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ANALYSIS OF THE RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND PHYSICAL FITNESS LEVEL

Dwi Aprilianto*[1], Rachmat Dody Ariesna[2]
[1,2] STKIP Al Islam Tunas Bangsa, Bandar Lampung, Indonesia
*Corresponding Author: dwiaprilianto1993@gmail.com

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Abstract: *This study aims to analyze the relationship between nutritional status and physical fitness level of class X students at SMK Satu Nusa 2. The study used a correlational quantitative approach with data collection techniques through tests and direct measurements. The results of the Shapiro-Wilk normality test showed that the nutritional status and physical fitness data were normally distributed. The regression linearity test (ANOVA) shows that the relationship between the two is linear. Pearson correlation analysis found a very strong and significant negative relationship between nutritional status and physical fitness level. This means that the higher the nutritional status of students (especially those categorized as obese), the lower their physical fitness level. This finding emphasizes the importance of maintaining a balanced nutritional status to improve the quality of physical fitness in school-age adolescents. This study is expected to serve as a basis for designing appropriate nutrition and exercise programs in the school environment.*

Abstrak: Penelitian ini bertujuan untuk menganalisis hubungan antara status gizi dan tingkat kebugaran jasmani siswa kelas X di SMK Satu Nusa 2. Penelitian menggunakan pendekatan kuantitatif korelasional dengan teknik pengumpulan data melalui tes dan pengukuran langsung. Hasil uji normalitas Shapiro-Wilk menunjukkan bahwa data status gizi dan kebugaran jasmani berdistribusi normal. Uji linearitas regresi (ANOVA) menunjukkan hubungan keduanya bersifat linear. Analisis korelasi Pearson menghasilkan temuan adanya hubungan negatif yang sangat kuat dan signifikan antara status gizi dan tingkat kebugaran jasmani. Artinya, semakin tinggi status gizi siswa (terutama yang masuk kategori gemuk atau obesitas), maka semakin rendah tingkat kebugaran jasmani mereka. Temuan ini menegaskan pentingnya menjaga status gizi yang seimbang demi meningkatkan kualitas kebugaran jasmani pada remaja usia sekolah. Penelitian ini diharapkan dapat menjadi dasar dalam merancang program gizi dan olahraga yang tepat di lingkungan sekolah.

INTRODUCTION

Physical fitness is an important indicator in assessing an individual's physical condition, particularly in adolescence, which is undergoing growth and development. In the context of national education, physical fitness is an integral part of the learning objectives of physical education, namely to develop students who are physically, mentally, and socially healthy. Bucher and Wuest (2009) state that physical education aims to improve human performance through purposefully selected physical activities to achieve optimal results.

Achieving optimal physical fitness is not only influenced by the intensity of physical activity but also by various other factors, one of which is nutritional status. Nutritional status is a condition resulting from the balance between nutrient intake and the body's needs for metabolism (Nur et al., 2023). Imbalanced nutrition, whether in the form of deficiency or excess, can negatively impact a person's endurance, muscle strength, and physical abilities. Research conducted by (Rismayanthi, 2015), and Muharam, R. R. shows a positive relationship between good nutritional status and optimal physical fitness levels. These findings reinforce the importance of monitoring and evaluating nutritional status in efforts to improve the quality of students' physical fitness (Muharam, 2019).

At the Vocational High School (SMK) level, attention to physical fitness development is often less than optimal because the primary focus of learning is directed at mastering vocational competencies. Agusta, E. stated that the dominance of skills learning leads to minimal physical activity among vocational high school students, which can impact the quality of fitness (Agusta, 2023). This is in line with the Global Status Report on Physical Activity from the World Health Organization 2022, which shows that 81% of adolescents and 27.5% of adults worldwide do not meet the minimum recommendations for physical activity (WHO, 2022). This condition can certainly negatively impact the health and physical readiness of adolescents to face the challenges of the world of work.

