

# Jogging Effect on Blood Pressure in Hypertension Elderly with Normal Nutrition Status and Obesity

1<sup>nd</sup> Oktia Woro Kasmini  
Handayani  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
oktia\_woro@yahoo.co.id

2<sup>nd</sup> Dinda Kartika Yulisa  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
dindakartika01@yahoo.co.id

3<sup>rd</sup> Siti Baitul Mukarromah  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
sitibaitul@yahoo.co.id

4<sup>th</sup> Yuni Wijayanti  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
yuniwija@gmail.com

5<sup>th</sup> Lukman Fauzi  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
lukman.ikm@mail.unnes.ac.id

6<sup>th</sup> Arif Rahmat Kurnia  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
arif.arifrk@mail.unnes.ac.id

7<sup>th</sup> Mursid Tri Susilo  
Department of Public Health  
Faculty of Sport Science  
Semarang, Indonesia  
mursid@mail.unnes.ac.id

**Abstract**—The prevalence of hypertension in the elderly in Central Java is higher than in Indonesia. This research aimed to analyze the effect of jogging on blood pressure in elderly hypertension with normal nutritional status. The research design was quasi-experimental, with blood pressure measurements carried out before treatment and after treatment. Treatment in the form of jogging. The population was an elderly hypertensive community at Mulyoharjo Community Health Center with 32 people. The sample was determined by purposive sampling technique, which was divided into hypertensive groups with normal nutritional status and obesity hypertension group. The free variable is jogging, and the dependent variable is blood pressure. Data were analyzed by Friedman test. Jogging exercise produced a significant difference in systolic and diastolic blood pressure, both in the obese hypertension group and in the normal nutritional status group, with a p value of 0,000. Although the effect is more clearly seen in the group of patients with hypertension with obesity. Or it can be said that jogging performed by obese elderly people is more effective in decreasing blood pressure than the elderly with normal nutritional status.

**Keywords**—jogging, hypertension, obesity

## I. INTRODUCTION

Hypertension sufferers increase every year, and hypertension has caused 8 million people to die each year, 1.5 million of them coming from Southeast Asian countries. Globally the prevalence of hypertension is 42%. The largest proportion of all Non-Communicable Diseases (PTM) is occupied by hypertension, which is equal to 57.87%. The prevalence of hypertension in Central Java is greater in Indonesia, as for the elderly in Central Java at 58.4% for ages 55-64 years, 61.6% aged 65-74 years and 65.5% aged > 75 years old [1].

The results of several studies found factors that cause the tendency of hypertension in a person can be gender, age, socioeconomic, overweight or obese, including consumption of

alcohol and tobacco [2], [3]. In addition to Yao Lu's research[4], finding that the life style factor plays an important role for the occurrence of hypertension described in healthy Body Mass Index (18.5-24.9 kg / m<sup>2</sup>) and sleep duration (6-8 hours / day) were related with hypertension.

Blood pressure changes that occur in the elderly due to structural and functional changes in the peripheral vascular system. The main effects of aging physiologically occur in the cardiovascular system involving changes in systemic aorta and blood vessels. The thickness of the aortic and large artery walls increases and the elasticity of the vessels decreases with age. Reduction of the elasticity of large vessels can cause an increase in peripheral vascular resistance. The change in balance between  $\beta$ -adrenergic vasodilation and  $\alpha$ -adrenergic vasoconstriction supports vasoconstriction which increases peripheral vascular resistance and blood pressure. Sodium retention due to increased intake and decreased excretion can also cause hypertension [5], [6].

An increase in the elderly population is followed by an increase in obesity. Whereas overweight and obesity are the risk factors for non-communicable diseases, including hypertension [7]–[9]. The 2013 Riskesdas (Basic Health Research) data showed an increase in the incidence of obesity from 2007 compared to 2013, namely from 1.4% to 7.3%. People who are less active tend to have excess weight, while excess weight will increase the risk of hypertension. People who are not actively exercising also tend to have a higher heart rate so that the heart muscle must work harder at each contraction, and cause greater pressure to be imposed on the arteries[10]. Obese people are people who consume excess food compared to their needs and usually tend to be very carbohydrate-rich diets that encourage an increase in other lipid components in the blood, namely triglycerides, which is an additional risk factor for atherosclerosis, which could be the trigger of hypertension[11].

Exercise causes major changes in the circulatory and respiratory systems, both of which occur together as a homeostatic response. Exercise that is often used in patients with hypertension is aerobic exercise in the form of jogging. Regular exercise can reduce systolic and diastolic pressure in people with mild hypertension[12]. The purpose of this study was to analyze the effect of jogging on blood pressure in elderly hypertension with normal levels of nutritional status and obesity.

