertension was 5 people (17%) and grade II hypertension was 3 people (10%).

Effect of stroke exercise on blood pressure

Post-test stroke exercises

The *wilcoxon test* is used to determine the difference in blood pressure before and after being given a stroke exercise, the test results are as follows:

Table 5.
Wilcoxon Test Results

	Sistole				Diastole			
	Average	Zhitung	*p-value*	Information	Average	Zhitung	*p-value*	Information
Pre-Test	154,6	2,947	0,003	Cheap Price	94,1	2,274	0,006	Cheap Price
Post-Tests	128,6				80,0			

The results of *the wilcoxon calculation* for the effect of stroke exercise on blood pressure were obtained a value z_{hitung} of 2.947, while z_{tabel} it was 1.96 and p value (0.003 < 0.05), because z_{hitung} (2.947) > z_{tabel} (1.96) Ho was rejected and Ha was accepted, meaning that there was a difference in blood pressure (Sistole) before and after being given stroke exercise. The results of *the wilcoxon calculation* for the effect of stroke exercise on blood pressure in hypertensive patients were obtained a value z_{hitung} of 2.274, while z_{tabel} it was 1.96 and p value (0.006 < 0.05), because z_{hitung} (2.274) > z_{tabel} (1.96) Ho was rejected and Ha was accepted, meaning that there was a difference in blood pressure (diastole) before and after being given stroke exercise.

DISCUSSION

Characteristics of respondents by age and gender

Based on the results of the study, it shows that the age of the elderly who experience hypertension is mostly elderly with a total of 22 people (73%) with the majority of the female gender. There are various factors that can cause a person to experience hypertension, including factors that cannot be changed including age, gender, and heredity. Meanwhile, factors that can be changed include smoking habits, salt consumption, saturated fat consumption, obesity, lack of physical activity and stress (Eviyanti et al., 2021). The increase in blood pressure in this study is related to increasing age which is one of the factors that cannot be changed where as we age, there will be a decrease in physical condition, including a decrease in the level of vascular elasticity which can trigger an increase in blood pressure. As you get older, blood pressure will increase. This can happen because the blood vessels will become larger, harder, less elastic and thicker so the heart has to work harder to pump blood (Milan, 2022).

Women tend to have more potential to suffer from hypertension than men because women experience an increased risk of high blood pressure (hypertension) after menopause, which is the age of over 45 years (Tina et al.2021). Gender can affect the occurrence of hypertension. Men have a 2.3 times greater risk of increased systolic blood pressure compared to women because men tend to have lifestyles that tend to increase blood pressure. However, unlike women who enter menopause, the prevalence of hypertension in women will increase after the age of 65, this occurs due to hormonal factors. (Sumartini et al., 2019). Based on international research, a large population study in Germany reported that the prevalence of hypertension in the age group of 65–94 years reached 73.8%, with almost the same rate between males (74.8%) and females (73.5%) (Muli et al., 2020) . However, some studies in different countries show that in older age groups, women tend to have a higher prevalence of hypertension than men, especially after menopause, which is thought to be linked to hormonal changes and increased arterial resistance with age (Ahmad & Oparil, 2017; Egan et al., 2024; Yeo et al., 2024).

Research in the United States and other countries also confirms that older women are more prone to hypertension than older men, although at a young age men are more likely to develop hypertension (Ahmad & Oparil, 2017; Yeo et al., 2024). This is supported by data from the study *Risk of Atherosclerosis in the Community (ARIC)* which shows that at the age of over 60 years, the prevalence of hypertension and uncontrolled hypertension increases more sharply in women than in men (Yeo et al., 2024). In addition to age and hormonal factors, social factors such as low levels of physical activity, socio-economic status, and social isolation also contribute to the high rate of hypertension in elderly women (Hosseini et al., 2021; Leszczak et al., 2024).

Research in Poland and Bangladesh found that risk factors such as obesity, lack of physical activity, and diabetes are more commonly found in elderly women with hypertension (Hanif et al., 2021; Leszczak et al., 2024). The Canadian study also highlighted that older women who do not have a partner or have limited social networks have a higher risk of hypertension, signaling the importance of social support in the prevention and management of hypertension in this group (Hosseini et al., 2021). Overall, the finding that the majority of people with hypertension in the elderly are women is supported by numerous international studies, and confirms the need for more gender-specific interventions, including the promotion of physical activity, early detection, and social support for older women (Ahmad & Oparil, 2017; Egan et al., 2024; Hanif et al., 2021; Hosseini et al., 2021; Muli et al., 2020; Yeo et al., 2024) . Thus, the results of this study are in line with global epidemiological trends and highlight the importance of a gender-based approach in the management of hypertension in the elderly.

