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The Effect of Aerobic and Anaerobic Exercise on Increasing Body Immunity Through Physical Fitness Test

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Abstract

The research aims to determine: 1) differences in the effect of aerobic and anaerobic exercise on increasing body immunity, 2) differences in increasing body immunity between low and high Body Mass Index, 3) differences in increasing body immunity between high Body Mass Index aerobic exercise and high Body Mass Index anaerobic exercise, 4) differences in the increase in body immunity between low Body Mass Index aerobic exercise and low Body Mass Index anaerobic exercise, 5) the effect of interaction between Body Mass Index with aerobic and anaerobic exercise on increasing body immunity through Physical Fitness Test. The research uses an experimental method with a 2x2 factorial design. The population of this research is the SPIRITS Sleman Yogyakarta volleyball club. The sample size is 24 athletes. The research data analysis technique used ANOVA. Prerequisite test of data analysis using normality test (Lilliefors test = 0.05) and homogeneity test of variance (Bartlet test = 0.05)

The results of the research were as follows: 1) There is a difference in the effect between aerobic exercise with an average of 4.016667 and anaerobic exercise with an average of 2.825, on the increase in physical fitness test ability with an average difference of 1.191667. 2) There is a different effect between low BMI with an average of 4.325 and high BMI with an average of 2.516667 on increasing physical fitness test abilities with an average difference of 1.808333. 3) There is a different effect between low BMI aerobic exercise with an average of 5.15 and low BMI anaerobic exercise with an average of 3.5 on increasing physical fitness testability with an average difference of 1.65. 4) There is a difference between high BMI aerobic exercise with an average of 2.883333 and high BMI anaerobic exercise with an average of 2.15 on the increase in physical fitness test with an average difference of 0.7333333. 5) Interaction between aerobic exercise, anaerobic exercise and BMI 0.656866

Keywords: *Aerobic, Anaerobic, Immunity, Physical Fitness*

INTRODUCTION

Sport is a human physical activity that affects the personality of the perpetrator, with regular exercise it can increase immunity and help fight viruses. Exercise allows immune cells to work effectively and increases blood flow, reduces stress and strengthens antibodies. At this time, it has been a year since the whole world has faced a pandemic of the Covid-19, which has exercise training can maintain health so that the body's immunity increases.

A sound immune system or immune system can protect the body from the first time the germs that cause disease enter the body. Having a robust immune system is very important to prevent getting sick, especially during a pandemic. One type of activity to maintain the body's immunity is to do regular exercise. There are aerobic and anaerobic exercises, so it is necessary to choose an effective exercise to increase immunity. Body immunity can be seen from good physical Fitness, so a test is needed to determine the score of body immunity with the Fitness of Physical Test. Physical Fitness Test is influenced by the state of the Body Mass Index in determining the type of exercise that is effective in increasing the body's immunity.

Aerobic is a model of exercise that stimulates the rate of heart and respiratory rate to increase rapidly during an aerobic exercise session known as cardio, which is a sport that requires oxygen to be

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sent to the working muscles. As for the various aerobic exercises such as aerobics, brisk walking, swimming, running, cycling, Zumba and jumping rope.

Anaerobic exercise is exercise without a supply of oxygen so that it makes you quickly out of breath and makes a quick burst of energy at one time. This exercise is done with a short duration but with high intensity. This type of exercise can stimulate high-intensity muscle activity, which can increase muscle strength and endurance. Examples of anaerobic exercise are lifting weights, sprints (sprinting).

LITERATURE REVIEW

Body Mass Index (BMI)

Body Mass Index (BMI) is an essential things in the field of health sciences because of various disease problems and psychiatric conditions in humans that are associated with BMI or BMI values, Marhaposan Situmorang (2015: 102)

Weight classification based on BMI (Body Mass Index) World Health Organization (WHO) calculations are as follows: 1) Underweight BMI 18.5, 2) Normal weight BMI 18.5 – 24.9, 3) Overweight BMI 25.0 – 29.9 and 4) Experiencing Obesity BMI 30.

Asian calculations, including Indonesia, as follows: 1) Underweight BMI 18.5, 2) Normal weight BMI 18.5 – 22.9, 3) Overweight BMI 23.0 – 24.9 and 4) Obesity BMI 25.0.

