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Research Article

The effect of walking physical exercise on blood pressure of the pedestrian community in Penjaringan Sari Surabaya

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ABSTRACT

Hypertension is a non-communicable disease that is one of the main causes of premature death in the world. Pharmacologically by administering anti-hypertensive drugs. In non-pharmacological management of hypertension can be done with a healthy lifestyle. A study states that the most appropriate non-pharmacological treatment for people with hypertension is exercise. This research is quantitative research with a quasi-experimental design. The dependent variable in this study was walking physical exercise, while the independent variables in this study consisted of heart rate, systolic blood pressure, and diastolic blood pressure. The subjects of this study were 30 members of the pedestrian community, who were divided by purposive sampling into the treatment group and the control group. The tools used to obtain primary data in this study were the results of measuring blood pressure before and after walking. The results of the study: 1) there is a difference in the average pulse rate between the pretest and post-test in both the treatment and control groups; 2) there is an effect of walking physical exercise on pulse rate; 3) there is a difference in the mean systolic blood pressure and diastolic blood pressure between pretest and post-test; 4) there is a difference in the average blood pressure between the pretest and post-test of the control group; 5) there is no effect of physical exercise walking on blood pressure; 6) There was no difference in blood pressure and pulse between the treatment and control groups. In conclusion, the physical exercise of walking for 1 week could reduce pulse rate but could not reduce systolic blood pressure and diastolic blood pressure.

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INTRODUCTION

Hypertension is a condition of cardiovascular disease characterized by an increase in blood pressure beyond normal. Hypertension is expressed in millimeters (mm) of mercury (Hg). There are two types of blood pressure levels, namely when the heart beats, the blood pumps blood into the blood vessels and the pressure increases, which is called systolic pressure, and when the heart relaxes, blood pressure decreases to its lowest level, which is called diastolic blood pressure. If it drags on, blood pressure will increase and if it is not treated immediately it can result in heart and kidney attacks and what is most feared is paralysis caused by rupture of blood vessels in the brain (stroke) (Subakti, 2014).

Hypertension is a non-communicable disease that is one of the main causes of premature death in the world (RI Ministry of Health, 2020). Hypertension is often referred to as the silent killer because it often occurs without complaints and sufferers only find out about it after complications occur (Kemenkes RI, 2019). Without realizing it, sufferers experience complications in vital organs such as dizziness, visual disturbances, and headaches, and often occur because blood pressure has reached a certain significant number (Triyanto, 2014).

Based on data from the World Health Organization (WHO) in 2015, around 1.13 billion people in the world have hypertension, meaning that 1 out of 3 people in the world is diagnosed with hypertension. The number of people with hypertension continues to increase every year, it is estimated that by 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 9.4 million people die from hypertension and its complications (Ministry of Health RI, 2019). In Indonesia, hypertension is still ranked first as the highest prevalence of non-communicable diseases and has even become the government's main focus in handling it. In 2018, the prevalence of hypertension in Indonesia was 34.11%, the highest prevalence occurred in South Kalimantan (44.13%) and the lowest in Papua (22.22%) (Litbang KemKes, 2018).

The cause of a person suffering from hypertension is a decrease in the elasticity of the aortic wall, thickening of the heart valves which stiffens the valves, decreased ability to pump the heart, loss of elasticity of the peripheral blood vessels, and increased resistance of the peripheral blood vessels (Nurarif & Kusuma, 2016). Another factor is an unhealthy lifestyle, for example, smoking, consuming alcohol, lack of activity, obesity, consuming excessive salt, and stress. It is necessary to control the risk factors for hypertension by modifying the lifestyle of people with hypertension, one of which is exercising habits (Basha, A., 2008). Management of patients with hypertension can be done pharmacologically and non-pharmacologically.

Pharmacologically by administering antihypertensive drugs. Several groups of hypertension drugs that are commonly used are diuretics, beta-blockers, Angiotensin Converting Enzyme inhibitors (ACE Inhibitors), angiotensin receptor blockers (ARBs), and calcium antagonists (CCBs). However, the pharmacological treatment also has side effects, namely worsening the disease state or other fatal effects. This is because the response to a type of drug in each person is different. Side effects that may arise are headaches, dizziness, weakness, and nausea (Susilo & Wulandari, 2011).