Blood Pressure Before Stroke Exercise

Based on the results of the study, it shows that before being given exercise stroke treatment, the

average elderly person is in the category of degree I hypertension, this finding is consistent with the epidemiology of hypertension in the elderly population. Hypertension degree I (*Hypertension stage 1*) is generally defined as systolic blood pressure of 130–139 mmHg or diastolic 80–89 mmHg according to the 2017 ACC/AHA guidelines, and is an early stage often found in the elderly before lifestyle or pharmacological interventions are performed (Vamvakis et al., 2020; Wang et al., 2019). Research by Banks et al. (2023) confirms that in middle-aged and advanced individuals with untreated grade I hypertension, the average blood pressure before physical exercise intervention is indeed in the range of stage 1 *Hypertension*. The study also showed that interventions in the form of *resistance training (RET)* significantly lowered systolic and diastolic blood pressure in this group, indicating that the elderly with grade I hypertension were highly responsive to nonpharmacological interventions (Banks et al., 2024).

In addition, a meta-analysis by Hejazi et al. (2024) and Kazeminia et al. (2020) also found that most elderly participants in the exercise intervention study started the program with blood pressure in the category of degree I hypertension. (Hejazi et al., 2025; Kazeminia et al., 2020). Other intervention studies, such as the HINTreat Trial by Vamvakis et al. (2020), have also reported that participants with grade I hypertension who underwent intensive lifestyle interventions (diet and exercise) experienced a meaningful reduction in blood pressure, reinforcing the importance of early detection and treatment at this stage (Vamvakis et al., 2020). Thus, the findings that the average elderly before treatment were in degree I hypertension is in line with global trends and supports the importance of exercise-based early intervention to prevent further complications. The results of the above research are also in line with several research results on hypertension in Indonesia. There are various factors that can cause a person to experience hypertension, including factors that cannot be changed including age, gender, and heredity. Meanwhile, factors that can be changed include smoking habits, salt consumption, saturated fat consumption, obesity, lack of physical activity and stress (Hernawan & Rosyid, 2017).

In line with the research conducted by Naldi *et al.* (2022) which showed that the average blood pressure of respondents before the intervention was 153/96.5 mmHg. The increase in blood pressure in this study is related to increasing age which is one of the factors that cannot be changed where as we age, there will be a decrease in physical condition, including a decrease in the level of vascular elasticity which can trigger an increase in blood pressure. (Hejazi et al., 2025) As you age, blood pressure will increase. This can happen because the blood vessels will become larger, harder, less elastic and thicker so the heart has to work harder to pump blood (Milan, 2022).

Blood Pressure After Stroke Exercise

Based on the results of the study, it was found that blood pressure after administration stroke exercise, normal blood pressure as many as 13 people (43%), pre-hypertension as many as 9 people (30%), degree I hypertension as many as 5 people (17%) and degree II hypertension as many as 3 people (10%). Average blood pressure after hypertension exercise was 127/78 mmHg. The decrease in the proportion of grade I and II hypertension and the increase in the number of elderly people with normal blood pressure are in line with the findings of the latest meta-analysis and randomized clinical trials. Hejazi et al. (2024) reported that various physical exercise protocols, including a combination of aerobic and resistance, significantly lowered systolic and diastolic blood pressure in hypertensive elderly, with an average decrease in SBP of about 6–11 mmHg and DBP of about 4–6 mmHg (Hejazi et al., 2025) . A study by Li et al. (2024) also confirms that combination exercise is effective in lowering blood pressure, even in the elderly who use or do not use

antihypertensive drugs (Li et al., 2024).

The average blood pressure of 127/78 mmHg after stroke exercise is consistent with the results of the research of Ruangthai & Phoemsapthawee (2019), where the combination of aerobic exercise and strength for 12 weeks lowered blood pressure to close to the normal range in hypertensive elderly (Ruangthai & Phoemsapthawee, 2019) . Other meta-analyses also showed that structured physical exercise can lower blood pressure by up to 5–10 mmHg, which is clinically significant in lowering the risk of cardiovascular complications (Kazeminia et al., 2020).