Based on initial observations at SMK Satunusa 2, variations in students' physical conditions were found, indicating potential nutritional problems and low levels of physical fitness. Therefore, this study aims to analyze the relationship between nutritional status and physical fitness levels of students at SMK Satunusa 2. The results of this study are expected to provide empirical contributions to the development of physical fitness

development strategies based on students' nutritional conditions, as well as serve as a basis for consideration for schools and physical education teachers in designing holistic and sustainable intervention programs.

METHOD

This study uses a quantitative approach with a correlational research type. The purpose of this approach is to determine the relationship between two variables, namely nutritional status (independent variable) and physical fitness level (dependent variable) in students of SMK Satunusa 2. The population in this study were all grade X students of SMK Satunusa 2 in the 2025/2026 academic year. The research sample consisted of 51 students, taken by total sampling, because all members of the population were sampled. The sample consisted of 27 male students and 24 female students. Data collection was carried out through two types of measurements: 1) Nutritional status; Nutritional status data was obtained through measuring students' weight and height using digital scales and height measuring meters. Body Mass Index (BMI) was calculated using the formula;

$$IMT = \frac{Berat\ Badan\ (kg)}{Tinggi\ Badan\ (m)^2} \quad \text{...} \quad (1)$$

BMI values are classified based on World Health Organization (WHO) standards, with categories: a) malnutrition, b) normal nutrition, c) overnutrition and e) obesity. 2) Physical fitness level; Physical fitness was measured using the Indonesian Physical Fitness Test (TKJI) for the 16–19 year old age group. The test components include: a) 50-meter run, b) 60-second sit-ups (abdominal muscle endurance), c) pull-ups (for boys) and push-ups (for girls), shuttle run (agility) and 1000-meter run (cardiopulmonary endurance). Each test result was converted into an assessment score and categorized into fitness levels: very good, good, sufficient, less, and very less. Data were analyzed descriptively to describe the distribution of nutritional status and physical fitness levels of students. To test the relationship between the two variables, the Pearson Product Moment correlation test was used with a significance level of 5% ($\alpha = 0.05$). Data processing and analysis were carried out using the latest version of SPSS statistical software or a similar program.

RESULTS AND DISCUSSION

Results

This study was conducted on 51 10th-grade students at Satunusa 2 Vocational School, consisting of 27 boys and 24 girls. The aim of this study was to determine the relationship between nutritional status and physical fitness levels.

Student Nutritional Status

Nutritional status was analyzed using the Body Mass Index (BMI) indicator. BMI measurements were classified into three categories: a) undernutrition, b) normal nutrition, and c) overnutrition.

Table 1. Classification of Body Mass Index (BMI) Measurements

Classification	BMI
Undernutrition	< 18.5
Normal Nutrition	18.5 – 22.9
Overnutrition	23.0-24.9

The distribution of students' nutritional status can be seen in the following table;

Table 2. Distribution of Student Nutritional Status

Nutritional Status	Number of Students	Percentage
Undernutrition	16 Students	31.4%
Normal Nutrition	28 Students	54.9 %
Overnutrition	7 Students	13.7 %
Total	51	100%

Table 2. The distribution of students' nutritional status shows that the majority of students are in the normal nutritional category, although there are still a number of students with malnutrition and overnutrition who need special attention.

Student Physical Fitness Level

Physical fitness levels were measured using the Indonesian Physical Fitness Test (TKJI). TKJI scores were then classified into three categories: a) very good, b) good, and c) poor.

Table 3. Classification of Physical Fitness Test (TKJI) Scores

Classification	Score
Very Good	≥ 85
Good	70 – 84
Poor	< 70

The distribution of students' fitness levels can be seen in the following table;

Table 4. Distribution of Students' Physical Fitness Levels

Fitness Category	Number of Students	Percentage
Very Good	6 Students	11.8%
Good	14 Students	27.5%
Poor	31 Students	60.8%
Total	51	100%

Table 4. The distribution of students' physical fitness levels found that some students were in the less fit category.

Data Normality Test Results

Data normality testing was conducted to determine whether the data distribution for nutritional status and physical fitness variables met the assumption of normality. The testing was conducted using the Shapiro-Wilk Test and supported by histogram visualization.

