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### The Effect of Aerobic Heart Rate Zone Physical Activities on the Body's Systole Diastol System on the Students of FIK UNM

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#### Abstract

This study aimed to determine the effect of aerobic heart rate zone physical activity on the systolic and diastolic systems. This type of Research is quantitative with an experimental approach (Pretest-posttest one group design). The sample in this study amounted to 10 pieces selected through the purposive sampling technique: data collection techniques using systolic and diastolic measurement tests. At the same time, the treatment given is in the form of aerobic heart rate zone physical activity hypothesis testing using paired T-test or influence test. The results of the hypothesis testing the effect of aerobic heart rate zone physical activity on systole obtained a significant value of 0.023, which is smaller than 0.05. Furthermore, the average value before treatment was 128.4000, and after treatment was 125.0000. So aerobic heart rate zone physical activity has a significant effect on systole. The results of the hypothesis testing the impact of aerobic heart rate zone physical activity on diastole obtained a substantial value of 0.004, which is smaller than 0.05. Furthermore, the average value before treatment was 82,5000, and after treatment was 79.5000. So aerobic heart rate zone physical activity has a significant effect on diastole.

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#### INTRODUCTION

Health at this time is precious, especially for people who live in big cities. Some things can interfere with health, such as pollution, busy work or unhealthy food (Hambali & Suwandar, 2019). However, people are increasingly concerned about

their health and are starting to take the time to exercise regularly. Many types of sports, such as jogging or going to fitness places, can be done.

One that is often used as a benchmark for health status is blood pressure. Normal blood pressure ranges from 90/60 to 120/80 mmHg. The front

number shows the pressure when the heart pumps blood throughout the body or systolic pressure (Chang et al., 2021). At the same time, the back number shows the pressure when the heart rests for a moment before pumping again or is called the diastolic pressure. If a person's blood pressure is high, it can cause several diseases, such as heart disease and stroke. Meanwhile, if the blood pressure is low, it can cause disturbances in the heart and brain.

In addition to consuming food and a healthy lifestyle, additional activities are needed so that the body is always maintained healthy (Ramadan & Ningrum, 2019; Syafei et al., 2021). The most common choice people make is to exercise. However, there are still many people who need help understanding the correct and safe measures of exercise. There are still many people who choose high-intensity sports. As a result, it makes the body more tired instead of getting healthy (Antczak et al., 2020; Nur et al., 2020). In addition, high-intensity exercise done too often will hurt the heart.

There have been many reported cases related to death after exercising. Of course, this needs to be of public concern. Exercise is an activity that must be done to maintain health. However, people also need to know the sufficient exercise level

that does not have the potential to harm their bodies.

The results showed that there are five levels in sports in terms of heart rate. Namely light, moderate, aerobic, anaerobic and VO2Max levels. So that the exercise we do is safe and beneficial, we want the heart not to work too hard when exercising (Ramadan & Ningrum, 2019). Therefore when exercising occasionally, we need to control our heart rate. Controlling heart rate can be done with tools or without tools. If you use a device, you can use a heart rate meter on a smartwatch or smart bracelet (Smartband), and if there is no tool, controlling heart rate can be done with a speaking test (Talk Test).

In connection with the explanation above, two critical points are stated: health and exercising safely. So this is the background for researchers to find out the benefits of exercise on the performance of cardiac systole and diastole. More specifically, we want to study the effect of physical activity in the aerobic zone on the body's systole and diastole systems.

Physical activity is the activity of the body's muscles that move the skeleton and produce energy and power (Chang et al., 2021). Physical activity is only sometimes done by doing particular sports. However, it can also be done through various simple daily activities such as sweeping,

gardening, walking, mopping, cleaning the house, ironing, etc. Someone is advised to carry out a reasonable, measurable and regular physical activity that needs to be done 3-5 times a week or every day for 30 minutes.

Furthermore, according to (Setyawan, 2022), physical activity is divided into three types, i.e.: 1) Light Physical Activity. This activity requires little energy and usually does not cause a change in breathing rhythm. Physical activity that is relatively light is ironing, sweeping the floor, playing music and others. The energy expended during light physical activity is less than 3.5 Kcal/minute; 2) Moderate Physical Activity. These are activities that require more energy and continuous muscle movement. Moderate physical activity includes swimming, brisk walking and cycling. The energy released during moderate physical activity is around 5-7 Kcal/minute; 3) Heavy Physical Activity. These activities are related to sports and make the body sweat.

