

Relationship Between Body Mass Index and Physical Condition of Endurance of Football Referees of PSSI, Rokan Hulu Regency, Zone I

Deri Putra^{1A-D*}, Resdianto^{2BC}, Chayani^{AC}

¹²³Universitas Pasir Pengaraian, Riau, Indonesia

ABSTRACT

The problem in this study is the physical condition which is an important aspect for a football referee in carrying out the task of leading a football match for 90 minutes. The dominant physical aspect of leading the match is closely related to endurance. In reality, the condition of the Referee in the PSSI football sport of RokanHulu Regency Zone I on average has a reduced physical fitness condition. This research is a correlational study that aims to determine the relationship between Body Mass Index and the physical condition of the endurance of the PSSI football referee Rokan Hulu Zone I. with license levels C3, C2, and C1. This study uses 2 variables, consisting of 1 independent variable and 1 dependent variable. The independent variable is Body Mass Index (X), while the dependent variable is Endurance (Y). Based on the results of the correlation test using Product moment correlation, it shows a significant value ($r_{xy} = 29.62$) so it can be said that Body mass index is related to referee endurance. From the results of this analysis, the correlation coefficient value is obtained as $r_{count} = 29.62 > r_{table} = 0.396$ which means it has a solid relationship.

Keywords: Football Referee; Body Mass Index; Endurance

Corresponding author:

*Deri Putra, University of Pasir Pengaraian, Riau, Indonesia. Email: deriputra@upp.ac.id

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INTRODUCTION

Indonesian people like sports activities; one of their favourite sports is football. Football is a sports game that is played using the feet. Football is the most popular sport in Indonesia, with a large proportion of the population actively involved or following the sport. A survey showed that almost 50% of Indonesians consider football their favourite sport (Suryanto et al., 2022). In Sidoarjo, a study found that football is the most widely played sport, with 26% of respondents regularly participating (Hakim, 2022). The Indonesian Football Association (PSSI) has been the governing body since 1930, highlighting the long tradition and institutional support for the sport (Hakim & Astuti, 2024). Football is one of the most popular sports in Indonesia. Football is a game played by two teams, with a minimum limit of 7 per team and a maximum limit of 11 players, whose primary goal is to touch the ball or score as many goals as possible. Opponent's goals in the rules set.

Despite its popularity, Indonesian football faces several challenges, including management issues within the PSSI and disputes with the Ministry of Youth and Sports



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(Andrew & Suryawan, 2016). Football development in Indonesia is also hampered by the lack of academic research and strategic planning, which affects the sport's growth and competition level (Pradana et al., 2024). The rules of the game and the rules of the match must be understood, comprehended, and implemented by football people, so it is necessary to study and understand the rules of the game and the rules of the match. The person who understands and comprehends the rules of the game the most is the referee. The referee is tasked with enforcing the game's rules and leading the match in collaboration with the assistant referee and the fourth official if there is an assignment. The referee's decision regarding facts related to the game, including whether or not a goal was scored and the result of a match, is final. In Indonesia, the body that oversees football and all its match equipment is PSSI (Persatuan Sepakbola Seluruh Indonesia).

Indonesia itself is pursuing the needs of the proportion of the Referees as stated in the Decree of the Minister of Education and Sports of the Republic of Indonesia Number 58 of 2022 concerning: "Technical Instructions for the Acceleration of National Football Development include improving the Quality of Football Human Resources in the coaching and Referee sectors. This Decree of the Indonesian Minister of Youth and Sports emphasizes the importance of maintaining Referee Human Resources and their readiness in terms of physical fitness."

Based on observations on February 7, 2024, at the PSSI Office of Rokan Hulu Regency, the results of observations conducted were made. The smooth running of a match is determined by the performance and ability of the referee in making a decision. Referees assigned to a competition should understand the game's rules and have a fit physical condition. Physical condition is essential for a football referee to carry out the task of leading a football match for 90 minutes. The dominant physical aspect of leading a game is closely related to endurance and body mass index.

