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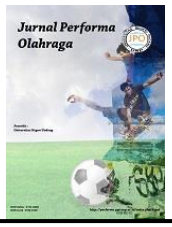

CORRELATION OF VO2MAX AND AGILITY WITH FUTSAL PLAYING SKILLS

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ABSTRACT

A low VO2max can slow down the recovery process, which can affect skills in subsequent matches. When athletes become tired, their agility and technical skills decline. Low VO2max ability and limited agility can also affect athletes' psychology in futsal playing skills. The aim of this research is to determine the correlation between VO2max and agility with futsal playing skills. The method used is quantitative research with a correlational design. The population in this study was 30 students who took part in extracurricular activities at SMA 2 Kendari. The sampling technique used total sampling, namely the entire population sampled was 30 people. The VO2max test instrument uses the Cooper test. Agility instruments use agility tests. The instrument for playing futsal skills uses passing, controlling and shooting tests. Based on the results of the correlation test between VO2max, agility and futsal playing skills (rx1x2Y) which is 0.758 with a significance value of 0.000 with a coefficient of determination of 0.57 or 57% supported by the VO2max and agility factors, it can be concluded that there is a correlation between VO2max and agility and playing skills. futsal with a significance value <0.05. From the research results it can be concluded that there is a significant correlation between VO2max and agility with futsal playing skills.

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INTRODUCTION

Futsal is a sport that combines complex physical, technical and tactical elements. Futsal players must have superior technical skills, the ability to move quickly, and good physical endurance to succeed in this fast-paced and intense game. Therefore, research on the factors that influence player performance in futsal has become the focus of attention in the world of sports (Gumantan et al., 2021). In this case, VO2max ability (the maximum volume of oxygen that can be taken in by the body during physical activity) and agility are two important factors that have a significant role in futsal playing skills (Sepang et al., 2023). VO2max reflects a person's cardiorespiratory fitness, while agility is the ability to move quickly and control the body agilely (Nohrizal & Kahri, 2020). Futsal playing skills include ball control, dribbling, passing, kicking and other technical aspects. The question that arises is to what extent VO2max and agility abilities can contribute to futsal playing skills (Sugiarto et al., 2022).

Futsal playing skills include dribbling, passing, kicking, ball control, and team interaction (Sekulic et al., 2021). Players who have these skills well are more effective in matches. VO2max is an indicator of cardiorespiratory fitness, which reflects the body's ability to use oxygen during physical activity (Haryesa et al., 2021). A high VO2max level is often associated with better endurance during training and competition. Agility is an important factor in playing futsal (Pratomo et al., 2023). Agile players can more easily avoid opponents,

dribble the ball, and participate in game situations well. Futsal players with a high VO2max perform better because they have better endurance, while players who are more agile and better are able to control the ball and participate in game situations better. The results of research on the correlation between VO2max, agility and futsal playing skills can provide valuable insight in developing more effective training programs (Yunus & Raharjo, 2022). Coaches and players can use this information to improve their performance in this sport.

VO2max ability is influenced by a person's general physical condition. Regular cardiorespiratory training can increase VO2max. Therefore, players with good physical condition tend to have a higher VO2max, which will contribute to their endurance during futsal matches. A high VO2max can produce players who are more durable on the field. In the context of futsal, this can mean that players have more opportunities to apply their skills well during the game. Additionally, with better endurance, players can make better decisions in fast-paced game situations. Agility is also greatly influenced by the player's physical condition (Paskalis et al., 2022; Fauzi & Mardiana, 2022; Sugiarto et al., 2022). Flexibility, strength, and speed of key muscles play a role in a person's ability to move quickly and agilely. Proper physical training can improve a player's agility. Agility has a direct impact on a player's ability to control the ball, avoid opponents, and participate in dynamic game situations (Fitrian et al., 2023).