For example, activities such as playing soccer, running, aerobics and others. The energy expended during strenuous physical activity is more than 7 Kcal/minute. Many people underestimate the importance of physical activity, especially for adults. This is because the

impact of lack of movement will not be felt immediately on the body, in contrast to the need to eat. If you do not eat, your body will warn you of hunger. Meanwhile, a new lack of physical activity will show a warning in the long term. Physical activity can provide various essential benefits but only for you for some days. According to (Anindyaputri, 2019), several benefits can be obtained if you regularly carry out physical activity, namely: 1) Prevent Disease. Physical activity for adults is good for maintaining body fitness and preventing diseases that lurk with age. Some diseases triggered by a lack of physical activity include coronary heart disease, stroke, hypertension, diabetes, and obesity; 2) You were maintaining Mental Sharpness. As we get older, the cognitive function of adults decreases more and more. Especially if more physical activity is needed, your memory, concentration or accuracy will decrease. Meanwhile, people who actively move and exercise their minds will remain sharp. This is because as long as you are physically active, the brain will continue developing by forming new networks and creating hundreds of connections between brain nerves. You can also avoid the risk of dementia, Alzheimer's, or other disorders in your cognitive function; 3) Think More Positively. Moving the body, even if you

have to force it because you are not interested, has made a person feel more positive and confident. This is, of course, very useful because in adulthood, a person must be faced with various life problems that can cause stress or depression. So, instead of constantly eating when you are in trouble, you should get up from your seat and look for active activities. The physical activity carried out is certainly expected to provide good results.

However, having good knowledge of physical activity is, of course, something that also needs attention. One knowledge that needs to be known related to physical activity is the heart rate zone when doing physical activity. By knowing this heart rate zone, someone knows about maintaining and controlling physical activity so that it remains safe and does not pose a dire risk to the body. According to (Joslyn, 2016), heart rate zone namely: 1) Ultra Light Zone. With a maximum pulse rate in the range of 50-60 per cent. Even though the intensity of exercise in this zone is very light, it still impacts health; 2) Recovery Zone. The heart rate in this zone is between 60-70 per cent of the maximum heart rate. Maximum heart rate is obtained from  $220 - \text{age}$ . If a person is 30 years old, the maximum heart rate is  $220 - 30 = 190$  beats per minute. In this zone, the energy expended during practice is

very efficient. Practising in this zone will improve the heart's ability to pump blood. The body's metabolism in this zone will use body fat as fuel to carry out the activities; 3) Aerobic Zone. This zone is at 70-80 per cent of the maximum heart rate. This aerobic zone is perfect for training cardiovascular abilities. The aerobic zone is also the most effective zone for training muscle strength. Practice on this zone so that abilities continue to increase with minimal risk of injury; 4) Anaerobic Zone. This zone is in the range of 80-90 per cent of the maximum heart rate. Practising in this zone will cause lactic acid to build up because the body cannot quickly release the lactic acid that the body produces. The accumulation of lactic acid is one of the causes of muscle cramps. However, practising in this zone will increase the lactic acid accumulation threshold. However, remember that training in the anaerobic zone is very hard, your muscles will get tired, and your breathing will become heavy. If you are not careful, unwanted things like heart attacks can occur.

Red Line Zone. This zone is 90-100 per cent of your maximum heart rate. If you want to practice in this zone, ensure your physical condition is in prime condition and practice quickly. This zone

is usually used to increase speed capabilities.

A person's blood pressure is determined by two measurements, namely, systolic and diastolic. When your blood pressure shows 120/80 mmHg, your systolic blood pressure is 120, and your diastolic blood pressure is 80. Pressure is a measure of how strong the heart is in pumping blood so that it circulates to all tissues of the human body. In other words; blood pressure is an indicator to assess the cardiovascular system and how optimal a person's body is performing. Blood pressure is expressed in mmHg and consists of upper (systolic) and lower (diastolic) blood pressure. The average normal blood pressure in adults is 120/80 mmHg. Meanwhile, a blood pressure of 140/90 or more is considered hypertension or high blood pressure. Meanwhile, below 90/60 is considered low blood pressure or hypotension.

