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The Effect of High-Intensity Interval Training and Fartlek on Vo2max Players U15 and U23 Pamoso Football School

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Abstract

The purpose of this study was to analyze the differences in the effect of high-intensity interval training and fartlek on the VO2max of players u15 and u23 at the Pamoso football school in Majene Regency, to analyze the differences in VO2max of players U15 and U23 in high-intensity interval training and fartlek, to analyze the interaction between high-intensity interval training exercises and fartlek with age against the vo2max football player Pamoso Majene District football school. This study used an experimental method with a factorial experimental design research design. This study totaled 38 people, 18 U15 and 20 players U23 and formed into four groups: high-intensity interval training U15 and U23 with fartlek U15 and U23. The results showed an increase in VO2Max in high-intensity interval training for U15 players with an average of 12.167. At the same time, U23 obtained an average pre-test of 36.820 and a post-test of 47.840, with a difference of 11.02. the U15 fartlek group, on the study's results, obtained 37,533 pre-tests and 49,467 post-test with a distinction of 11,943. Fartlek U23 received an average pre-test of 37.140 and post-test of 47.810 with a difference of 10.67, and there was no interaction between training and age on the increase in VO2Max of Pamoso soccer school players. Based on the study's results, there is no difference in growth between training high intensity and fartlek, and both increase the player's VO2 max. There is a difference in the rise in VO2Max for U15 and U23 players; U15 players experienced a 32% higher VO2Max increase than U23 players, who increased 29%. And there was no interaction between high-intensity interval training and fartlek exercises with the age of the players on the increase in vo2max of the Pamoso football school players, Majene Regency.

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INTRODUCTION

Sports performance is significant for athletes because performance can also be a reference for athletes in reaching the peak of achievement. To achieve good performance and determine individual achievements, regular training is needed in terms of exercise size related to physical factors, techniques, tactics, and psychology (Bompa &; Haff, 2009). Good physical condition will influence the way of thinking of each individual. Therefore, it can be assumed that when the physical condition of each individual is in good condition, it will be easier to understand and carry out a tactic (Pambudi, 2015). Physical condition is one of the most important things for every athlete to have to improve performance. These physical components are endurance, speed, flexibility, strength, coordination, balance, and reaction. Well-programmed training is needed to get all these physical components (Boy Indrayana &; Ely Yuliawan, 2019). Physical condition is critical in improving the performance of athletes for the achievement of an achievement.

Soccer is a team game in which cooperation and cohesiveness are valued to produce victory (Brophy et al., 2012). Football is a team game, and to succeed, it takes teamwork, not just one player (Tarju &; Wahidi, 2017). Football games are conducted for 90 minutes, with an additional 30 minutes if the score is tied. To adapt to that time, a good VO2Max is needed (Oman Hadiana, Didi Muhtarom, 2019). Some factors that must be met to support achieving a goal in soccer are mastery of essential technical skills, physical condition, and mastery of tactics and strategies. The dominant physical characteristics in soccer are strength, coordination, agility, speed, and endurance (Muhammad Akbar Husein AllSabah, Weda, Irwan Setiawan, 2019). The benchmark of success in soccer players is not only seen through the resulting score achievements, but the formation of character or player personality requires sportsmanship that is still upheld (Jariono &; Subekti, 2020). in junior football players, it has been shown that the decline in the fatigue-related technical ability for a certain intensity is closely related to player fitness (Carling &; Dupont, 2011).

Training is a process where a person who desires more than the previous condition, and in its implementation, is carried out repeatedly each time given the burden of improvement through an organized and programmed method. Training is needed in sports to achieve achievements (Adhi et al., 2017). Improving players' ability in terms of technique, physique, and tactics requires special training in general (Malik Alkayis, 2019). In planning an exercise program, several elements must be considered regarding the dose of exercise, namely, frequency, intensity, duration, and type of exercise tailored to the needs (Palar et al., 2015); the intensity of exercise given to each individual must be by his physical capacity and ability, with supervision carried out to match the intensity programmed. Training programs need to follow stages that have

been arranged according to the sport itself, for muscle adjustments and energy systems in athletes according to specific sports (Mubarok &; Kharisma, 2021).

