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The Relationship Between Interval Training Frequency and Aerobic Endurance Level Among Futsal Extracurricular Students at SMPN 3 Ungaran

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ABSTRACT

This study aimed to investigate the relationship between the frequency of interval training and aerobic endurance among futsal extracurricular students at SMP Negeri 3 Ungaran. A total of 35 male students actively participating in the futsal extracurricular program were selected as research subjects. The frequency of interval training was measured using a questionnaire, while aerobic endurance was assessed through the Multistage Fitness Test (Beep Test). Descriptive statistical analysis showed that the average frequency of interval training was 12.43 sessions with an average Beep Test score of 7.51. The normality test indicated that the data were partially non-normal; therefore, Spearman's rho correlation analysis was used. The results revealed a strong, positive, and statistically significant relationship between the frequency of interval training and aerobic endurance ($r = 0.731$, $p < 0.001$). These findings indicate that students who engage more frequently in interval training tend to have better aerobic endurance. This study highlights the importance of incorporating regular interval training sessions in school-based sports programs to enhance physical fitness and athletic performance in futsal.

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A. Conception and design of the study;
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INTRODUCTION

Sports are physical activities performed in a planned and structured manner to improve physical fitness, health, and individual performance. Engaging in sports offers numerous benefits, including enhancing endurance, strengthening muscles, and developing flexibility and movement speed (Wijayanto, 2024). One key component of physical fitness is endurance, which refers to the ability of the respiratory and circulatory systems to supply oxygen to the muscles during prolonged physical activity (Aditya Prana et al., 2019). Sports activities not only improve physical condition but also aim to enhance performance, both individually and in teams (Debyanto et al., 2022).

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One popular and widely practised sport is futsal. Futsal is a high-intensity team sport that requires a combination of technical skills and optimal physical capacity, particularly endurance. Futsal is played by two teams of five players each, with a game duration of 2x20 minutes. The fast pace and continuous ball movement demand that players maintain excellent physical endurance (Kharisma & Mubarok, 2020). Cardiovascular endurance plays a crucial role in sustaining optimal performance throughout high-intensity matches (Tamerlan et al., 2024).

Physical fitness is the body's ability to handle daily physical demands without excessive fatigue while maintaining sufficient energy reserves for other activities (Arsi et al., 2023). Achieving optimal fitness requires regular physical activity tailored to individual needs, which not only benefits physical health but also contributes to psychological and social well-being (Suryadi, 2022a). Sports, as a form of physical activity, help maintain health, prevent various diseases, and improve overall fitness (Pranata, 2022).

In the context of futsal, aerobic endurance is a critical aspect of fitness. Aerobic endurance refers to the body's capacity to utilize oxygen efficiently for sustained energy production during prolonged activity. It also accelerates physical recovery and ensures consistent performance throughout matches. Developing aerobic endurance in futsal requires targeted training programs such as interval training and circuit training (Shalahudin & Sifaq, 2023).

Beyond competitive goals, sports also play a vital role in education, often facilitated through extracurricular activities in schools. Extracurricular activities allow students to develop interests, talents, and skills outside regular class hours (Heri et al., 2022). Futsal, as a popular extracurricular activity, fosters social skills, teamwork, and physical fitness among students.

Given futsal's high-intensity nature, appropriate training methods are essential. One effective method to enhance endurance is interval training, which alternates periods of high-intensity activity with rest or low-intensity activity. This method effectively improves both aerobic and anaerobic endurance (Radif & Aryanti, 2023). However, the exact aerobic endurance level of futsal extracurricular students remains unclear, as does the correlation between higher frequency of interval training and better aerobic endurance in adolescents. Therefore, this study aims to examine the relationship between interval training frequency and aerobic endurance among futsal extracurricular students at SMP Negeri 3 Ungaran.

METHODS

This study employed a quantitative approach with a correlational design to examine the relationship between the frequency of interval training and the level of aerobic endurance among futsal extracurricular students at SMP Negeri 3 Ungaran. The research was conducted at SMP Negeri 3 Ungaran, Semarang Regency, Central Java, during the period from May to July 2025. The school was selected because it has an active futsal