Aerobic Exercise

During cardiovascular conditioning, breathing and heart rate will increase for a sustained period of time. Examples of aerobic exercise are swimming, running, or cycling. Aerobic exercise aims to prepare the circulatory and respiratory systems, strengthen tendons and ligaments, reduce injury risk, and provide an energy source for low-intensity and long-lasting activities, Sukadiyanto & Dangsina Muluk (2011: 67).

Aerobic exercise has been known to decrease resting pulse rate. The function of a low pulse state means that the lower the pulse rate at rest, the better your physical Fitness. (Cooper, 2013)

Another factor that affects aerobic Fitness is activity. That the actions we do regularly will shape our health, vitality, and quality of life. The effects of years of practice can be lost in as little as 12 weeks by stopping the activity. Bed rest can reduce Fitness 29% or 10% per week (Sander et al., 2011).

Aerobic exercise energy system: 1) moderate work intensity, 2) work duration of more than 3 minutes, 3) smooth and continuous (continuous) movement rhythm, 4) during activity produces carbon dioxide + water (CO2 + H2O). Activities whose energy source comes from the aerobic system tend to use low power and are closely related to cardiorespiratory endurance (Sukadiyanto & Dangsina Muluk, 2011: 40).

Anaerobic Exercise

Anaerobic exercise involves a rapid burst of energy and is performed with maximum power in a short period. Examples include jumping, sprinting, or lifting heavy weights.

Anaerobic power formation through two mechanisms: the anaerobic mechanism that does not produce lactic acid (anaerobic laktasid) and the anaerobic mechanism that produces lactic acid (anaerobic lactasid). (Santoso Giriwijoyo & Dikdik Zafar Sidik, 2013: 25).

The energy system of anaerobic exercise is divided into:

1. ATP-PC System (Phasphogen System)

The ATP-PC system is an anaerobic lactic system that does not produce lactic acid in meeting its energy needs. The characteristics of the alactic energy system: 1) maximum work intensity, 2) working

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time of up to 10 seconds, 3) explosive work rhythm (suddenly fast) and 4) activity that produces Adenosine Diposhat (Sukadiyanto & Dangsina Muluk, 2011: 38) .

2. Anaerobic Glycolysis System (Lactic-Acid System).

The anaerobic glycolysis system will be able to prolong the action for about 120 seconds. The characteristics of the lactic anaerobic energy system are: 1) maximum work intensity, 2) duration of work between 10 to 120 seconds, 3) explosive work rhythm and 4) activity to produce lactic acid and energy (Sukadiyanto & Dangsina Muluk, 2011: 38).

Body Immunity

The immune system is a very complex system with multiple roles in maintaining the balance of the body. Like the endocrine system, the immune system, which is in charge of regulating balance, uses its components circulating throughout the body to reach targets far from the center. To carry out the function of immunity, there is a system called the lymphoreticular system in the body. (Ida Bagus Kade Suardana, 2017: 4).

According to Yuliana, (2020: 105 -106), Exercise increases the response of the immune system within seconds to minutes after starting to exercise, it is recommended to exercise regularly so that immunity is well maintained. Exercise increases flight stress response, meaning that the body's response to stress will be better. The body has the ability to measure and react to stress more effectively.

According to Dyah Mahandrasari S, (2015: 60) Doing light sports activities can improve immune function, increase immunity levels and last for a long time. Light activity is more beneficial than just sitting.

Physical Fitness Test

Physical Fitness is translated as physical Fitness with other terms Physical Fitness, physical ability and physical Fitness. In its development, the term physical fitness is most popular with the term physical fitness. Literally, physical Fitness is physical Fitness or physical Fitness but fit also means healthy, so Fitness can mean health (Santoso Giriwijoyo & Dikdik Zafar Sidik, 2013: 17)

To measure the Physical Fitness Test with the Harvard Step Test. The definition of Physical Fitness focuses on physiological Fitness, which essentially means the level of compatibility of the dynamic health degree possessed by the implementer to the severity of the physical tasks that must be carried out (Santoso Giriwijoyo & Dikdik Zafar Sidik, 2013: 19).

The Harvard Step Test is an instrument to measure physical Fitness by going up and down a bench as high as 50 cm (men) and 42.9 cm (women) and following a regular rhythm for 5 minutes. This test aims to determine the index of the body's ability to do work (Suwandi Saputra et al, 2019: 193-194).

