

Analysis of aerobic and anaerobic endurance levels in junior soccer players in various field positions

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Abstract: In football, the energy system used is aerobic endurance and anaerobic endurance. So every football player needs to have the quality of endurance in facing every match. The aim of this research is to determine the ability of aerobic endurance and the ability of anaerobic endurance. The subjects of this research were 20 junior football players aged 14 years. The research method in this research is quantitative with a descriptive approach. The instruments used in the research were the Running Anaerobic Sprint Test (RAST) for collecting data on anaerobic endurance and the Multistage Fitness Test (MFT) for aerobic endurance. The percentage results of aerobic endurance were 3 people in the very poor category, 6 people in the poor category, 8 people in the sufficient category, and 3 people in the good category. Meanwhile, regarding anaerobic endurance, 8 people were in a good category, 6 people were in the sufficient category, and 3 people were in the very poor category. From the description results for the anaerobic endurance variable, the mean is 5.99, the standard deviation is 0.39. Meanwhile, from the results of the description for the aerobic endurance variable, the mean was 39.90, standard deviation of 4.73. Based on the results of the research conducted, it can be concluded that there is an influence of aerobic and anaerobic training on endurance in junior football athletes in the city of Kediri. Even though it has an influence on the durability of this research, it has several limitations, namely limited subjects and age categories.

Keywords: Endurance; Aerobics; Anaerobics; Football

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INTRODUCTION

The game of football is a team sport or team game and football is a type of game that requires excellent physical condition, so a good, strong, tough team is a team consisting of players who are able to play a unified game, meaning they have good teamwork. Good. Football (soccer) is one of the most complex sports in the world, where players require technical, tactical and physical skills to achieve successful performance, and ultimately win matches (Yi et al., 2019). A team's performance depends on the cooperative interactions between players playing in different positions (Quino et al., 2018). For example, the midfielder's main role is to organize the attack with ball control and precise passes, while the defender's main task is to win aerial duels and tackle or intercept the ball fed to the attacker (Modric et al., 2019).

In football, the elements of good and excellent physical condition and being ready to face opponents when competing are important basic elements in the game of football. A football player in dealing with things like that must be nurtured and trained from the start and must maintain physical fitness. Therefore, the physical aspect is very influential in supporting football playing patterns because physical condition is very important in football. Modern football requires a high level of endurance, speed, strength and coordination skills (Chmura et al., 2015). Therefore, the players must have well-developed physical fitness. Consider the fact that the energy used by football players is mostly produced by aerobic metabolism (Garcia-Tabar et al., 2019) It is therefore important for players to have well-developed aerobic fitness (AF). In particular, an appropriate level of AF allows players to sustain repetitive high-intensity actions in football games,

to speed up the recovery process and to maintain their physical condition at an optimal level during matches and seasons.

In football, the energy system used is aerobic endurance and anaerobic endurance. Looking at the activities and playing football for 2 x 45 minutes, it is clear that the aerobic and anaerobic energy systems are used. So every football player needs to have the quality of endurance in facing every match. Physical fitness is a person's ability to carry out tasks, work or daily routines with excellent physical fitness, not experiencing severe fatigue after carrying out these activities and having good physical abilities. to carry out urgent or other additional work (Utomo et al., 2021) It's a shame if good free time is used up with useless activities. Thus, every player must have good aerobic and anaerobic endurance as the main asset in playing football. Football is a sport that requires the Adenosine Triphosphat-Phospho Creatin (ATP-PC) energy system and the aerobic energy system. According to FIFA's statement in the book Physical preparation and physical development and training, it is stated that 10.1% of the energy system in the game of football is ATP - PCr energy, 19.5% is aerobic (carbohydrate) and anaerobic glycolysis, 70.4% is aerobic metabolism and fat.