**II. MATERIALS & METHODS**

The research design was quasi-experimental, with blood pressure measurements carried out before treatment (pre-test) and after the treatment were re measured (post-test). Treatment is carried out in the form of jogging for 6 weeks with a frequency of 3 times a week or 2 days in 30 to 60 minutes (with incremental time increments) and the intensity given is 75-80% of the maximum heart rate, which is guided by a sports instructor. The study population was elderly hypertensive people in the work area of the Mulyoharjo Community Health Center in Pemalang Regency in July 2018 with a total of 32 persons. Samples were determined by purposive sampling technique, with sample conditions: 1) aged 60-70 years, 2) with mild hypertension diagnosed and not taking antihypertensive drugs, 3) not having other comorbidities such as kidney failure, heart disease and stroke, 4) having normal nutritional status or obesity, 5) willing to be a research sample. The number of samples was obtained by 10 people divided into 2 groups, namely the hypertension group with normal nutritional status and obesity hypertension group.

Free variable in the form of jogging, the confounding variable controlled in this study is food consumption, and the dependent variable is blood pressure. The research instrument is a Sphygmomanometer which is a tool for measuring blood pressure, and a data recording form. Before the hypothesis testing is carried out the normality test is done first using the Shapiro Wilk normality test and obtained p value <0.05 or abnormally distributed data, then Friedman test is performed to determine the difference in elderly blood pressure before and after jogging.

**III. RESULTS & DISCUSSIONS**

The systolic and diastolic blood pressure checks were carried out 21 times both before and after jogging. The results obtained are as follows:

- 1) Systolic blood pressure before jogging exercise, in the group of obesity nutritional status the highest average was on day 3 namely 159.00 mmHg and the lowest was on day 21 namely 147.2 mmHg. In the group of normal nutritional status the highest average was on day 3 namely 159.00 mmHg and the lowest was on day 13 namely 141.0 mmHg
- 2) Diastolic blood pressure before jogging exercise, in the obesity group the highest average was on day 3 namely 98.0 mmHg and the lowest was on day 21 namely 93.0 mmHg. In the group of normal nutritional status the highest average is on day 1 namely 97.4 mmHg and the lowest was on day 8 namely 92.0 mmHg.

Table I. Shows that Systolic blood pressure before jogging in the obese group averaged 152.20 / 95.80 mmHg, while in the group normal nutritional status averaged 151.00 / 94.40 mmHg. This shows that blood pressure before doing jogging in the normal nutritional status group is lower than the obese group.

**TABLE I. 21 DAYS AVERAGE DISTRIBUTION OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURE BEFORE JOGGING EXERCISE**

Variable	Experiment				Control			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Systolic Blood Pressure (Pre)	152,20	1,304	151	154	151,0	0,707	150	152
Diastolic Blood Pressure (Pre)	95,80	0,837	95	97	94,40	0,894	93	95

- 3) For systolic blood pressure after jogging, in the obesity group the highest average was on day 3 namely 156.60 mmHg and the lowest was on day 21 namely 141.00 mmHg. In the group of normal nutritional status the highest average was on day 3 namely 158.4 mmHg and the lowest was on day 13 namely 140.6 mmHg.
- 4) Diastolic blood pressure after jogging in the obese group, the highest average was on day 1 namely 97.20 mmHg and the lowest was on day 16 namely 91.6 mmHg. In the group of normal nutritional status the highest average was on day 1 namely 97.4 mmHg and the lowest was on day 21 namely 91.2 mmHg

Table II. Shows that blood pressure after jogging, in the obese group averaged 147.60 / 93.60 mmHg, while in the group normal nutritional status averaged 150.00 / 94.20 mmHg. This shows that blood pressure after jogging in the normal nutritional status group is higher than the obese group.

**TABLE II. 21 DAYS AVERAGE DISTRIBUTION OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURE AFTER JOGGING EXERCISE**

Variable	Experiment				Control			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Systolic Blood Pressure (Post)	147,6	0,548	147	148	150,0	1,0	149	151
Diastolic Blood Pressure (Post)	93,6	1,342	92	95	94,20	0,83	93	95

- 5) The results of the normality test found that the data were distributed abnormally, so the Friedman test was carried out and found: (1) there were differences in systolic blood pressure and diastolic on day 1 - 21 before jogging in elderly hypertension in Mulyoharjo Public Health Center, Pemalang District with p value 0,000. (2) There were differences in systolic and diastolic blood pressure on day

1 - 21 after jogging in elderly hypertension with a p value of 0,000.

