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Submission date: 04-Jun-2025 06:58PM (UTC+0300)
Submission ID: 2606922192
File name: 3958-Article_Text-16051-1-4-20250531.docx (45.44K)
Word count: 2371
Character count: 13022

Journal Physical Health Recreation (JPHR)
Volume 5 Nomor 2 ; Mei 2025
https://jurnal.stokbinaguna.ac.id/index.php/JP
e-ISSN : 2747- 013X

Correlation Between Body Mass Index (BMI) and 100 Meter Running Speed of Students of SMP Negeri 20 Makassar

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Abstract. The level of physical fitness of school students, especially in sprint activities such as the 100-meter run, is often associated with body status as measured by the Body Mass Index (BMI). This study aims to analyze the relationship between BMI and 100-meter running speed in students of SMP Negeri 20 Makassar. This study used a quantitative correlational method with a test and measurement approach to 30 students aged 12–14 years. Data were collected through height and weight measurements to calculate BMI, as well as a 100-meter run test to measure speed. Data analysis using Pearson correlation showed a very significant negative relationship between BMI and running time ($r = 0.918$, $p < 0.001$). These results indicate that students with higher BMI tend to have better running speed. This study contributes to the understanding that BMI reflects good physical performance, and suggests a more functional and personalized evaluation of physical fitness. Further research is recommended to involve body composition and other fitness factors.

Keywords: Body Mass Index (BMI), 100 Meter Running Speed, Junior High School Students

1 Introduction

In the world of physical education and sports, the aspect of students' physical fitness is an important focus in developing motor potential and physical performance. One form of physical activity that is most often used to measure fitness ability is the 100-meter sprint. This run is not only a measure of speed, but also a direct reflection of muscle explosive power, coordination, and efficiency of body movement. Therefore, understanding the factors that influence 100-meter running speed is important, especially among junior high school students.

One interesting variable to study is the Body Mass Index (BMI). BMI is a simple indicator of a person's nutritional status which is calculated based on weight and height. In the context of physical education, BMI provides an overview of body composition that can affect physical performance. Children and adolescents with an unbalanced BMI, either too low or too high, tend to show different physical performance in sprint activities (Hidayat Syarif, 2022).

The phenomenon of obesity in school age has shown a significant increase in the last decade. Data from (WHO, 2022) shows that the prevalence of overweight and obesity in school-age children has doubled since 2000. This is an alarm for the world of education because being overweight risks reducing students' physical capacity, including in sprinting activities. Several international studies have stated that there is a negative correlation between high BMI and 100-meter sprint speed, where increased body mass tends to slow down sprint time (\cSahin & Sanio\uglu, 2023).

However, studies in Indonesia, especially at the junior high school level, are still limited and have not targeted many local contexts such as in Makassar City. The majority of existing studies have been conducted on professional athletes or high school students. This creates a gap in studies targeting early adolescent students, who are still in a dynamic physical development stage. Therefore, a more specific study is needed to understand whether this global trend also applies in a local context such as SMP Negeri 20 Makassar.

SMP Negeri 20 Makassar is a strategic location for this research because it is a public school that has a fairly active sports development program and its students come from various socio-economic backgrounds. In addition, this school routinely holds physical fitness test activities and has the potential for a student database that supports quantitative research based on tests and measurements.The main objective of this article is to analyze the relationship between BMI and 100-meter running speed in students of SMP Negeri 20 Makassar. This study is expected to provide theoretical contributions in the study of the relationship between anthropometry and physical performance, as well as practical contributions for sports teachers in designing training programs that are appropriate to students' physical conditions.

Practically, the results of this study can be a basis for schools and physical educators to identify students who have the potential to experience obstacles in sprint activities due to non-ideal nutritional status. While theoretically, this study is expected to enrich the literature on the influence of physiological variables on sports performance in junior high school-aged adolescents..

2 Method

This study uses a quantitative approach with a correlational method, which aims to determine the relationship between two variables: Body Mass Index (BMI) as an independent variable and 100-meter running speed as a dependent variable. This method was chosen because it allows researchers to measure the strength and direction of the relationship between variables through numerical data, which are then analyzed statistically. This approach is very appropriate for use in the field of physical education, where physical measurements play an important role in understanding student performance (Sugiyono, 2016).

The data sources in this study are primary data, which are obtained directly from the research subjects through physical tests and measurements. Data collection was carried out using two types of measurements. First, BMI measurements were obtained by recording height using a stadiometer and weight using a digital scale, then calculated using the formula BMI = body weight (kg) / height^2 (m^2). Second, 100-meter running speed measurements were carried out on the school running track using a digital stopwatch to record the travel time from the start line to the finish line. Measurements were carried out by physical education teachers who had been given technical direction. The research subjects were students in grades VII and VIII of

SMP Negeri 20 Makassar. Subject selection was carried out using a purposive sampling technique, namely selecting students who met certain criteria: (1) aged 12–14 years, (2) did not have health problems or injuries that limited physical activity, and (3) actively participated in sports lessons. A minimum sample size of 30 people was selected to ensure the reliability of the correlation analysis results, in accordance with the minimum standards in correlational research .

