



THE EFFECT OF HIGH INTENSITY INTERVAL TRAINING AND FARTLEK TRAINING ON INCREASING VO2MAX TOKAMBANG FUTSAL CLUB

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Abstract: The purpose of this study was to improve the Vo2Max of Tokambang FC futsal players. This type of research uses experimental research which is carried out for 16 meetings with the treatment of high intensity interval training and fartlek training which is carried out through a training program that has been prepared. This study aims to determine: (1) whether there is an effect of interval training to increase Vo2Max; (2) whether there is an effect of fartlek training to increase Vo2Max; (3) whether there is a difference between high intensity interval training and fartlek. This research was conducted using an experimental method with a Two-group pretest-posttest design. The main Tokambang futsal club. The sampling technique was matched pair. The research instrument used Multi stage fitness. The data analysis technique used in this study is t-test to determine the comparison of high intensity and fartlek exercises in increasing Vo2Max. Based on the results of the study are as follows. (1) There is an effect of increasing Vo2Max in PS futsal athletes. Himalaya with interval training, which is evident from the t value (13.321) > t table (2.132). (2) There is an effect of increasing Vo2Max in PS futsal athletes. Himalaya with fartlek training, which is evident from the t value (10.994) > t table (2.132). (3) High intensity interval training and fartlek training are equally good at increasing VO2max in Tokambang futsal club players because there is no significant difference in results, which is evident from the value of t count (0.587) > t table (2.201).

Keywords: High Intensity Interval Training, Fartlek dan Vo2Max

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INTRODUCTION

Sport is a physical activity that is done to get a healthy and strong body. Fun and entertaining sports activities, such as soccer, are favored by all elements of society around the world, from children, teenagers, adults, to the elderly. Football sports can be played in all places, played according to the environmental conditions where the community is located. At the world football grand event which is held every 4 years, it is certainly a moment that the world community is waiting for and also all the constituent countries in the event representing their respective continents.

Futsal is also an achievement sport in both national and international competitions. Futsal is actually a complex sport, because it must be supported by good cooperation between players and must also be supported by good techniques, physical, tactical and mental in order to play well. Physicality is a component that must be possessed by futsal players. According to Mochamad Sajoto (1988: 57), futsal games have differences with other sports, physical condition is one of the indispensable requirements in an effort to improve the performance of an athlete, even as the starting point of a sports achievement. In this case, physical ability is needed to support the psychomotor movements of an athlete. Physical condition is one of the inseparable components of both improvement and maintenance. This means that in an effort to improve physical condition, all components must be developed, one of which is endurance. The physical components according to Lhaksana (2011: 17) are: Endurance, Strength, Speed, Agility, Power, Flexibility, Accuracy, Coordination, Balance, and Reaction.



Of the ten physical components, the author will only examine the increase in VO₂max through high intensity interval training and fartlek training methods. At Tokambang Futsal Club. The physical training aspect is prioritized, because it is the foundation of an achievement sport. Physical condition is a very important element in almost all sports. Therefore, physical condition training needs serious attention to be planned properly and systematically so that the level of physical fitness and functional abilities of the body's organs are better. Futsal has characteristics resembling football, the only difference is the size of the field, the number of players, and several points of match regulations, futsal is one of the sports that has interesting characteristics, in addition to stamina, speed and agility, it also requires mental and strategic, especially in dribbling, passing, and maintaining defense and attacking the opponent's area quickly, and accurately.

Futsal sport is a game with fast intermittent intensity and optimal heart work, good heart work will be able to transfer oxygen to active muscle tissue, so that energy resistance is fast and can accelerate the recovery process. This is based on the duration of the futsal game 2 x 20 minutes with the number of players 5 people with a field measuring 38m-42m x 20m-25m so that it requires players to focus and keep moving such as opening space, creating opportunities and guarding opponents. Therefore, futsal players must have strong endurance, strong endurance is obtained from hard and correct training. These demands can be met by players if the player has a good physical condition, especially the aerobic endurance component. This aerobic ability can also be said to be aerobic endurance, regarding this matter explained by Sukadiyanto (2011: 65) that good aerobic ability will be able to recover itself quickly, so that it can perform high intensity for a long time. One of the factors that influence the success of an athlete regarding his physical component is the training factor. The physical demands, namely aerobic endurance, are not optimally trained to be improved for Tokambang Futsal Klub. This is because according to the observations of researchers in several championships, players seem to experience fatigue quickly, causing their playing ability to decline, one of which is often losing the ball, improper passing, inaccurate shooting and decreased ball control (decreased concentration). In this case there are factors that affect the appearance in each championship including explosive power (power), speed, agility, endurance and strength. If someone has a good VO₂max capacity, their respiratory endurance will also be good so that in playing a futsal game which is carried out for 2x20 minutes with 10 minutes of rest time the futsal players do not experience fatigue easily so that respiratory endurance plays an important role in futsal games (Yoga, 2013). VO₂max is the maximum limit of oxygen that a person can consume during intense physical activity until fatigue occurs (Uliyandari, 2009).

