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The Effect of Fartlek Exercise on Endurance Futsal Players For The High School State 11 Jambi City

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ABSTRACT

This study aimed to investigate the effect of fartlek training on the endurance of futsal players at SMA Negeri 11 Kota Jambi. The research employed a quantitative experimental method with a one-group pretest-posttest design. The population consisted of all active futsal players at SMA Negeri 11 Kota Jambi, with 15 players selected as the sample using a total sampling technique. The intervention consisted of fartlek training conducted three times per week for eight weeks, totalling 16 training sessions. Data collection was performed using the Multistage Fitness Test (Bleep Test) to measure VO_2max as an indicator of aerobic endurance capacity. Data analysis was conducted using a paired sample t-test with SPSS version 27, preceded by normality and homogeneity tests. The results showed a significant improvement in players' endurance levels. The mean pretest score was 5.20 (SD = 1.474), which increased to 6.27 (SD = 1.534) in the posttest. Statistical analysis revealed a significant difference between pretest and posttest scores ($p = 0.001 < 0.05$), with a t-value of 25.239 exceeding the t-table value of 1.71. The normality test using Shapiro-Wilk showed that data were normally distributed (pretest sig = 0.560; posttest sig = 0.401), and the homogeneity test confirmed homogeneous variances (sig = 0.793). These findings indicate that fartlek training significantly improved the aerobic endurance of futsal players at SMA Negeri 11 Kota Jambi. The study concludes that fartlek training can be effectively implemented as a training method to enhance futsal players' physical endurance and overall performance.

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INTRODUCTION

Sport is a form of planned and structured physical activity involving repetitive body movements aimed at improving physical fitness (Herlambang & D, 2020). According to Herlambang et al. (2020), several definitions of sport based on its etymology include: (1) disport/disportare, meaning to move from one place to another (avoiding). Sport is an initiation that creates people's desire to avoid or engage in pleasure (recreation). (2) field sport, first known in 18th-century England. Activities performed by nobles/aristocrats consist of two main activities: shooting and hunting during leisure time. (3) desporter,

meaning to release fatigue (French). (4) sport, as a satisfaction or hobby (German encyclopedia). (5) olahraga (Indonesian), physical exercise to strengthen the body, such as swimming, playing ball, and so on. Sport is an effort to manage and train the human body to become healthy and strong.

One popular sport today is futsal. Futsal is a game played on a smaller field compared to football, with a fast and dynamic tempo. According to Lhaksana (2012), futsal is a game using a relatively smaller field with very fast and dynamic play, followed by stricter rules. Futsal requires high technical, tactical, and physical abilities. Meanwhile, according to Isnanto in Kurniawan (Kurniawan, 2023), futsal is a ball sport game that is almost similar to football. However, futsal is identified as a miniaturized version of football. The difference between futsal and football lies only in the playing duration, while the basic techniques remain the same. Broadly speaking, futsal and football are similar - both games use feet, and except for goalkeepers, who can use both feet and hands to prevent goals.

Technique is a skill that futsal players must possess, as technique is essential for every team to create good gameplay. Lhaksana (2012) states that basic futsal techniques include passing, ball control, dribbling, and shooting. Additionally, physical aspects such as endurance, speed, and agility are determining factors in futsal players' performance.

Physical condition components in futsal differ from other sports. Futsal has characteristics that demand endurance, strength, and agility over relatively long durations. The main factor required is an optimal level of physical fitness so players can play the game without experiencing excessive fatigue. Physical fitness is defined as the body's ability to perform physical activities without experiencing excessive fatigue while remaining fit to carry out subsequent physical tasks (Suhartoyo et al., 2019). Furthermore, Suhartoyo et al. (2019) explain that physical fitness is the main factor supporting various physical activities and sports.

In futsal, good physical condition is crucial for players, especially in aspects of strength, speed, endurance, and flexibility (Setiawan et al., 2021). (Maryani, 2017) adds that endurance, strength, and speed are dominant physical factors that futsal players must possess. With optimal physical condition, players can master various skills better and improve performance in matches. Therefore, physical conditioning training must be conducted in a planned and programmed manner.