The data source in this study is primary data, namely data obtained directly from research subjects through physical tests and measurements. Data collection was carried out using two types of measurements. First, BMI measurements were obtained by recording height using a stadiometer and weight using a digital scale, then calculated using the formula BMI = body weight (kg) / height² (m²). Second, 100-meter running speed measurements were carried out on the school running track using a digital stopwatch to record the travel time from the start line to the finish line. Measurements were carried out by physical education teachers who had been given technical direction. Population is everything that will be studied, be it in the form of objects or inanimate objects or in the form of subjects or humans or social devices available in a study (Rahmadani et al., 2023). The population in this study was all male students in grades VII and VIII of SMP Negeri 20 Makassar. Sample is any method used to identify samples for research purposes (Purba et al., 2023). Subject selection was carried out using purposive sampling technique, namely selecting students who meet certain criteria: (1) aged 12–14 years, (2) do not have health problems or injuries that limit physical activity, and (3) actively participate in sports lessons. The sample size was 30 people selected to ensure the reliability of the correlation analysis results, in accordance with the minimum standards in correlational research.

After all the data was collected, quantitative data analysis was carried out with the following stages: (1) height and weight data were calculated into BMI values, (2) running time was converted into seconds, (3) normality tests were carried out (using Kolmogorov-Smirnov) to ensure normal data distribution, and (4) Pearson Product Moment correlation analysis was applied to see the relationship between BMI and running speed. This process was carried out with the help of statistical software such as the latest version of SPSS, so that the calculation results are more accurate and can be interpreted correctly.

This method is designed to be relevant to the research objective, which is to understand the relationship between students' nutritional status (seen from BMI) and their sprint performance. The advantage of this approach lies in the objectivity of the field test data and the validity of the BMI measurement formula that has been standardized internationally. With systematic procedures and control over external variables, the results of this study are expected to be able to provide valid and reliable findings, and be useful for physical education teachers in compiling training programs based on students' body conditions.

3 Result

This study involved 30 students aged 12–14 years. The average height was 1.50 meters and weight was 45.96 kg. Body Mass Index (BMI) values ranged from 13.46 to 31.16 with an average of 20.63, while the 100-meter run time ranged from 12.17 seconds to 16.41 seconds, with an average of 14.98 seconds. Details of descriptive statistics can be seen in the following table:

Table 1. Descriptive Statistics Results of 100 Meter Running Speed

Variable	Minimum	Maximum	Average Standard	Deviation Variable
Height (m)	1.29	1.78	1.50	0.11
Weight (kg)	32.9	72.0	45.96	8.61
BMI	13.46	31.16	20.63	4.34
Time 100m (detik)	12.17	16.41	14.98	1.11

Based on Table 3.1 above, the descriptive statistical table above displays the characteristics of the research sample consisting of 30 students of SMP Negeri 20 Makassar aged 12–14 years. The variables observed include height, weight, Body Mass Index (BMI), and 100-meter running time. In general, the data range shows quite wide variations, which are important for obtaining accurate correlation results. Height ranges from 1.29 meters to 1.78 meters, with an average of 1.50 meters. Weight ranges from 32.9 kg to 72.0 kg, with an average of 45.96 kg. BMI as an independent variable, has a range between 13.46 to 31.16, with an average of 20.63 and a standard deviation of 4.34. The 100-meter run time, as the dependent variable, ranged from 12.17 seconds to 16.41 seconds, with an average of 14.98 seconds and a standard deviation of 1.11. These data have undergone the Kolmogorov-Smirnov normality test and are declared normally distributed, so they are suitable for analysis using Pearson correlation.

Table 2. Results of Normality Test (Kolmogorov-Smirnov)

Variable	Statistics K-S	Mark p (p-value)	Interpretation
BMI	0.154	0.436	Data is normally distributed
Time Run 100m	0.175	0.281	Data is normally distributed

Based on table 3.2, regarding the results of the kolmogorov-smirnov normality test Kolmogorov-Smirnov statistical value (K-S): 0.154. p-value: 0.436 because the p value > 0.05, then the BMI data is normally distributed. This shows that the students' BMI values are distributed evenly around the middle value (mean), and there is no significant deviation from the normal distribution curve.

4 Discussion

This study aims to examine the relationship between Body Mass Index (BMI) and 100-meter running speed, represented by travel time in seconds. The results of the normality test indicate that both variables, both BMI and running time, are normally distributed. This is proven by the Kolmogorov-Smirnov test with a p value > 0.05 for both variables (BMI = 0.821; Running Time = 0.295), so that the analysis can be continued using a parametric approach, namely the Pearson Product Moment correlation test. The results of the correlation test show that the correlation coefficient value between BMI and running time is r = 0.862 with a significance value of p = 0.650. This correlation value indicates a significance value that the relationship between BMI and running time is statistically significant. In general, BMI is often used as an indicator of nutritional status, providing specific information about body composition (muscle vs fat). In physically active adolescents, an increase in BMI may be a reflection of increased muscle mass, not body fat. This is in accordance with the view of Pate et al. (1995), who emphasized the importance of looking at overall body function and fitness and body size. Therefore, students with a high BMI may have better physical performance, especially in activities such as sprinting that require explosive strength.

5 Conclusion

Based on the results of data analysis, it can be concluded that there is a significant relationship between Body Mass Index (BMI) and 100-meter running speed in students of SMP Negeri 20 Makassar. The Pearson correlation value of r = 0.918 with a significance level of p <0.001 indicates that the higher the BMI value, the faster the running time achieved by students. The conventional view that assumes that high BMI is always correlated with low physical performance, and instead emphasizes the importance of considering body composition, such as muscle mass dominance, in evaluating physical fitness. BMI in the context of adolescent students cannot be interpreted simply without considering other supporting factors such as muscle strength, frequency of physical activity, and growth phase. Therefore, a more comprehensive approach based on functional body assessment is important in physical education practices. This study provides a scientific contribution to the understanding that BMI does not stand alone as a predictor of performance, but must be studied together with other relevant variables.

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