Aerobic and anaerobic endurance is the capacity of the heart and lungs and blood vessels to function optimally during rest and exercise to take in oxygen and distribute it to active tissues for processing by the body's metabolism. Every player needs to have good anaerobic and aerobic endurance to maintain physical condition for 90 minutes during a match. Because the anaerobic endurance of football players will not be able to work with high intensity and short duration or the work system is explosive (Sukadiyanto & Muluk, 2011). Judging from the energy system data above, it shows that football is a sport that emphasizes good physical condition, especially endurance physical condition, both aerobic and anaerobic.

In the context of junior soccer, the age range of 12-14 years is referred to as middle school age and puberty. During this time, rapid growth occurs, muscle development develops, and the speed of the development process does not proceed evenly for each system. During adolescence (14-18 years), the functioning of the nervous system develops, the muscular system is strengthened, coordination skills improve, the cardiovascular system improves, creating better and better conditions for training. The previous study showed, that boys only after 12 years of age experience an increase in power and glycolytic capacity in response to the training measures used (Armstrong & Barker, 2012). Therefore, it seems advisable to select an age group of players who train from the age of 12. Anaerobic efficiency increases significantly after puberty.

The basis of performance assessment is maximum power and work performed. In addition, the course of changes in the rise and fall of power during the test is also assessed (Akıncı et al., 2019; Taylor et al., 1990; Vasilescu, 2013). From observations on the field, players at the Triple's Ku 13-14 football school in the city of Kediri during training and matches are required to have aerobic endurance and anaerobic endurance, because this endurance is related to their energy system. Aerobic endurance is the basis for the development of the anaerobic energy system, therefore these two types of energy cannot be absolutely separated during training activities. This study aims to see the level of aerobic and anaerobic endurance abilities of students at the Triple's football school in Kediri City.

METHODS

The design and type of research used in this research is quantitative descriptive research. The method used in this research is in the form of numbers and analysis using statistics (Sugiyono, 2014). In this research, the sample used was 20 SSB Tripel's KU 13-14 students in Kediri. The sample determination technique uses a purposive method, namely men, the core male players of SSB Triple's. In this study, researchers used the Running Anaerobic Sprint Test (RAST) research instrument to collect anaerobic endurance data and the Multistage Fitness Test (MFT) to collect aerobic endurance data. The data analysis technique used in this research is descriptive quantitative, because it describes the level of aerobic endurance and anaerobic endurance of athletes at the Triple's Ku 13-14 football school in Kediri.

The research procedure carried out to measure aerobics is carried out with the research procedure for anaerobic carried out with this test requiring athletes to do six sprints of 35 meters with a recovery time of 10 seconds between each sprint. When the athlete completes the 35 meter run, the first assistant stops the stopwatch, records the time and resets the stopwatch. Meanwhile, the research procedure for the aerobic test via the Multistage Fitness Test (MFT) test is carried out with cones/limit poles installed opposite each other at a distance of 20 meters. Participants start the test from one side. When instructed by the audio player, they must run towards the opposite 20 meter line in a beep. Participants must then run back and forth in the same pattern over and over again until they reach the highest limit. If the athlete fails to reach the opposite 'turn-around' line before the 'beep', the participant is recorded as one failed attempt. If an athlete achieves two consecutive failed attempts, they are withdrawn from the test and their score is recorded as final. However, if the person reaches the line before the second consecutive beep, their failed attempt will be reset. After the test ends, individual scores must be recorded.

RESULTS AND DISCUSSIONS

Results

Aerobic Endurance Ability

The description of research power has the aim of making it easier to present research data. Description of research data to determine aerobic endurance ability.

Table 1. Descriptive data categorization of aerobic endurance

No.	Kategori	Interval	Frekuensi	Presentase
1.	Verypoor	< 35.0	3	15 %
2.	Poor	35.0 - 38.3	6	30%
3.	Fair	38.4 - 45.1	8	40 %
4.	Good	45.2 - 50.9	3	15 %
5.	Excelent	51.0 - 55.9	0	0%
6.	Superior	> 55.9	0	0 %
	Jumlah		20	100%

From the distribution data for aerobic endurance categories above, there are 3 people (15%) in the very poor category, 6 people (30%) in the poor category, 8 people (40%) in the fair category, 3 people (15%) in the good category. If we look at the frequency of each category, it can be seen that the aerobic endurance ability of SSB Triple's KU-13-14 players is Fair.