Kusuma et al. (2019) explain that regular exercise provides benefits for the body, including improving cardiovascular and pulmonary endurance. One important aspect supporting futsal performance is aerobic endurance, which plays a role in maintaining the body's ability to perform activities for extended periods (Nala, 2011). (Sandi, 2016) also reveals that increased heart rate and breathing frequency can occur due to continuous physical activity. Therefore, aerobic endurance becomes a crucial physical component for futsal athletes.

Fartlek training is a training method that combines various running intensities, such as sprinting, jogging, and walking, performed continuously without clear rest breaks. The main goal of this training is to improve aerobic endurance by creating speed

and intensity variations during training sessions. Fartlek training is usually performed outdoors with varied terrain to add challenges to the training (Bompa & Haff, 2009).

Research shows that fartlek training is effective in increasing VO_2max capacity, which is the main indicator of aerobic endurance. A study conducted by Fathoni et al. (2022) in Altius: Journal of Sports and Health Sciences examined the effect of fartlek training using sand tracks on increasing VO_2max in football players. The results showed significant improvement in VO_2max after a six-week fartlek training program.

Additionally, research published in the Sports Collaboration Journal by Ramadhan et al. (2023) also found that fartlek training has a positive effect on improving football players' aerobic endurance. This study used a pre-experimental design involving 20 football players as samples, and the results showed significant differences in aerobic endurance values before and after fartlek training.

SMA Negeri 11 Kota Jambi is an A-accredited senior high school with 861 active students, comprising 376 male and 485 female students, including 287 grade X students, 321 grade XI students, and 253 grade XII students. Futsal is quite popular at the school, with futsal extracurricular activities being one of the active non-academic activities for approximately the past ten years at SMA Negeri 11 Kota Jambi, serving as a platform for students to channel their talents and hobbies during this period. This activity is open to both male and female students of SMA N 11 Kota Jambi, as the extracurricular has two teams: boys' and girls' teams. The futsal extracurricular activities at SMA Negeri 11 Kota Jambi have successfully produced talented athletes who can compete at the national level. For the boys' group, one graduate from the extracurricular team represented Jambi Province at the Pre-PON Papua event in 2019, and three graduates from the futsal extracurricular team at SMA Negeri 11 Kota Jambi represented Bapomi Jambi at the National Student Sports Week in 2022.

The futsal extracurricular team from SMA Negeri 11 Kota Jambi regularly participates in futsal competitions at both city and provincial levels in recent years and has recorded several achievements. The latest achievement obtained by the boys' extracurricular team from SMA Negeri 11 Kota Jambi was as Runner-up in the AXIS-NATION CUP 2024 competition for Jambi Province. This was the first achievement obtained after four years without any achievements. Previously, the last achievement of the SMA N 11 Kota Jambi futsal team was at the FKM Cup for Jambi Province, where the team finished as runner-up.

From observations conducted through direct interviews with the coach, the researcher found several problems related to the endurance and condition of the SMA Negeri 11 Kota Jambi futsal team players. In recent tournaments, players often experienced human error situations, causing mistakes that led to conceding goals. Additionally, players often appeared fatigued before the first half ended. Some players were unable to play for a full 20 minutes, while the ability to play with high intensity remained unstable. Most players relied on speed due to their relatively light body weight, but this was not balanced with good endurance.

Endurance is the body's ability to perform physical activities for extended periods without experiencing excessive fatigue. In a sports context, endurance is crucial as it allows athletes to maintain optimal performance throughout matches or training. Endurance can be divided into two main types: aerobic endurance and anaerobic endurance. Aerobic endurance relates to the cardiovascular system's ability to supply oxygen to muscles during prolonged activities, while anaerobic endurance relates to the body's ability to perform high-intensity activities in short periods without sufficient oxygen (Sepriadi et al., 2018). In futsal, both types of endurance are essential. Futsal matches lasting 2 x 20 minutes of actual playing time require players to have good aerobic endurance to run and move effectively throughout the match. Additionally, futsal also requires anaerobic endurance due to frequent rapid and explosive movements, such as sprints and sudden direction changes (Sepriadi et al., 2018).

The importance of endurance in futsal is also reflected in players' need to have a high VO_2Max. VO_2Max is the maximum oxygen measurement that the body can use during intense physical activity and is the main indicator of a person's aerobic endurance capacity (Sambora & Ismalasari, 2021).

