Fartlek vs Plyometric: Which Exercise Boosts Body Immunity More?

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Abstract. The aim of this study was to compare the effects of Fartlek and Plyometric exercises on increasing body immunity and to investigate the differences in immunity between high and low BMI groups. Additionally, the study aimed to explore the effects of different types of exercises for each BMI group and the potential interaction between exercise type, BMI, and VO2 Max on immunity. The study used an experimental method with a sample of 24 athletes from the SPIRITS Sleman Volleyball club. The research employed a 2×2 factorial design and ANOVA for data analysis. The results indicated that Fartlek exercises had a greater effect on increasing body immunity than Plyometric exercises. The study also found a difference in the effect of exercise on VO2 Max between high and low BMI groups, and that the type of exercise had a significant impact on VO2 Max in both groups. The study suggests that Fartlek exercises may be more effective than Plyometric exercises for boosting immunity, and that exercise type and BMI should be considered in developing exercise programs for immune enhancement.

Keywords: Fartlek · Plyometric · Immunity · Vo_2 Max

1 Introduction

The impact of the COVID-19 pandemic has brought many changes in attitudes and behavior in society. All human movement activities are currently not free and limited, even activities must be carried out at home. However, during this pandemic, activities outside the home including sports must be done carefully and considered carefully. Sports activities during this pandemic are very important, because by exercising regularly, measurably and programmed, the impact that occurs on the body becomes more fit so that a body that has good fitness will contribute to increasing body immunity.

To improve the body's immunity for the better so that it can prevent covid -19 from entering the body, not only implementing the Health Protocol. In this study, we will develop a form of physical activity that can increase body immunity by comparing fartlek and plyometric exercises which are more effective which method of exercise.

Fartlek and plyometric exercises are sports training methods that can increase the body's immunity. Choosing the right exercise will produce good results, one of which can increase the body's immunity. Good body immunity can be seen from the level of physical fitness. So that a test is needed to determine the level of the body's immunity

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through the ability of VO2 Max with the Multistage Fitness test. One of the indicators that support VO2 Max is Body Mass Index [BMI], in determining the right, effective and efficient type of exercise to increase body immunity.

1.1 Body Mass Index (BMI)

We use the Body Mass Index (BMI) to determine if we are normal, overweight, or underweight (m). BMI-based WHO weight classification: a) Underweight BMI 18.5. b) Normal BMI 18.5–24.9. c) Overweight BMI 25.0–29.9. d) Obesity BMI 30.0.

Asia—including Indonesia—is calculated as follows: a) Underweight BMI 18.5. b) Normal BMI 18.5–22.9. c) Overweight BMI 23.0–24.9. d) Obesity BMI $>$ 25.0. Body weight (kg) divided by height (meters) squared is BMI. BMI can indicate overweight status. You weigh 60 kg and stand 1.65 m. Weight is 60 kg divided by $(1.65)2 = 22$. The classification calculation matches the results and BMI calculation. Your weight is normal [1].

1.2 Fartlek Practice

Fartlek exercise or speed play is a form of continuous exercise in which athletes change speed during the session, with slow intensity then fast then slow then fast alternating so on. [2]. The point is that fartlek training is a combination exercise of walking, jogging, sprinting where fartlek training is a variation of speed playing exercises can be started from slow, medium and fast exercises. Fartlek exercise can be repeated continuously according to the ability of the athlete who performs it, so that it can determine the distance and time. If this fartlek exercise is done programmed, it will be able to affect the increase in VO2 Max ability.

1.3 Plyometric Exercise

Sports plyometric exercises have characteristics and characteristics, namely the strength of muscle contractions with the speed of motion reactions both dynamically and statically, plyometric exercises in principle have elongated and shortened muscle movements with the aim of increasing muscle nerve reactions, explosiveness, speed and strength.

Ability to change style under certain circumstances [3]. In plyometric training by doing maximally and increasing high intensity, it can be achieved maximally by adding repetitions and sets according to the training program, in increasing explosive power plyometric training is the main choice of trainers in increasing muscle strength and cardiovascular endurance.

1.4 Body Immunity

The complex immune system helps maintain body balance. The immune system, which regulates balance, uses components circulating throughout the body to reach targets far from the center, like the endocrine system. The lymphoreticular system performs immunity. [4].

