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Effect of Ergonomic Gymnastics on Systolic Blood Pressure Among Individuals with Hypertension in Kaliasin Family Welfare Development

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ABSTRACT

One of the things that can affect blood pressure is a lack of physical activity. Ergonomic gymnastics is an exercise that easy to learn and understand. This paper analyzes the effect of ergonomic exercise on systolic blood pressure among individuals with hypertension in the Kaliasin family welfare empowerment. This research was a pre-experimental study with a One-group pre-posttest design. The sampling technique utilized non-probability sampling with the purposive sampling technique. In addition, the population was 20 individuals with hypertension in Kaliasin family welfare empowerment. Fifteen people met the inclusion criteria – 45-55 years old and had stage I hypertension with 140-159 mmHg systolic. The independent variable was ergonomic gymnastics, while the dependent variable was systolic blood pressure. Ergonomic gymnastics were performed six times for two weeks with 25-30 minutes in each meeting. In addition, the instruments were ergonomic gymnastics manual with an observation sheet and a sphygmomanometer. Data analysis utilized the Wilcoxon signed-rank test with a significance level of 0.05. The results showed that most respondents had 155-159 mmHg in systolic blood pressure (40%) before the ergonomic gymnastic. Meanwhile, after the intervention, they had 145-149 mmHg (33.3%) and 150-154 mmHg (5.3%). In addition, the Wilcoxon signed-rank test obtains $p=0.001$ ($\alpha \leq 0.05$). Thus, there was a difference in systolic blood pressure before and after ergonomic gymnastics. Ergonomic gymnastics can decrease systolic blood pressure. Individuals with stage I hypertension should perform ergonomic gymnastics routinely to avoid the complication of hypertension.

INTRODUCTION

Health is essential to carry out life well. Without health, every human being will be challenging to carry out their daily activities. Most people with busy activities will ignore the importance of exercising (Prasetyo, 2015). Individuals with fewer workouts potentially have increased blood pressure. Increased blood pressure or hypertension has become a concern in various parts of the world (Bistara and Kartini, 2018). It is often the number one non-communicable disease in many countries (Fitriani and Nilamsari, 2017). Blood pressure is the force of blood pushing against the walls of arteries. It occurs when blood is pumped from the heart to the rest of the body. In addition, it plays a vital role because blood will not flow without it. The blood pressure measurement results are systolic and diastolic pressures. Systolic pressure is the pressure that occurs in the arteries. It occurs when the heart pumps blood into the arteries. Meanwhile, diastolic pressure is the pressure that occurs in the arteries when the heart relaxes between two beats (contractions) (Palmer, 2007).

One of the things that can affect blood pressure is a lack of physical activity. Physical activity includes daily life activities, such as sweeping, mopping, washing clothes, gardening, cleaning the bathroom, and

drawing water (Effendi, Budhi Setianto, Agus Aan Adriansyah, Akas Yekti Pulih Asih, 2021). In addition, sports are also physical activity. 30 minutes/day of regular and routine exercise can help increase High-density lipoprotein (HDL) levels. Furthermore, physical activity significantly affects blood pressure stability. Individuals with physically unactive ⁷tend to have a higher heart rate. The condition causes the heart muscle to work harder in every contraction. The greater the heart workload, the greater the blood pressure in the artery walls. Thus, the peripheral pressure causes increased blood pressure.

Based on Basic Health Research (2013), hypertension prevalence was 45.9% in 55-64 years and 57.6% in 65-74 years (Riskasdas, 2013). In addition, 935,736 people (13.47%) had hypertension in East Java, consisting 387,913 man (13.78%) and 547,823 women (13.25%) (Kemenkes, 2017). In 2015, the Surabaya District Department of Health Office reported 16.78% of 818,331 individuals who checked in the health center had hypertension (Dinkes, 2015). The preliminary study results showed the number of hypertension cases in Kedung Doro Village in the last three months of 2018 was 85 people. Furthermore, Kaliasin family welfare empowerment has 50 members. In addition, we interviewed with the Head of the Neighborhood Association (here and after it is called RT) and the Chair of the Kaliasin family welfare empowerment. They said that individuals in RT 08 had never been taught ergonomic exercise.

Various factors predispose changes in blood pressure. One of them is a lack of physical activity. Regular daily physical activity can train the heart muscle and reduce peripheral resistance to prevent increased blood pressure. In addition, it can stimulate the release of endorphins, causing a euphoric effect and muscle relaxation. As a result, blood pressure does not increase (Sase, 2013). One of the easy physical activities to do every day to prevent chronic diseases – such as hypertension – is exercise. Exercise can increase the body's metabolic activity and oxygen demand. Ergonomic gymnastics is an exercise that easy to learn and understand. In addition, individuals of all ages can do it. Furthermore, it can increase blood vessel circulation and maintain health. It has very anatomical, simple, and harmless movements – such as pulling the nerve endings, restoring the position of the nerves, putting more pressure on the fine blood vessels in the head. It can circulate oxygen through the bloodstream to the brain. It also can activate sweat glands, the body's heating system, and other nervous systems. Ergonomic gymnastic movements are efficient to do by everyone from children to the elderly (Safitri, Safri and Jumaini, 2015).

