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Speed, Agility, and Endurance in Mekarsari Sape U-15 Football Players

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Objectives: This study aims to analyze the physical fitness profile of Mekarsari Sape U-15 soccer players, with a focus on the components of speed, agility, and aerobic endurance as important factors in supporting player performance during training and matches.

Materials and Methods: This study used a quantitative descriptive method with a survey approach. The research sample consisted of 24 Mekarsari Sape U-15 soccer players selected using a total sampling technique. The research instruments included a 30-meter sprint test to measure speed, the Illinois Agility Test to measure agility, and the Multistage Fitness Test (MFT) to measure aerobic endurance through VO₂ max estimation. Data were analyzed using descriptive statistics including mean values, standard deviation, frequencies, and percentages.

Results: The results of the study indicate that the physical fitness profile of Mekarsari Sape U-15 players is generally in the moderate category. The average speed of players is 4.88 seconds, the average agility is 18.45 seconds, and the average aerobic endurance based on the estimated VO₂ max is 42.76 ml/kg/minute. Based on the distribution of physical fitness categories, 5 players or 20.83% are in the very good category, 7 players or 29.17% are in the good category, 8 players or 33.33% are in the moderate category, 3 players or 12.50% are in the poor category, and 1 player or 4.17% is in the very poor category.

Conclusions: The physical fitness profile of Mekarsari Sape U-15 soccer players is generally in the moderate to good category. Aerobic endurance still requires special attention in training programs because it plays a crucial role in maintaining consistent player performance during matches. The results of this study can serve as a basis for coaches in developing more targeted physical training programs, particularly to improve the endurance, agility, and speed of young players.

Keywords: physical fitness; youth football; speed; agility; aerobic endurance



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Introduction

Football is a sport that demands a combination of physical, technical, tactical, and mental abilities. In modern football, players are not only required to master basic techniques but also to be physically fit to move quickly, change direction effectively, apply pressure to opponents, and maintain intensity throughout the match. Therefore, physical fitness is a crucial factor in determining the quality of a player's performance on the field.

Physical fitness in soccer is closely related to a player's ability to perform various game activities, such as sprinting, one-on-one duels, changes of direction, offensive and defensive transitions, and movement without the ball. Soccer is an intermittent game, with players alternating between low, medium, and high intensity activities throughout the match. This requires a combination of physical abilities, particularly speed, agility, and aerobic endurance. Players with good fitness are better able to maintain performance, reduce fatigue, and execute tactical instructions more consistently.

Speed is a crucial component in soccer because many game situations require players to sprint quickly, whether to chase the ball, open space, press, or navigate transitions. In addition to speed, agility is also crucial because soccer players frequently change direction, make sudden stops, turn, and respond to opponent movements in limited space. Meanwhile, aerobic endurance is essential for maintaining game intensity, accelerating the recovery process, and remaining effective until the end of the match. Therefore, these three components are essential components of the physical fitness profile of young soccer players.

In the U-15 age group, measuring physical fitness plays a strategic role in the athlete development process. This age is a crucial developmental phase as physical abilities, motor coordination, tactical understanding, and playing skills begin to develop more complexities. Physical fitness evaluations can help coaches assess player readiness, identify individual strengths and weaknesses, and develop training programs tailored to the team's needs. Without objective fitness data, training programs risk being general and lacking in effectiveness.

Several previous studies have shown that physical components such as speed, agility, and endurance are significantly related to the performance of youth soccer players. Stølen et al. (2005) explained that soccer requires a combination of aerobic capacity, sprinting ability, strength, and explosive movement ability. Furthermore, Rampinini et al. (2007) emphasized that soccer player performance is influenced by the ability to maintain high-intensity activity during matches. In the context of youth development, evaluating physical condition is crucial because the results can be used as a basis for short-term and long-term training planning.

The Mekarsari Sape football club is a youth development platform in Bima Regency, actively participating in training and regional competitions. However, information on players' physical fitness profiles, particularly in the U-15 group, remains limited. Data on speed, agility, and endurance are crucial for assessing players' actual condition and determining training priorities. This limited data underpins the importance of conducting this research, providing coaches with an objective picture of their players' physical condition.

Based on this description, this study aims to analyze the physical fitness profiles of Mekarsari Sape U-15 soccer players based on speed, agility, and aerobic endurance. The results are expected to provide evaluation material for coaches in developing more targeted, measurable, and tailored physical training programs tailored to the needs of young players.



Materials and Methods

Study Design

This study employed a quantitative descriptive method with a survey approach. This design was used to describe the physical fitness profiles of Mekarsari Sape U-15 soccer players based on the components of speed, agility, and aerobic endurance. This study did not provide any training interventions, but instead focused on measuring the players' physical condition through a predetermined physical fitness test.