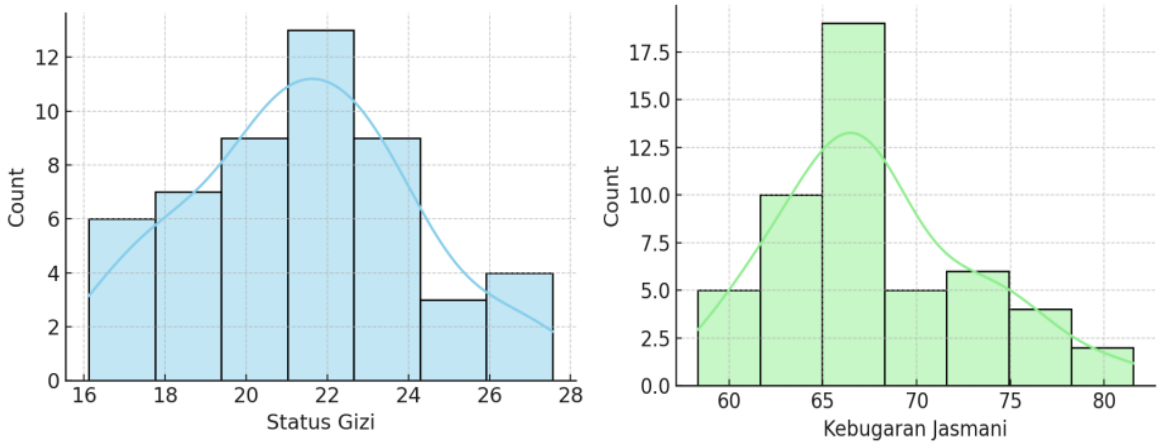

Figure 1. Histogram of Normality of Nutritional Status and Physical Fitness

The histogram shows that the data distribution approximates a normal curve for both nutritional status and physical fitness. Furthermore, the Shapiro-Wilk Test results show a significance value of 0.236 for the nutritional status variable and 0.187 for the physical fitness variable.

Table 5. Shapiro-Wilk Test Results

Variabel	Statistics W	Sig. (p-value)
Nutritional Status	0.971	0.236
Physical Fitness	0.967	0.187

Because both p values > 0.05, it can be concluded that both variables are normally distributed, so the Pearson correlation test can be used for further analysis.

Data Linearity Test Results

A linearity test was conducted to determine whether there was a linear relationship between the independent variable (nutritional status) and the dependent variable (physical fitness). The linearity test was conducted using regression analysis of variance (ANOVA), comparing the variance between nutritional status category groups based on the quartiles of the data distribution. The linearity test yielded a significance value of 0.806 ($p < 0.05$), indicating no deviation from the linear model. The significance value for the linear relationship between nutritional status and physical fitness also reached 0.257, indicating that the relationship did not deviate from the overall linear pattern. Therefore, it can be assumed that the relationship between the independent and dependent variables is suitable for further analysis.

Table 6. Results of the Analysis of Variance Regression (ANOVA) Test

Source of Variance	Sum of Squares	Df	F Count	Sig. (p)
Nutritional Status Category	31.84	4	0.403	0.806
Nutritional Status (Linear)	26.10	1	1.321	0.257
Residual	889.34	45	-	-

Pearson Correlation Test

After a series of data normality and linearity tests were fulfilled, a Pearson correlation test was carried out to determine whether there was a relationship between the independent variable (nutritional status) and the dependent variable (physical fitness level). The results of this Pearson correlation test were also supported by the results of the scatter plot visualization.

