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Analysis of the Physical Demand of Rugby 7s Athletes

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Abstract

This study aims to analyze the physical condition of Rugby 7s athletes, focusing on aerobic endurance, speed, and agility. A total of 12 male provincial-level Rugby 7s athletes who participated in the 2024 XXI National Sports Week (PON) in Aceh–North Sumatra were involved in the study. Aerobic endurance was assessed using the 12-minute run test (Cooper Test), speed was measured through 10-meter, 30-meter, and 30-meter flying start sprint tests, while agility was evaluated using the standardized T-Test. The results showed variations in physical performance among the athletes, reflecting individual fitness levels across the three components tested. These findings provide a comprehensive overview of the physical condition profiles of Rugby 7s athletes and emphasize the importance of aerobic endurance, speed, and agility in supporting game performance. This study contributes valuable benchmark data for evaluating and designing more specific, structured, and effective physical training programs. Coaches and sports practitioners can utilize these results to develop more targeted training strategies, aiming to enhance the competitive performance and achievements of Rugby 7s athletes.

Keywords: Rugby 7s, Benchmark, Speed, Agility, Aerobic Endurance

INTRODUCTION

Rugby union is a contact sport that is intermittent in nature, players perform a series of high intensity actions followed by rest periods that may not fully restore their condition. (Duthie et al., 2003 & Cerdas, 2011). The movement pattern is determined by acceleration, sprinting, carrying the ball, and tackling, interspersed with walking or jogging to return to playing position. (Duthie et al., 2003; Duthie et al., 2005; Duthie et al., 2006). Rugby union was originally played with only 15 players on each side, then another match number appeared, number 7, Ned Haig and David Sanderson created Rugby 7s with the aim of creating a faster and more exciting game than traditional rugby 15s (Jones et al. 2015).

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Currently, the popularity of rugby 7s is increasingly widespread, this began with the holding of an international tournament in Hong Kong in 1976. The Hong Kong Sevens tournament was a turning point that introduced rugby 7s to a global audience (Higham et al. 2019). Rugby 7s reached a significant milestone with its debut at the 2016 Olympics, as expressed by Brown (2020) who noted the increase in global popularity, especially in countries less familiar with rugby. Furthermore, Smith and Taylor (2021) highlighted the role of rugby 7s as a tool for sports diplomacy, supported by World Rugby's development program for developing countries. Anderson (2022) also emphasized that rugby 7s is more than just a sport, but a cultural phenomenon that upholds sportsmanship, cooperation, and inclusion.

According to a study conducted by Couderc et al. (2019), rugby 7s players performed an average of 27 high-intensity activities per match, which included 37% collisions (such as tackles and rucks), 34% rapid accelerations, 27.5% high-speed running, and 1.5% sprints. In addition, each player experienced approximately 3.7 repeated high-intensity effort (RHIE) episodes, which are a series of three or more high-intensity activities with a recovery interval of less than 21 seconds in between. These findings suggest that the physical demands of rugby 7s matches are high and varied, requiring optimal aerobic and anaerobic capacity, as well as rapid recovery ability to maintain performance throughout the match.

In relation to body composition and athletic ability of rugby athletes, Cross et al. (2016) stated that rugby 7s athletes generally have a body fat percentage of around 8–12% for men and 12–18% for women, and the ability to sprint 40 meters in less than 5.5 seconds. In addition, the average vertical jump of professional players reaches 60–70 cm, indicating high leg explosiveness. The article also highlights the importance of VO2 max as an indicator of aerobic capacity, with a minimum standard of 50–60 ml/kg/min to ensure players can recover quickly between sprints. Based on research by Lee et al. (2018), the average VO_2max of Singapore national rugby 7s players participating in the Asia Rugby 7s Series in 2015 and 2016 was 46.7 ± 3.7 ml kg^{-1} min^{-1}, which can be used as a benchmark for the aerobic performance of rugby 7s athletes in the Southeast Asia region. This physical benchmark is a reference for coaches to design specific training programs to improve athlete performance on the field.

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Previous studies have made important contributions to understanding the physical aspects that are crucial for Rugby 7s athletes. Studies such as that conducted by Lakomy (2016) have provided an overview of the physical demands of the game, including strength, speed and endurance, although have not integrated the various components in depth. Furthermore, research by Till et al. (2017) specifically investigated the anthropometric and physical characteristics of elite male Rugby 7s players, providing valuable quantitative data on the physical profile of athletes. However, there is a significant gap in the current scientific literature, namely the lack of more comprehensive analyses that simultaneously integrate the various interrelated physical aspects. In particular, there is a need for more in-depth exploration of how the combination of factors interact and contribute to overall athletic performance in the context of Rugby 7s.

Research into other sports with similar physical demands such as studies into endurance in team sports, flexibility and athletic performance, and a review of the physiological demands of Rugby 7s by Gabbett (2016), and insights from Rugby Union research by Barnes et al. (2014) can provide valuable additional perspectives to fill the gap in our understanding of the integration of physical aspects into Rugby 7s. Principles from books such as Fleck & Kraemer (2014) also underline the importance of flexibility in athletic training programmes.

