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The Effectiveness of Speed Play and Fartlek Methods in Improving VO₂Max of Futsal Athletes

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ABSTRACT: This study aims to determine the effectiveness of speed play and fartlek training methods in improving VO₂Max among futsal players at SMA Labschool Bandung. Method: This research employed an experimental method with a two-group pretest-posttest design. The sampling technique used was total sampling. The sample consisted of 14 futsal athletes from SMA Labschool Bandung, aged between 15 and 17 years. Data were collected using the Multistage Fitness Test (MFT) or Bleep Test to assess VO₂Max levels. Following the initial data collection, the samples were grouped using the A-B-B-A method to create two homogeneous groups. For data analysis, validity and reliability tests were conducted, starting with Pearson correlation and Cronbach's alpha, followed by a t-test. Results: The results showed that the t value (5.164) > t-table (2.178), indicating a significant difference between the effects of the speed play and fartlek training methods on VO₂Max levels among futsal athletes.

KEYWORDS: Speed play and fartlek training methods, VO₂Max, futsal athletes.

I. INTRODUCTION

Futsal is characterized by physical demands that require endurance, speed, strength, and agility over an extended period (Prima et al., 2021). This sport heavily relies on players' aerobic endurance (VO₂Max). The higher the VO₂Max, the better the player's physical condition (Maitimu et al., 2024).

VO₂Max is a key indicator of cardiovascular fitness, reflecting the upper limit of the body's capacity to perform aerobic exercise (Bambang et al., 2022). VO₂Max, which represents the body's ability to process oxygen during intense physical activity, increases along with better organ function, thus enhancing physical endurance (Muttaqin et al., 2024). Currently, VO₂Max is increasingly recognized as the best measure of fitness level and is acknowledged for its vital role in physical health (Kharisma & Mubarok, 2020).

VO₂Max is essential for futsal players (Sepang et al., 2023). Based on the above, it can be concluded that VO₂Max plays a crucial role in futsal performance, particularly for students who compete in futsal. This includes having a higher oxygen consumption capacity, better blood vessel supply to the muscles, larger lung capacity to deliver more hemoglobin and red blood cells, as well as a stronger heart (Bachtiar et al., 2022).

Observations and interviews with the futsal coach at SMA Labschool Bandung in early January 2024 revealed that training sessions were primarily focused on technique and strategy due to the limited training schedule of only twice a week. This condition was evident at the beginning of matches. In the first 20 minutes, the players performed well, maintaining control of the game and matching the opposing team's capabilities. However, in the second half, particularly in the first five minutes, the players' condition declined drastically (Qurniati & Yanto, 2024). This indicates that physical training, which should be conducted 3–4 times a week to improve VO₂Max, was significantly lacking (Ramadani & Faruk, 2025). Currently, many coaches pay insufficient attention to athletes' physical condition, resulting in excessive fatigue during training or competition. As a result, technical, tactical, and physical training cannot be effectively implemented if the athletes' physical condition is poor (Arwandi & Yenes, 2021).

A poor level of physical fitness significantly affects technical and tactical aspects as well (Ridwan, 2020). In several observed competitions, many athletes were easily fatigued or experienced a decline in stamina, leading to inadequate or poor VO₂Max levels. As a result, athletes showed decreased concentration, inaccurate passing, and even signs of dehydration (Manihuruk et al., 2023).

Endurance capacity is not solely determined by a high VO_2Max . More importantly, individuals with higher VO_2Max levels recover more quickly compared to those with lower VO_2Max (Iskandar, 2019). However, it is important to note that several factors influence cardiorespiratory fitness, as stated by Qurniati & Yanto (2024), including; a) genetics or heredity, b) age, c) gender, d) obesity, e) smoking habits, f) physical activity, g) sufficient rest, h) hemoglobin levels in the blood, i) total blood cholesterol levels, d) nutritional status.

Based on these considerations, this study aims to design a physical training program to improve aerobic endurance and VO₂Max in futsal athletes (Ridwan et al., 2023).