Study Participants

The population in this study was all 24 active Mekarsari Sape U-15 players. The sampling technique used was total sampling, so all members of the population were included in the study sample. Therefore, the study sample consisted of 24 Mekarsari Sape U-15 soccer players.

The study participants were male players aged 14–15, active members of the Mekarsari Sape U-15 club, and regularly participating in training activities. All participants underwent a series of physical fitness tests according to established procedures.

Study Organization

Data collection was conducted at the Sape Football Field in Bima Regency. The instruments used in this study included 10-meter sprint test to measure speed, the Illinois Agility Test to measure agility, and the Multistage Fitness Test (MFT/Bleep Test) to measure aerobic endurance through VO₂ max estimation.

Prior to the test, all participants were briefed on the purpose of the study, the test procedure, the test sequence, and safety regulations during the measurements. Participants then performed a 15-minute warm-up consisting of light jogging, dynamic stretching, and preparatory movements as needed. After the warm-up, participants underwent a series of physical fitness tests according to standard procedures.

The 30-meter sprint test was conducted to determine a player's speed ability over short distances. The Illinois Agility Test was used to measure a player's ability to change direction quickly and effectively. Meanwhile, the Multistage Fitness Test was used to estimate a player's aerobic endurance based on the level and shuttle achieved during the test. All measurement results were recorded by researchers with the assistance of a research assistant to ensure the data obtained was accurate and consistent with player performance.

Statistical Analysis

Data were analyzed using descriptive statistics. The analysis was performed by calculating minimum and maximum values, means, standard deviations, frequencies, and percentages. The results were used to describe the players' physical fitness profiles based on each test component: speed, agility, and aerobic endurance.

Next, the test results were classified into five categories: very good, good, moderate, poor, and very poor. This classification was used to more systematically determine the distribution of physical fitness levels among Mekarsari Sape U-15 players.

Results

Description of Player Physical Fitness

The results of this study describe the physical fitness profile of Mekarsari Sape U-15 soccer players based on three main components: speed, agility, and aerobic endurance. A summary of descriptive statistics for each component is presented in Table 1.

Table 1. Descriptive Statistics of Physical Fitness Components

Variables	Minimum	Maximum	Mean	Elementary School
Speed (seconds)	4.35	5.52	4.88	0.32



Agility (seconds)	16.82	20.65	18.45	0.91
VO ₂ max (ml/kg/min)	35.20	51.60	42.76	4.38

Based on Table 1, the average player speed in the 30-meter sprint test was 4.88 seconds with a standard deviation of 0.32. The average player agility based on the Illinois Agility Test was 18.45 seconds with a standard deviation of 0.91. Meanwhile, the average aerobic endurance based on the estimated VO₂ max was 42.76 ml/kg/minute with a standard deviation of 4.38. These results indicate that the physical fitness condition of Mekarsari Sape U-15 players is generally at a fairly good level, although there are still variations in ability between players.

Distribution of Physical Fitness Levels

The distribution of physical fitness categories of Mekarsari Sape U-15 players is presented in Table 2.

Table 2. Distribution of Players' Physical Fitness Categories

No	Category	Frequency	Percentage
1	Very good	5	20.83%
2	Good	7	29.17%
3	Currently	8	33.33%
4	Not enough	3	12.50%
5	Very less	1	4.17%
Total		24	100%

Based on Table 2, the majority of players are in the moderate category, namely 8 players (33.33%). Furthermore, 7 players (29.17%) are in the good category, 5 players (20.83%) are in the very good category, 3 players (12.50%) are in the poor category, and 1 player (4.17%) is in the very poor category. These findings indicate that the majority of players have a moderate to good level of physical fitness.

Physical Fitness Component Profile

The percentage of categories in each component of physical fitness of Mekarsari Sape U-15 players is presented in Table 3.

Table 3. Percentage of Categories for Each Component of Physical Fitness

Component	Very good	Good	Currently	Not enough	Very less
Speed	25.00%	33.33%	25.00%	12.50%	4.17%
Agility	20.83%	29.17%	33.33%	12.50%	4.17%
Durability	16.67%	25.00%	37.50%	16.67%	4.16%

Based on Table 3, the speed component showed relatively better results compared to the other components, with 25.00% of players in the excellent category and 33.33% in the good category. In the agility component, the largest percentage was in the moderate category, namely 33.33%, followed by the good category at 29.17%. Meanwhile, the endurance component showed the highest percentage in the moderate category at 37.50% and the poor category at 16.67%. These results indicate that aerobic endurance is a component that still needs more attention in the training program of Mekarsari Sape U-15 players.