This study aims to provide a comprehensive analysis of the physical condition of Rugby 7s athletes, with a primary focus on three key components of physical performance, namely Aerobic endurance, speed, and agility. Suarez-Arrones et al. (2020) emphasized that measuring sprinting and agility performance provides important insights into rugby athletes readiness to face the demands of the match. These three aspects were chosen because they play an important role in supporting the high physical demands inherent in the game of Rugby 7s, which requires athletes to be able to maintain performance intensity throughout the short but very intense match duration.

By systematically analyzing the profile of each physical condition component, this study is expected to contribute empirical data that comprehensively describes the fitness characteristics of Rugby 7s athletes. These findings not only serve to map the athletes' current physical readiness but also provide a scientific foundation for developing more structured, specific, and performance-oriented training programs tailored to the demands of Rugby 7s.

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METHOD

This study is included in the type of descriptive study that aims to analyze the profile of physical conditions and aspects of athletic performance in the sport of Rugby 7s. Descriptive studies are used to provide a systematic and accurate picture of the characteristics of the research subjects as they are, without manipulating the variables studied. This approach is in accordance with the opinion of Creswell & Creswell (2018) who stated that descriptive studies aim to illustrate certain phenomena or conditions in detail through the collection and analysis of quantitative data. The research was carried out during the athlete training camp period as part of the preparation for the XXI National Sports Week (PON) which will be held in the provinces of Aceh and North Sumatra in 2024.

The population in this study consisted of male Rugby 7s athletes who were members of the regional training program for the XXI National Sports Week (PON). All members of the population who met the inclusion criteria, namely 12 athletes, were used as research samples. The inclusion criteria included athletes who were actively registered in the training program and had no history of serious injuries in the last six months that could potentially affect participation in physical testing. This study used a total sampling technique, namely taking samples from the entire relevant population, which was considered appropriate in conditions of a limited population size. This approach is in accordance with the opinion of Etikan, Musa, & Alkassim (2016) who stated that total sampling is appropriate when the population size is relatively small and all of its members are relevant to be analyzed. Participation in this study was voluntary, taking into account the willingness and availability of athletes to participate in the entire series of data collection.

The research procedure includes the data collection stage carried out in several physical testing sessions in accordance with the applicable test protocol standards in Rugby 7s. Data collection instruments consist of various measuring instruments for physical condition and athletic performance, such as VO_2max, speed, and agility tests. In accordance with Gabbett's statement (2016), physical performance assessments must consider the specific demands of the sport, so that the tests used in this study are adjusted to the characteristics of Rugby 7s. The data analysis technique was carried out

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descriptively with the aim of providing a comprehensive picture of the physical and athletic profiles of Rugby 7s athletes who were the subjects of the study.

Demographic data such as age, height, weight, and playing experience will be recorded. Aerobic endurance will be measured using a 12-minute running test, recording the total distance covered. Physical performance aspects will be evaluated through 10-meter, 30-meter and 30-meter fly sprint speed tests, and agility using the T-Test (Bompa & Claro. 2008). Data collection procedures will be carried out in one testing session for each participant, with a standardized test sequence to minimize the effects of fatigue. The collected data will be analyzed using descriptive statistics (mean, standard deviation) to describe the athlete's physical condition profile.

RESULT

Following a series of physical tests designed to evaluate the various physical components relevant to the demands of the Rugby 7s game, the next section of this study will present quantitative findings obtained from athlete measurements. The data to be presented includes the results of sprint tests at a distance of 10 meters and 30 meters (including a flying start to measure maximum speed), agility ability through the T-Test, and Aerobic endurance as measured by the Cooper Test. Descriptive analysis of this data will provide a clear picture of the physical condition profile of the athletes involved in this study.

Table.1 Physical Test Results

Male	10 m	30 m	30 m fly	T-test	Cooper test
Average	1,77	4,32	3,75	10,00	47,18
Standard deviation	0,10	0,15	0,15	0,47	6,50

The data obtained from the physical test of the Men's team showed quite good results in several categories. In the speed test, the average time to complete the 10-meter sprint test was 1.77 seconds with a standard deviation of 0.10 seconds, indicating that the participants had very consistent times, this is in line with the opinion of Batterham & Hopkins (2015), a good average value with a low standard deviation indicates solid and consistent performance among athletes. In the 30-meter sprint test, the average time