Based on the results of interviews and observations with the coach when the author asked about the training program for Tokambang Futsal Klub, each training session only focused on techniques and strategies. This is not without reason, due to the limited training time, only 2 times a week. So that the choice of trainers in providing each training session is more dominant in techniques and strategies with very little physical exercise intensity, which should be based on the theory and methodology of training 3 to 4 times a week. Not yet optimal physical exercise program to train and increase VO₂max. becomes an obstacle to improving the athlete's physical condition and athlete performance during the match, therefore in this study researchers designed a physical exercise program to increase aerobic endurance which will affect the increase in VO₂max. Of the several components of physical exercise to increase VO₂max, researchers chose high intensity interval training (HIIT) and fartlek training. high intensity interval training (HIIT) the most appropriate method for improving physical quality prioritizes giving rest time between sets with the main target of energy fitness.... In order to play well, futsal players must have a good VO₂ max, VO₂max is the maximum amount of oxygen that a person can consume during intense physical activity until fatigue finally occurs, also known as aerobic power and cardiorespiratory endurance capacity (Uliyandari, 2009).

Fartlek exercise is an exercise method with changing speeds. The implementation of the fartlek method is a variation of jogging, walking, and sprinting activities. The intensity of fartlek

training is formulated the longer the distance traveled or the longer the time to do a sprint the higher the intensity and vice versa Fartlek is one form of exercise that is very good for developing endurance in almost all sports that require endurance. This method is more often used as a variation of training so that athletes do not get bored quickly and is carried out during the preparation period. For more details about the high intensity interval training (HIIT) training program and fartlek training will be explained in chapter II and chapter III.

METHODS

The method used in this research is the Experimental research method. In experimental research there is treatment, thus the experimental method is defined as a research method used to seek the effect of certain treatments on others under controlled conditions (Sugiyono, 2009: 72). The research design used is pre-experimental design, because this research is a research activity that begins with determining the subject and ends with a form of test to determine the effect of the treatment that has been given.

This pre-experimental research design whose type is pretest-posttest design compares between two methods of high intensity interval training and fartlek. In this study the test was carried out twice, namely before and after treatment. The difference between the pretest and posttest is assumed to be the effect of treatment or treatment, the results of the treatment are expected to be known more accurately, because there is a comparison between the situation before and after being given treatment and it is known which method is more effective for training to increase VO₂max. The research design is outlined in the form of a picture as follows:

Pretest and posttest two group design, so that the scheme can be described as follows:

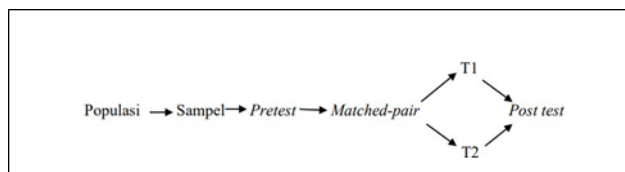


Figure 3.1 Research design Source. Suryanto (2018: 29)

Description:

Pre-test: Initial test with reaction speed conducted before the subject gets treatment.

Matched-pair: Dividing pairs of subjects based on the principle of balance and then randomly determined according to the research group.

T1 : The first treatment using interval training method.

T2 : The second treatment using the fartlek ride training method.

Post-test: The final test conducted after the subject gets treatment.

T2 (Post-test): The final test measures VO₂max using the yoyo Intermittent recovery Test (YYIR) after the subject gets treatment.