Non-pharmacological management of hypertension can be done with a balanced diet, activity, a healthy lifestyle, and good stress management. A study states that the most

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appropriate non-pharmacological treatment for people with hypertension is exercise or exercise. Several studies suggest that physical exercise is very beneficial and may have a positive effect on chronic disorders, such as hypertension. Some research results show that 32.9% of people are active in physical exercise and 67.1% are less physically active. The risk for the physically active group was 0.40 times lower than the less physically active group (Gandasentana & Kusumaratna, 2011). This is supported by Iswahyuni's research in 2017 which stated that lack of physical exercise is an independent risk factor for chronic disease and is expected to cause death globally.

Some exercises that can be done are walking, jogging, swimming, cycling, and dancing (Hasanudin et al., 2018). Walking has positive effects, namely reducing blood pressure, improving lipid profiles, reducing body fat ratios, emotional and mental well-being, reducing pain, and reducing heart disease (Wallace. J, 2003). A previous study stated that walking for 4 weeks had significant results in reducing systolic blood pressure, diastolic blood pressure, LDL values, and triglyceride. In walking training, there is an initial response in the form of a linear increase in systolic blood pressure that occurs together with an increase in work intensity which is secondary to an increase in cardiac output. This decrease in resistance is more evident in diastolic blood pressure (Powers & Howley, 2007).

According to WHO (2020), a person should do at least 150 – 300 minutes of moderate-intensity aerobic physical activity throughout the week. Therefore, walking physical exercise in this study was carried out at moderate intensity using 30 minutes (5x/week) for 4 weeks. This study aimed to investigate the effect of walking on blood pressure from members of the Penjaringan Sari community.

METHODS

Researchers used a type of quantitative research using a quasi-experimental research design. The data collection method used purposive sampling, then divided into a treatment group and a control group. Data sources were taken from the results of measurements of pulse rate, systolic blood pressure, and diastolic blood pressure. Data analysis in this study used the normal test and the Wilcoxon test. This research has received permission from *Komite Etik Penelitian Kesehatan FK Unair* with No. 235/EC/KEPK/FKUA/2022.

RESULTS

Table 1. Characteristics of Research Subjects

Characteristic	Frequency (n=30)	Percentage (%)
Age (years)		
40 – 50	11	36.7
51 - 60	19	63.3
Sports habits		
Yes	13	43.3
No	17	56.7

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Table 2. Description of Pulse Rate Members of the Pedestrian Community in Penjaringan Sari (Treatment Group)

Category	Mean	Standard Deviation
Pre-Test	93.67	9.005
Post-Test	87.67	9.469

Table 3. Description of Pulse Rate Members of the Pedestrian Community in Penjaringan Sari (Treatment Group)

Category	Mean	Standard Deviation
Pre-Test	93.20	7.599
Post-Test	91.87	9.086

Table 4. Normality Test Results (The Effect of Walking Physical Exercise on Pulse Rate of Members of the Walking Community in Penjaringan Sari (Treatment Group))

Group	Sig.
Pre-Test Pulse Rate	0.010
Post-Test Pulse Rate	0,892

Based on Table 1, it shows that there are 14 research subjects aged 40-50 years (36.7%) and 16 research subjects aged 51-60 years (63.3%). Regarding sports habits, 17 people (56.7%) said they had never done sports and 13 people (43.3%) said they had done sports.

Based on Table 2, the average pre-test pulse rate for the treatment group was 93.67. The standard deviation of the treatment group's pre-test pulse was 9.005. Meanwhile, the average post-test pulse rate of the treatment group was 87.67. The standard deviation of the post-test pulse in the treatment group was 9.469.

Based on Table 3, the average pre-test pulse for the control group was 93.20. The standard deviation of the control group's pre-test pulse was 7.599. Meanwhile, the average post-test pulse of the control group was 91.87. The standard deviation of the control group's post-test pulse was 9.086.