A prior study examined the effect of ergonomic exercise in patients with Type 2 Diabetes on fasting blood glucose levels and glucose levels 2 hours postprandial. The study showed an average decrease in fasting blood glucose levels of -4.13 mg/dl and standard deviation ± 56.30 mg/dl. In addition, there were decreased glucose levels 2 hours postprandial levels with an average of 2.87 mg/dl and standard deviation ± 81.55 mg/dl (Fahmi and Widiyatmoko, 2013). Furthermore, stretching in ergonomic exercise could reduce musculoskeletal disorders pain scores in aluminum can makers (Nunik, Hakimi and Huriyah, 2015). The ergonomic exercise can be an option for all age groups. This paper analyzes the effect of

ergonomic exercise on systolic blood pressure among individuals with hypertension in the Kaliasin family welfare empowerment.

METHOD

This research was a pre-experimental study with a One-group pre-posttest design. The sampling technique utilized non-probability sampling with the purposive sampling technique. In addition, the population was 20 individuals with hypertension in the Kaliasin family welfare empowerment. Fifteen people met the inclusion criteria – 45-55 years old and had stage I hypertension with 140-159 mmHg systolic. The independent variable was ergonomic gymnastics, while the dependent variable was systolic blood pressure. Ergonomic gymnastics were performed six times for two weeks with 25-30 minutes in each meeting. In addition, the instruments were ergonomic gymnastics manuals with an observation sheet and a sphygmomanometer. Then, we measured systolic blood pressure before and after ergonomic exercise. Data analysis utilized the Wilcoxon signed-rank test with a significance level of 0.05.

RESULTS

Table 1 contains the characteristics of respondents in this study. In addition, table 2 reveals systolic blood pressure before and after ergonomic gymnastics.

Table 1. Characteristics of respondents in Kaliasin family welfare empowerment, Surabaya (n=15)

Characteristics	Frequency	Percentage (%)
Age (years old)	45-49	5 (33.3%)
	50-55	10 (66.7%)
Gender	Female	15 (100%)
	Male	0 (0 %)
Last Education	No School	1 (6.7 %)
	Elementary School	3 (20.0 %)
	Junior High School	1 (6.7 %)
	Senior High School	10 (66.7%)
Occupation	Civil servants	0 (0%)
	Entrepreneur	4 (26.7%)
	Pensioners	0 (0%)
	Farmer/labor	0 (0%)
	Housewife	11 (73.3%)
Blood Pressure (Systolic)	145-149 mmHg	4 (26.7%)
	150-154 mmHg	5 (33.3%)
	155-159 mmHg	6 (40.0%)
Body Weight (kilograms)	40-49	2 (13.3%)
	50-59	6 (40.0%)
	60-69	5 (33.3%)
	70-79	2 (13.3%)
Exercise Habits		

Habit of Checking Blood Pressure	Not Often	12 (80.0%)
	Frequent	3 (20.0%)
Eat healthy food	Often (2-3x/Month)	3 (20.0%)
	Rarely (1x/Month)	5 (33.3%)
	Never	7 (46.7%)
Consuming high-salt foods	No	12 (80.0%)
	Yes	3 (20.0%)
	Not Often	4 (26.7%)
	Often	11 (73.3%)

Table 1. shows that all participants are female (100%), and most are 50-55 years old (66.7%). Most participants are housewives (73.3%), graduated from Senior High School (66.7%), have 50-59 kilograms of weight (40%). In addition, they do not often exercise (80%) and never do blood pressure checks (46.7%). Furthermore, they do not eat healthy food (80%) and often consume high-salt foods (73.3%).

Table 2. Systolic Blood Pressure before and after the Ergonomic Gymnastics (n=15).

Variable	Systolic Blood Pressure	Percentage %
Systolic blood pressure before ergonomic gymnastics	140-144 mmHg	0 (0%)
	145-149 mmHg	4 (26.7%)
	150-154 mmHg	5 (33.3%)
	155-159 mmHg	6 (40.0%)
	Total	15 (100%)
Systolic blood pressure after ergonomic gymnastics	140-144 mmHg	3 (20.0%)
	145-149 mmHg	5 (33.3%)
	150-154 mmHg	5 (33.3%)
	155-159 mmHg	2 (13.3%)
	Total	15 (100%)
Wilcoxon Test	$\rho=0.001$	

Table 2 reveals that most respondents have 155-159 mmHg in systolic blood pressure (40%) before the ergonomic gymnastic. Meanwhile, after the intervention, they have 145-149 mmHg (33.3%) and 150-154 mmHg (33.3%) in systolic blood pressure. In addition, the Wilcoxon signed-rank test obtains $\rho=0.001$ ($\alpha<0.05$). Thus, there was a difference in systolic blood pressure before and after ergonomic gymnastics.

DISCUSSION

1. Systolic blood pressure before ergonomic gymnastics

Our findings found that most respondents have 155-159 mmHg in systolic blood pressure before the ergonomic gymnastic. It is categorized as stage I hypertension. Predisposing factors of increased blood pressure are physical activity, diet consumption, and the habit of consuming high-salt foods.

