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Submission date: 28-May-2023 04:57PM (UTC+0700)
Submission ID: 2103547874
File name: 1_FIX.pdf (477.21K)
Word count: 5338
Character count: 29025

Journal Sport Area
http://journal.uir.ac.id/index.php/JSP
Vol. 8. No. 2. August, (2023)

Yo-Yo Intermitten Recovery Test: A study of football players' VO2max physical condition

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Received: 04 March 2023; Accepted 12 May 2023; Published 01 June 2023
Ed 2023; *8*(2): 141-151

ABSTRACT

The Yo-Yo Intermittent Recovery Test is frequently used to evaluate VO2max and is crucial for determining an athlete's physical condition. However, its effectiveness in accurately assessing the physical condition of football players remains limited. This study aims to analyze the level of the physical condition of football players' VO2max which will be used as evaluation material for designing training programs so that the pattern of coaching becomes focused and produces achievements. This research used a quantitative approach to the survey method. The subjects of this study were Pusaka FC football club athletes, the sampling technique used total sampling so that all athletes were a sample of 23 players. The test instrument used the Yo-Yo Intermitten Recovery Test level 2. Data analysis used descriptive percentages, with the assistanceof the Microsoft Excel 2019 software application. The results of the study show that the VO2max level value in soccer athletes is 13.04% of athletes in the poor category and 34.78% in the good category. Below average, 47.82% shows the average category, and there is only 4.35%, which shows the value of the good category. Based on the result of the VO2max ability test, the average classification of Club Pusaka FC players is still relatively low. However, it is necessary to know that the limitations of this study lie in the condition of the players' nutritional intake which has not been controlled and their age which must also be taken into consideration by researchers. Furthermore, it can find information on the effect of athlete nutrition on endurance ability.

Keywords: Physical condition; vo2max; football; yo-yo intermittent recovery

https://doi.org/10.25299/sportarea.2023.vol8(2).12392

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How to Cite: Suryadi, D., Yanti, N., Tjahyanto, T., Ramli, & Rianto, L. (2023). Yo-Yo Intermitten Recovery Test: A study of football players' VO2max physical condition. *Journal Sport Area*, *8*(2), 141-150. https://doi.org/10.25299/sportarea.2023.vol8(2).12392

Authors' Contribution: a – Study Design; b – Data Collections; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Physical condition is a very important part of a sport because aspects of physical condition greatly affect game performance (Sandika & Mahfud, 2021). Physical condition plays a very important role in creating an effective playing pattern (Syafi'i & Setiawan, 2019), it is also a requirement that must be possessed by a

football player in order to improve and develop optimal sports achievements (Ridwan, 2020). In addition, good physical abilities make a positive contribution to fitness (Baek et al., 2020; Rubiyatno et al., 2023; Saputra et al., 2023; Suryadi et al., 2021; Suryadi, 2022a; Suryadi et al., 2023b; Suryadi & Rubiyatno, 2022), and one of them is needed in football games (Suryadi, 2022b). Football is a sport that is enjoyed by people from all walks of life and is one of the most popular games (Suryadi et al., 2023a). Furthermore, it is a sport that necessitates complicated energy processing through the use of two energy systems, namely aerobic and anaerobic (Jarkasih & Fardi, 2020), this statement is reinforced by Guntoro et al. (2020) that the physical abilities that must be possessed in playing football are agility, power, coordination, speed, flexibility, strength and endurancewhere endurance is essential in a game.

Endurance is one of several physical elements that need to be trained and developed as a factor that greatly supports the technical and tactical abilities of playing football (Warni et al., 2017). The ability to maintain physical activity for long periods of time is often called endurance (Tudor & Michael, 2015). In addition, according to Syahda et al. (2016), endurance has a relationship to technical skills in playing footballso it plays a very important role in playing football (Allsabah, 2021), as it is the case with VO2max endurance (Supriatna et al., 2023). Research studies by Satria (2019) state that the physical conditions that football players need to have include aerobic endurance VO2max because it is to maintain the body ability to carry out aerobic activity for a long time (Nala, 2011). Furthermore playing football also requires the Adenosine energy system Triphosphate-Phospo Creatin (ATP-PC) and the aerobic energy system (Nugroho & Kusuma, 2022). An example of a football player use an aerobic energy system is when a football player is jogging (Purba & Setiowati, 2022).