Based on Table 4, the pre-test pulse in the treatment group has a sig. 0.010 and the post-test pulse of the treatment group has sig. 0.892, there is a significant difference in the results between the pre-test and post-test. Therefore, it can be concluded that the above data is not normally distributed, and testing must be done with the Wilcoxon test.

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Table 5. Wilcoxon Test: Statistical Test

		Post-test-Pre-test
Z		-2.622b
Asymp. (2-tailed)	Sig.	0.009

Table 6. Normality Test Results (The Effect of Walking Physical Exercise on Pulse Rate of Members of the Walking Community in Penjaringan Sari (Control Group))

Group	**Sig.**
Pre-Test of Pulse Rate	0.624
Post-Test of Pulse Rate	0.816

Table 7. Wilcoxon Test: Statistical Test

		Postest-Pretest
Z		-.398b
Asymp. (2-tailed)	Sig.	0.691

Table 8. Description of Blood Pressure of Pedestrian Community Members in Penjaringan Sari (Treatment Group)

Category	**Mean**	**Standard Deviation**
Pre-Test Systolic	156.67	18.387
Post-Test Systolic	151.37	18.676
Pre-Test Diastolic	97.33	12.517
Post-Test Diastolic	92	12.364

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Based on Table 5, it can be seen that the significance of the Wilcoxon test for pretest and posttest data has a sig value < 0.05. This shows that there is an effect of walking physical exercise on the pulse rate of members of the pedestrian community in Penjaringan Sari treatment group.

Based on Table 6, it can be seen that the pulse pre-test without sig. 0.624 and post-test pulse without intervention sig. 0.816, there is a sig. > 0.05 between pre-test and post-test. Therefore, it can be concluded that the above data is not normally distributed, and testing must be done with the Wilcoxon test.

Based on Table 7, it can be seen that the significance of the Wilcoxon test for pretest and posttest data has a sig value. >0.05. This shows that there is no effect of walking physical exercise on pulse rate in members of the pedestrian community in the control group.

Based on Table 8, the mean pre-test systolic blood pressure for the treatment group was 156.67. The standard deviation of the pre-test systolic blood pressure in the treatment group was 18.387. Meanwhile, the mean post-test systolic blood pressure in the treatment group was 151.37. The standard deviation of the post-test systolic blood pressure in the treatment group was 18.676. Meanwhile, the mean pre-test diastolic blood pressure for the treatment group was 97.33. The standard deviation of the pre-test diastolic blood pressure in the treatment group was 12.517. Meanwhile, the mean post-test diastolic blood pressure in the treatment group was 92. The standard deviation of the post-test diastolic blood pressure in the treatment group was 12.364.

Table 9. Description of Blood Pressure of Pedestrian Community Members in Penjaringan Sari (Control Group)

Category	Mean	Standard Deviation
Pre-Test Systolic	162.33	14.251
Post-Test Systolic	156.67	14.475
Pre-Test Diastolic	96.33	10.768
Post-Test Diastolic	93.67	9.348

Table 10. Normality Test Results (The Effect of Walking Physical Exercise on Blood Pressure of Members of the Walking Community in Penjaringan Sari (Treatment Group))

Group	Sig.
Pre-Test Systolic	0.083
Post-Test Systolic	0.063
Pre-Test Diastolic	0.241
Post-Test Diastolic	0.002

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Based on Table 9, the mean pre-test systolic blood pressure for the control group was 162.33. The pre-test systolic blood pressure standard deviation for the control group was 14.251. Meanwhile, the mean post-test systolic blood pressure in the control group was 156.67. The standard deviation of the post-test systolic blood pressure in the control group was 14.475. Meanwhile, the mean pre-test diastolic blood pressure for the control group was 96.33. The standard deviation of the control group's pre-test diastolic blood pressure was 10.768. Meanwhile, the post-test average diastolic blood pressure for the control group was 93.67. The post-test standard deviation of the control group's diastolic blood pressure was 9.348.

Based on Table 10, it can be seen that the pre-test systolic blood pressure, post-test systolic blood pressure, pre-test diastolic blood pressure have sig. > 0.05, whereas in the post-test the blood pressure was sig. has a value <0.05, so it can be concluded that the above data is not normally distributed and testing must be done with the Wilcoxon test.