Most respondents in this paper did not often exercise. Nuraini (2015) explains that lack of physical activity can increase the risk of hypertension because it is correlated with obesity. It impacts homeostasis imbalances, resulting in a faster heart rate, and the heart muscle has to work harder at each contraction.

Therefore, the more complex and often heart pump, the greater the force pushing on the arteries, causing hypertension. The authors assume that lack of activity can increase obesity. Individuals with obesity potentially have hypertension because fats in the arteries or veins can increase blood pressure. We believed that many respondents in this study were obese because most were homemakers, so they most likely had minimal exercise.

In addition, most respondents did not eat healthy food. An unhealthy eating pattern is a predisposing factor for obesity. Furthermore, individuals with obesity most likely experience hypertension or other diseases. A diet containing high salt intake, high fat, and much cholesterol will affect blood pressure (Hamidi, 2014). We assume that an unhealthy diet is one of the triggers for increasing blood pressure.

Furthermore, most respondents often consumed high-salt foods. Foods with an excessive sodium composition can increase sodium concentration in extracellular fluid, causing increased blood volume in extracellular fluid. As a result, the impact is hypertension (Nuraini, 2015). High-salt foods consumption impacts the blood volume, resulting in increased heart workload.

2. Blood pressure after Ergonomic Gymnastics

There was a change in the number of respondents with a systolic blood pressure of 140-144 mmHg (from 0 respondents before ergonomic gymnastics to 3 respondents after the intervention). In addition, the number of respondents with a systolic blood pressure of 155-159 mmHg also changed (from 6 respondents before ergonomic gymnastics to 2 respondents after the intervention). Ergonomic gymnastics has the potential to reduce blood pressure. One thing that needs attention is the frequency of doing ergonomic exercise.

Ergonomic gymnastics is an exercise utilizing deep and long breathing techniques. It makes a person to be relaxed, calm, and more concentrated. Its four movements are modifications of perfect Islamic prayer movements (Safitri, Safri and Jumaini, 2015). In addition, it provides extraordinary benefits in maintaining body fitness and improving blood flow because all blood vessels experience vasodilation. There are chest movement, bowing movement, sitting, and prostration movements in ergonomic gymnastics. Therefore, correct and regular ergonomic gymnastics can support body resistance and regulate normal blood pressure. In addition to ergonomic gymnastics, individuals must continuously improve and maintain a healthy lifestyle to control blood pressure to decrease high blood pressure (Triwibowo, 2011).

3. The Effect of Ergonomic Gymnastics on Systolic Blood Pressure

Our findings revealed a difference in systolic blood pressure before and after ergonomic gymnastics. It is in line with a previous study. The study found the highest systolic blood pressure before ergonomic gymnastics was 179mmHg, while after the intervention was 150mmHg. Most respondents experienced a decrease in blood pressure, with the average decline Mean Systolic was 33.65 mmHg (Syahrani, 2017).

Ergonomic gymnastics is a modification of the Islamic prayer movement. Prior research showed that the average ⁵ systolic and diastolic blood pressure in the performing salah ⁵ was lower than imitating prayer movements. After performing salah, ⁵ systolic blood pressure decreased by 2.5%, and systolic blood pressure decreased by 1.7% after imitating prayer movements. In addition, diastolic blood pressure decreased by 2.8% after performing salah and 1.6% after imitating prayer movements (Doufesh *et al.*, 2013). Doufesh (2013) argues that postural changes are associated with heart rate changes. In the standing position, there is decreased venous return due to the effects of gravity. The decreased ¹³ venous return causes reduced cardiac output, leading to reduced baroreceptor stimulation in the aorta and carotid arteries. Then, it reduces parasympathetic nerve activity and increases sympathetic nerve activity.

The mechanism of lowering blood pressure from stretching stimulation in the aortic arch and carotid sinus is received and transmitted by the vagus nerve to the medulla oblongata (cardiovascular regulation center). Then the stimulation responds to increase baroreceptor reflexes. Baroreceptors are sensitive to changes in arterial pressure and stretch. They receive stimulation in stretching or alterations in arterial pressure located in the aortic arch and carotid sinus (Mutaqin, 2015). Then, they rapidly send impulses to the vasomotor center. The inhibited vasomotor center results in vasodilation of the arterioles and veins. As a result, there is a decreased blood pressure.

In addition, arteriolar dilatation reduces peripheral resistance. Venous dilation causes blood to accumulate, reducing venous return and decreasing cardiac output. Furthermore, ³ afferent impulses from baroreceptors also reach the heart. It stimulates the activity of the parasympathetic center and inhibits the sympathetic center (cardio accelerator). Thus, there is a decreased heart rate and power of heart contraction. As a result, it can lower blood pressure.

CONCLUSION

Ergonomic gymnastics can decrease systolic blood pressure. Individuals with stage I hypertension should perform ergonomic gymnastics routinely six times in two weeks to avoid the complication of hypertension. Further research could use a control group and a more significant sample.

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