5 Discussion

The results of the study indicate that the physical fitness profile of Mekarsari Sape U-15 soccer players is generally in the moderate to good category. This finding indicates that the training program implemented so far has made a positive contribution to the development of players' physical abilities. However, the results also indicate that several fitness components still need to be improved, particularly aerobic endurance. In soccer, physical condition is a crucial factor because players are required to perform



various high-intensity activities, such as sprinting, changing direction, pressing, attacking defensive transitions, and repeated movements without the ball during the match (Bangsbo et al., 2006; Stolen et al., 2005).

The speed component showed relatively good results. The average player speed in the 30-meter sprint test was 4.88 seconds. These results indicate that most players have sufficient sprinting ability to support the demands of youth soccer. Speed is crucial because many match situations require players to move quickly in a short time, whether chase the ball, open space, counterattack, or close down the opponent's movement. Little and Williams (2005) explain that speed, acceleration, and agility are specific physical qualities that require targeted development. Therefore, even if a player's speed results are quite good, sprint training still needs to be carried out systematically to optimally develop their acceleration and maximum speed.

Player agility also showed quite good results, with an average of 18.45 seconds on the Illinois Agility Test. In soccer, agility is essential because players frequently change direction, stop suddenly, turn their bodies, avoid opponents, and respond to rapidly changing game situations. Good agility skills indicate that players have adequate motor coordination, body control, balance and the ability to change direction. Hachana et al. (2013) stated that the Illinois Agility Test is a reliable and valid test for measuring change of direction ability in team sports athletes. Therefore, the agility results in this study can provide important information for coaches to determine players' ability to move quickly and efficiently on the field.

The aerobic endurance component showed results that still require further attention. The average VO₂ max of players was 42.76 ml/kg/min. This value indicates that the players' endurance capabilities are at a sufficient level, but still need to be improved so that players can maintain the intensity of the game throughout the match. Soccer is an intermittent sport that combines low, medium, and high intensity activities alternately. Therefore, good aerobic capacity is necessary to accelerate recovery from high-intensity interactions, maintain movement consistency, and reduce performance decline due to fatigue. Helgerud et al. (2001) showed that programmed aerobic endurance training can improve soccer performance, including players' work capacity during matches.

The lower performance of endurance compared to speed and agility may be due to several factors. First, training programs may emphasize technical drills, games, or short sprints over structured endurance training. Second, U-15 players are still in their biological development phase, so differences in physical maturity between individuals can influence fitness test results. Towlson et al. (2021) emphasized that in youth soccer development, maturation factors need to be considered because players of the same chronological age can have different physical development rates. Third, training intensity and consistency can also influence a player's aerobic capacity.

The results of this study align with several previous studies showing that speed, agility, and endurance are important components of the fitness profile of young soccer players. Buchheit and Mendez-Villanueva (2013) emphasized the importance of measuring physical performance in young players because physical development is strongly influenced by age and maturity. Parpa and Michaelides (2022) also found that the physical fitness characteristics of young soccer players differ by age group, therefore, regular physical evaluations are necessary to tailor training programs to the player's developmental stage.

Practically, the results of this study can serve as a basis for Mekarsari Sape U-15 coaches in developing more targeted training programs. Speed training can be developed through short sprints, acceleration drills, and reaction drills. Agility can be improved through change-of-direction exercises, ladder drills, cone drills, and small-sided games.



Meanwhile, aerobic endurance can be improved through interval training, small-sided games with adjusted duration and intensity, and repeated running exercises tailored to the age and condition of the players. Impellizzeri et al. (2006) explained that soccer-specific aerobic training, such as small-sided games, can be an effective training alternative because it combines physical aspects and game situations.

Thus, the fitness profile of the Mekarsari Sape U-15 players shows good potential for development. Speed and agility have shown sufficient results to support the game's requirements, while aerobic endurance still needs to be improved through a more systematic training program. Regular physical fitness evaluations are necessary so coaches can monitor player progress, identify physical weaknesses, and develop training programs based on objective data.

This study has limitations because it only involved 24 players from a single club, so the results cannot be generalized to all youth soccer players in Bima Regency or other regions. Furthermore, this study only analyzed three components of physical fitness: speed, agility, and aerobic endurance. Future research is recommended to involve a larger sample size, compare multiple clubs, and include other variables such as leg muscle strength, power, flexibility, body composition, and technical skills to provide a more comprehensive picture of player performance.

Conclusions

Based on the research results, it can be concluded that the physical fitness profile of the Mekarsari Sape U-15 soccer players is generally in the moderate to good category. Speed and agility components showed relatively good results, while aerobic endurance still requires improvement to enable players to maintain playing intensity more consistently throughout matches.

The results of this study can serve as a basis for coaches in developing more targeted physical training programs tailored to the players' needs. The recommended training program not only maintains speed and agility training but also places greater emphasis on improving aerobic endurance through systematically designed endurance drills, interval training, and small-game games.

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Conflict of Interest

The author declares that there is no conflict of interest in this research.

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