Conduct a pretest and the sample is divided into 2 groups, group one high intensity interval training and group two fartlek exercise. Group division using matched-pair. In quotation from Suryanto (2018: 31) According to Fajar Ibnu, matched-pair is dividing pairs of subjects based on the principle of balance and then randomly determined according to the research group.

The division of the experimental group is described as follows:

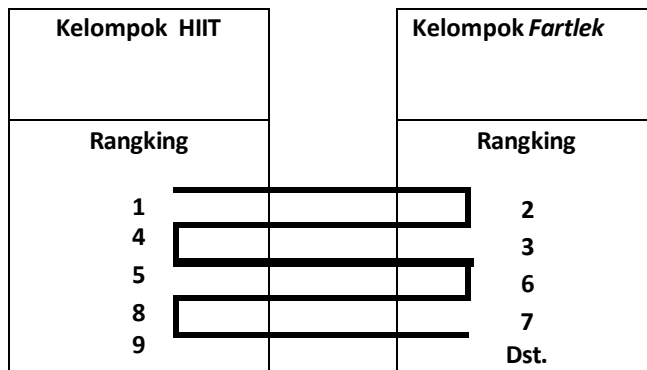


Figure 3.2 Matched-pair group assignment

RESULT AND DISCUSSION

Results of Descriptive Analysis of Vo2max Data on Tokambang futsal club players. The summary of the results of the descriptive analysis of Vo2max in table 4.1 below:

Statistik	Pretest	Post Test	Pretes t fartlek	Post Test Fartlek
	high intensity interval training	high intensity interval training		
N	7	7	7	7
Mean	31,4429	44,4000	31,4143	43,4286
Std.Deviation	2,94441	2,68763	2,97626	3,54434
Minimun	27,60	40,80	27,10	36,60
Maximun	36.40	48.40	36.00	47.40
Sum	220,10	310,80	219,90	304,00

From the table above is a descriptive data description of pretest high intensity interval training, posttest high intensity interval training, pretest fartlek and posttest fartlek on Tokambang futsal club players can be stated as follows:

1. Pretest high intensity interval training for Tokambang futsal club players, the number of samples (N) of 7 people obtained an average value of 31.44, standard deviation 2.944, minimum value 27.60, maximum value 36.40 and Sum value 220.10.
2. Post test high intensity interval training Tokambang futsal club players the number of samples (N) as many as 7 people obtained an average value of 44.40, standard deviation 2.687, minimum value 40.80, maximum value 48.40 and Sum value 310.80.
3. Pretest fartlek players Tokambang futsal club the number of samples (N) of 7 people obtained an average value of 31.41, standard deviation 2.976, minimum value 27.10, maximum value 36.00 and value Sum 219.90. Sum 219.90.
4. Post test fartlek players Tokambang futsal club the number of samples (N) of 7 people obtained an average value of 43.42, standard deviation 3.544, minimum value 39.60, maximum value 47.40 and Sum value 304.00.

1. There is an effect of high intensity interval training on increasing Vo2 Max in Tokambang futsal club players.

This method combines a variety of conditions, ranging from sprinting, jogging, walking to rest. The advantage of this exercise is that it can increase VO₂max capacity in Tokambang futsal club players, because high intensity interval training is a very complicated training method, every coach who wants to apply this method must consider such as initial aerobic ability not at a low level so that before starting to apply the high intensity interval training method the coach is recommended to apply training methods that can develop aerobic basics as stated in the theoretical study on the discussion of aerobic endurance ability as a stage in applying training methods appropriately targeted and appropriate benefits, There are several advantages of using high intensity interval training, this separate player will train his patience because the movements carried out are very easy while in the framework of training endurance what is needed is to fight boredom, this is what makes the player's VO₂max increase. Based on the data above, it is known that of all the subjects who took the pre-test and post-test high intensity interval training tests, all of them experienced an increase with a very good classification of 1 person, a good classification of 4 people, and a moderate classification of 2 people. Other studies include research from (Batacan et al., 2017) which says that High-Intensity Interval Training (HIIT) can increase VO₂ max with a large effect on trial samples that have normal body weight. Meanwhile, (Astorino et al., 2017) concluded that in a young sample, 20 sessions of periodic HIIT led to a significant increase in VO₂ Max which was accompanied by an increase in SV and maximal CO. The data suggests that the increase in VO₂ Max as a result of HIIT is due to an increase in central O₂ delivery as is often reported. Another study from Wen et al. (2019) mentioned that HIIT is effective for increasing VO₂ Max in healthy, overweight/obese adults and athletes. Based on this description, it can be concluded that High-Intensity Interval Training (HIIT) is defined as an exercise consisting of several cycles of short or medium duration and high intensity and each cycle is interspersed with rest periods in the form of light intensity exercise. In addition, according to (Ciolac et al., 2010) High Intensity Interval Training (HIIT) can cause myocardial thickening of the left ventricle of the heart which is physiological so that the strength and ability of the heart to pump blood per contraction increases, reducing the number of pulse beats per minute. This is an indication that the high intensity interval training method shows superiority in increasing VO₂max.

