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Physical Fitness of Students in the Futsal Extracurricular at SMP Negeri 9 Semarang

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ABSTRACT

Physical fitness is a key determinant of performance in high-intensity intermittent sports like futsal, which require the simultaneous integration of aerobic capacity, strength, explosive power, agility, and coordination. This study aimed to analyze the physical fitness levels of students participating in futsal extracurricular activities at SMP Negeri 9 Semarang as a basis for designing a data-driven training program. The study used a quantitative descriptive survey approach with a total sample of 20 students. The measurement instrument referred to the Indonesian Student Fitness Test (TKSI) Phase D, which includes five components: hand-eye coordination, abdominal muscle strength (sit-ups), leg muscle explosive power (standing broad jump), agility (T-test), and aerobic endurance (beep test). Data were analyzed by converting total scores into TKSI norm categories. The results showed that 80% of students were in the moderate category, 5% in the good category, and 15% in the poor category, with no categories in the very good or very poor categories. Empirically, these findings indicate that participation in futsal extracurricular activities has not been fully followed by optimal fitness levels required to support the demands of game performance. Conceptually, the moderate category reflects adequate basic capacity but is not yet competitive. Therefore, a more systematic, progressive, and periodized training program is needed, accompanied by regular fitness evaluations, to comprehensively and sustainably improve students' physical quality.

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INTRODUCTION

Futsal is a high-intensity sport that has experienced rapid growth both globally and nationally. The characteristics of futsal—a small pitch, fast tempo, dynamic shifts between attack and defense, and the involvement of five players per team—demand optimal physiological and biomotor capacity (Naser et al., 2017; Sarmento et al., 2020). Physiologically, futsal is dominated by intermittent high-intensity activity with a balanced contribution from the aerobic and anaerobic energy systems, thus requiring good cardiorespiratory endurance, muscular strength, agility, and repeated sprinting ability (Castagna et al., 2018; De Freitas et al., 2021).

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Physical fitness in the context of competitive sports is not only defined as the ability to perform physical activity without excessive fatigue, but also as the capacity to maintain technical and tactical performance throughout the match (Bangsbo et al., 2019). In sports like futsal, decreased fitness directly impacts passing accuracy, transition speed, and decision-making effectiveness (Rampinini et al., 2019). Therefore, physical fitness is not merely a supporting attribute, but rather the foundation of game performance.

At the junior high school level, extracurricular futsal activities serve as a vehicle for developing students' interests, talents, and fitness development. Active involvement in school sports has been shown to be positively correlated with increased cardiorespiratory capacity and improved body composition compared to inactive students (Galarina et al., 2022; Ortega et al., 2018). However, several studies indicate that extracurricular participation does not always correlate with optimal fitness levels. Research by Hartanto et al. (2020) and Jufendi & Arief (2018) showed that students participating in extracurricular futsal activities were still in the moderate fitness category. Similar findings were also reported by Ayuningtiyas et al. (2024), who found that the majority of female futsal participants were in the poor to adequate category in several components of physical condition.

This situation is relevant to the futsal extracurricular activity at SMP Negeri 9 Semarang. Based on initial observations and interviews with coaches, the team has not demonstrated significant achievements at the city level, and students frequently show signs of fatigue during training and competitions. This phenomenon indicates a possible mismatch between the physiological demands of futsal and the students' actual fitness levels. Therefore, a systematic physical fitness analysis is necessary as a basis for developing a needs-based training program.

Over the past decade, scientific studies on the fitness profiles of futsal players have grown. Research indicates that VO_2max, agility, leg muscle explosiveness, and sprint speed are the main determinants of futsal performance (Spyrou et al., 2020; Nobari et al., 2021). Field-based physical profiling models such as the Yo-Yo Intermittent Recovery Test, the Illinois Agility Test, and explosive power tests have become standard instruments for identifying the biomotor capacity of futsal players (Castagna et al., 2018; Slimani et al., 2019).

Empirically, Sarmento et al. (2020) confirmed that the performance of elite futsal teams is significantly influenced by aerobic capacity and repeated sprinting ability. Furthermore, longitudinal studies have shown that regular fitness monitoring can improve the effectiveness of training periodization and prevent overtraining (Malone et al., 2019). Evidence-based training approaches that integrate fitness test results with training program design have been shown to improve the performance of adolescent players (Lopes et al., 2021).

