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The Effect of Training Method and Speed on VO_2max of Futsal Players

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***Abstract*—The purpose of this study was to determine the differences between the effects of interval training, *fartlek* training, and speed on the increase of VO_2 max capacity in futsal players. This research used an experimental research method with a 2×2 factorial design. The research instruments used include Yo-Yo test level one and a 30-meter speed test. The result of this study showed that there was no significant difference between the effects of interval training and *fartlek* training. Furthermore, there was no significant difference between the increased VO_2 max capacity of high-speed players and that of low-speed players. Thus, *fartlek* training can be used to increase VO_2 max capacity of futsal players, thereby enabling them to compete with a higher intensity and overcome their fatigue issues.**

Keywords—interval training, fartlek training, VO2Max, Speed.

I. INTRODUCTION

There are various purposes for the development of sports; these include health, recreation, as well as education and achievement. Football, futsal, basketball, volleyball, and other Indonesian sportspeople put in their best in every competition. Citizens of a country may use their nation's sports achievement as their identity.

The body's ability to meet the demands of sporting activities depend on the active distribution and efficient use of oxygen to and by the muscle tissues [12]. The efficient use of oxygen by the muscle makes the body fit.

Exercise has become one of the popular pastimes in the society; many people with busy schedules create time to exercise regularly. Efforts have been made to improve the fitness and performance of sportspeople. Sportspeople are also willing to try various fitness improvement methods in order to find the most effective method. The progressive development of science is expected to bring about positive changes in the society.

Juan Carlos Ceriani created futsal in 1930; its popularity began to grow rapidly when Indonesia organized the Asian futsal championship in the year 2002 [9]. The PSSI held the first professional futsal league in 2006 under the name Indonesia Futsal League (IFL). This league sparked the popularity of futsal and marked the growth of many futsal academies. Ten futsal leagues have been organized annually between the periods of 2006 – 2017 (except in 2014).

Futsal is an indoor version of football that is played by two teams with five players each [1]. The futsal match consists of two 20-minute rounds and 10-15 minutes break [5]. A round of futsal can be as long as a round of football because the clock stops each time the ball is not in the field. Playing futsal for a long period of time certainly requires a strong endurance.

Futsal is currently played by almost anybody, including women, amateurs, and professionals all over the world. Amateurs and professionals have a different purpose for playing the game. Professionals play for achievement and victory, while amateurs play to become professionals [1].

The main goal of each player is to play in the national and professional futsal league. Achievements in sports are determined by several factors such as excellent physical abilities, mastery of techniques and tactics, praiseworthy psyche, moral, discipline, dedication and diligence [7]. All these components are complementary and should be improved in the training process. The training process should be effectively programmed and implemented for every player.

Futsal is an intermittent sport that is played on a small field; it involves unrestricted player substitution and a quick defending and attacking by players [11]. This rapid process limits the rest period available to players. Thus, players must have good physical ability in order to meet the demands of the swift rotation process [1]. This will help players to develop the techniques required to win the game and apply the tactics suggested by the coach.

The improvement of futsal league management in Indonesia prompted the development of the techniques, tactics, and overall fitness of each team. A player must have a good understanding of the techniques, tactics, and excellent physical abilities required to play the game. The maximum volume of oxygen (VO_2Max), is the rate at which an individual consumes oxygen from the atmosphere for aerobic respiration. The index indicates that the resilience of VO_2Max is limited by the amount of oxygen that is supplied to the muscle [6]. VO_2Max is a valid marker of a person's fitness. Factors such as exercise affect a person's fitness improvement [3].

Exercise is a long-term process that involves many psychological, sociological, and physiological variables. The training process could improve an individual athlete's skill if applied with the right principles [2]. Exercise helps athletes to acquire good and varied skills, keeps them psychologically

sound and maintains their state of health. Athletes prefer to explore a wide variety of training processes to avoid boredom and reduce stress levels. Therefore, the exercise must be organized and well planned.

Some of the factors that influence VO_2Max include age, sex, fitness, and training [8]. Various methods of physical training impact certain advantages and disadvantages to the athlete. Thus, the level of physical fitness should be developed at an early stage of the athletes' life and maintained through individually designed regular exercises [10]. The program design can be delivered in the form of a variety of exercises in order to maintain the endurance and excitement of players. Endurance exercises include interval training, *fartlek* training, circuit training, persistent training, and other variations of exercise.

II. METHOD

An experimental research method was used to obtain findings in this study. The research design used was the factorial design. This design is a modification of the *posttest-only control* or *pretest-posttest control group,* in which speed was included as an additional variable [4]. The additional variable in this study was speed.