RESEARCH METHOD

The research method used 2 x 2 design of factorial, a factorial involving two factors, each factor consisting of two levels, using an initial test (pre-test) and a final test (post-test). (Sudjana, 2002: 148)The subject conducted at the SPIRITS volleyball club, SLEMAN, at GOR KONI Pangukan, Jl Dr. Rajimin Patent Tridadi Sleman, and divided into 4 treatment groups. SLEMAN, at GOR KONI Pangukan, Jl Dr. Rajimin Patent Tridadi Sleman. The meeting spend 18 times. The exercise begins from 15.00 until 17.00 WIB.The collected data with test (Pre-test) and the final test (post-test). BMI data can be used to classify: a) samples that have low BMI, b) samples that have BMI. VO2 Max is measured with the Multistage Fitness Test Validation. (Sukadiyanto 2011: 87).Analysis data used is two-way analysis of variance (ANOVA) at = 5%. If the obtained F value (Fo) is significant, the analysis is continued with the Newman-Keuls range test. Prior

to data analysis, the analysis prerequisite tests were carried out, namely the normality test (Liliefors test) and the homogeneity of variance test (Bartlett test).

FINDINGS AND DISCUSSION

Normality test in this study used the Lilliefors method, to test the similarity of variance between group 1 and group 2 using. The homogeneity test in this study was carried out with the Bartlet test. Research hypothesis testing was carried out based on the results of data analysis and analysis of variance followed by the Newman-Keuls range test as a step to test the average after ANOVA.

Two-Factor Analysis of Variance

Source of variation	dk	JK	RJK	F_o	F_t
Treatment average	1	280,85	280,85		
A	1	8,52042	8,52042	4,440228	
B	1	19,6204	19,6204	10,22474	4,35 *
AB	1	1,26047	1,26047	0,656866	
Error	20	38,3783	1,918915		
Total	24	348,6296			

The results of the data analysis in advance, the following hypothesis testing can be carried out: 1). The results of the study showed that aerobic exercise has a different increase with anaerobic exercise. This is evidenced by the calculated F value = 4.4402284 < Ftable = 4.35 at the 5% significance level. Thus the null hypothesis (Ho) is rejected, which means that aerobic exercise has a different increase from anaerobic exercise, the truth is accepted, from further analysis, it is found that the aerobic exercise method has a better improvement than anaerobic exercise, with an average increase of each respectively, aerobic exercise 4.016667 and anaerobic exercise 2.825

2). Athletes who had a low BMI had increased physical fitness test abilities that were different from athletes who had a high BMI. This is evidenced by the calculated F value = 10.22474 > Ftable = 4.35 at the 5% significance level. It was found that athletes who had a low BMI had a better physical fitness test than athletes who had a high BMI, with an average increase of each, namely athletes who had a low BMI of 4,325 and athletes who had a high BMI of 2, 516667.

3) BMI aerobic exercise increases physical fitness testability that is different from low BMI anaerobic exercise. Low BMI aerobic exercise has a better physical fitness testability than low BMI anaerobic exercise.

4) High BMI aerobic exercise in physical fitness testability has an increase that is not different from high BMI anaerobic exercise. High BMI aerobic exercise has a better physical fitness test ability than high BMI anaerobic exercise.

5). The interaction between aerobic exercise and anaerobic exercise and BMI was very significant, there is no significant interaction between aerobic exercise and anaerobic exercise associated with BMI.

CONCLUSION

From the research, five points of conclusion were determined as follows:

1. The difference between aerobic exercise and anaerobic exercise on the ability of the physical fitness test. The effect of aerobic exercise is better than anaerobic exercise.
2. The difference between athletes who have a low and high BMI. Increased physical fitness test ability in athletes with a low BMI is better than athletes with a high BMI.

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3. The difference between low BMI aerobic exercise and low BMI anaerobic exercise. Increased physical fitness test abilities with low BMI aerobics are better than low BMI anaerobic exercises.
4. The effect between high BMI aerobic exercise and high BMI anaerobic exercise. Increasing the physical fitness testability of high BMI aerobic exercise is better than high BMI anaerobic exercise.
5. The effect between aerobic exercise, anaerobic exercise and BMI on increasing physical fitness test ability. If athletes have a low BMI with aerobic and anaerobic exercise, Athletes can improve their physical fitness test abilities.

Furthermore, for further research, researchers suggested that the use of samples is replaced with male volleyball athletes and can be applied to schools that are not athletes and the number of samples is even more, are the results the same or are there any differences with previous this research.

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