To maintain immunity, exercise regularly [5]. Exercise boosts flight stress response, improving stress response. The body measures and responds to stress better. Light exercise boosts immunity and lasts. Light activity is better than sitting [6].

1.5 VO2 Max Ability

VO2 Max measures oxygen use by the heart, lungs, and muscles for metabolism. VO2 Max measures sports health fitness [7]. VO2 Max is the ability of the respiratory system to inhale as much oxygen as possible during exercise (physical activity). Running a distance or time is the easiest way to calculate VO2 Max. Running back and forth for 20 m is a multistage fitness test that measures VO2 Max.

VO2 Max is cardiovascular endurance. The lung, heart, and muscle systems can absorb oxygen at VO2 Max. Age, gender, fitness, and exercise affect VO2 Max (P.O & U.G, 2016) Accordingly, HIIT and Fartlek can be used to improve VO2 Max.

2 Methodology

2.1 Research Type or Design

The research method used in this study is a 2x2 factorial design, which is a factorial experiment involving two factors, each factor consisting of two levels, using an initial test (pre-test) and a final test (post-test) Table 1.

2.2 Population and Research Sample

The population of this research is the Volleyball Players at the SPIRITS Sleman Volleyball Club at the KONI GOR Pangukan, Jl Dr Rajimin Patent Tridadi Sleman totaling 24 players. The sample used was volleyball players at the SPIRITS Sleman Volleyball Club at KONI Pangukan Sports Center, Jl Dr Rajimin Patent Tridadi Sleman, totaling 24 players, obtained from the entire population. In determining the sample in this study by random. Before the experiment was carried out, the population was 24 players, then the Body Mass Index was measured. This measurement is used to determine the level of low and high Body Mass Index. Then each low and high group was divided into two groups respectively. Fartlek exercise and plyometric exercise group. Samples that have a low Body Mass Index and samples that have a high Body Mass Index are drawn by lot.

Table 1. Research Design Framework

Research Design Framework		
Manipulative variable	Exercise method	
Attributive Variable	Fartlek Exercise (A1)	Plyometric Exercise (A2)
Low Body Mass Index (B1)	a_1b_1	a_1b_1
High Body Mass Index (B2)	a_1b_2	a_1b_2

So that there will be four groups according to research needs. Furthermore, 24 players, divided into 12 players with low Body Mass Index, each divided into two groups by means of a random draw, namely 6 players receiving fartlek training and 6 players as a group receiving plyometric training and 12 players having high body mass index. Each group was divided into two groups by drawing randomly, ie 6 players received fartlek training and 6 players as a group received plyometric exercises.

2.3 Data Collection Technique

The pre-test and post-test collect data (post-test). According to the variables, Body Mass Index (kg/m2) was used to collect research data. The BMI can indicate whether a person is overweight. Weight (kg) divided by height (meters) squared determines BMI. The BMI can indicate whether a person is overweight. Before volleyballers were treated. The multistage fitness test predicts VO2 Max by measuring the heart and lungs' maximum capacity based on body mass index data.

2.4 Data Analysis Technique

Two-way analysis of variance (ANAVA) at 5% is used. If Fo is significant, the Newman-Keuls range test continues. The Lilliefors and Bartlett tests were used to test normality and homogeneity, respectively, to meet ANOVA assumptions.

3 Result and Discussion

3.1 Data Description

The description of the results of the VO2 Max data analysis using a multi-stage fitness test carried out according to the group being compared is as follows in Table 2.

The results of each variable are summed into one initial test data, and this final test is used to determine the increase in results of the initial and final tests, which become VO2 Max ability data with a multi-stage fitness test. Fartlek and plyometric exercises increase VO2 Max differently. Fartlek training increased VO2 Max by 0.703333334, which was higher than plyometric training. Compared to high BMI athletes, low BMI athletes have an average VO2 Max increase of 1.763333333.

3.2 Data Analysis

Homogeneity. The homogeneity test assessed variance similarity between groups 1 and 2. This study used the Bartlet homogeneity test. Group 1 and 2 data homogeneity test results are as on Table 3.

From the results of the homogeneity test, the value of χ 2o = 0.34168, while with K-1 = 4 -1 = 3, the number χ 2table 5% = 7.81, which turns out that the value of χ 2 = 0.34168 is smaller than χ 2table 5% = 7.81. So it can be concluded that between groups in this study has a homogeneous variance.