TABLE I. EXPERIMENTAL METHOD

	Exercise	
Speed (V)	**Interval Training (L1)**	***Fartlek* Training (L2)**
High Speed (V1)	(L1V1)	(L2V1)
Low Speed (V2)	(L1V2)	(L2V2)

Description:

L1 : Exercise training method interval
L2 : Exercise training method fartlek
V1 : High speed
V2 : Low speed
L1V1 : High-speed group performed interval training
L1V2 : Low-speed group performed interval training
L2V1 : High-speed group performed the *fartlek* training
L2V2 : Low-speed group performed *fartlek* training

The experiment was conducted in two universities; there were two different treatments in each university. This study was conducted fifteen times for a duration of two months. The body would adapt to the workload if the exercise was done three times a week. The training schedule of each university was used to carry out the experiment. Universitas Negeri Islam trained on Tuesdays, Thursdays, and Saturdays from 4-6 p.m. at GOR UIN. Universitas Teknologi Yogyakarta conducted exercises on Tuesdays, Thursdays, and Saturdays from 7-9 p.m. at Jogokarian Futsal.

Based on the Slovin's formula above, a minimum sample of 22 people was needed. This means that eleven participants must be selected from each university. However, a total number of 12 participants were chosen. The twelve participants were placed in the interval training groups and the *fartlek* training group. Six high-speed and six low-speed students at Universitas Islam Negeri Sunan Kalijaga received interval and *fartlek* training, respectively. Meanwhile, at the Universitas Teknologi Yogyakarta, six high-speed students received *fartlek* training while the rest of the six low-speed students received interval training.

The instruments used in this study include a 30-meter speed test and *Yo-Yo Intermittent Recovery Test* to measure VO_2Max. The researchers decided on a 30-meter speed test since the dimension of the futsal field was 40×25 meter. The *Yo-Yo Intermittent Recovery Test* was used to evaluate the ability to repeat a 20-meter run with high intensity. The run started at level five upward, with an increase in speed at each level and 10 seconds break between runs [13].

III. RESULT AND DISCUSSION

The findings obtained from the initial test and the final test was documented and is discussed in this section. Table 2 shows the VO_2Max result for each treatment groups:

TABLE II. AVERAGE SCORES OF TREATMENT GROUPS

Method	**Speed**	**Statistics**	***pretest***	***posttest***
Interval	High	Total	260.39	272.17
		Average	43.39	45.36
	Low	Total	257.05	271.15
		Average	42.8	45.19
Fartlek	High	Total	258.04	272.5
		Average	43	45.41
	Low	Total	251.47	264.9
		Average	41.91	44.15

Based on the table above, high-speed interval training averaged at 43.39 in the initial test and 45.36 in the final test (with a margin of 1.97). On the other hand, the low-speed training had an average value of 42.8 in the initial test and 45.19 in the final test (with a margin of 2.39). The high-speed *fartlek* training averaged at 43 in the initial test and 45.41 in the final test (with a difference of 2.41). As for the low-speed *fartlek* training, the initial test average was 41.91 while the final test average was 44.15 (with a margin of 2.24). Thus, it can be inferred that a combination of training methods and speed increased the VO_2Max capacity of all participants.

Hypothesis Testing

The researchers tested the research hypotheses using data analysis and result interpretation with the two-way ANOVA. The first hypothesis was "…there is a significant difference between the effects of interval training and the *fartlek* training on the increase of futsal players' VO_2Max". The results showed no significant difference between interval and *fartlek* training, although both training methods had an effect on the increase of futsal players' VO_2Max. The results are presented in Table 3 as follows:

TABLE III. RESULTS OF TWO-WAY ANOVA TEST ON TRAINING METHOD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Training Method	0.168	1	0.168	0.060	0.809

Table 3 shows that the value of significance is 0.809. Since the value of significance is less than the margin of error (0.809 < 0.05), Ho was accepted. Therefore, there was no significant difference between the influence of interval training and *fartlek* training on the increase in futsal players' VO_2Max.

The second hypothesis was "there is a significant difference between the effects of high-speed and the low-speed training on the increase of futsal players' VO_2Max". If the results of the analysis showed significant differences, this means that high expiratory volume and low expiratory volume has an effect on the increase in futsal players". VO2Max. The data analysis results are shown in Table 4.

TABLE IV. RESULTS OF TWO-WAY ANOVA TEST ON SPEED

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Speed	0.069	1	0.069	0.25	0.877

Table 4 shows that the value of significance is 0.877. Since the value of significance is less than the margin of error (0.877 < 0.05), Ho was accepted. Therefore, there was no significant difference between the influence of high-speed and low-speed training on the increase in futsal players' VO_2Max.

IV. CONCLUSION

This research study highlights the importance of various training methods to futsal coaches and self-training players. Based on the data analysis, the researchers concluded that *fartlek* training could increase the VO_2Max capacity of futsal players, thereby enabling them to compete with a higher intensity and overcome their fatigue issues.

LIMITATIONS OF THE STUDY

The researchers did not have total control over the participants that were on and off practice. The participants stayed in their homes during the course of the research. This condition could indirectly affect the results of this study.

The researchers believe this research is able to familiarize various training method beneficial for both futsal coaches and self-training players.

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