Blood pressure can change depending on your activities, food, and emotional state. This condition is normal as long as the numbers are not consistently high or low over a long period. (Muhlisin, 2019), the explanation of systolic blood pressure and diastolic blood pressure is as follows:

**Systolic Blood Pressure.** When the heart beats, the heart muscle will contract

to pump blood through the arteries throughout the body. Contraction of the heart muscle then puts pressure on the arteries. This pressure is referred to as systolic blood pressure or the highest pressure achieved when the heart muscle contracts. Average systolic blood pressure in adults ranges from 90-120 mmHg. If it is in the range of 120-139 mmHg, it is pre-hypertension. A person is considered hypertensive if their systolic blood pressure is 140 or more.

**Diastolic Blood Pressure.** When the heart muscle contraction has ended, the heart muscle will relax. This causes the blood supply to the aorta (the largest artery in the body) to stop for about 1/10 of a second. At this time, the aorta will return to its original position, and blood pressure will decrease. The blood pressure in the arteries when the heart is resting/relaxed is called diastolic blood pressure. In adults, normal diastolic blood pressure is in the range of 60-80 mmHg. If it ranges from 80-89, it is still considered normal but not ideal. Meanwhile, it is considered hypertension if it is at 90 or more.

Meanwhile, according to (Kafe Kepo, 2020), systole and diastole affect a person's blood pressure differently. The pressure on the vessels increases when the heart pushes blood around the body. This is called systolic pressure. When the heart

relaxes between beats and refills blood, blood pressure drops. This is called diastolic pressure. What is related to the function of systole and diastole is blood pressure. If the body is not in good condition, two possibilities can occur high blood pressure or hypertension and low blood pressure or hypotension.

**METHODS**

The type of Research used this time is experimental Research (one group pretest-posttest design) (Ramadan & Juniarti, 2020). Experimental Research is a method used to look for the effect of specific treatments on others under controlled conditions. The population in this study were FIK UNM students. The samples in this study were ten people. The sampling technique uses a purposive

sampling technique (determination of the sample with specific considerations). The experimental technique was to provide a sample treatment in the form of aerobic physical exercise heart rate zone. The treatment was given for 12 meetings. The data collection technique uses a systolic and diastolic measuring test (Afifah, 2021). This test was carried out before and after being given the exercise treatment.

**FINDINGS AND DISCUSSION**

**Findings**

After going through the prerequisite test, namely the normality test and stating that the data distribution was normally distributed, a hypothesis test was carried out using the paired T-test method. The results of hypothesis testing are as follows:

Variable	N	Mean	Paired Mean	Sig	$\alpha$
<i>Pre Test Pistol</i>	10	128,4000	2,90000	0,023	0,05
<i>Post Test Pistol</i>		125,0000			
<i>Pre Test Diastol</i>	10	82,5000	3,00000	0,004	0,05
<i>Post Test Diastol</i>		79,5000			

Based on the results of testing data analysis on the effect of aerobic heart rate zone physical activity on the body's systolic-diastolic system in FIK UNM

students, the results are obtained with the following details:

Test Results The effect of aerobic heart rate zone physical activity on the

systole system in UNM FIK students obtained a significant value of 0.023, less than 0.05. So, there is a significant effect of aerobic heart rate zone physical activity on the systolic system in FIK UNM students. Furthermore, the table above shows that the average systolic value before being given the treatment of aerobic physical activity is the heart rate zone of 128.4000. This value decreased after being given aerobic physical activity treatment; the heart rate zone was 125.0000. This indicates that the systolic value of students experienced a positive change marked by a decrease in the average systolic value after being given aerobic heart rate zone physical activity treatment.

**Test Results** The effect of aerobic physical activity on the heart rate zone on the diastole system in FIK UNM students obtained a significant value of 0.004, less than 0.05. So aerobic physical activity significantly affects the heart rate zone of the diastole system FIK UNM students. Furthermore, from the table above, it is known that the average diastole value before being given the treatment of aerobic physical activity is the heart rate zone of 82.5000. This value decreased after being given aerobic physical activity treatment, and the heart rate zone was 79.5000. This indicates that the systolic value of students experienced a positive change marked by a

decrease in the average systolic value after being given aerobic heart rate zone physical activity treatment.

## Discussion

The statistical analysis showed a significant effect of aerobic heart rate zone physical activity on the body's systolic-diastolic system in FIK UNM students. Considering the theories and frameworks discussed previously, this study's results align with or support the existing theories.