Pamoso football school Majene Regency is a team in Majene Regency with players of different age groups and often represents Majene Regency in national tournaments. VO2Max condition and player fitness are currently a problem for Pamoso football school players in Majene Regency, so they cannot perform well. With the existing problems, researchers will provide solutions by providing high-intensity interval training and fartlek training programs to deal with problems in VO2Max conditions of U15 and U23 players. The problems described above are solved by providing a programmed and well-planned exercise program. A well-structured training program can develop all skills or potentials in each individual, including physical, tactical, technique, strategy, and mental (Hanafi, Brahmana, Utomo, 2019).

High-intensity interval training is recognized as one safe and effective exercise type that improves fitness (Artese et al., 2022). HIIT training combines high intensity with rest or interval periods (Fajar Syamsudin, Rony Syaifullah, Muhammad Bakhtiar Subardi, 2021). High-intensity interval training is a cardiovascular exercise model, its implementation using high intensity and heavier training loads with a short time and interspersed with recovery time (Brastangkara &; Jatmiko, 2019). High-intensity interval training uses repetitive, short, too-long high-intensity training interspersed with low-intensity exercise or rest recovery periods. One proposed mechanism is that high-intensity interval training increases aerobic capacity and thus delays the onset of fatigue.

Fartlek training is a combination training model of walking, jogging, and sprints; in this exercise, there are variations in speed. Repetitions and distances are adjusted to individual abilities (Sumintarsih et al., 2022). Fartlek can develop an individual anaerobic system because this fartlek is an exercise to increase athletes' endurance (Kharisma &; Mubarok, 2020). Fartlek training is very suitable to be applied to soccer players, by the characteristics of the game of soccer in which there is a combination of movement and speed. Based on observations and observations that there are difficulties and challenges in the process of fartlek training because what is usually done to increase endurance is only running at a moderate pace for a few minutes, now including variations in the exercise through rhythm, when individual training creates several levels of movement not only moderate running, walking, and can even do sprints at any time, This will be able to drain much stamina.

Maximum aerobic capacity, commonly referred to as VO2Max, is the highest oxygen intake or commonly said by using oxygen every minute and carried out continuously (Suharjana, 2013). Exercises that can increase VO2Max are exercises whose implementation includes aerobic activities such as walking,

running, and swimming (Firmansyah Dahlan, 2019). VO2Max is generally affected by exercise, and energy supply is also affected by exercise and becomes more aerobic when the intensity of exercise is further increased. Maximum oxygen volume is not only a benchmark for the body's physical ability to take oxygen, but VO2Max also delivers to muscles that work and help remove the remnants of substance exchange. There are also other things, namely in achieving an achievement VO2Max plays an important role (Salman, 2018). VO2Max is the highest value where a person can consume oxygen during exercise Factors that influence the condition of VO2Max include gender, genes, age factors, individual residential conditions, and nutritional intake. (Boy Indrayana &; Ely Yuliawan, 2019). In soccer, the most crucial thing every player possesses is a good VO2 max. To run a tactic and strategy from a coach, good stamina and endurance are needed in displaying skills, and techniques also need good physical condition.

METHODS

The method used in this study is an experimental research method with a factorial experimental design research design by paying attention to the possibility of variables that affect treatment. This research uses quasi-experiments and designs in the form of pre-test and post-test. The experimental group is carried out according to the predetermined group. In this design, a group has been selected according to predetermined criteria and given a pre-test to determine the initial conditions and whether there are differences in the experimental group.

The population in this study is SSB Pamoso football players, Majene Regency, with a population of 55 people. This study used purposive sampling, namely population sampling, by predetermined criteria. Through these criteria, the sample in this study was determined to be 34 people. After that, the sample was divided into four groups. Thus, each group consisted of U15 high-intensity interval training nine people, U15 fartlek nine people, U23 high-intensity interval training ten people, and U23 fartlek ten people.