In reality, the condition of the Referees in the PSSI Rokan Hulu Regency Zone I football sports branch, on average, has a reduced physical fitness condition. This is due to the lack of attention from themselves and the environment to maintain the referee's physical fitness. Seeing the demands of the referee's performance, which must be optimal in every football match activity, efforts are needed to restore and maintain the referee's physical fitness according to the existing terms and conditions. Physical condition is an ability that includes strength, speed, endurance, flexibility, and coordination. Specifically for football referees, endurance and speed are the more dominant components of physical condition. An average referee in a match runs a distance of 10.3 km, so a referee must have endurance and speed that are at least the same as football players. These conditions can be trained and prepared with a systematic and continuous training process.

RESEARCH METHODOLOGY

This correlational study aims to determine the relationship between Body Mass Index and the physical condition of the endurance of PSSI football referees in Rokan Hulu Regency Zone I. This study uses two variables, consisting of 1 independent variable and one dependent variable. The independent variable is Body Mass Index (X), while the dependent variable is Endurance (Y). Population is a generalization area consisting of objects/subjects with specific qualities and characteristics determined by researchers to be studied and then conclusions drawn. The population in this study consisted of active PSSI football referees in the Rokan Hulu Regency Zone, totalling

25 people. The sample selection technique in this study was total sampling, which means that the entire population was used as a sample. So, the sample in this study was all football referees in Rokan Hulu Regency Zone I, totalling 25 people.

For the endurance test, use category 1, which is running with a distance of 40 x 75 meters with a maximum time of 15 seconds interspersed with intervals of walking 25 meters in 18 seconds. (this test is based on the FIFA referee health/fitness test instructions). A weight scale and meter are used to measure the body mass index of the PSSI Rokan Hulu Regency Zone I football referees. In this study, the instruments used for data collection consisted of two test items: 1) a 40 x 75 meter running endurance test and 2) scales to measure BMI.

RESULTS AND DISCUSSION

Data Description

Based on the discussion that has been described previously, the variables in this study are Body Mass Index (X) and Endurance (Y) in PSSI Football Referees in Rokan Hulu Regency Zone I. To be more explicit, each of the data descriptions can be seen as follows: 1) To determine the Body Mass Index in referees, a measurement test was used to calculate Body Weight and Height, and the sample was 25 referees ($n = 25$). After being carried out, the maximum score was obtained at 31.9; the minimum score was 21.7; the average was 25.2; the standard deviation was 3.04; and the median was 24.2. The description of the research results is presented in the following frequency distribution:

Table 1. Frequency Distribution of BMI Data

No	Interval Class	Absolute Frequency	Absolute Frequency (%)
1	Normal	17	68
2	Fat	8	32