Table 11. Wilcoxon Test: Statistical Test

	Post-test systolic – Pretest systolic	**Post-test diastolic – Pretest diastolic**
Z	-1.508b	-1.516b
Asymp. Sig. (2-tailed)	0.132	0.129

Table 12. Normality Test Results (The Effect of Walking Physical Exercise on Blood Pressure of Members of the Walking Community in Penjaringan Sari (Control Group))

Group	**Sig.**
Pre-Test Systolic	0.214
Post-Test Systolic	0.120
Pre-Test Diastolic	0.128
Post-Test Diastolic	0.104

Table 13. Wilcoxon Test: Statistical Test

	Post-test systolic – Pretest systolic	**Post-test diastolic – Pretest diastolic**
Z	-1.266b	-.815b
Asymp. Sig. (2-tailed)	0.205	0.415

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Table 14. Wilcoxon Test: Statistical Test (Difference post-test pulse rate between the treatment group and the control group)

	Post-test pulse rate in the treatment group – Post-test pulse rate in the control group
Z	-1.365b
Asymp. Sig. (2-tailed)	0.172

Table 15. Wilcoxon Test: Statistical Test (Difference in post-test blood pressure between the treatment group and the control group)

	Post-test systolic between the treatment and control group	**Post-test diastolic between the treatment and control group**
Z	-1.072b	-.316b
Asymp. Sig. (2-tailed)	0.284	0.752

Based on the Table 11, it can be seen that the significance of the Wilcoxon test for pretest and post-test data has a sig value. >0.05. This shows that there is no effect of walking physical exercise on the blood pressure treatment group of members of the pedestrian community in Penjaringan Sari.

Based on Table 12, it can be seen that the pre-test systolic blood pressure, post-test systolic blood pressure, and pre-test diastolic blood pressure have sig. >0.05, whereas in the post-test the blood pressure was sig. has a value > 0.05, so it can be concluded that the above data is not normally distributed and testing must be done with the Wilcoxon test.

From Table 13, it can be seen that the significance of the Wilcoxon test for pretest and post-test data has a sig value. >0.05. This shows that there is no effect of walking physical exercise on the blood pressure control group of members of the pedestrian community in Penjaringan Sari.

From Table 14 above it can be seen that the significance of the Wilcoxon test for the posttest data for the treatment group and the posttest for the control group has a sig value. >0.05. This shows that there is no effect of walking physical exercise on pulse rate in members of the pedestrian community in Penjaringan Sari, both the treatment group and the control group.

From Table 15, it can be seen that the significance of the Wilcoxon test for pretest and posttest data has a sig value. > 0.05. This shows that there is no effect of walking physical exercise on blood pressure in members of the pedestrian community in Penjaringan Sari, both the treatment group and the control group.

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DISCUSSION

Hypertension is a condition of cardiovascular disease characterized by an increase in blood pressure beyond normal. Hypertension has long been known as a disease that has many risk factors, both uncontrollable and controllable factors. The classification of hypertension is divided into 2, namely based on the cause and based on the form of hypertension. If viewed based on the cause, there is primary hypertension and secondary hypertension. However, when viewed based on its shape, there are diastolic hypertension, systolic hypertension, and mixed hypertension (Ashwini, A., 2008). Several studies suggest that physical exercise is very beneficial and may have a positive effect on chronic disorders, such as hypertension. In walking training, there is an initial response in the form of a linear increase in systolic blood pressure that occurs together with an increase in work intensity which is secondary to an increase in cardiac output (Isral, G., Afriwardi, A. & Sulastri, D., 2014; Iswahyuni, S., 2017)

Based on Table 1, there were 11 people aged 40-50 years (36.7%) and 19 people (46.7%) who were aged 51-60 years. This is in accordance with Harrison's Principle of Internal Medicine which states that the older a person is, the higher their blood pressure. This is due to increasing age, the arteries experience a lack of elasticity (Braunwald et al., 2005). This is in line with previous research which stated that the age of most respondents with hypertension was those aged over 50 years. In this study, there were 13 research subjects who had the habit of walking with a percentage of 43.3% and those who did not have the habit of walking were 17 people with a percentage of 56.7%, so in this study more did not have the habit of walking.