Besides, football is also a game that requires a lot of energy to boost enthusiasm in a team (Syukur & Soniawan, 2015). Therefore, football players are required to have good physical and aerobic conditions so that the game can run well (Hardinata et al., 2021). Thus, the ability of VO2max becomes the greatest aerobic exercise (Gumantan & Fahrizqi, 2020) where this ability is also often said to be the soul of its appearance to improve good physical work (Debbian & Rismayanthi, 2016). Further, good quality endurance is the main support for developing skills (Nugroho & Kusuma, 2022), because the heart and lungs supply oxygen throughout the body for a long time (Debbian & Rismayanthi, 2016). Next, VO2max is the basic foundation for building physical fitness which plays a very important role for every sport (Nesra Barus, 2020), which is very important to have before practicing anaerobic endurance (Pamungkas & Hardika, 2023).

The higher the level of VO2max the better the aerobic endurance possessed by athletes (Kharisma & Mubarok, 2020). In addition, VO2max affects the ability of the heart and lungs to supply oxygen throughout the body for a long time therefore VO2max is pivotal for everyone (Indrayana & Yuliawan, 2019). Thus, VO2max becomes one of the main physical condition elements that must be possessed by football athletes, due to the type of football game that is played for a long time, namely 2 x 45 minutes (Wahyudi et al., 2020). Apart from that, if football players are almost the same ability, then the victory can be determined by the physical and mental condition of a player (Musrifin & Bausad, 2020). VO2max is also one of the barometers of fitness and body composition consisting of body mass index and body fat percentage, which are ideal benchmarks for whether or not a person's body is (Nirwandi, 2017).

Although the previous research has shown the results of VO2max analysis documentation (Supriatna et al., 2023; Yanti et al., 2022) and specifically presented the VO2max of football athletes (Allsabah, 2021; Nirwandi, 2017; Sinurat, 2019), it further discusses the differences in VO2max between athletes and non-athletes (Kostić, 2017), as well as field tests to predict VO2max in hockey players (Morton & Klein, 2019). However, this study offers an offer from a different perspective from previous research, namely the instrument used to measure the athlete's VO2max using the Yo-Yo Intermittent Recovery Test level 2 (YIRT2) where the Yo-Yo test is a valid test used to measure VO2max in football athletes (Hardinata et al., 2021). In addition, the level 2 Yo-Yo test has been indicated as an anaerobic-based field test (Castagna et al., 2009). Furthermore, this research was conducted at different locationswhich to our knowledges have not found reports discussing the VO2max analysis of football athletes in West Kalimantan using the Yo-Yo test instrument. Therefore, this study aims to analyze the VO2max levels of football athletes using the Yo-Yo test. The purpose of this study is reinforced by Arianto and Setyawan (2019), that the importance of aerobic endurance for football players

is to support their ability to play and to achieve an achievement. In addition, aerobic endurance in football is considered an indicator of superior performance (Casamichana et al., 2015; Lacome et al., 2018). Therefore, this research is necessary as an evaluation of the success of the coaching patterns and training processes that have been implemented (Vavilov et al., 2020).

METHOD

The research method was a quantitative approach with a survey method, namely tests and measurements were carried out on athletes to analyze VO2max. The subjects in this study were the male athletes from Club Pusaka FC using total sampling which means that all players on the team were sampled so that a total of 23 athletes were obtained. The instrument used in this study was the Yo-Yo Intermittent Recovery Test level 2 as a valid tool to measure the level of VO2max of football players (Supriatna et al., 2023). The implementation of the Yo-Yo Intermittent Recovery Test level 2 has a 20 m running track, the running speed will increase according to the level, with active recovery/rest 10 seconds between tracks spaced 5 m. Before the test, the athlete warmed up first and stretching to avoid injury during the test. Furthermore, the test is declared complete if the player has failed to reach the finish line twice or the player is no longer able to feel like completing the moderate test at a predetermined speed (Schmitz et al., 2018).

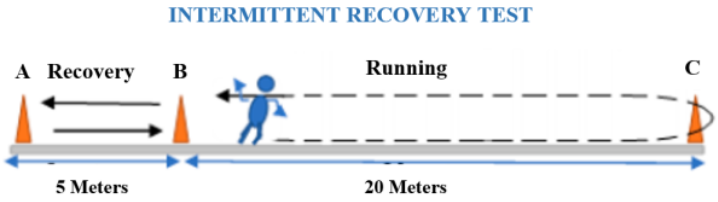

Figure 1. Yo-Yo Intermittent Recovery Test Instrument

Data analysis in this research uses descriptive percentages, to determine the VO2max ability level of football players. Then, data calculations were assisted using Microsoft Excel 2019 software. The fitness norm category was used to find out an explanation of the VO2Max value achieved by the players. The following are categories of VO2max assessment norms.