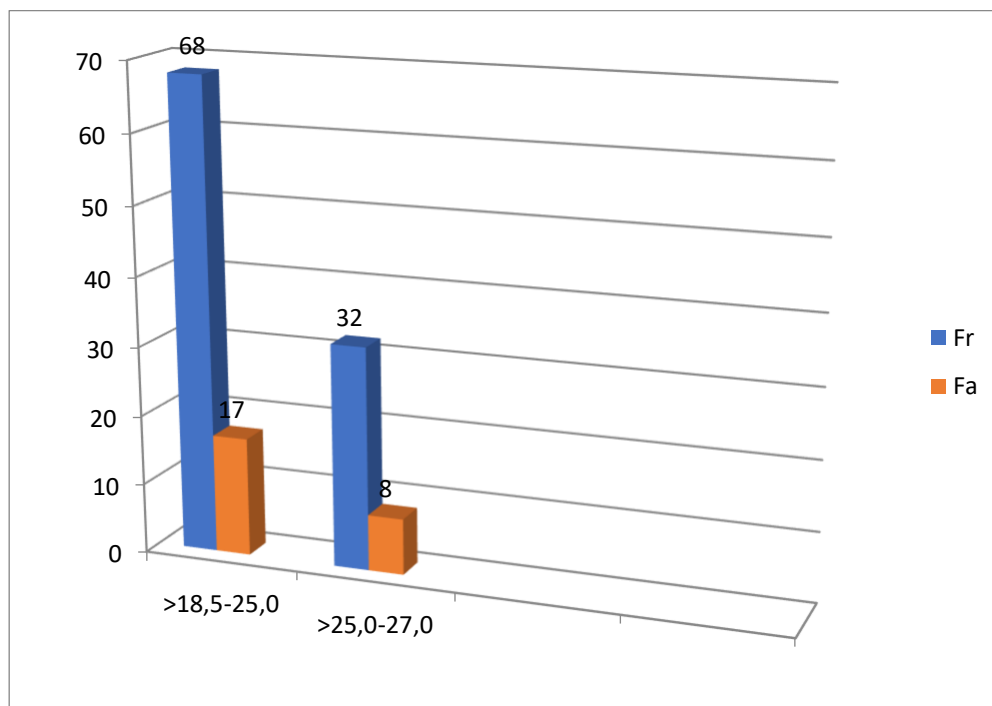


Figure 1. Histogram of BMI

Endurance

To determine the endurance of referees, a measurement test was used with a category 1 test, namely running with a distance of 40 X 75 meters (M), where the sample consisted of 25 referees ($n = 25$). After being carried out, the maximum score was obtained at 23.76, the minimum score was 13.37, the average was 16.01, the standard deviation was 2.18, and the median was 15.86. The description of the research results is presented in the following frequency distribution.

Table 4.2 Frequency Distribution of Endurance Data

No	Interval Class	Absolute Frequency	Absolute Frequency (%)
1	< 15 second	7	28
2	15 second	0	0
3	> 15 second	18	72

Based on the frequency distribution data from the Endurance test data in table 4.2 from 25 samples, it turns out that seven samples (28%) have Very Good results with a value range of <15 seconds, then zero samples (0%) have Good Endurance with a value range of 15 seconds, then 18 samples (72%) have poor endurance with a value range of >15 seconds. For more clarity, it can be seen in the histogram as follows:

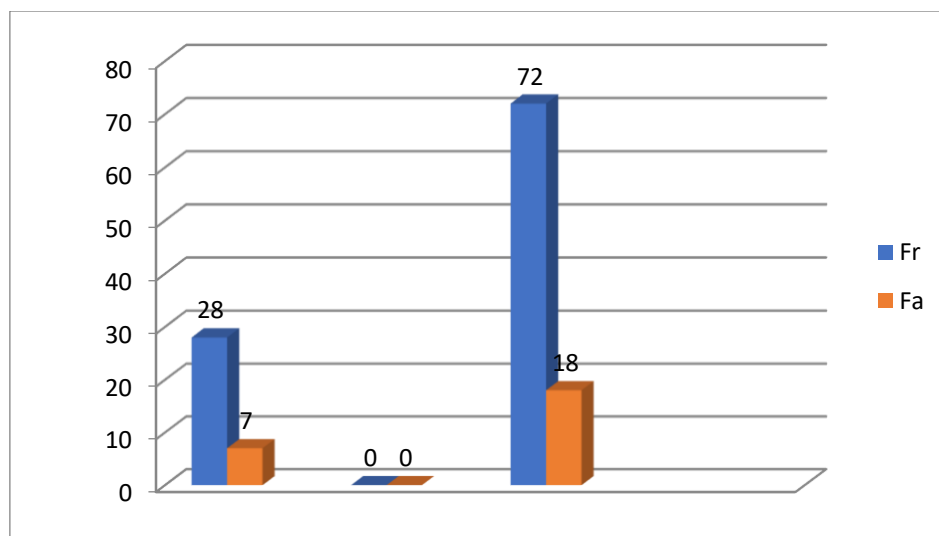


Figure 2. Histogram of Endurance

Table 3. Descriptive Research Data

Variable	N	Mean	STD	Min	Max
BMI	25	25,2	2,980996	21,7	31,9
Endurance	25	16,01	2,144821	13,36	18,86
Valid N			25		

The table above shows that the theoretical mean of the Body Mass Index variable is 25.208, and the theoretical standard deviation of the Body Mass Index variable is 2.980. The minimum value of patience is 21.7; the maximum value is 31.9. The theoretical mean of the Football referee's Endurance variable is the empirical mean is 16.0148. The theoretical standard deviation of the endurance variable is 2.14, the minimum value is 13.36, and the maximum value is 23.76.