The variables in this study consisted of independent variables, high-intensity interval training and fartlek, VO2Max bound variables, and attribute variables, namely, U15 and U23 players. The data collection technique used in this study was a multistage fitness test to determine VO2Max Participants were required to run back and forth on a 20 m track and touch a predetermined line. All test takers were required to run until they felt tired. Running level and number of shuttles can be used to predict VO2Max, the purpose of the test is to measure the degree of efficiency of heart and lung function, which refers to the size of maximum oxygen uptake.

Some data can be obtained and obtained during the initial implementation of the experiment, which will make it initial data, and obtained from the end of the experimental test, which also makes it the final data, to be able to analyze the results of treatment and

how the differences from variables are also the ultimate goal in conducting experiments.

Data analysis was carried out using paired sample test techniques with the help of SPSS. The data that has been collected needs to be analyzed through descriptive statistics, as well as inferential for the benefit of hypothesis testing in research. After the data, a selection is carried out, so it requires an analysis step. In this research process, normality tests will also be carried out, as well as data homogeneity. As for the following steps, the normality test uses the Shapiro-Wilk formula with the SPSS program. The data is usually distributed if the significance value is >0.05. The homogeneity test is carried out to test the similarity of variation or to find out the data obtained from a homogeneous population, in this case, using a statistical Levene test. The decision-making criterion is if the value of Sig. More> 0.05. If the data proves to be expected, it will proceed to the paired sample t-test

FINDINGS AND DISCUSSION

Findings

Description of the results of the analysis of pre-test test data and post-test VO2Max ability of U15 and U23 players of Pamoso football school Majene Regency in the high-intensity interval training group. The results of the data description for the high-intensity interval training group of U15 and U23 players are presented in the following table.

Table 1. The difference in the effect between high-intensity interval training and fartlek on VOMax of U15 and U23 players of Pamoso football school

Variable	Age	Pre-test	Post-test	Difference	Df	Sig
HIIT	15	37,900±2,2886	50.067±1.4629	12.167±0.8257	8	0,000
	23	36.820±1.8849	47,840±1,7174	11.02±0.1675	9	0,000
Fartlek	15	37,533±2,2705	49.567±1.5083	12.034±0.7622	8	0,000
	23	37,140±2,0940	47.810±1.7156	10.67±0.3784	9	0,000

The table above shows the analysis of paired sample tests; in the high-intensity interval training U15 group, the average pre-test value was 37.900±2.2886, and the post-test was 50.067±1.4629 with a sig value. 2-tailed) of 0.000. So it is known that U15 high-intensity interval training affects increasing VO2Max players. In the U15 fartlek group, the average pre-test score was 37.533±2.2705 and the post-test 49.567±1.5083 with a sig value. (2-tailed) of 0.000, so it can be ascertained that fartlek training affects the increase in the VO2 max *of* U15 players. While in the U23 group, high-intensity interval training obtained an average pre-test value of 36.820±1.8849 and a post-test of 47.840±1.7174 with a significant value. (2-tailed) was 0.000, and the U23 fartlek exercise group had a pre-test mean of 37.140±2.0940 post-test 47.810±1.7156 sig scores. (2-tailed) 0.000. With these results, the U23 high-intensity interval

training and U23 fartlek groups have a sig.< value of 0.05, so it can be concluded that there is a significant influence between high-intensity interval training and fartlek training on increasing VO2Max U23 players at Pamoso football school, Majene Regency. The *test on the* paired sample test obtained a significance of 0.000 <.05, so it can be concluded that "there is a difference in the effect of high-intensity interval training and fartlek training on increasing VO2Max U15 and U23 players of Pamoso football school Majene Regency" received

The table above shows the test sample test result data. If the sig p value < 0.05 or *the t value is* calculated > t table, then there is a difference in increase between variables. In the U15 group, results were obtained in high-intensity interval training, with the average value of pre-test 37.900±2.2886 and post-test 50.067±1.4629 with a difference of 12.167±0.8257. In the fartlek group, the average pre-test score was 37.533±2.2705 and the post-test 49.567±1.5083 with a difference of 12.034±0.7622 with the same increase of 32%. While in U23 high-intensity interval training, the average pre-test value was 36.820±1.8849 and the post-test 47.840±1.7174 with a difference of 11.02±0.1675. In the fartlek group, the average pre-test score was 37.140±2.0940 and the post-test 47.810±1.7156 with a difference of 10.67±0.3784, with an increase in both U23 groups by 29%. The second hypothesis, "There is a difference in VO2Max *increase* of U15 and U23 players in high-intensity interval training and fartlek of Pamoso football school Majene Regency" is accepted.