The results of the study concluded that blood pressure before jogging in the elderly with normal nutritional status was lower than ones with obesity nutritional status. Nutritional status can be said to be a factor that influences a person's blood pressure. Obesity increases the risk of hypertension for several reasons. The greater the body mass, the more blood is needed to supply oxygen and food to the body's tissues. This means that the volume of blood circulating through the blood vessels increases, giving greater pressure to the arterial wall. Body weight and Body Mass Index (BMI) are directly correlated with blood pressure, especially systolic blood pressure. The relative risk of suffering from hypertension in obese people is 5 times higher than a person who has normal weight. In patients with hypertension, around 20-30% have more weight [10]. The food content that is high in fat and carbohydrates in obese people, acutely stimulates peripheral  $\alpha_1$  and  $\beta$ -adrenergic receptors, thus affecting increased sympathetic activity and high blood pressure or hypertension [11].

According to Riyadi [13], changes in nutritional status characterized by increased body weight can also directly affect changes in blood pressure. Whereas according to Suhardjono [14], hypertension that occurs in someone who has a lack of nutritional status or normal can also be caused by the sympathetic system and rennin angiotensin system. The activity of the sympathetic nerves is to regulate nerve and hormone functions, so that it can increase heart rate, constrict blood vessels, and increase water and salt retention. In the renin-angiotensin system, rennin triggers the production of aldosterone which will affect the kidneys to hold water and sodium, while angiotensin will reduce the diameter of the blood vessels so that blood pressure will rise [15].

Blood pressure after jogging in the elderly with obesity averaged 147.60 / 93.60 mmHg, while ones with normal nutritional status averaged 150.00 / 94.20 mmHg. This shows that blood pressure after jogging in the elderly with normal nutritional status is higher than ones with obesity nutritional status. The results of the intervention in this study, changes in blood pressure in the elderly with hypertension and obesity after doing jogging exercise is very different. Jogging is more evident in changes or decreases in blood pressure towards normal blood pressure in obese groups.

According to Rohaendi[5], walking or jogging regularly can maintain blood pressure stability because blood circulation will be smooth. Someone who exercises regularly is proven to be able to lower blood pressure to a normal level of 50% compared to people who rarely do these activities.

A research conducted in Brazil found that regular exercise can reduce systolic blood pressure by 6 mmHg or 2% and diastolic blood pressure by 3 mmHg or 4% in patients with resistant hypertension [16]. Aerobic exercise in the form of fast walking for 30 minutes 3 to 5 times a week in patients with primary hypertension can reduce systolic blood pressure and resting diastolic by 1.4 mmHg. According to The 7th Report of The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) the

key to treat hypertension is lifestyle modification, one of which is by walking for at least 30 minutes a day and several times a week. Walking in the form of jogging is a lightweight, simple, inexpensive and able to be performed by all hypertensive patients.

Walking habits are aerobic activities that are useful for increasing and maintaining cardiovascular and musculoskeletal endurance. With regular physical exercise will make the heart work efficiently. The ability of the heart to work will increase according to changes that occur in the body such as the heart frequency, stroke and cardiac output.

Regular morning physical activity will reduce blood pressure. Regular activity can reduce blood pressure in old age. Recent research shows that regular activity can help maintain blood vessel elasticity. In addition, regular physical activity teaches the body to distribute blood well to the muscles when walking. So that it further reduces the workload of the heart. This change serves to reduce heart rate and blood pressure during physical activity. Because heart muscle needs for oxygen are related to heart rate and blood pressure [16]–[18].

This is aligned with Syatria's research [19], stated that programmed exercise has an effect on decreasing blood pressure. The study explained that physical exercise will have a good influence on various systems performed in the body, one of which is the cardiovascular system, where with proper physical training and regular work, efficiency will occur. The efficiency of the heart performance or the ability of it will increase in accordance with the changes that occur. A decrease in blood pressure can also occur due to reduced heart pumping activity. Heart muscle in people who exercise regularly is very strong, so the heart muscle in these individuals contracts less than the heart muscle of individuals who rarely exercise to pump the same blood volume. Because exercise can cause a decrease in heart rate, exercise will reduce output cardiac, which in turn causes a decrease in blood pressure. The heart performance efficiency increase is reflected by a decrease in systole pressure, while a decrease in peripheral resistance is reflected by a decrease in diastole pressure. The results of the study shows that there is a significant decrease in systole after programmed exercise training.

#### IV. CONCLUSION & SUGGESTIONS

Jogging exercise produces a significant difference in systolic and diastolic blood pressure, both in the group of hypertensive patients with obesity and in groups with normal nutritional status. Although the effect is more clearly seen in the group of patients with hypertension with obesity. Or it can be said that jogging performed by obese elderly people is more effective in decreasing blood pressure than the elderly with normal nutritional status.

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