In the educational context, recent research emphasizes the importance of fitness evaluation as a basis for training interventions in schools (Tomkinson et al., 2019; Lang et al., 2021). Fitness measurement is not only for mapping physical condition, but also as a pedagogical strategy to increase students' motivation and self-awareness of their physical condition (Kurniawan, 2022).

However, most research still focuses on professional or semi-professional athletes. Studies at the high school level, particularly those linking fitness analysis to the needs of

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extracurricular futsal training programs, are relatively limited. Yet, adolescence is a crucial period for physiological development and training adaptation (Lloyd & Oliver, 2017). Therefore, school-based fitness profiling has both academic and practical urgency.

Although various studies have identified important physical components in futsal, there is a gap in the literature regarding a comprehensive mapping of the physical fitness of extracurricular futsal students at the junior high school level in Indonesia. Most studies are partially descriptive and have not integrated analytical results to form the basis for developing contextual training program recommendations.

Furthermore, the international literature focuses largely on elite players, while the context of school-age development which has different characteristics of growth, biological maturation, and training frequency is still poorly addressed (Meylan et al., 2020). Yet, differences in maturation can influence the interpretation of fitness test results and adaptive training responses (Malina et al., 2019).

In the local context, there has been no specific empirical study that captures the physical fitness profile of extracurricular futsal students at SMP Negeri 9 Semarang to serve as a basis for evidence-based training design. Without objective data, training programs tend to be generic and not based on students' actual needs. This condition has the potential to lead to performance stagnation and the risk of fatigue or injury due to inappropriate training loads (Gabbett, 2018).

Thus, there is an urgent need to conduct a comprehensive, standardized, and contextual physical fitness analysis to bridge the gap between the physiological demands of futsal and the students' actual conditions.

This study aims to comprehensively analyze the physical fitness levels of students participating in futsal extracurricular activities at SMP Negeri 9 Semarang through a series of standardized tests, covering cardiorespiratory endurance, muscle strength and explosive power, agility, and speed. The results of this analysis will be used as the basis for developing needs-based and data-driven training program recommendations.

The novelty of this research lies in three main aspects. First, this study integrates an internationally-based fitness profiling approach with the context of school extracurricular development in Indonesia. Second, this study not only describes fitness levels but also positions the analysis results as a foundation for designing adaptive training programs. Third, this research provides an empirical contribution to the development of an evidence-based model for junior high school futsal coaching, thus aligning with the modern sports science paradigm that emphasizes data-driven monitoring, evaluation, and periodization (Bangsbo et al., 2019; Malone et al., 2019).

Theoretically, this research enriches the literature on physical fitness in the context of youth futsal coaching in schools. Practically, the research findings are expected to serve as a reference for physical education teachers and extracurricular coaches in developing more structured, effective training programs oriented toward improving performance and preventing excessive fatigue. Thus, this research contributes to the sustainable and science-based improvement of school futsal coaching.

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METHODS

This study employed a quantitative descriptive survey method to obtain an overview of the physical fitness of students involved in futsal extracurricular activities at SMP Negeri 9 Semarang. The study subjects were 20 students registered and actively involved in futsal extracurricular activities at SMP Negeri 9 Semarang, all male. All members of the population were sampled using a total sampling technique.

The survey method was chosen because it allows for systematic data collection on students' physical condition through the Indonesian Student Fitness Test (TKSI), Phase D, intended for junior high school level. The TKSI is a student fitness test resulting from research and development by a development team (Kemendikbudristek, 2021). The TKSI instrument includes five types of tests: the Hand and Coordination Test, the Sit-up Test, the Standing Board Jump Test, the T-test, and the Beep Test. According to Megi (Rayhan et al., 2024), participants in extracurricular activities are still classified as students because these activities take place within the school environment. Therefore, the TKSI instrument is considered appropriate and relevant for assessing the fitness levels of extracurricular participants. The following table presents information regarding TKSI values and norms, which can be found in the section below.