Table 2. The interaction between high-intensity interval training and fartlek with the age of players at Pamoso soccer school, Majene Regency.

Variable	Mean square	f	Sig.
Exercise and Usia	,769	,296	,590

The results of the analysis calculation in the table above test of between-subjects effects show that F count = 0.296, and F table 2.66 with a significance value of 0.590. So it is known that F counts < F tables. In explaining whether or not the hypothesis is accepted in the Two-Way Anova test if the significance value < 0.05, then Ho is accepted. Namely, there is an interaction between high-intensity interval training and fartlek training with the age of players on the increase in VO2Max of Pamoso football school players, Majene Regency. If the significance value > 0.05, then Ha is accepted; that is, there is no interaction between high-intensity interval training and fartlek training with the player's age on the increase in VO2Max of Pamoso football school players, Majene Regency. So it can be

concluded that the third hypothesis stating 'There is an interaction between high-intensity interval training and fartlek training with the age of players on the increase in VO2Max of Pamoso football school players Majene Regency" is rejected.

Discussion

High-intensity interval training and fartlek are two physical training models that are applied and implemented with a specific purpose, in this case, to improve the player's vo2max ability. The first hypothesis was that between high-intensity interval training and fartlek, there was no difference in VO2 max increase in U15 and U23 players, meaning that these two physical exercise models were equally good at increasing VO2 max ability in soccer players. High-intensity interval training is a cardiovascular exercise model, its implementation using high intensity and heavier training loads with a short time and interspersed with recovery time (Brastangkara &; Jatmiko, 2019). high-intensity interval training significantly influences cardiovascular endurance (Hernawan et al., 2021). Increasing oxygen demand or oxygen consumption can be achieved by doing high-intensity interval training (Putra et al., 2017). High-intensity interval training conducted for eight weeks is more efficient in improving cardiorespiratory fitness and better in maintaining and maintaining cardiorespiratory fitness (Mendelson et al., 2022).

Exercise fartlek is a combination exercise model of walking, jogging, and sprints; this exercise has variations in speed. Repetitions and distances are adjusted to individual abilities (Sumintarsih et al., 2022). Fartlek can develop an individual anaerobic system because this fartlek is an exercise to increase athletes' endurance (Mubarok &; Kharisma, 2021). Fartlek training is very suitable to be applied to soccer players, by the characteristics of the game of soccer in which there is a combination of movement and speed. In line with the study results given fartlek exercises with a sample of 13 people, it is known that they influence increasing VO2Max values (Muryadi &; Arif, 2021). Many training methods can help soccer players increase VO2Max, including interval training, fartlek training, continuo, and small-side game training (Triyanto et al., 2021).

Fartlek exercises influence VO2Max, and this exercise can provide new colors in training so that players are not bored and bored in training, in its implementation can be combined several movements ranging from walking and jogging to sprints and, according to the characteristics of the game of soccer. Fartlek training can increase endurance in athletes aged 15-16 (Hariyanto &; Irawan, 2017). The results of the study obtained by the researcher at this moment can be assumed that high-intensity interval training and fartlek play an essential role in increasing VO2Max and are very suitable to be applied by coaches to be used as a training method for Pamoso football school players, Majene Regency. In contrast to the results of the study, which explained that the high-intensity interval training and fartlek training methods both provide an increase in endurance, high-

intensity interval training shows better results (Festiawan et al., 2020).