More agile players have the ability to apply their technical skills better and more efficiently. Good physical condition provides a foundation for the development of technical skills in futsal. For example, players with sufficient muscle strength can be better at controlling the ball and executing accurate kicks. Players with good strength and flexibility are more efficient at dribbling (Pinho et al., 2022). In futsal, technical skills and physical condition must work together. A good VO2max ability gives players the opportunity to apply their technical skills repeatedly during a game, while allowing them the agility to perform the movements necessary to apply those skills well. Overall, physical condition is an important factor in understanding the correlation between VO2max ability, agility, and futsal playing skills. Good physical condition can provide players with a strong foundation for improving their endurance, agility and technical skills in this sport. Therefore, improving physical condition through training and health management is the key to developing quality futsal players (Kusumawati et al., 2019; Apriantono et al., 2023).

The problem that occurs in many athletes who have low VO2max or lack poor cardiorespiratory endurance will experience fatigue more quickly during the competition. This fatigue can affect futsal playing skills, especially in situations that require extra effort. A player's ability to recover efficiently between futsal playing activities is very important. A low VO2max can slow down the recovery process, which can affect skills in subsequent matches. When athletes become tired, their agility and technical skills decline. Low VO2max makes athletes more susceptible to fatigue, which in turn can affect futsal playing skills. Tired athletes are more likely to make poor decisions on the field. This includes decisions about when to dribble, when to take a shot, or when to pass. Low VO2max can affect an athlete's ability to make good decisions. Agility is very important in futsal, especially in situations that require quick maneuvers and avoiding opponents. Lack of agility can reduce futsal playing skills, especially in defensive situations and ball movement. Every athlete has a different VO2max and agility level. These differences can create inequalities in futsal playing skills, especially if teams consist of players with different fitness levels.

Low VO2max ability and limited agility can also affect athlete psychology. They feel frustrated or lack confidence, which can affect their futsal playing skills. It is important for athletes and coaches to understand how VO2max and agility abilities can influence futsal playing skills. By evaluating these issues and designing appropriate training programs, athletes can work to maximize their skills on the field. This involves focused physical exercise, a good recovery program, and efficient health management. So the aim of this research is to find out and analyze the correlation of VO2Max ability with futsal playing skills, the correlation of agility with futsal playing skills, and the correlation of VO2Max ability and agility with futsal playing skills.

METHOD

The method used is quantitative research with a correlational design with the aim of finding out the correlation between VO2max and agility with futsal playing skills. This research was carried out on students at SMA Negeri 2 Kendari, the implementation of this research outside of school learning hours was carried out in October 2023. The population in this study was students who took part in extracurricular activities at SMA 2 Kendari totaling 30 people, the sampling technique was total sampling, namely The entire population sampled was 30 people. The VO2max test instrument uses the Cooper test (Ginting et al., 2023). The agility instrument uses an agility test (Pasaribu, 2020). The instrument for playing futsal skills uses passing, controlling and shooting tests (Fadhillah et al., 2023). The VO2max test data collection technique is to first warm up, stand at the starting point when running and wait for the signal to do the running test. Run without stopping for 12 minutes, if you are tired, alternate with walking. Travel time is 12 minutes, distance measured.

The agility data collection technique is divided into 6 test groups, passing through arranged cones, the sample stands on starting line A and goes to point B by touching the cone. When passing cone A the stopwatch is stopped. If the hand does not touch the cone during the test, it is considered a failure. Data collection

techniques for futsal playing skills are (1) kicking and stopping the ball, the sample stands behind the line 3 meters away, on the "yes" signal, kicks the ball at a target or wall for 30 seconds. The score is calculated if the ball is held in front of the kick line. (2) dribbling the ball, namely dribbling the ball in the direction through obstacles in accordance with the specified arrow direction, dribbling is done with the left and right feet alternately using a stopwatch, the time elapsed when dribbling the ball from start to finish. (3) shooting at a target or shooting, done by kicking the ball towards a predetermined target. If you kick it outside the target, it still counts but the score obtained is zero. The opportunity to kick is given 6 times.