The high intensity interval training method demands many requirements so this can be a reference to find causal problems in the application of physical training methods that can be studied through further research development. So that this becomes one of the important recommendations for players and coaches in developing research so that achievements can be achieved more optimally thanks to the relationship and support of the ability of physical components according to the needs and demands of the method. The interlude between high intensity and recovery intensity causes the player's body to effectively form and use energy derived from the anaerobic system. The addition of intervals helps the metabolic waste from the player's muscles during the rest period when high-intensity interval training is being performed by the body of the Tokambang futsal club player.

2. There is an effect of fartlek training on Vo2 Max ability in Tokambang futsal players.

Fartlek training is one of the training methods to increase endurance, especially aerobic endurance. Fartlek exercise is a training method that varies the form of exercise or exercise that changes the speed of walking, jogging and sprinting, fartlek exercise can be done alone or with a coach program. Fartlek exercises are carried out in the open or in closed places according to their individual needs. This exercise is done in groups and performs movements based on the instructions of the trainer who has distributed the exercise program. This program is certainly very good if it has strict supervision and athlete discipline in carrying out the training program so that athletes can do training with the same opportunities and repetitions so as to improve good VO₂max results. This form of exercise requires strict supervision so as to produce maximum results. Thus fartlek training has a significant influence in increasing the results of VO₂max in Tokambang futsal club players. In line with Atradinal's research (2018). based on the results of

research on the effect of the fartlek training model on increasing the aerobic endurance of PSTS Tabing Padang Football School athletes, it can be concluded that there is a significant effect on the aerobic endurance of the fartlek group as evidenced by the t-test analysis. The results of this study are in line with research conducted by Ilyas (2016) showing that there is an increase in fartlek training with a futsal game model on improving the aerobic endurance ability of futsal players. Fartlek training is carried out with a program that has been prepared progressively, namely by increasing the load periodically, both increasing the intensity of training so that athletes can adapt well. Fartlek training is carried out with the starting position at the marker that has been arranged and waiting for the signal from the coach to start training, from walking, jogging, sprinting and recovery time so that it can stimulate the body for the next exercise. This situation must be maintained by practicing continuously, namely training that is carried out continuously for 16 meetings. At each meeting the intensity of the exercise is always increased and the recovery time per set is lowered according to the player's ability, so as to cause the training effect in the form of increased endurance and be able to optimize the work of the heart and lungs when circulating oxygen to all tissues to the maximum. General endurance includes; overall muscle, muscle nervous system, heart work system (cardiovascular) and lung work system (cardiorespiratory). Fartlek training athletes are required to move optimally when doing walking, jogging, and sprinting, so that indirectly continuous activity will increase the performance of the heart and lungs, so as to increase VO₂max, to increase heart performance in the implementation of the pulse training program.

Based on the data above, it is known that of the total subjects who took the pre-test and post-test fartlek test, 7 people all experienced an increase with a good classification of 1 person, a moderate classification of 2 people, and a very good classification of 3 people. Fartlek training has the effect of increasing VO₂max, so that the body's performance when it needs oxygen is fulfilled, from the description above it can be proven that fartlek training can increase the VO₂Max value of Tokambang futsal club. The advantage of fartlek training is that during training players can play around and have fun because the intensity is not determined, so that athletes do not feel burdened and enjoy the course of training, while the disadvantage of fartlek training is that during training players cannot reach the maximum level of fatigue. Based on the results of this study, it can be interpreted that fartlek training can increase VO₂max in Tokambang futsal club players.