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extracurricular program that aligns with the study population. The population consisted of all male students actively participating in the futsal extracurricular program during the 2024/2025 academic year. A purposive sampling technique was used to select 35 male students who met the inclusion criteria: active participation in the futsal program, willingness to participate with parental consent, good physical health, and regular attendance in training sessions. The independent variable was the frequency of interval training, measured through a questionnaire or attendance records over the past month. The dependent variable was aerobic endurance, assessed using the Multistage Fitness Test (Beep Test), with results expressed as the estimated VO2 Max or the highest level achieved during the test. Data collection instruments included questionnaires, attendance records, and equipment for the Beep Test, such as a 25-meter flat field, cones, audio recordings, speakers, result forms, stadiometer, digital scale, and stationery. The data collection process involved obtaining research permissions, conducting briefings with participants, collecting informed consent, recording training frequency, and administering the Beep Test. Participants performed warm-up exercises before the test and cool-down activities afterwards, with results documented carefully. Data analysis included descriptive statistics to summarise the characteristics of each variable and inferential statistics to test the research hypothesis. Normality and linearity tests were conducted as prerequisites. Pearson's Product-Moment correlation test was used for normally distributed data, while Spearman's Rank correlation was used for non-normally distributed data.

The correlation coefficient was interpreted to determine the direction and strength of the relationship between the frequency of interval training and aerobic endurance.

RESULTS AND DISCUSSION

This study aimed to determine the relationship between the frequency of interval training and aerobic endurance among futsal extracurricular students at SMP Negeri 3 Ungaran. Data were collected from 35 male students who completed an interval training frequency questionnaire and participated in the Multistage Fitness Test (Beep Test) to assess aerobic endurance. The descriptive statistics of the two main variables are presented below:

Table 1.
Descriptive Statistics of the Two Main Variables

n = 35	Mean ± SD	Min	Max
Total Interval Training Score	12,43± 2,77	10,00	19,00
Skor *Bleep Test*	7,51 ± 1,65	4,11	10,00

Source: Researcher (2025)

The mean total interval training score was 12.43±2.77, with a minimum of 10.00 and a maximum of 19.00. The Beep Test score, reflecting aerobic endurance, had a mean of 7.51±1.65, ranging from 4.11 to 10.00.

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Table 2.
Normality Test Results

Variable	Sig. Shapiro-Wilk
Total Score Interval Training	**< 0.001**
Bleep Test	0.119

Source: Researcher (2025)

Normality testing using Shapiro-Wilk (for sample sizes <50) showed that the interval training score had a p-value < 0.001, indicating non-normal distribution. The Beep Test score had a p-value of 0.119, indicating normal distribution. As one variable was not normally distributed, the non-parametric Spearman correlation was used.

Table 3.
Linearity Test Result

Componen	Sig.
Linearity	**< 0.001**
Deviation from Linearity	0.682

Source: Researcher (2025)

Linearity testing confirmed a statistically significant linear relationship between the variables ($p < 0.001$) without significant deviation from linearity ($p = 0.682$).

Table 4.
Spearman's rho Test Result

Variabel	Correlation Coefficient (ρ)	Sig. (2-tailed)
Latihan Interval & Bleep Test	**0.731**	**< 0.001**

Source: Researcher (2025)

The Spearman's rho test showed a strong positive correlation ($\rho = 0.731$, $p < 0.001$) between interval training frequency and aerobic endurance. The correlation coefficient of 0.731 indicates a strong and positive relationship: students who trained more frequently tended to have higher aerobic endurance scores. The significance level ($p < 0.001$) confirmed that this relationship is statistically significant.

These findings suggest that increasing the frequency of interval training is associated with improved aerobic endurance in futsal players. Interval training, which alternates periods of high-intensity activity with recovery, has been shown to enhance aerobic capacity through physiological adaptations such as increased VO_2 Max and cardiovascular efficiency (Radif & Aryanti, 2023). This aligns with the work of Shalahudin & Sifaq (2023), who emphasized the role of interval training in targeting the aerobic energy system in futsal. Similarly, Tamerlan et al. (2024) highlighted the importance of aerobic endurance as a foundation for futsal performance.

The strong positive correlation ($\rho = 0.731$) also indicates that interval training not only improves general fitness but is directly related to enhanced endurance performance, supporting the inclusion of interval training in extracurricular futsal programs. Practically, these findings can guide PE teachers and futsal coaches to prioritise frequent interval training to improve student endurance. Overall, the study demonstrates that regular interval training significantly contributes to the development

of aerobic endurance, providing both theoretical and practical insights for sports education and coaches.

CONCLUSION

Based on the results of the study conducted on 35 futsal extracurricular students at SMP Negeri 3 Ungaran, it can be concluded that there is a positive and significant relationship between the frequency of interval training and students' aerobic endurance, with a correlation coefficient of $r = 0.731$ and a significance value of $p < 0.001$. This means that the higher the frequency of interval training performed by the students, the better their aerobic endurance.

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