The data analysis technique uses descriptive statistical values by finding the mean value, standard deviation, maximum value and minimum value. Next, SPSS analysis uses regression, namely using the data normality test, data linearity test, and hypothesis testing using the correlation test with SPSS version 26.

RESULT AND DISCUSSIONS

Research Result

The research implementation consisted of 3 variables, namely the independent variable VO2max and agility, while the open variable was futsal playing skills. The results of the research description are as follows:

Table 1. Descriptive Statistics of VO2max, Agility, and Futsal Playing Skills

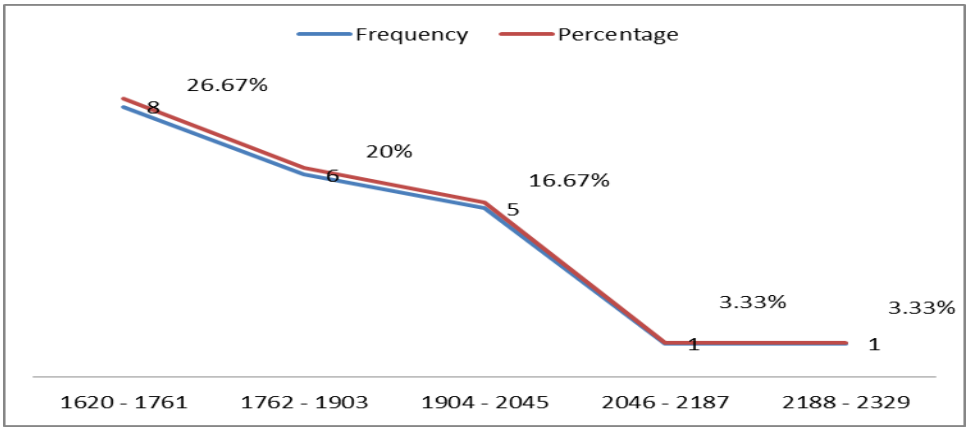
Variable	Mean	Standard Deviation	Maximum	Minimum
VO2max (X1)	2007.43	282.12	2450	1620
Agility (X2)	11.156	0.64	12.30	10.00
Futsal playing skills (Y)	72.652	5.29	87.29	61.70

Based on the results of descriptive statistical data analysis, the mean value for VO2max was 2007.43, with a standard deviation of 282.12, a maximum value of 2450, and a minimum value of 1620. The mean agility variable was 11.1567, with a standard deviation of 0.64, a maximum value of 12.30, and the minimum value is 10.00. The futsal playing skill variable has a mean value of 72,652, with a standard deviation of 5.29, a maximum value of 87.29, and a minimum value of 61.70. The following is the frequency distribution of VO2max, agility and futsal playing skills.

Table 2. Frequency Distribution of VO2max (X_1)

Interval	Frequency	Percentage
1620 - 1761	8	26,67%
1762 - 1903	6	20%
1904 - 2045	5	16,67%
2046 - 2187	1	3,33%
2188 - 2329	1	3,33%
2330 - 2471	9	30%
Total	30	100%

Based on the results of the frequency distribution analysis of students' VO2max ability, it was 26.67% with 8 people having a score interval of 1620 - 1761, 20% with 6 people having a score interval of 1762 - 1903, 16.67% with 5 people having a score interval 1904 – 2045, amounting to 3.33% with 1 person having a score interval of 2046 – 2187, amounting to 3.33% with 1 person having a score interval of 2188 – 2329, amounting to 30% with 9 people having a score interval of 2330 – 2471. These results can be depicted in a histogram as follows.