Anaerobic Endurance Ability

The description of research power has the aim of making it easier to present research data. Description of research data to determine the ability of anaerobic endurance to determine the fatigue index of Triple's Ku 13-14 football school players in Kediri.

Table 2. Categorization of Anaerobic Endurance Data

No.	Kategori	Interval	Frekuensi	Prosentase
1.	Sangat baik	$x < 5.39$	0	0
2.	Baik	$5.39 < x < 5.79$	8	40 %
3.	Sedang	$5.79 < x < 6.16$	9	45 %
4.	Kurang baik	$6.19 < x < 6.59$	0	0
5.	Sangat kurang	$X > 6.59$	3	15 %
	Jumlah		20	100 %

This research was conducted to determine the ability of anaerobic endurance and aerobic endurance of SSB Triple's Ku 13-14 players. In this study, the instrument used to measure aerobic endurance was the Multistage Fitness Test (MFT). The instrument used to measure anaerobic researchers used the Running-based Anaerobic Sprint Test (RAST). In playing football, good endurance is required, especially anaerobic endurance. Because the predominant energy used in football games is the anaerobic energy system, followed by the aerobic energy system.

Discussions

Based on the results of research conducted, it was found that aerobic and aerobic skills have an influence on the endurance of football players in the city of Kediri. If it is related to the results of previous research, there are several similarities regarding both of them regarding the endurance of football players. (Amrullah, 2022) In particular, sports activities involving aerobic exercise, strength training, and flexibility training can improve a person's physical fitness. Aerobic exercise (requires a lot of oxygen) can help increase maximum oxygen consumption into the lungs. This is called VO₂max (VO₂max) (Gao et al., 2021). Exercises that involve cardiorespiratory endurance, including structured and regular exercises with progressive loads, can help increase VO₂max (Saputra et al., 2024).

(Guntoro et al., 2024) stated that increasing aerobic endurance as an initial step before focusing on teaching or training basic football techniques and good aerobic endurance can only be obtained through a programmed training process. Aerobic endurance is in the Good category, explosive power is in the Good category, speed is in the medium category, and agility affects the performance of football players (Amanah & Rahmadani, 2023). (Budiansyah et al., 2024) stated that football is a sports game that prioritizes good aerobic endurance or high VO₂max. To meet these endurance demands, a person must have large amounts of energy. Large amounts of energy demands will be produced through the aerobic system which requires oxygen, therefore the level of endurance of a player depends on the level of maximum oxygen capacity or VO₂max.

Aerobic endurance, the ability of a group of muscles to maintain energy in carrying out consecutive activities under maximum pressure within a specified period of time (Adelina & Anam, 2023). This low VO₂max test result will definitely have a bad impact on KFC futsal players. There are several impacts that occur when futsal players have low cardiopulmonary endurance (Bentar & Irawan, 2023). Generally, the higher the VO₂max (maximum lung capacity to consume oxygen), the better the aerobic and cardiorespiratory endurance (Attamimi et al., 2024). (Setiawan et al., 2024) revealed that the aerobic and anaerobic metabolic systems are used by individuals who do sports in their performance where the anaerobic phase takes a shorter time than the aerobic phase.

Firmansah dan Jatmiko (2023) revealed that anaerobic endurance is related to the body's explosive ability to move quickly and repeatedly with breaks. In the game of football, physical ability is influenced by a player's stamina or anaerobic endurance. Anaerobic endurance is the process of meeting energy needs in the body to utilize glycogen to become a source of energy without the help of oxygen from the outside (Ramadhan et al., 2021). (Ramadhan et al., 2022) said that anaerobic endurance can take the form of interval training and circuit training. Interval training and circuit training can be done at the beginning of the season or long before a match, competition or championship is held. (Risma et al., 2023) said that the components of physical condition such as muscle strength, speed, explosive power, aerobic endurance and anaerobic endurance are very high.