To enhance futsal performance and reduce the risk of physiological injuries during and after matches, it is recommended to focus on physical conditioning programs that prioritize the dominant components of futsal (Ramadani & Faruk, 2025; Ramli et al., 2024). Therefore, a combination of aerobic and anaerobic training is needed. Methods such as speed play and fartlek may serve as effective training strategies to improve VO₂Max in futsal athletes (Aribi et al., 2024; Bahtra et al., 2024; Manggala et al., 2023; Ridwan et al., 2023).

The speed play method was developed by Gosta Holmer from Sweden. Speed play is an effective form of training designed to enhance aerobic capacity and speed, and it is conducted in an enjoyable manner (Beato et al., 2021). Speed play is a type of endurance training system that helps build and maintain physical conditioning. As such, it can be applied across nearly all sports disciplines, especially those that require stamina (Aribi et al., 2024).

Speed play training offers an enjoyable way to improve strength and aerobic fitness. It involves running with sprint intervals, interspersed with various physical activities such as walking, jogging, fast running, and backward running, with varying intensities. The core principle is to run with speed variation (Arede et al., 2020).

Fartlek, which originated in the 1930s from the Swedish term meaning "speed play," is an effective training method for enhancing cardiovascular fitness. It combines continuous running and interval training, allowing athletes to adjust distance and speed according to their capacity. The training features intensity variations, including high-intensity running, and targets both the aerobic and anaerobic energy systems (Bahtra et al., 2024).

Fartlek is a training method designed to improve endurance by changing running speed according to the individual's needs. In other words, athletes are free to regulate their running pace. Therefore, fartlek is commonly used to enhance aerobic endurance (Iskandar, 2023). Fartlek training, which combines speed, strength, and endurance, is an effective form of aerobic exercise. This training can be performed on various terrains, including hills, sand, grass, and paved roads, making it ideal for improving endurance across nearly all sports disciplines (Bagus & Bulqini, 2024).

There are distinctions between the speed play and fartlek training methods, as described by Sidik (2024) during an interview conducted by the researcher. When varying speed in differing environmental conditions, it is referred to as fartlek; whereas when performed solely on a track, without changing location, where there are variations in speed on curves and straight paths, it is termed speed play. When conducted on a field involving diagonal, short, and long runs with both fast and slow intervals, it is also considered speed play. Although fartlek and speed play are not the same, they are often mistakenly used interchangeably. Ideally, fartlek should be conducted outdoors in environments featuring hills, shrubs, ditches to jump over, sandy ground, grassy areas, soft soil, and so forth.

Based on the nature of the training, speed play and fartlek resemble the patterns in futsal, which involve speed variability and continuous running. Moreover, stamina is essential to maintain peak performance throughout the match duration. Therefore, consistent and well-structured training is necessary to maintain physical endurance during the entire game. Both speed play and fartlek exercises are highly beneficial for developing technical skills, strength, and athletic endurance (Aribi et al., 2024).

Speed play and fartlek training rely on variation within training sessions, specifically, alternating between slow, moderate, and fast phases. Thus, the fartlek method can serve as a training approach to improve aerobic endurance (Satimin et al., 2024). This is especially relevant in futsal, which involves movements that are sometimes rapid and at other times slower, sustained over an extended duration. Through speed variation, both speed play and fartlek training aim to improve strength and aerobic endurance capacity, as well as strengthen respiratory muscles. These methods are among those used to optimize VO₂Max.

To produce ATP (adenosine triphosphate) from food, every cell in the human body requires oxygen to function optimally. The cells with the lowest oxygen demand are resting muscles. VO₂Max refers to the maximal aerobic capacity, typically defined as maximal oxygen uptake (VO₂Max) (Wahyudi et al., 2024).

VO₂Max can be measured either as the volume of oxygen in liters per minute (I/min) or as milliliters of oxygen per kilogram of body weight per minute (ml/kg/min). Aerobic strength is assessed by the maximum level at which the body can intake and utilize oxygen during intense physical activity, also referred to as maximal oxygen uptake (VO₂Max) (Bafirman et al., 2023). The higher the VO₂Max, the greater the athlete's endurance.