Gambar 1. Histogram Kemampuan VO2max

Table 3. Frequency Distribution of Agility (X_2)

Interval	Frequency	Percentage
10 - 10,39	4	13,33%
10,40 - 10,79	7	23,33%
10,80 - 11,19	2	6,67%
11,20 - 11,59	6	20,00%
11,60 - 11,99	10	33,33%
12,00 - 12,39	1	3,33%
Total	30	100%

Based on the results of the analysis of the frequency distribution of student agility, it was 13.33% with 4 people having a score interval of 10 - 10.39, amounting to 23.33% with 7 people having a score interval of 10.40 - 10.79, amounting to 6.67% with 2 people having a score interval of 10.80 - 11.19, amounting to 20.00% with 6 people having a score interval of 11.20 - 11.59, amounting to 33.33% with 10 people having a score interval of 11.60 - 11.99, amounting to 3.33% with 1 person having a score interval of 12.00 - 12.39. These results can be depicted in a histogram as follows.

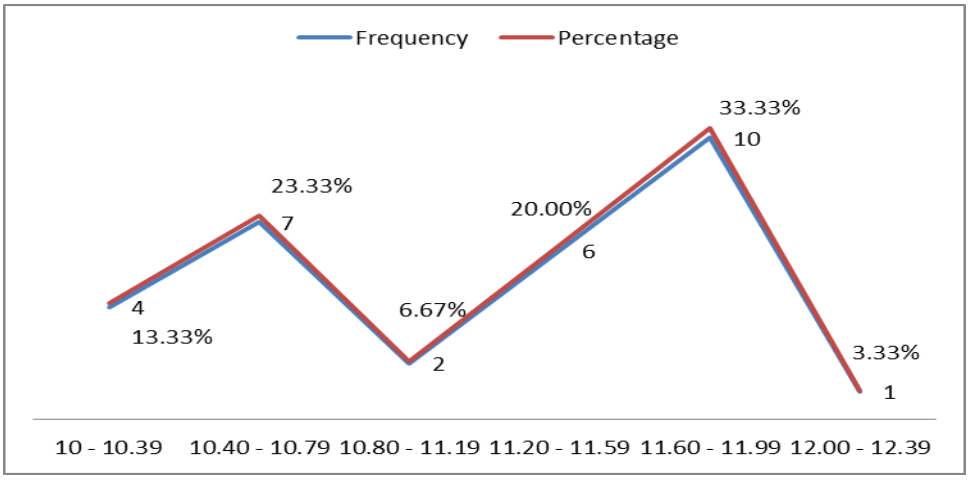


Figure 2. Agility Histogram

Table 4. Frequency Distribution of Futsal Playing Skills (Y)

Interval	Frequency	Percentage
61,7 - 66,05	2	6,67%
66,06 - 70,41	9	30,00%
70,42 - 74,77	8	26,67%
74,78 - 79,13	8	26,67%
79,14 - 83,49	2	6,67%
83,50 - 87,85	1	3,33%
Total	30	100%

Based on the results of the analysis of the frequency distribution of students' futsal playing skills, it was 6.67% with 2 people having a score interval of 61.7 - 66.05, amounting to 30.00% with 9 people having a score interval of 66.06 - 70.41, amounting to 26.67% with 8 people having a score interval of 70.42 - 74.77, amounting to 26.67% with 8 people having a score interval of 74.78 - 79.13, amounting to 6.67% with 2 people having an interval score 79.14 - 83.49, amounting to 3.33% with 1 person having a score interval of 83.50 - 87.85. These results can be depicted in a histogram as follows.