Table 1. VO2max Assessment Norms through the Yo-Yo Test for Men

Ratings	Levels	ValueRange
Ellite	>20.1	>56.6
Excellent	18.7-20.1	53.2-56.6
Good	17.3-18.6	49.2-52.9
Average	15.7-17.2	45.1-48.8
Below average	14.2-15.6	40.8-44.8
Poor	<14.2	<40.8

RESULTS AND DISCUSSION

Based on the results of the research data, it is known that Club Pusaka FC football athletes who carried out the Yo-Yo test totaled 23 athletes, and the results of the study show that there are still many who have below-average VO2max abilities. For clarification, the results are described in Table 2 below.

Table 2. Data on the Results of the Physical Condition Test for VO2max Ability through the Level 2 Yo-Yo Test

Age	VO2max Results	Category
22	45.1	Average
20	43.8	Below average
20	43.1	Below average
18	40.4	Poor
20	45.8	Average

Age	VO2max Results	Category
20	48.2	Average
21	46.5	Average
22	42.1	Below average
19	46.1	Average
20	46.1	Average
18	40.8	Below average
17	44.1	Below average
20	44.5	Below average
20	40.1	Poor
21	45.8	Average
22	39.4	Poor
21	49.2	good
20	45.8	Average
20	46.1	Average
20	46.1	Average
19	43.5	Below average
22	45.8	Average
21	42.1	Below average

Table 3. VO2max Levels in Male Football Athletes

Ratings	Frequency	Percentage %
Ellite	0	0%
Excellent	0	0%
Good	1	4.35%
Average	11	47.82%
Below average	8	34.78%
Poor	3	13.05%

Based on the results data that has been described in tables 2 and 3, it shows the value of the VO2max level in football athletes. The results explain that the athletes' VO2max ability is 13.04% in the poor category, 34.78% in the below average category, and 47.82% indicates the average category. Furthermore, there is only 4.35% which shows the value of the good category. Based on these results it proves that the average VO2max ability in football athletes is still relatively low.

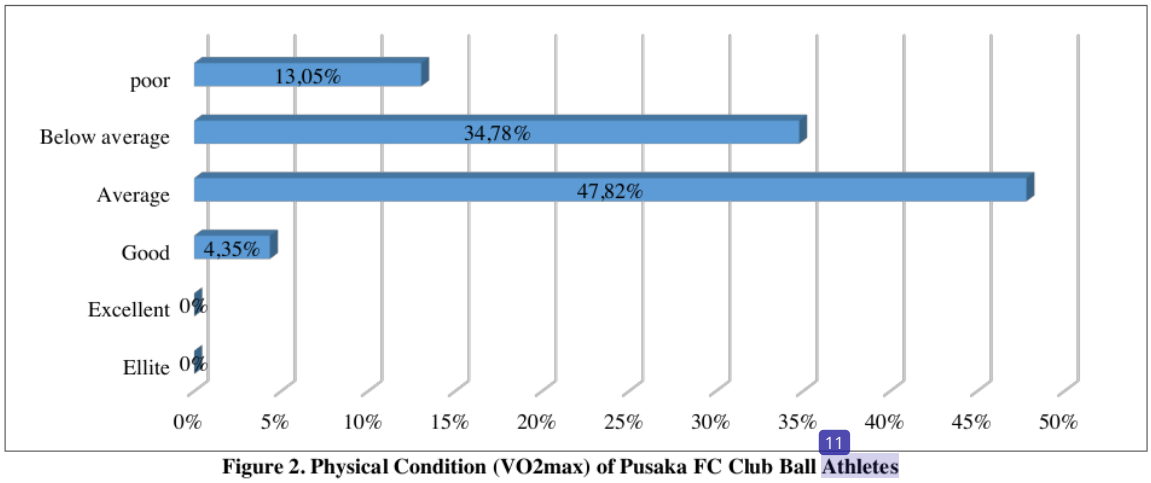

Figure 2. Physical Condition (VO2max) of Pusaka FC Club Ball Athletes

This study aims to analyze the VO2max ability of football athletes using the Yo-Yo test. The results showed that the VO2max ability of Club Pusaka FC football athletes was still relatively low. This result can also be