Stroke exercise is one of the exercises that aims to increase blood flow and oxygen supply to active muscles and skeletons, especially the heart muscle. Stroke exercise is one way of maintaining physical freshness or physical training that can be done to reduce weight and manage stress so that it can increase the body's metabolic activity, can stimulate the heart's work activities and can strengthen the heart muscles (Milan, 2022). By doing gymnastics (exercise), the oxygen requirement of cells increases for energy formation so that there is an increase in heart rate, heart output, and stroke volume. This is in line with the results of research by Kazuaki Oyake et al. (2019) published in the journal PLoS ONE. In the study, it was found that during physical exercise, oxygen consumption (VO_2) increased significantly, which was followed by an increase in heart rate, heart output, and stroke volume. The study also confirmed that increased heart rate and the ability of muscles to extract oxygen were major factors in increased oxygen consumption during physical activity (Oyake et al., 2019). If you exercise regularly and continuously, then the drop in blood pressure will last longer and the blood vessels will be more elastic (Arindari & Alhafis, 2019). These results confirm that stroke exercise or hypertension exercise is an effective, safe, and integrable nonpharmacological intervention in hypertension prevention and management programs in the elderly

The Effect of Stroke Exercise on Blood Pressure in Hypertensive Patients

The results of the study show that stroke exercise is effective in lowering blood pressure in the elderly. The results of the study after a stroke exercise will cause the blood pressure of the elderly to decrease. Based on the results of research, stroke exercise or structured physical exercise has been proven to be effective in lowering blood pressure in the elderly with hypertension. This decrease occurred in both systolic and diastolic blood pressure, and its effects were consistently found in a variety of research designs, ranging from randomized clinical trials to meta-analyses. Herrod et al. (2020) in randomized controlled clinical trials found that physical exercise interventions such as high-intensity interval training (HIIT) and *Isometric Handgrip Training (IHG)* for 6 weeks was able to lower systolic blood pressure by an average of 9 mmHg in the elderly, with no significant change in the control group (Herrod et al., 2021). This decrease is clinically significant and may lower the risk of cardiovascular complications.

A meta-analysis by Kazeminia et al. (2020) involving 69 studies and more than 2,200 elderly people showed that regular physical exercise lowered systolic blood pressure from an average of 137.1 mmHg to 132.98 mmHg, and diastolic from 80.3 mmHg to 76.0 mmHg, with statistically significant differences ($p < 0.01$) (Kazeminia et al., 2020). Similar results were also found by Hejazi et al. (2024), who reported that various exercise protocols (aerobic, resistance, combination) significantly lowered blood pressure in hypertensive elderly (Hejazi et al., 2025).

Another study by Ruangthai & Phoemsapthawee (2019) specifically examined a combination of resistance and strength training in hypertensive elderly people, and found a decrease in systolic

blood pressure by 8.2% after 12 weeks of intervention (Ruangthai & Phoemsapthawee, 2019). This is in line with the research of Tina, et al. who stated that after a stroke exercise intervention for 2 weeks (4 sessions with a duration of 30 minutes) the results of systolic blood pressure were obtained with an average of 127.4 mmHg (min – max value 110 – 150 mmHg) and diastol pressure of 77.7 mmHg (nilia min-max 60 – 90 mmHg). Based on these conditions, there was a 22 mmHg decrease in systolic blood pressure and a 3.4 mmHg decrease in diastolic blood pressure. (Tina et al.2022). This study is also in line with the research of Basuki & Barnawi (2021) which states that stroke exercise has an effect on reducing systolic blood pressure as evidenced by a P value of 0.002 where a P-Value of <0.05 in the elderly community of women in Petir village, Kalibagor district, Banyumas. There is an effect of lowering diastolic blood pressure before and after administration *Treatment* gymnastics for three times on elderly women in Petir village, Kalibagor district, Banyumas (Basuki & Barnawi, 2021).

The reduction in blood pressure achieved through stroke exercise or hypertension gymnastics in the elderly is not only statistically significant, but also has a major impact on lowering the risk of stroke, heart disease, and other complications related to hypertension. Physical exercise can be recommended as the main nonpharmacological therapy in the elderly with hypertension, both as a prevention and management of blood pressure.

CONCLUSION

Based on the study of the effect of stroke exercise on blood pressure in hypertensive patients can be concluded as follows as : the age of respondents who experienced hypertension was mostly elderly with female gender, before the stroke exercise treatment, the majority of respondents were degree I hypertension , after exercise stroke, the majority of respondents had normal blood pressure, there is an effect of stroke exercise on lowering blood pressure in people with hypertension.

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