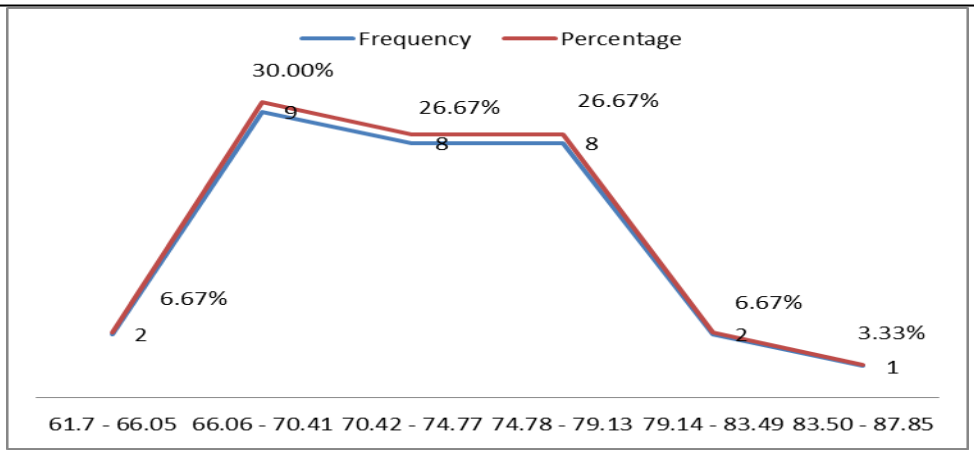


Figure 2. Histogram of Futsal Playing Skills

Prerequisite test for analysis using the research data normality test to determine whether the data is normal or not, using the one sample Kolmogorov Smirnov statistical test based on each variable. For linearity test data, use deviation of linearity. This data was analyzed using the SPSS version 26 application, with the following procedure: (probability > 0.05 research is normally distributed, and if probability < 0.05 is not normally distributed). The normality test results can be seen in the following table:

Table 5. Normality of VO2max, Agility and Futsal Playing Skills Data

Data	X_1	X_2	Y	Significance	Information
Asymp. Sig. (2-tailed)	0,192	0,539	0,808	0,05	Normal

Based on data analysis through a normality test for the VO2max variable it was 0.192, the agility variable was 0.539, and for the futsal playing skill variable it was 0.808. From these results it can be concluded that the values of the three variables are greater than 0.05, meaning they are normally distributed. The following is a linearity test which can be seen in the following table.

Table 6. Linearity of VO2max, Agility and Futsal Playing Skills Data

Data	$Y - X_1$	$Y - X_2$	Significance	Information
Linearity Deviation	0,516	0,110	0,05	Linear

Based on the results of the linearity test between VO2max and futsal playing skills with a value of 0.516, and between agility and futsal playing skills with a value of 0.110. From the results of the linearity test, both data are linear, because the probability value is greater than 0.05. Hypothesis testing to see whether there is a correlation between the ability variables VO2Max (X1), agility (X2) and the dependent variable, namely futsal playing skills (Y), both the relationship between each variable and together. The results of hypothesis testing can be described as follows:

Table 6. Variables VO2Max (X1), Agility (X2) with Futsal Playing skills (Y)

Varible	Pearson Correlation	Significance
Correlation of VO2Max (X1) with Futsal Playing skills (Y)	0,624	0,000
Correlation of Agility (X2) with Futsal Playing skills (Y)	0,727	0,000
Correlation of VO2Max (X1), Agility (X2) with Futsal Playing skills (Y)	0,758	0,000

Based on the results of the correlation test between VO2max and futsal playing skills (rx1Y), namely 0.623 with a significance value of 0.000 with a coefficient of determination of 0.39 or 39% supported by VO2max ability, it can be concluded that there is a correlation between VO2max ability and futsal playing skills with a significance value of < 0.05. The results of the correlation test between agility and futsal playing skills (rx2Y) are 0.727 with a significance value of 0.000 with a coefficient of determination of 0.53 or 53% supported by the agility factor, it can be concluded that there is a correlation between agility and futsal playing skills with a significance value of <0, 05. The results of the correlation test between VO2max, agility and futsal playing skills (rx1x2Y) are 0.758 with a significance value of 0.000 with a coefficient of determination of 0.57 or 57% supported by the VO2max and agility factors, it can be concluded that there is a correlation between VO2max and agility and futsal playing skills with a significance value <0.05.