3. There is no difference in the effect of high intensity interval training and fartelk training on VO₂ Max ability in Tokambang futsal club players.

Based on the independent t test hypothesis test, there is no significant difference in influence between HIIT and fartlek training because both types of exercise have almost the same form of exercise even though on average HIIT training is higher than fartlek but that is not enough to prove that HIIT training has a higher influence than fartlek. In line with previous research conducted by Suriyanto (2018) that interval training and fartlek training are equally good at increasing VO₂max in PS futsal athletes. Himalaya because there is no significant difference in results. Other research conducted by Rifqi (2020) There is no significant difference in the effect of the High-Intensity Interval Training (HIIT) and Fartlek Training training methods on VO₂max levels.

Fartlek Training on the VO₂ Max level of Soedirman VII Expedition Athletes (Goes to Aconcagua: Argentina), but when viewed from the average increase, the High- Intensity Interval Training (HIIT) training method shows better results than Fartlek Training. Before conducting research activities, many players asked about training programs that apply the HIIT (high intensity interval training) method. So that the author prepares himself in his product knowledge to answer various questions from the Tokambang futsal club players. The HIIT high intensity interval training and fartlek training groups provide variations in their training because there are several forms of exercise that can be said to be new to Tokambang futsal club players because they have never done these exercises before, thus fostering a sense of enthusiasm in practicing cardiovascular endurance conditions.

This study also proves that the High-Intensity Interval Training (HIIT) and Fartlek Training training methods can provide an increase in VO2 Max with a good and measurable training program. This can happen because the 2 exercises have some of the same advantages such as shorter time, flexibility and the heart is encouraged to do high activity and continued with low intensity. The selection of exercise programs in accordance with the principles of training progressive increase in load and training doses 2 methods made have similar doses and continuous training. High intensity interval trainging and fartlek exercises are good for increasing VO2max in Tokambang futsal club players.

Futsal games with a fast tempo when attacking, defending and mastering the game, both setting the tempo, finding space, dismantling the opponent's defense, and managing stamina. Apart from futsal, high intensity interval training and fartlek can also be used for other sports such as basketball, badminton, and for sports that generally require endurance. Each exercise has different variations so as not to make the athlete's condition quickly experience psychological fatigue. In addition to increasing VO2max, HIIT and fartlek can also develop a person's economic exercise (running efficiently). With better economic exercise, a person will expend less energy when doing the same activity. This is because HIIT and fartlek indirectly train a person to run more efficiently. Therefore, energy wasted on unnecessary movements is minimized. This is what really affects a player when playing futsal. Players who do HIIT and fartlek training will be able to do more sprints than players who only do endurance training. Just like other aerobic exercises, HIIT and fartlek exercises improve muscle cell function. So that along with the increase in endurance will affect the increase in oxygen consumption. If a person who lacks endurance when doing activities, his heart rate per minute can reach 200 beats. But if you do endurance sports training, then the pulse can drop to 185-190 per minute (Kamaruddin, 2020). So High-Intensity Interfal Training (HIIT) and fartlek exercises will make a positive contribution to increasing the Vo2max of futsal players. To get good cardiovascular endurance, it is expected to maintain a diet so that there is no accumulation of energy reserves in the body (Kamaruddin, 2020).

The results of data analysis and supported by some of the results of previous research above, it can be concluded that efforts to improve physical and skills through VO2Max and the use of High Intensity Interfal Training (HIIT) and fartlek exercises provide an influence in increasing VO2Max of Tokambang futsal club players.

Influence in increasing the VO2Max of Tokambang futsal club players. To encourage regional, as well as national futsal sports achievements, so that later through futsal sports it will be able to make the Indonesian Nation proud in the arena of higher events. Fartlek and HIIT training methods can still be said to be unfamiliar to the ears of tokambang fc futsal players so that they are curious and all players participate and never even absent but on the contrary are always present and added by other players who give the impression of a new cardiovascular endurance physical condition training program in increasing vo2max.