VO2Max is the maximum oxygen uptake consumed in units of ml/kg bb/minute; individuals with high VO2Max can do more intense physical activity. A good VO2Max can influence increasing the safety of soccer players (Ilissaputra &; Suharjana, 2016). The increase in VO2Max of players can be achieved by intensely doing well-programmed physical exercise; both the U15 and U23 groups in high-intensity interval training and fartlek training found that there was a difference in VO2Max increase between players with 15 years of age and 23 years of age, where U15 years of age players experienced higher increases compared to players with U23. With this difference in increase, of course, some factors influence it, starting from lifestyle, nutrition, and exercise itself; in increasing VO2Max, each individual can be influenced by several factors, including lifestyle, living environment, exercise habits, and food nutrition (Nurmitasari &; Zaidah, 2020).

Factors that affect VO2Max include body composition, genes, differences in exercise intensity, duration of exercise time, and differences in tests given (Yanti &; Marisa, 2021). Body mass index is a factor that affects an individual's VO2Max because a high body mass index causes low VO2Max conditions (Alfarisi, 2016). The increase in VO2Max conditions in a person begins to be high at the age of 10 years and, in general, begins to experience a decrease in aerobic ability at the age of 25 years, so it takes a long time to be able to improve the condition of physical endurance (Busyairi &; Ray, 2018). One of the factors that cause players to experience problems in endurance conditions is laziness and lack of interest in players to be active in routine training so that the training program runs smoothly (Afkhar, 2019). The results on the endurance of U15 players after training increased in the excellent category, with a percentage of 60.9% in the men's SSB Tulungagung (Priangmbodo, 2019).

High and low VO2Max are influenced by supporting elements, in this case, the ability of the heart, blood, lungs, and those who can consume oxygen, namely skeletal muscles (Ashfahani, 2020). Something that can be noticed is that in exercise, the factors that can cause damage and pain depend on the dose and intensity of the exercise itself (Triansyah &; Haetami, 2020). In this case, according to the results of the third hypothesis, it is known that there is no interaction between High-intensity interval training and fartlek training with the age of the player to increase VO2Max. High-intensity interval training is designed to increase body metabolism and fat that can be reduced (Tribuana et al., 2022). Fartlek training is a suitable method used in all sports that require VO2Max endurance, with slow, medium, and fast running characteristics to improve the physical condition of each individual (Lavenia et al., 2020). Physical exercise needs to be done to improve the condition of VO2 max. It is done with an aerobic program so that there is a burden in improving the condition of the heart and lungs because the ability of VO2Max is very

influential on the physical condition and freshness of individuals (Busyairi &; Ray, 2018). Aerobic exercise affects cardiorespiratory fitness; aerobic exercise can increase oxygen uptake, blood capacity in transporting oxygen, and low pulse rate during rest and activity (Ruqayyah &; Rahadianti, 2022).

CONCLUSION

The conclusion of this study was to conduct meetings in an exercise program for 16 meetings, 5 weeks with a frequency of 4 times a week which then obtained the following results. Between the two training models, high-intensity interval training and fartlek, in their implementation, both provide an increase in vo2max players. In high-intensity interval training, u15 years increased by 32%, fartlek u15 by 32%, high-intensity interval training u23 by 29%, and fartlek u23 by 29%. So it is known that there is no difference in high-intensity interval training and fartlek training on increasing vo2max of pamoso football school players, majene regency.

The age group in high-intensity interval training and fartlek training is divided into 4 groups, including high-intensity interval training u15 and u23 with fartlek u15 and u23. Where in the u15 group from the results of data analysis obtained a higher increase compared to u23. Where in u15, each group increased by 32%, while in u23, each training group increased by 29%. So it is known that there is a difference in the increase in vo2max of u15 and u23 players in high-intensity interval training and fartlek of pamoso football school majene regency, where the vo2max ability of u15 players is better than u23.

A significance value greater than 0.05 means there is no interaction; on the other hand, if the sig value is smaller than 0.05, it means an interaction. The results of data analysis obtained the interaction between high-intensity interval training and fartlek training with the age of players on increasing vo2max obtained a significance value of 0.590>0.5, so it is known that there is no interaction between high-intensity interval training and fartlek training with the age of players on increasing vo2max of school players infamous football, majene regency.

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