Discussions

The research results show that there is a positive correlation between VO2max ability and futsal playing skills. This means players with higher VO2max levels have better futsal playing skills. This fact emphasizes the importance of cardiorespiratory fitness in player performance during futsal matches. A high VO2max ability can increase a player's ability to play the game with better endurance. In a fast, long game like futsal, this gives players more opportunities to actively participate in the match, apply their technical skills and make the right decisions. This can also reduce the risk of fatigue during the game. Therefore, futsal players and coaches can realize the importance of training and developing cardiorespiratory fitness, as well as how to increase their VO2max ability to improve futsal playing skills. This research also shows that there is a positive correlation between agility and futsal playing skills. More agile players tend to have better futsal playing skills. Agility affects a player's ability to move quickly, avoid opponents, and control the ball. This is important in fast and dynamic game situations such as futsal. With good agility, players have an advantage in dribbling, passing, kicking and participating in complex game situations. As a result, futsal players and coaches can focus training on agility development as an integral part of improving futsal playing skills.

A player's physical condition plays a key role in shaping both VO2max and agility. Good physical condition is a prerequisite for improving cardiorespiratory abilities and agility. Therefore, understanding the importance of physical condition and the role of cardiorespiratory training and general physical training in improving the performance of futsal players is important. The results of this research have significant practical implications in the development of more effective futsal training programs. According to Wiriawan & Sukmanda, (2017), coaches can design training that includes cardiorespiratory training, strength training and agility training to maximize players' abilities in terms of VO2max and agility. This research is also relevant in developing young talent in futsal. Knowing that these physical factors can improve futsal playing skills can help in identifying and developing young players with potential. Overall, this research makes a valuable contribution to understanding the factors that influence futsal playing skills. This underlines the important role of cardiorespiratory fitness, agility and general physical condition in improving the performance of futsal players. By better understanding this relationship, futsal players and coaches can design more effective training programs and improve the quality of the sport of futsal as a whole.

Players with higher VO2max levels have better technical skills or whether cardiorespiratory fitness influences endurance during a match, which in turn can influence skill (Hudain et al., 2023). Agility can also be an important factor in futsal playing skills. More agile players have the ability to change direction quickly, avoid opponents, and dribble the ball more effectively (Pamungkas et al., 2022). VO2max reflects the body's ability to use oxygen during physical activity. Players with a high VO2max have better endurance during futsal matches. This can impact their skills, especially in the later stages of a match when fatigue can affect performance. Agility can affect a player's ability to dribble the ball, avoid opponents, and perform quick maneuvers. Discussions may involve research or findings on how agility tests can predict or correlate with futsal technical skills. In futsal, situations can change quickly, and players need to respond quickly. Agility can contribute to a player's ability to respond to dynamic situations, such as dealing with opposing defenses or creating goal opportunities. Futsal involves complex technical skills, including controlling the ball, passing, and executing kicks. How physical factors such as VO2max and agility interact with these technical aspects can be a point of discussion.

CONCLUSSION

This research shows that VO2max ability has a positive correlation with futsal playing skills. Players who have a high VO2max level have better endurance during futsal matches. A high VO2max can improve a player's ability to stay engaged in the game, optimize their technical skills, and make better decisions throughout the game. This research also shows that agility has a positive correlation with futsal playing skills. Players who are more agile and better able to control the ball, evade opponents, and participate in a variety of game situations. Agility can influence futsal playing skills in terms of movement, dribbling, passing and kicking. A player's general physical condition plays an important role in determining their VO2max and agility capabilities. Exercise and good health management can improve overall physical condition, which can have a positive impact on futsal playing skills. This research has significant practical implications. Futsal players, coaches and talent developers can use these findings to design more effective training programs. This research may also help in preventing player injuries and promoting good physical health within the futsal community. Overall, this research provides evidence of the importance of understanding and developing a player's physical condition in a futsal context. Both VO2max ability and agility have an important role in forming futsal playing skills. Therefore, futsal players seeking to improve their skills should pay attention to these aspects in their training program.

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