To improve endurance, programmed and specific training is necessary. Interval and fartlek training are examples of effective methods for increasing aerobic and anaerobic capacity. With good endurance, futsal players can maintain game intensity, perform techniques effectively, and contribute positively to overall team performance. Based on the above phenomenon, the researcher aims to investigate "The Effect of Fartlek Training on the Endurance of Futsal Players at SMA Negeri 11 Kota Jambi."

METHODS

This research was conducted at SMA Negeri 11 Kota Jambi and will be implemented from July 14 to August 14, 2025. The design used in this research is a quantitative design with an experimental approach using One Group Pre-test Post-test, which means that one experimental group will be tested in two conditions: before and after receiving treatment or intervention. The pre-test was conducted to measure the initial VO_2max condition of futsal players, while the post-test was conducted after players underwent Fartlek training to measure changes in their VO_2max. This design allows researchers to observe changes occurring in the dependent variable, namely VO_2max, in the same experimental group without involving a control group. This is particularly useful when it is difficult or impossible to form a separate control group, but still enables researchers to assess the impact of Fartlek training on the same group by comparing pre-test and post-test results (Pratama et al., 2021).

The population in this study consists of all active futsal players at SMAN 11 Kota Jambi. The players referred to are students officially registered as school futsal team members, actively participating in regular training activities during the research period, and in healthy physical condition. The sampling technique used in this research is saturated sampling or total sampling. According to Sugiyono (2013), saturated sampling

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is a sampling technique where all population members are used as samples. This is done when the population is relatively small, or when the research aims to make generalizations with minimal error. Since the available population in this study is limited and homogeneous, all population members are used as research samples. The main instrument in this research is the Multistage Fitness Test (Bleep Test), which is a method for measuring aerobic capacity by running back and forth over a 20-meter distance following audio signals that progressively increase in speed at each level. This test was chosen because it has been proven valid and reliable in measuring VO_2max, and is easily applicable in school settings with limited facilities. Additionally, stopwatches and whistles are used as auxiliary tools in test implementation to ensure time accuracy and coordination during data collection. The test results will be converted into estimated VO_2max values using established standard formulas. All instruments have been adapted for effective use in field research at SMA Negeri 11 Kota Jambi.

Data analysis will be conducted using the T-score test. However, researchers must first ensure that the analyzed data is normally distributed, thus normality and homogeneity tests are also performed (Arikunto, 2006).

The normality test is used to determine whether the data is normally distributed or not. In this case, the Shapiro-Wilk formula is used. The normality test will be conducted on all variables, namely endurance capacity with fartlek training variations. The testing criteria are: if the obtained significance is > 0.05, the sample comes from a normally distributed population; conversely, if the obtained significance is < 0.05, the sample is not normally distributed. The homogeneity test is used to determine whether both groups have homogeneous variances or not. This testing is performed using SPSS version 27.

In addition to these two tests, hypothesis testing is also necessary. According to Arikunto (2006:306), "statistical tests are used to test hypotheses." The purpose of comparing two means is to determine whether the results of the effect of fartlek training variations on the endurance of futsal players at SMA Negeri 11 Kota Jambi show improvement between pretest and post-test in a one-group design. The hypothesis testing uses the t-test with a 95% confidence level or $\alpha = 0.05$, with data processing assisted by SPSS version 27.

RESULTS AND DISCUSSION

Result

Based on previously collected data, the research results were obtained through data processing from both the initial test (pre-test) and final test (post-test). The research data results can be seen in Table 1.

Table 1.
Research Data Results Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	15	3	8	5,20	1,474
Posttest	15	4	9	6,27	1,534
Valid N (listwise)	15				

Source: Based on SPSS

From the table above, it can be seen that the mean pre-test score is 5.20 with a standard deviation of 1.474, while the maximum score is 8 and the minimum score is 3. For the post-test, the mean is 6.27 with a standard deviation of 1.534, while the maximum score is 9 and the minimum score is 4. There is a visible improvement from pre-test to post-test.