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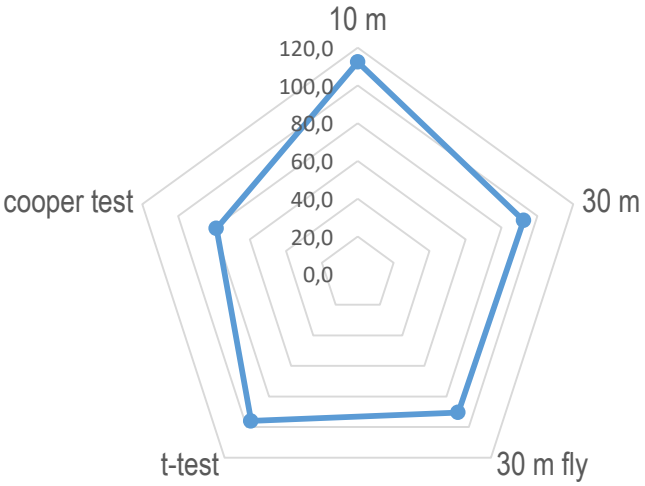
required was 4.32 seconds with a standard deviation of 0.15 seconds, indicating good performance with small time variations between participants. The 30-meter fly test showed an average time of 3.75 seconds with the same standard deviation, which is 0.15 seconds, which also shows high consistency among the Men's team participants. In terms of agility, the t-test showed an average value of 10.00 with a standard deviation of 0.47, indicating the stability of the participants' performance in the agility test. Jeffreys and Moody (2016), stated that measuring speed and agility is very important for assessing athlete capabilities in team sports, and analysis of variability such as standard deviation provides an overview of the consistency of performance within a group.

Chart 1. Percentage of Physical Test



From the endurance test results, the Men's team scored an average of 47.18 with a standard deviation of 6.50 in the 12-minute run test. The average score indicates that most participants were able to maintain a fairly good running speed throughout the test duration, reflecting aerobic capacity that supports performance in sports such as rugby. Meanwhile, the fairly large standard deviation (6.50) indicates significant variation in performance among participants. This means that there are striking differences in physical ability, some participants may show superior long-distance running ability, while others have difficulty maintaining speed or rhythm due to limited endurance. These differences can be caused by various factors, including individual fitness levels, training experience, and physical conditions during the test.

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DISCUSSION

This study analyzed the results of physical tests on the Men's team which included speed, agility, and endurance tests. The 10-meter speed test indicated that the participants had very consistent times, the 30-meter test showed good performance with little variation in times between participants, and the 30-meter fly test also showed high consistency among team members. Jones and Smith (2021) said that successful teams in rugby 7s usually have flexible and adaptive playing patterns, with a focus on quick transitions from defense to attack.

Quick and accurate decisions in pressure situations are important elements that distinguish winning teams from other teams. Based on the following opinion and supported by the results stating that the speed of the men's team showed good performance, it can support the game process, especially in fast transitions both when attacking to defending and vice versa. The results of the T-test agility test on the men's team indicated the stability of participant performance, which reflects the athlete's readiness to face changes in direction and rhythm of the game. This supports the team's ability during the transition process in the game, as explained by Young & Farrow (2018), that effective agility contributes significantly to fast and efficient responses in the transition phase of the game in team sports.

For endurance tests, it indicates quite large variations between participants. Higham, et. al (2013) showed that endurance for rugby 7s athletes was 53.8 ± 3.4 mL kg–1 min–1. Based on the results of the endurance test obtained from the Cooper Test score, the average VO_2max of male athletes was 47.18 ml/kg/minute. When compared to the ideal VO_2max value of 53.8 ml/kg/minute, there is a difference of 6.62 ml/kg/minute. This difference indicates that the aerobic capacity or aerobic endurance of athletes is still below the ideal performance standards usually possessed by high-level athletes. Thus, although the value is quite good for the general category, improvements in the endurance aspect are highly recommended so that the athlete's physical performance can be more optimal and approach the standards of elite athletes. Several types of exercise that can be done to increase VO_2max include high intensity interval training (HIIT), fartlek training, and medium to long distance running with variations in tempo.

Overall, the team performed well in all categories of the tests performed, with fast times on the speed tests and good scores on the endurance tests, although there was

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considerable variation in endurance. These results suggest that while athletes' aerobic capacity still needs to be improved, their physical performance on the speed tests is already at the desired standard in Rugby 7s. The agility tests showed stability in performance, reflecting the team's readiness to respond to changes in direction and rhythm of play. This is important because the rapid transitions in Rugby 7s can determine a team's success in facing an opponent. Endurance enhancement is highly recommended so that the team can achieve optimal aerobic capacity and approach elite athlete standards. Higham et al. (2013) showed that endurance, speed, acceleration, repeated sprints and strength can be improved without compromising other performance qualities. Therefore, a comprehensive training program, which includes improvements in endurance and other physical components, needs to be designed to support overall team performance improvement.

CONCLUSION

Based on the analysis of the research results, it can be concluded that the Men's Rugby 7s team has a significant advantage in the speed and agility components. The test data showed consistent travel times and approached high performance standards, indicating the team's readiness to make game transitions quickly and effectively. However, an evaluation of team endurance revealed that the average VO_2max capacity of athletes was still below expectations for elite level athletes. Therefore, efforts to improve endurance are very relevant to optimize overall physical performance. Training methods such as high intensity interval training (HIIT), fartlek, and other aerobic training are suggested to increase endurance capacity without sacrificing the quality of other physical components. Overall, the findings of this study provide a strong basis for designing a more focused and specific training program for the Men's team. This program should prioritize improving aerobic endurance while maintaining and developing the already good speed and agility. A balance in the development of these various physical components, as emphasized by Bompa and Claro (2008), will be key to achieving optimal performance in Rugby 7s competition.

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