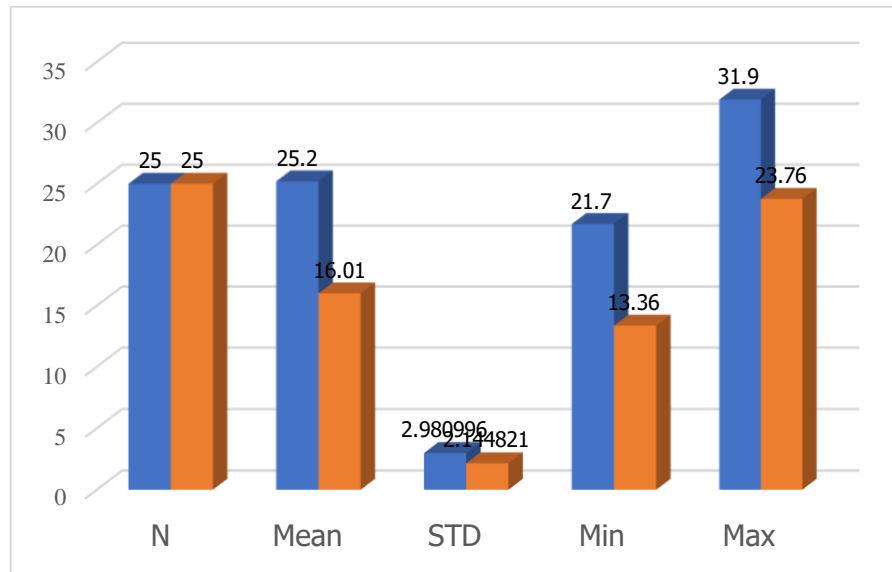


Figure 3. Body Eye Index and Football referee endurance

DISCUSSION

Body Mass Index is generally a person's body structure or forms of a person's body condition. BMI is a valuable tool for assessing overall population health and identifying trends in weight distribution across demographic groups. It helps public health officials develop targeted interventions to address obesity-related health problems such as type 2 diabetes and cardiovascular disease (Muscogiuri et al., 2023). Many clinical treatment guidelines use BMI as a stratification measure, correlating with various disease pathophysiologies (Zierle-Ghosh & Jan 2021).

Meanwhile, the endurance of a referee is very much needed by a referee, so when becoming a football referee, one must have good and prime endurance so that the football match runs smoothly. Cardiovascular training is essential in improving referee fitness levels. Both intensive and extensive interval training methods have been shown to significantly improve the fitness of futsal referees, with extensive interval training producing more significant improvements (Andrianto et al., 2024). The Yo-Yo Intermittent Recovery Test (YYIR1) is a standard measure of endurance capacity, and its performance is moderately correlated with running ability, indicating the importance of speed and endurance in refereeing (Sánchez-García et al., 2018). Referees typically cover between 11 and 12 km per match, with at least 10% of this distance at high intensity, reaching 85–95% of their maximum heart rate. This highlights the intense physical demands of referees during matches (Kokaly et al., 2018)]. Mixed methods heat acclimatization programs can enhance physiological responses, such as reducing core and skin temperature and heart rate, which are beneficial for referees working in hot conditions (Read et al., 2024).

In this study, researchers used 25 male football referees in Rokan Hulu Regency Zone I who had often been football referees in every match in Rokan Hulu Regency. From the results of the discussion, we can see the results of the correlation test using the Product moment correlation, showing a significant value ($r_{xy} = 29.62$) so that it can be said that the Body Mass Index is related to the referee's Endurance. The

analysis results obtained the correlation coefficient value as $r_{\text{count}} = 29.62 > r_{\text{(table)}} = 0.396$), which means it has a powerful relationship.

CONCLUSION

This study's results conclude a strong and non-unidirectional relationship between Body Mass Index and referee endurance, as evidenced by a significant value ($r_{xy} = 29.62$). The higher the body mass index, the lower the results of the football referee's endurance. Likewise, if the Body Mass Index value is low, then the results of the Endurance value are high.

CONFLICT OF INTEREST

Authors declare no conflict of interest in this manuscript.

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