Table 1.
Indonesian Student Physical Fitness Test (TKSI) Scores, Phase D

No	Hand And Eye Coordination Test	Sit Up Test	Standing Board Jump Test	T Test	Beep Test	Value
1	≥ 21	≥ 30	≥ 224	≤ 00.10.00	>L7 B7	5
2	15 - 20	21 - 29	195 - 223	00.12.37 – 00.10.01	L4 B4 – L7 B7	4
3	9 - 14	18 - 20	165 - 194	00.13.17 – 00.12.38	L2 B2 – L4 B3	3
4	4 - 8	9 - 17	136 - 164	00.14.75 – 00.13.18	L1 B2 – L2 B1	2
5	≤ 3	≤ 8	≤ 135	≥ 00.14.76	<L1 B2	1

Table 2.
TKSI Phase D Norms (Male)

No.	Category	Rentang Nilai
1	Excellent	22 - 25
2	Good	18 - 21
3	Average	14 - 17
4	Poor	10 - 13
5	Very Poor	≤ 9

The scores obtained from each item of the Indonesian Student Fitness Test (TKSI) are summed to obtain a total physical fitness score for each participant. This total score is then converted into five fitness level categories: Very Good, Good, Moderate, Poor, and Very Poor. Based on guidelines from the Ministry of Education, Culture, Research, and Technology, as shown in Table 2 above.

RESULTS AND DISCUSSION

Result

Referring to the research objective, which was to identify the physical fitness of students participating in the futsal extracurricular activity at SMP Negeri 9 Semarang,

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the test was conducted on 20 students active in the futsal extracurricular activity, and the results are presented in the following table.

Table 3.
Physical Fitness Test Results

No	Name	Value	Category
1.	DF	16	Fair
2.	JF	14	Fair
3.	AD	18	Good
4.	MI	15	Fair
5.	JM	16	Fair
6.	ZA	13	Fair
7.	ZL	17	Poor
8.	FN	16	Fair
9.	AD	16	Fair
10.	FA	13	Fair
11.	AR	16	Fair
12.	MR	13	Fair
13.	AR	14	Fair
14.	RM	15	Fair
15.	MI	17	Fair
16.	ID	17	Fair
17.	EN	15	Fair
18.	RA	14	Fair
19.	AD	17	Fair
20.	AN	15	Fair

The physical fitness of students at SMP Negeri 9 Semarang who participated in extracurricular futsal activities is displayed in the form of a frequency distribution, as shown in the following table:

Table 4.
Frequency Distribution of Physical Fitness Levels

Frequency	Percentage	Category
0	0%	Excellent
1	5%	Good
16	80%	Average
3	15%	Poor
0	0%	Very Poor

The results of physical fitness measurements indicate that students who participate in extracurricular futsal sports are at the "moderate" fitness level. The fitness condition of extracurricular futsal students at SMP Negeri 9 Semarang shows a variety of values, with the lowest value being 13 and the highest value being 18. The average fitness value obtained was 15.35 with a middle value (median) of 15.50 and the most frequently appearing value (mode) being 16.

Discussion

The study results showed that the majority of futsal extracurricular students at SMP Negeri 9 Semarang were in the moderate category (80%), with 5% in the good category, 15% in the poor category, and no students in the very good or very poor category. Conceptually, this distribution illustrates that students' physical fitness capacity has not yet reached the optimal level to support the physiological demands of the intermittent,

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high-intensity nature of futsal (Castagna et al., 2018; Spyrou et al., 2020). In futsal, performance is largely determined by aerobic capacity (VO_2max), repeated sprinting ability, agility, and leg muscle explosiveness (Sarmento et al., 2020; Nobari et al., 2021). When the majority of players are in the moderate category, performance consistency across the two halves of the match can potentially decline, particularly in the final phase due to accumulated fatigue (Rampinini et al., 2019; De Freitas et al., 2021).

These findings align with various studies in school contexts. Hartanto et al. (2020) and Jufendi & Arief (2018) reported that students participating in extracurricular futsal activities generally had moderate fitness levels. Research by Ayuningtiyas et al. (2024) also showed that most female futsal participants were in the poor to adequate category in several biomotor components. Furthermore, Irsanty's (2019) study on extracurricular basketball activities showed a predominance of the very poor category (40%). Meanwhile, Ashari et al.'s (2024) study on futsal at SMPN 13 Banjarbaru found that the majority of students were in the poor category (62.5%). This pattern indicates that participation in extracurricular sports does not automatically result in optimal fitness without a structured training program.