Based on the above explanation, this study aims to; 1) Determine the effect of the speed play and fartlek training methods, 2) Identify the differences in the effects between the speed play and fartlek training methods, 3) Determine which of the two methods (speed play or fartlek) is more effective in increasing the VO₂Max of futsal athletes at SMA Labschool Bandung. The benefits of this study are as follows; 1) Theoretically, it can serve as meaningful information regarding the effects of the speed play and fartlek methods on improving VO₂Max, 2) Practically, it can serve as a reference for futsal athletes and coaches concerning the influence of speed play and fartlek methods on enhancing VO₂Max, 3) As a reference for future research.

II. METHODOLOGY

The research method employed in this study was the experimental method, which implied the presence of a treatment or intervention in the study (Sahir, 2021). The design used in this research was the Two-Group Pretest-Posttest design. This study was conducted at the futsal field of Labschool UPI Bandung, located on Jl. Dr. Setiabudhi No. 229, Bandung, 40154, Jawa Barat -Indonesia. The research was carried out over a period of 5 weeks, in accordance with Bompa's (2015) statement that effective training requires a minimum duration of 4–6 weeks (Nugroho & Kusuma, 2022). The study began on 13 February 2024 and ended on 26 March 2024. The population of this study comprised 14 futsal athletes from SMA Labschool. The sampling technique used was total sampling, meaning that the entire population was selected as the sample. The data collection technique utilized in this research was the Multistage Fitness Test (MFT) or bleep test instrument, to measure VO₂Max. In this study, data were processed using SPSS version 25 software. The objective of data processing was to present a clear and comprehensible depiction of the collected data. In addition, data analysis was performed to draw conclusions regarding the broader population characteristics based on the sample data. This process involved estimation and hypothesis testing.

O ₁	X _A	O ₂
O1	Хв	O2

Tabel 1. One Group Pretest-Posttest Design

Description: O1: Pretest O2: Posttest XA: Treatment XB: Treatment



Ganbar 1. Uji bleep test Multistage Fitness Test (MFT)

III. RESULTS

The research results indicate that the data are normally distributed, homogeneous, and show a significant effect of the tested methods, namely the speed play training method and the fartlek training method. The table below presents the results of the data analysis conducted.

Table 2. Validity Test

pre_test	Pearson Correlation	1	.999**
	Sig. (2-tailed)		<,001
	Ν	14	14
post_test	Pearson Correlation	.999"	1
	Sig. (2-tailed)	<,001	
	N	14	14

a. Data Validity Correction

It was determined that the data were valid, as indicated by the calculated r-value of 0.999, which is greater than the r-table value of 0.532, or a significance value (sig) less than 0.05. Therefore, the data are considered valid.

Table 3. Reliability Test

Cronbach's	
Alpha	N of Items
.999	2

b. Data Reliability Correction

The data were found to be consistent/reliable, as shown by a Cronbach's Alpha value greater than 0.60; thus, the data are deemed reliable.

Table 4. Normality Test

Shapiro-Wilk Normality Test

		Statistic	dt	Sig.
Hasil Pengukuran	Pretest-speed play	.940	7	.635
	Postlest-speed play	939	7	.631
	Pretest-fartlek	.947	7	.703
	Posttest-fartiek	928	7	534

c. Significant Correction of Normality

Based on the data analysis results using SPSS 25, as presented in Table 1, it is evident that the data follow a normal distribution. This is indicated by a significance value greater than 0.05, leading to the conclusion that the data meet the criteria for normal distribution.

Table 5. Homogeneity Test

		Levene Statistic		
Bleep Tesy	Speed Play	0.006	7	0.941
	Fartlek	0.018	7	0.896

d. Homogeneity significant correction

The significance values in Table 2 indicate that the data are homogeneous, with values of 0.941 and 0.896, both of which are greater than 0.05. This suggests that the pretest and posttest data have homogeneous variance.

Table 6. Effect Test Result Data

Kelompok	8	Sd	t-hitung	Sig.
Speed play	0.29	2.3	9 -6.97	1 0.000
Fartlek	0.36	2.3	-7.77	8 0.000

e. Significant Correction of Effects

The results of data analysis presented in Table 4 indicate a value of less than 0.05. This leads to the acceptance of Ha and the rejection of Ho. It can be concluded that both methods significantly influence the improvement of VO₂Max in futsal athletes at SMA Labschool.