If you look at the systolic data from the results of the Research conducted, the average systolic category before being given treatment was in the pre-hypertension category with an average value of 128, where one sample was included in the level 1 hypertension category. Meanwhile, for diastole, three samples entered category one hypertension with an average diastolic value of 82. This data is certainly enough to make us wonder. Why, at a relatively young age, their blood pressure exceeded normal? Some samples had an irregular lifestyle from the interviews I conducted during the Research. Some samples provide information that they often sleep late. Moreover, a lecture schedule requires them to get up early. As a result, the duration of rest for the body is less. The second thing that, according to them, is the cause that their blood pressure being above average, there is a pattern and diet. Some samples said their eating patterns were irregular. Sometimes they have breakfast, and sometimes they do not. Sometimes they eat during the day, sometimes

at night. As for the food menu, because of busy lectures and other activities, we buy ready-made food more often, which has lower nutritional value and nutritional balance than the food we cook at home.

After the treatment or treatment in the form of aerobic physical activity, the heart rate zone showed significant changes. If you look at the data directly, the average systolic value decreases to 128. Even though the average is still in the pre-hypertension category, this is quite a satisfying result. Especially samples that fall into the category of hypertension level 1; after being given treatment, the systolic pressure drops to the pre-hypertension category. For diastole, after being given treatment, the average decreased to normal diastole. Of the three samples which were in the category of hypertension level 1, after being treated, only one sample remained in the category of hypertension level 1. The results of this study are, of course, beneficial information for the general public because diastolic blood pressure itself has different characteristics from systolic blood pressure. If the systolic blood pressure can change over time, but the diastolic blood pressure does not. Lowering diastolic blood pressure takes several days, and of course, it is interspersed with a healthy lifestyle.

The research results that have been carried out when linked to the theories discussed previously are, of course, interrelated or support the results of the Research conducted as stated (Dinkes, 2018) that "Any increase in activity will be very

beneficial for health. Compared to sitting still on the couch, taking more frequent steps is better. Walking briskly or exercising moderately for 30 minutes 5 times a week can reduce the risk of coronary heart disease by 19 per cent or almost 1/5 times lower. If associated with research results, blood pressure is very closely related to heart performance. The more routine we do physical activity, the better it will be for the heart. If the heart is getting healthier, of course, the heart's performance in pumping blood is also getting better. In addition, regular physical activity will improve the body's performance so that it does not give excess portions to the heart to work.

Furthermore, (Mitra Keluarga, 2021) states that "in general, several causes of hypertension are: genetic or hereditary factors, physical changes, unhealthy lifestyles and certain medical conditions". As explained above, one of the causes of the sample having blood pressure that exceeds the standard limit is an unhealthy lifestyle. Youth is a busy time. The body also still feels strong, so it often ignores the factors that can cause illness. Therefore, even though they are still young, awareness is still needed to maintain health. Routinely taking the time for physical activity is certainly one that is recommended. In addition, routine health checks such as blood pressure and degenerative diseases such as blood sugar and cholesterol can also be carried out.

Some of the results of previous studies, which also discussed physical activity on

blood pressure, namely (Sitohang & Elon, 2020) in their Research, stated that there were significant differences in the blood pressure of individuals who were more active than those who were less active.

Blood pressure tends to be regular with high activity compared to low activity. Blood pressure is proven to decrease by doing regular physical activity. Physical activity with moderate to high intensity lowers blood pressure. Furthermore, Research conducted by (Fitri et al., 2016) stated that "physical activity in the form of aerobic exercise in obese women with a duration of one month can significantly reduce BMI from an average of 27.2 to 26.8. Moreover, it reduced systolic/diastolic blood pressure from an average of 119.9/80.2 to 113.8/73.8". Research conducted by (Sulaeman & Hasyim, 2022) states that "there is a significant effect of zone 3 physical activity on peak flow rate and relaxed heart rate in FIK UNM students, indicated by an increase in the average value of lung functional capacity and a decrease in the average value - average heart rate in FIK UNM students".

Nowadays, awareness of maintaining health is critical. Not only do people with old age need to pay attention to their health, but young people also need to pay attention to their health from an early age. Regular and controlled physical activity can provide enormous benefits. High blood pressure is a disease often suffered due to a lack of awareness of maintaining body condition.

High activity and laziness to move are factors that a person can get this disease.

## CONCLUSSION

Based on the data analysis and discussion described above, it can be concluded that "There is a significant effect of aerobic heart rate zone physical activity on the systolic and diastole systems of the body in FIK UNM students". Shown by increasing the average value of lung functional ability and decreasing the average value of heart rate in FIK UNM students.

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