The following are five hypotheses and their corresponding results based on a study on the effects of different exercises on an athlete's VO2 Max ability:

Table 2. Data Description The results of VO2 Max ability with multi-stage fitness test Volleyball Athletes

Treatment	*BMI*	Statistics	Preliminary Test Results	Final Test Results	Enhancement
Fartlek	Low	Total	199,67	299,65	29,98
		Mean	33,2783333	38,275	4,9966667
		SD	4,081830063	4,798306993	1,2665649
	Height	Total	180,46	197,45	16,99
		Mean	30,07666667	32,90833333	2,831666667
		SD	3,149594683	3,128804351	1,240522739
Plyometric	Low	Total	196,47	217,41	20,94
		Mean	32,745	36,235	3,49
		SD	3,0002917	3,355763698	1,490932594
	Height	Total	180,98	193,75	12,77
		Mean	30,1633333	32,29166667	2,128333333
		SD	2,02461519	1,795666079	1,523094438

Table 3. Homogeneity Test

$\sum$ Group	N_i	SD^2 gab	χ^2 o	χ^2table 5%	Conclusion
4	6	1,921445	0,34168	7.81	Homogeneous variance

Hypothesis 1: Fartlek and plyometric exercise affect VO2 Max differently. 3.813766 is less than the Ftable's 4.35 at 5% significance. Fartlek training increases VO2 Max differently from plyometric exercises, rejecting the null hypothesis (Ho). Further analysis shows that fartlek training increases VO2 Max ability by 3.914166667, compared to 2.809166667 for plyometric exercise.

Hypothesis Testing 2: Low- and high-BMI athletes have different VO2 Max increases. 9.711787 exceeds the Ftable of 4.35 at 5% significance. Thus, the null hypothesis (Ho) is rejected, indicating that low-BMI athletes have a different VO2 Max increase than high-BMI athletes. Further analysis shows that athletes with low BMI increase their VO2 Max by 4.243333333, while athletes with high BMI increase by 2.516667.

Hypothesis Testing 3: Low BMI fartlek and plyometric exercise increase VO2 Max differently. The mean difference is 1.50666667, which is less than the RST value of 2.207003189 at 0.05. Thus, low BMI fartlek exercise increases VO2 Max differently than low BMI plyometric exercise. Further analysis shows that low BMI fartlek exercise increases VO2 Max more than low BMI plyometric exercise.

Hypothesis Testing 4: High BMI fartlek and plyometric exercise increase VO2 Max differently. The mean difference is 0.703333334, which is less than the RST value of

1.6524229 at 0.05. Thus, high BMI fartlek exercise increases VO2 Max differently than high BMI plyometric exercise. High-BMI fartlek exercise increases VO2 Max more than plyometric exercise.

Hypothesis 5: Fartlek, plyometric, and BMI interact significantly. 0.503894 is less than the Ftable of 4.35 at 5% significance. Thus, fartlek, plyometric, and BMI do not interact with VO2 Max ability. Based on the results of the study, it turns out that athletes who have low BMI with fartlek training, have an increase in VO2 Max ability of 4.9966667 which is better than athletes with low BMI and receive plyometric training treatment of 3.49, the effective difference is an increase of 1.50666667. Meanwhile, athletes with high BMI with fartlek training had an increase in VO2 Max ability of 2.8316667 which was better than athletes with high BMI and received plyometric training treatment of 2.12833333, the effective difference increased by 0.70333333.

The effectiveness of increasing VO2 Max ability is influenced by the use of the type of exercise and is influenced by the athlete's BMI classification. Significant interaction effect between fartlek exercise, plyometric exercise and BMI to increase VO2 Max ability. Athletes increase their VO2 Max ability with fartlek training and plyometric exercises more effectively if they have a low BMI.

4 Conclusion

In summary, the research findings suggest that fartlek training is more effective in increasing an athlete's VO2 Max ability compared to plyometric training. Additionally, athletes with a low BMI experience greater improvements in VO2 Max ability compared to those with a high BMI. Further analysis shows that the increase in VO2 Max ability is better with low BMI fartlek exercise compared to low BMI plyometric exercise, and with high BMI fartlek exercise compared to high BMI plyometric exercise. The study also identifies a significant interaction between fartlek training, plyometric training, and BMI in relation to VO2 Max ability. The results suggest that athletes with a low BMI can benefit from both fartlek and plyometric exercises to improve their VO2 Max ability.

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