(Fahrin & Kafrawi, 2023) said that endurance is divided into two, namely aerobic endurance and anaerobic endurance. Anaerobic endurance is the ability of the circulatory and respiratory systems to adapt to the effects of all physical workloads. (Hafinudin et al., 2020) said that circuit training (anaerobic) has the effect of increasing the VO₂Max of football players. Where we can see that the two variables, namely VO₂Max, are correlated with anaerobic training. VO₂max is the main factor supporting performance, meaning that training activities carried out through high endurance can run well, while for non-athletes, VO₂max is also to maintain stamina stability through anaerobic training (Irkhami & Pramono, 2024). (Indah, 2024) revealed that anaerobic strength and endurance are high, as reflected in the Wingate test results. These results suggest that training focused on developing strength and anaerobic endurance may be an important component in professional basketball athletes' training programs to improve their performance on the court. (Putra et al., 2023) explained that High Intensity Interval Training (HIIT) is one of the most effective training methods for improving physical abilities, which combines strength, aerobic and anaerobic endurance, flexibility and coordination in one exercise. Aerobic and anaerobic training on endurance in junior football athletes in the city of Kediri. Even though it has

an influence on the durability of this research, it has several limitations, namely limited subjects and age and biological maturation categories. In this case, to analyze the ability of The aerobic fitness of a prepubertal 12–13-year-old footballer cannot be meaningfully compared with that of a biologically mature footballer of similar chronological age. These issues are a major problem in establishing a level playing field in age-group sport (Armstrong, 2018; Malina, 2017).

(Sumarno & Ristiawan, 2022) explains that dominant anaerobic characteristics can be proven by performance parameters that are always at high speed such as sprinting, acceleration and deceleration of more than 600 times. Players can change direction 700 times and approximately 1,400 action changes per game. (Dhiyauddin et al., 2023) stated that the game of football completely uses the legs, except for the goalkeeper who is allowed to use his arms in the penalty kick area. The sport of football involves a combination of strength, endurance, speed and agility. Therefore, it is important to assess the body composition of players to ensure that they have the right proportion of muscle and a healthy percentage of fat (Susilo et al., 2023). In several sports, body mass plays an important role in the selection of young athletes and their retention in elite training programs, but young athletes may experience difficulties in ratio-scale fitness comparisons across different sports.

Coaches have noted for many years that during childhood and early adolescence, those who excel in predominantly “anaerobic” activities also excel in “aerobic” activities and Bar-Or (1983) introduced the term “non-metabolic specialists” to describe the phenomenon. The present data suggest that this relationship is not one of non-metabolic specialism but can be explained by the strong, common influence of age and fat free mass (FFM) on both aerobic and anaerobic fitness. Analysis in this context, will provide recommendations on future research to be used to better understand the VO₂max capacity of junior soccer players.

CONCLUSION

Interplay of Anaerobic and Aerobic Metabolism in junior football almost always involves an interplay between anaerobic and aerobic metabolism which depends upon the intensity and duration of the activity and the individual's developmental physiology, modulated by training status. Based on data analysis and discussion, it can be concluded that the aerobic endurance ability of junior football players in Kediri City 13-14 is moderate, with a percentage of 40% and the anaerobic endurance ability of junior football players in Kediri City 13-14 is Medium, with a percentage of 45% part of the summary of answers to the hypothesis, research objectives and research findings as well as suggestions regarding further ideas from the research. After knowing that the average quality of aerobic endurance and anaerobic endurance abilities in schools is categorized as moderate. So it is hoped that players will further develop and improve their endurance, both aerobic endurance and anaerobic endurance, in order to support their achievements, both individual and team achievements. Aerobic and anaerobic training on endurance in junior football athletes in the city of Kediri. Even though it has an influence on the durability of this research, it has several limitations, namely limited subjects and age categories.

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