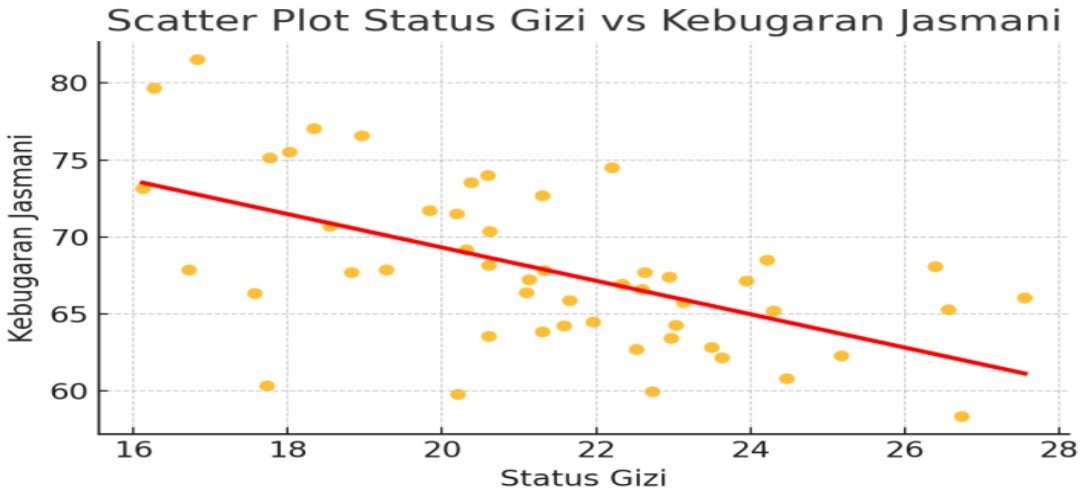

Figure 3 Scatter Diagram of Nutritional Status and Physical Fitness

The histogram shows a negative correlation between nutritional status and fitness. Furthermore, the analysis results show a correlation coefficient of r = -0.812 with a significance level of p = 0.000. This correlation coefficient is categorized as strong and negative, meaning that the higher the nutritional status (e.g., in the context of being overweight), the lower the student's physical fitness level tends to be. Since the p value is < 0.05, the relationship between nutritional status and physical fitness is statistically significant. Therefore, it can be assumed that there is a strong and meaningful relationship between the two variables.

Table 7. Pearson Correlation Test Results

Variable (x)	Variable (y)	N	r (Pearson)	Sig. (p-value)
Nutritional Status	Physical Fitness	51	-0.812	0.000

Discussion

The results of the study indicate that nutritional status is negatively and significantly related to students' physical fitness levels. The Pearson correlation value obtained is r = -0.0812 with a significance of p = 0.000 indicating that the higher the nutritional status of students (towards overweight or obesity), the lower their physical fitness levels. This negative relationship can be explained physiologically, as excess body fat can disrupt the efficiency of body organs, inhibit movement and increase the load during physical activity. Conversely, students with ideal nutritional status tend to have proportional body mass, better muscle strength and a more optimal cardiovascular system to support physical activity.

The results of this study are certainly supported by previous research by Muzakki, A. & Saputra, S. Y. which stated that there was a weak negative correlation between BMI and physical fitness r = -0.275, p = 0.03 (Muzakki & Saputra, 2020). Mahdiyyah, A. N. & Hidayat, T. also revealed that a negative correlation was found between nutritional status and physical fitness with a correlation value of -0.35, p = 0.004 (Mahdiya, 2020), which means it shows a significant relationship. Thus, good nutritional status (neither lacking nor excessive) is an important requirement in improving or maintaining students' physical fitness.

CONCLUSION

Based on the results of the research conducted on "Analysis of the Relationship Between Nutritional Status and Physical Fitness Level of Grade X Students of Satu Nusa

2 Vocational High School, Bandar Lampung", several conclusions can be drawn as follows:

(1). Data on students' nutritional status and physical fitness are normally distributed, based on the results of the Shapiro-Wilk normality test with a significance value of 0.05. This indicates that the data meets the requirements for parametric analysis.

(2). The relationship between nutritional status and physical fitness is linear, as evidenced by a linear regression analysis (ANOVA) with a significance value of p 0.05. This indicates that an increase or decrease in nutritional status is directly related to changes in physical fitness levels.

(3). The Pearson correlation test results indicate a very strong and significant negative relationship between nutritional status and students' physical fitness levels (r = -0.812; p = 0.000). This means that the higher a student's nutritional status (tendency to be overweight or obese), the lower their physical fitness level.

(4). These findings indicate the importance of optimally managing nutritional status among students to support the improvement and maintenance of overall physical fitness.

(5). These findings indicate the importance of optimal nutritional status management among students, in order to support the improvement and maintenance of overall physical fitness.

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