seen from the percentage level of VO2max ability in athletes. The previous relevant research has shown that national players have better VO2max than division 1 football players and 13% higher than division 2 players (Haugen et al., 2014). Based on these results, the VO2max in athletes needs to be increased again considering that the range of VO2max values that football athletes must have is 50-75 ml/kg/min (Modric et al., 2020). In line with the statement Septiany et al. (2019) that a football players with a high VO2max value can increase stamina or endurance when playing football. The farther the distance that can be covered, the faster recovery time and displays the ability to play well when under high pressure from opponents (Bahtra et al., 2020; Pratama & Nawawi, 2020). Subsequent studies have found that football players who are in the drum position have a higher VO2max than goalkeepers by 8% (Haugen et al., 2014).

A study by Hariyanti et al. (2020) stated that endurance is a component that is very much needed for an athlete. In addition, endurance also affects the quality of a player when carrying out a series of movements in a football game (Hardinata et al., 2021), and is an important factor in fighting fatigue during play. Therefore, for an athlete who wants to increase speed, strength, flexibility, and vital capacity, endurance is the main factor in developing these components of physical condition (Indrayana & Yuliawan, 2019). Furthermore, it is important for athletes to train systematically, planned, and continuously in order to achieve peak performance (Indrayana & Yuliawan, 2019).

Factors that affect endurance can be heredity, age, gender, aerobic capacity, anaerobic capacity, and physical activity (Prananda & Yanti, 2021). Another study conducted on young football athletes at the Real Madrid Football School and Baturetno Football School showed that athletes had poor knowledge about the nutritional and fluid requirements for young football athletes at the Real Madrid Football School and Baturetno Football School (Puspaningtyas et al., 2019). Apart from that, the age factor of 31-35 years until physiologically advanced, there was a decrease in body functions such as the cardiovascular and respiratory systems (Senefeld & Hunter, 2019) which are influenced by genetics, the cardiovascular system, exercise patterns, lifestyle, and body composition. Furthermore, professional athletes who experience Anterior Cruciate Ligament (ACL) injuries turn out to have a significant effect on decreasing aerobic fitness (De Almeida et al., 2018).

Several exercises can be done to improve physical fitness while in the case of elementary-aged children it can have a positive influence on gross motor (Samodra et al., 2023), one of which is by doing physical activity through sports (Ramirez-Campillo et al., 2022), and food intake also needs to be considered (Kuswari et al., 2019). A study conducted by Putra and Siahaan (2022), found that in order to improve VO2max abilities it is necessary to carry out systematically planned exercises. Using the Nike Training Club application has a significant effect on the endurance of futsal extracurricular players (Faozi & Rahmawati, 2019). According to Putro et al. (2018), he also stated that the Android application was designed as a tool for cardiovascular endurance fitness programs and there are 3 main features, namely providing education about fitness, assisting in VO2max testing, and assisting in making cardiovascular endurance fitness training programs automatically. In addition, the fartlek training method is an excellent form of training to increase endurance in almost all sports (Pratama et al., 2022; Pribadi et al., 2022). In order for VO2max to be maintained, endurance training must be carried out continuously so that significant fatigue does not occur (Candra, 2020). Therefore, a study by Hardinata et al. (2021) shows that triangle runs are proven to increase VO2max in football games.

CONCLUSION

The results of the research and discussion have a strong theoretical backing to be used as a reference source in the study of the VO2max physical condition of football players and connected sports. The basis for reference to previous research and the results of the packaged review of articles are included in the basis and discussion of the results and discussion. The results of this study have provided information that the VO2max ability of Club Pusaka FC football athletes is still relatively low where there are still many athletes who are in the below average and poor categories, then some athletes are in the average category. The results of this study certainly provide a new reference regarding the physical condition of VO2max in football games. These results can also be used as a reference for providing advanced training programs to improve VO2max abilities, especially in football athletes. However, it is necessary to know that the limitations of this study lie in the condition of the

players' nutritional intake which has not been controlled and their age which must also be taken into consideration by researchers. Recommendations for further research can test and compare the effectiveness of weight training and triangle run exercises on increasing VO2max abilities in football athletes.

ACKNOWLEDGEMENTS

The author would like to acknowledge the managers, instructors, personnel, and players of Pusaka FC for providing the opportunity and assisting with this research.

CONFLICT OF INTEREST

There is no conflict of interest.

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