Players who have good Vo2max will have a good impact on endurance in participating in training sessions and during futsal matches. Through good Vo2max, it will provide longer endurance so that the players are not easily tired during the match and are able to set the rhythm of the game to optimize good techniques in kicking, dribbling, and heading the ball precisely to the target to be achieved. With Vo2max and training HightIntensity Interfal Training (HIIT) and fartlek the players are able to find a good game pattern, which is supported by physical, skill, and mental, so that Tokambang futsal club players are expected to be able to produce quality players. The difference in improvement provides a clear indication that there are factors that can influence the achievement of a person's maximum ability. This is possible because player activity outside of training time cannot be observed, for example sleeping hours, nutritional adequacy, etc. where player activity is only observed during the provision of training, by combining these 2 training methods can provide better results.

In addition, players who participated in this study showed higher interest in HIIT training than fartlek training. HIIT and fartlek workouts also take less time, compared to other time-consuming endurance workouts. Thus HIIT and fartlek methods can be an option for better time efficiency. High intensity interval training and fartlek training can pump up the heart which has a positive impact on increasing the body's metabolism. Body metabolism here relates to the ability to convert fat into energy related to the body's ability to convert fat into energy. Training is a systematic process of practicing, which is done repeatedly and which increases the amount of training load. A person's ability to do something often must be supported by hard training (Kamaruddin, 2019).

Where futsal is one of the sports whose movements cannot be predicted (unpredictable) so that it requires excellent physical condition in Tokambang futsal club players. Based on the results of the author's research, and supported by some of the findings of previous research results and the exposure of experts, it can be concluded that it turns out that the results of field research as a whole players who use the high intensity interval training method show a greater average score than the group using the fartlek training method. This happens when in the implementation of research influenced by several factors that affect and threaten control. Based on this description, it affects the results of the interaction of the hypothesis answer. Below are some of the findings in the field including:

a. Due to the application of high intensity interval training and fartlek training methods, this refers to the theory of a person's ability limit (BKM). The maximum ability limit is a limiting factor for Tokambang futsal club players in displaying maximum endurance. Therefore, the sample group that has low VO₂max is suspected of experiencing BKM. So that further research or research that is more systematic and longer according to training periodization is needed, so that it can obtain more significant research results.

b. In addition, the time limitations of researchers and research samples are only 14 people so that they have an impact on the results and data management and the difference in numbers is too thin, therefore further research is needed with a larger number of samples.

c. Another obstacle faced in this study is the limited tools in calculating and knowing the pulse of a player during the training process. Therefore, supervision must be very good during the training process and VO₂max measurement because in the high intensity interval training and fartlek training methods, players must always complete the training program every rep / set of training well. In order to achieve the desired pulse and endurance results.

d. In the implementation, it is realized that the high intensity interval training and fartlek training methods with the aim of physical improvement, players must have a good VO₂max in order to achieve maximum goals. There are several players in this research sample group who do not have good endurance or VO₂max. So extra supervision in the training process must always be done.

e. besides that, facilities or training places are an obstacle because Tokambang futsal club does not have a fixed training ground.

In other words, the HIIT and fartlek training methods both have advantages based on field findings. High intensity interval training and fartlek there is no significant difference in influence between the two exercises, but both have an influence in increasing the VO₂max of Tokambang futsal club players. So that the two exercises are very suitable to be applied in increasing VO₂max Tokambang futsal club.

CONCLUSSION

Based on the results of the research, the results of data analysis, description, testing of research results, and discussion, it can be concluded that:

1. There is an effect of high intensity interval training on Vo2 Max ability in Tokambang futsal club players.
2. There is an effect of fartelk training on Vo2 Max ability in Tokambang futsal club players.
3. high intensity interval training and Fartelk training are equally good at increasing VO2max in Tokambang futsal club players because there is no significant difference in the results of the 2 exercises.

Based on the results of data analysis and the conclusions of this research, several things can be suggested:

1. It is hoped that coaches, players and team management can foster sports, especially futsal in Bulukumba Regency in order to know and understand the importance of the influence of high intensity interval training and fartelk on Vo2 Max ability.
2. For players, please understand the importance of Vo2 Max in futsal games to achieve maximum performance.
3. The author hopes that after the training program that has been applied so far can be carried out by the coach in order to contribute to sports science and the development of sports achievements, especially futsal.
4. For researchers who intend to continue or replicate this research, it is recommended to carry out tighter control in a series of experiments.

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