Based on Table 2, the average post-test pulse rate of the treatment group < the average pretest pulse rate of the treatment group, meaning that there is a decrease in the average between the pre-test and post-test. While in Table 3 it can be seen that the post-test average pulse rate of the control group < the pretest average pulse rate of the control group, meaning that there is a decrease in the average between the pre-test and post-test. The heart rate or pulse is controlled by the nervous system. The response in the form of an increase in nerve impulses from the brainstem to the sympathetic nerves will cause a decrease in the diameter of blood vessels and an increase in heart rate frequency. Changes in heart rate, both increasing and using it are regulated by sympathetic and parasympathetic activity. Besides the sympathetic nerves and parasympathetic nerves, the heart rate is also regulated by epinephrine and nor-epinephrine (Sundal, 2012).

Based on the results of the research on the effect of walking physical exercise on the blood pressure of members of the pedestrian community in the Penjaringan Sari treatment group, it can be seen that there is a difference between the pulse before and after carrying out the walking physical exercise treatment (sig. $0.009 < \alpha = 0.05$), which can be interpreted that there is a significant effect of physical exercise on the pulse before and after walking physical exercise. This is supported by Andiyani's research (2020) which states that there was an effect of student activity on the pulse during the COVID-19 pandemic at the Faculty of Medicine, Muhammadiyah University, North Sumatra. While the results of the research on the effect of walking physical exercise on the blood pressure of members of the pedestrian community in the control group showed that there was no difference between the pulse before and after in the control group (sig. $0.691 > \alpha = 0.05$), which mean that there is no effect on the pulse without physical exercise walking in the control group. The results of this study are different from Marinov's research (2016)

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which showed that aerobic exercise can increase pulse frequency, blood lactic acid, body temperature, and blood pressure.

Based on Table 8, the mean post-test systolic and diastolic of the treatment group < the mean of the pretest systolic and diastolic of the treatment group, meaning that there is a decrease in the average between the pre-test and post-test. While in Table 9 the systolic and diastolic post-test mean of the control group < the mean of the control group's pretest systolic and diastolic, meaning that there is a decrease in the average between the pre-test and post-test. Systolic and diastolic blood pressure is the power generated by blood against each unit area of the vessel wall (Guyton & Hall, 2008). Physical activity that is carried out regularly will have beneficial effects on health, including: Avoiding heart disease, stroke, osteoporosis, cancer, high blood pressure, diabetes, and others (KEMENKES RI, 2021).

Based on Table 11 there is no difference between systolic blood pressure before and after doing the walking physical exercise treatment (sig. 0.132 > α = 0.05), which means that there is no significant effect of physical exercise on systolic blood pressure before and after walking exercise. For diastolic blood pressure before and after the walking physical exercise intervention has sig. 0.129 > α = 0.05, which means that there is no significant effect of physical exercise on diastolic blood pressure before and after walking. Based on Table 13 there is no difference between systolic blood pressure without walking physical exercise (sig. 0.284 > α = 0.05), which means that there is no significant effect on systolic blood pressure without walking physical exercise. For diastolic blood pressure before and after the walking physical exercise intervention has sig. 0.752 > α = 0.05, which means that there is no significant effect on diastolic blood pressure without walking. This is different from the research conducted by Annazmi et al. (2022) stated that there was an effect of walking physical exercise on blood pressure, both systolic and diastolic. Research from Subakti (2014) also states that there is an effect of walking physical exercise on blood pressure. Other research also states that walking for 30 minutes with a frequency of 4 times a week greatly affects the decrease in systolic and diastolic blood pressure (Silwana et al., 2020).

Based on the results of the post-test different pulse test between the treatment group and the control group, the results were sig. 0.172, meaning that the significance value is > 0.05. Meanwhile, the results of the post-test differential blood pressure test between the treatment group and the control group (both systolic and diastolic) had a sig. > 0.05, meaning that there was no difference in post-test pulse and blood pressure between the treatment group and the control group.

CONCLUSION

Based on this study, the physical exercise of walking for 1 week can reduce pulse rate, but it cannot reduce systolic blood pressure and diastolic blood pressure.

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