Table 7. Data from Difference Test Results

Kel.	Mean	Bed	t	Sig.
Speed Play	0.295	0.066	5,164	0.000
Fartlek	0.361			

f. Significant Correction of Difference

The results of the analysis presented in Table 5 indicate a value of less than 0.05. This leads to the acceptance of Ha. It can be concluded that the speed play training method and the fartlek training method have significantly different effects on increasing VO₂Max in futsal players at SMA Labschool Bandung.

IV. DISCUSSION

The results of this study indicate that both the speed play and fartlek training methods have a significant effect on increasing VO₂Max. This conclusion is supported by hypothesis testing using the Independent Sample T-Test, which yielded a significance value of 0.000 < 0.05. This means that both training methods significantly contributed to the improvement of VO₂Max. However, what differentiates the two methods is the degree of significance in increasing VO₂Max.

As shown in Figures 6 and 7, the results demonstrate differing average effects between the speed play and fartlek methods. The average effect value of the speed play method was 0.295, whereas the average effect value of the fartlek method was 0.361. Therefore, the fartlek training method had a greater and more effective impact compared to the speed play method. These findings align with previous research (Aribi et al., 2024; Bahtra et al., 2024), which also showed that the speed play and fartlek training methods influence athletic performance.

VO₂Max, which is commonly used as a benchmark for aerobic fitness, reflects the maximum capacity of the aerobic energy system to produce energy (Ramli et al., 2024). VO₂Max plays a critical role in determining physical performance and overall health. This is because, during intense physical activity, the body requires up to twenty times more oxygen than under normal conditions (Bafirman et al., 2023).

VO₂Max, or aerobic endurance, reflects the capacity of the respiratory and cardiovascular systems to absorb and utilize oxygen. This ability enables individuals to engage in physical activity or strenuous sports involving large muscle groups over an extended duration without experiencing excessive fatigue (Crowley et al., 2022). Structured physical training is essential for improving VO₂Max, which serves as a fundamental component in achieving athletic performance and enhancing an athlete's physical condition (Santisteban et al., 2022).

 VO_2Max , which measures the maximum amount of oxygen the body can utilize during intense physical activity, is a key indicator of an individual's fitness level. The term consists of "V" for volume, " O_2 " for oxygen, and "max" for maximum, with the dot over the "V" indicating a measurement per unit of time. As training intensity increases, oxygen consumption rises to a peak or slightly plateaus, marking the individual's VO_2Max (Mohajan et al., 2023).

To improve the VO₂Max of futsal athletes, the speed play and fartlek training methods can serve as effective options. The running movements involved in these training methods naturally stimulate VO₂Max improvement. Additionally, this training enhances the cardiovascular system by increasing heart rate, which ultimately boosts the body's ability to absorb oxygen optimally (Hariono et al., 2023).

Existing literature and research indicate that enhancing VO₂Max through speed play and fartlek training methods leads to improved athletic performance. Training to increase VO₂Max typically involves extended duration and a variety of movements or variations at each station, which help to keep athletes challenged and motivated throughout the training process (Aldren et al., 2024).

To achieve optimal performance in futsal, improving VO₂Max through structured physical conditioning is vital. The speed play and fartlek training methods implemented in this study demonstrated positive results in enhancing the VO₂Max of futsal athletes at SMA Labschool, as shown in Table 4. This success was supported by a well designed training program and the high enthusiasm of the athletes in carrying it out (Syam et al., 2025; Tumaloto et al., 2024).

 VO_2Max is not an innate ability, but one that requires targeted training to ensure that athletes do not tire easily during competition. In line with the findings of Bahtra et al. (2023), low VO_2Max can hinder an athlete's performance on the field.

V. CONCLUSION

The speed play and fartlek training methods have an impact on increasing the VO₂Max of futsal players at SMA Labschool, 2) There is a significant difference in effect between the speed play training method and the fartlek training method,
Fartlek training contributes more significantly and effectively to improving the VO₂Max of futsal players at SMA Labschool.

VI. RECOMMEDATION

To help enhance athletes' VO₂Max, coaches may consider incorporating speed play and fartlek training as a regular part of the training program. Attention should be paid to variations in intensity and duration of training to maximize physiological adaptation. Future studies could involve a larger sample size and include a control group to strengthen the validity of the findings.

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