Normality Test

Table 2.
Normality Test Results

Variabel	Sig.	Information
Pre-test	0,560	Normally distributed data
Post-test	0,401	Normally distributed data

Source: Based on research data

Based on the table above, the futsal players from SMA Negeri 11 Kota Jambi show a significance value of 0.560 for pre-test data in the Shapiro-Wilk test, and a significance value of 0.401 for post-test data. The decision criteria for the Shapiro-Wilk Normality Test are: if Sig value > 0.05, the data is normally distributed; if Sig value < 0.05, the data is not normally distributed. The data obtained from the SMA Negeri 11 Kota Jambi futsal team players has a significance level greater than 0.05. This indicates that the data from the futsal players is normally distributed and meets the normality test requirements.

Homogeneity Test

The purpose of the homogeneity test is to determine whether the data are homogeneous or not. The data used are the pre-test and post-test results of SMA Negeri 11 Kota Jambi futsal players. The data was tested using SPSS.

Table 3.
Homogeneity Test Results

Variabel	Sig.	Information
PreTest-PostTest	0,793	Homogen

Source: Based on research data

Based on the data in the table above, the homogeneity test results for the pre-test and post-test of SMA Negeri 11 Kota Jambi futsal players show a significance value of 0.793. It can be concluded that the pre-test and post-test data have homogeneous variance or come from populations with the same variance, as the pre-test and post-test results are greater than 0.05.

Hypothesis Test

From the research conducted, which included pretest, treatment, and post-test for SMA Negeri 11 Kota Jambi futsal players, after conducting normality and homogeneity tests, a hypothesis test was performed to determine the effect of fartlek training on the endurance of SMA Negeri 11 Kota Jambi futsal players.

Table 4.
One-Sample T-Test Hypothesis Test Results

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
pretest	13,667	14	<,001	5,200	4,38	6,02
posttest	15,824	14	<,001	6,267	5,42	7,12

Source: Based on SPSS

The table above shows the one-sample t-test results, which reveal that with the same sample size for pre-test and post-test data, a 2-tailed sig value of 0.001 < 0.05 was found, indicating that there is an effect of Fartlek Training on the endurance of SMA Negeri 11 Kota Jambi futsal players.

The data obtained concludes that the hypothesis Ha is accepted and Ho is rejected, as it shows different pre-test and post-test results. From the research results, it can be concluded that there is an effect of Fartlek Training on the endurance of SMA Negeri 11 Kota Jambi futsal players.

Discussion

From the conducted research, the researcher found that the pre-test results fall into the moderate category. This indicates that the physical endurance of SMA Negeri 11 Kota Jambi futsal players is still not optimal. Based on observations, the lack of programmed physical training portions and some players' inconsistency in attending training sessions are causes of suboptimal endurance, which impacts the pre-test results. Therefore, fartlek training was implemented to improve players' endurance so they can last longer and maintain stability during matches. After providing fartlek training to 15 samples, the post-test results showed significant improvement in most players. Some players even reached the excellent category because they independently added training portions outside the given program.

These results demonstrate that fartlek training has a significant effect on improving futsal players' endurance. Fartlek training is effective because it combines fast, moderate, and slow running in one training sequence, allowing the body to adapt to varying game intensities. In futsal, which has a fast tempo, good physical endurance is essential for maintaining concentration, reducing the risk of human error, and maintaining optimal performance until the end of the match. With improved endurance, players can perform quick movements, maintain ball possession, and reduce excessive fatigue in the final periods.

Thus, Ha is accepted and Ho is rejected, as there are differences between pre-test and post-test results. From this research, it can be concluded that there is a significant effect of fartlek training on improving the endurance of SMA Negeri 11 Kota Jambi futsal players. The acceptance of this hypothesis proves that the fartlek method can be used as an effective training program to increase aerobic capacity (VO_2max) and support player performance. Although this research ran smoothly, the author acknowledges

some obstacles, including some players arriving late to training. However, overall, this research was successfully conducted and provided satisfactory results.

CONCLUSION

Based on data analysis, it is known that fartlek training has a significant effect on improving the endurance of futsal players at SMA Negeri 11 Kota Jambi. The data obtained concludes that the hypothesis Ha is accepted and Ho is rejected, as it shows different pre-test and post-test results. From the research results, it can be concluded that there is an effect of fartlek training on improving the endurance of futsal players at SMA Negeri 11 Kota Jambi.

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