Scientifically, physical fitness is an integrative foundation between physical, technical, tactical, and mental components in a sports development system (Bangsbo et al., 2019). In futsal, explosive movements such as short sprints, rapid changes of direction, and one-on-one duels require good muscle strength, power, and neuromuscular coordination (Slimani et al., 2019; Meylan et al., 2020). Without adequate physical conditioning, the quality of technical execution such as quick passing and accurate shooting will decline due to neuromuscular fatigue (Malone et al., 2019).

The moderate results in this study may be influenced by several factors. First, the limited frequency of extracurricular training (once per week) is not sufficient to trigger significant physiological adaptations, considering that increasing VO_2max and anaerobic capacity requires repeated training stimuli based on the principles of overload and progression (Lloyd & Oliver, 2017; Tomkinson et al., 2019). Second, as noted by Kurniasandi et al. (2025), many extracurricular futsal programs are still more oriented toward technique and tactics than toward systematic physical conditioning development. In fact, evidence-based training approaches show that measured periodization of physical exercise can significantly improve adolescent performance (Lopes et al., 2021; Lang et al., 2021).

Furthermore, adolescent biological maturation also influences fitness outcomes (Malina et al., 2019). During junior high school, variations in growth and hormonal development can lead to differences in responses to exercise. Therefore, interpreting fitness test results requires considering growth factors and individualizing training programs.

Although the majority of students fall into the moderate category, the absence of students in the very poor category is a positive indicator that participation in futsal still contributes to maintaining basic fitness. Research by Ortega et al. (2018) confirms that involvement in school sports is correlated with a better cardiorespiratory profile compared to sedentary students. However, to reach a competitive level between

schools, the moderate category is not sufficient. A study by Sarmento et al. (2020) showed that small differences in aerobic and anaerobic capacity can determine the outcome of matches at the youth competition level.

Therefore, the practical implication of this research is the need for data-driven training design based on fitness test results. Regular monitoring using standardized tests such as the Yo-Yo Intermittent Recovery Test, agility tests, and explosive power tests can serve as the basis for periodization evaluations (Castagna et al., 2018; Malone et al., 2019). This approach allows coaches to adjust training loads to match students' actual capacities while minimizing the risk of overexertion or injury (Gabbett, 2018).

Overall, the findings of this study strengthen the empirical evidence that physical fitness is a central element in school futsal development. The predominant moderate category indicates that the training program still needs to strengthen physical conditioning. Systematic integration of endurance, strength, and agility training, accompanied by regular evaluation, is a recommended strategy for improving the performance of extracurricular futsal students at SMP Negeri 9 Semarang in a sustainable and science-based manner.

CONCLUSION

Based on the analysis, the physical fitness level of students participating in the futsal extracurricular activity at SMP Negeri 9 Semarang is generally in the moderate category (80%), with a small proportion in the good (5%) and poor (15%) categories. There are no students in the very good or very poor categories. Conceptually, these findings indicate that students' physical capacity has reached a basic level sufficient for participation in futsal, but is insufficient to support optimal performance in high-intensity matches that require cardiorespiratory endurance, strength, agility, and consistent repeated sprinting. Empirically, various studies over the past decade have confirmed that the moderate category does not reflect ideal competitive readiness for intermittent sports like futsal, necessitating more structured and progressive training interventions.

These results imply the need for developing data-driven training programs that emphasize the principles of overload, periodization, and regular monitoring through standardized fitness testing. This approach has proven effective in systematically and sustainably improving adolescent physical capacity. Therefore, the role of coaches and the support of school institutions are crucial in designing integrated training programs that not only strengthen physical aspects, but are also integrated with the development of students' techniques, tactics, and mental readiness to achieve more optimal futsal performance.

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cooperation during the data collection process. The active participation of all futsal extracurricular students as research subjects was a key contributor to obtaining valid and representative data.

Conceptually, this research is inseparable from the support of a conducive academic environment and school sports coaching practices. Collaboration between the researcher, the school, and the coaches reflects the importance of synergy in developing a data-driven training program. Empirically, the involvement of various parties in the physical fitness measurement process helped ensure the objectivity, accuracy, and reliability of the research results.

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