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Relationship Between Diet and Physical Activity with Overweight in Basketball Players

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ABSTRACT

This study aims to analyze the relationship between overweight, physical activity, and diet in extracurricular basketball students at SMP Negeri 1 Palang. A quantitative approach with a simple correlation method was used to explore the relationship. The sample consisted of overweight students, selected using a simple random sampling technique. Data were collected through anthropometric measurements for Body Mass Index (BMI), a physical activity questionnaire based on the International Physical Activity Questionnaire (IPAQ), and a diet questionnaire using the 24-Hour Food Recall method. Data analysis was performed using SPSS version 29 with the Fisher's Exact test and gamma correlation analysis. The results showed a significant relationship between diet and physical activity with students' BMI status. Diet was shown to have a greater influence on overweight with a gamma value of 1,000, compared to physical activity with a gamma value of 0.692. These findings indicate the importance of regulating a healthy diet as a priority in efforts to prevent overweight in students. In addition, this study provides important insights for coaches and schools to promote an active and healthy lifestyle among students

INTRODUCTION

Overweight and obesity in children has become a global health problem that requires special attention (Sudargo et al., 2018). The prevalence of these cases has increased from year to year not only in developing countries but also in developing countries including Indonesia. Data from Indonesia's Basic Health Research (Riskesdas) in 2007, 2010, 2013, showed an increase in the prevalence of overweight in children aged 5-14 years. The obesity rate in children aged 6-14 years based on the 2007 Riskesdas results was 9.5% in boys and 6.4% in girls. According to the 2010 Riskesdas data, the rate increased to 10.7% in boys and 7.7% in girls (aged 6-12 years) (Ministry of Health of the Republic of Indonesia, 2010). Based on the 2013 Riskesdas data, 10.8% of children aged 5-12 years were obese, while 8.8% were classified as very obese (aged 4-6 years) (Ministry of Health of the Republic of Indonesia, 2013).

According to the Guidelines for Sports Nutrition Achievement (Ministry of Health, 2014) , the maximum performance of basketball athletes is influenced by factors such as health, fitness, physical activity, and diet during training, competition, and recovery. Energy and nutrient adequacy have a significant effect on athlete performance; nutrient deficiencies can hinder performance and affect game

results. Physical activity, as one of the main factors of fitness, is divided into measured and unmeasured, with exercise falling into the planned and measured category. Regular and intense exercise can improve physical fitness, with more strenuous exercise increasing oxygen demand to meet the body's energy needs.

Having healthy eating habits can provide enough energy to carry out physical activities that benefit the health, fitness, growth, and abilities of athletes. A consistent diet is key to maintaining weight and health. If a person does not have a stable diet with a variety of food types and a sufficient number of calories, it can affect overweight. Overweight as a form of overnutrition in children is often associated with lack of physical activity or movement, availability of unhealthy foods, or hormonal disorders.

Wibisono et al. (2024)) reported that obesity in Indonesia occurs at various ages. In adolescents aged 13-15 years, the overweight and obesity rate was 10.8%, with 8.3% in the obese category and 2.5% overweight. The year 2018 showed an increase in obesity with a prevalence of 31% in those over 15 years old. Riskesdas also recorded the prevalence of undernutrition in adolescents aged 13-15 years at 8.7%, and 8.1% in 16-18 years old, as well as the prevalence of overweight and obesity at 16.0% in 13-15 years old and 13.5% in 16-18 years old.

Efforts to prevent and overcome overweight in adolescents focus on diet and physical activity (Zahtamal & Munir, 2019). Someone who is not physically active will usually gain weight or have a body mass index that is not ideal (Haeril & Angriawan, 2022). Previous research by Devi (2023), discussed the relationship between overweight with physical activity and diet in adolescents aged 13-15 years at SMP Negeri 1 Karangploso. The study produced findings that there was a relationship between physical activity and diet with body mass index in overweight adolescents with a correlation coefficient of Sig. F Change 1.44 x 10-9 lt 0.05 while the R value is 0.754 which means that the effect of physical activity variables and eating patterns simultaneously on body mass index has a high contribution of 75.4%. BMI value has a negative relationship with physical activity where every increase of 1 unit of physical activity will be followed by a decrease of 0 61 times the BMI value. While the relationship between BMI and diet has a positive relationship where every 1 unit increase in diet will be followed by a 1 509-fold increase in BMI. Different from these studies, the current study targets students who take part in extracurricular basketball at SMP Negeri 1 Palang, Tuban Regency.

The researcher chose students of SMP Negeri 1 Palang who participated in basketball extracurricular activities in the age group of 13-15 years as the object of research because basketball extracurricular activities are one of the extracurricular activities that are in great demand but there are no acceptance criteria for both physical and posture tests and there is no intensive training and rules that require students to organize and maintain their diet, so the researcher used this sample to find out how the relationship between diet and physical activity on overweight in students who take part in basketball activities at SMP Negeri 1 Palang. In addition, researchers chose junior high school students with an

age group of 13-15 years, which is the age category of adolescence. Adolescence is the initial stage of a rapid development phase, both physically and psychologically. The process of brain development, hormonal changes, and the search for self-identity that occurs during adolescence can affect their behavior, decisions, and ways of thinking (Oktavianita & Wirjatmadi, 2020).

Based on the background of the problem and the data that has been described. Therefore, it is necessary to conduct research with the aim of knowing the relationship between diet and physical activity on overweight in extracurricular basketball students at SMP Negeri 1 Palang, Tuban Regency. The results of this study are expected to provide better insight into the factors that influence overweight, so that it can be the basis for creating more effective intervention or prevention programs to improve student health.

METHODS

This study used a quantitative approach with a correlation method to analyze the relationship between variables. The study population was extracurricular basketball students at SMP Negeri 1 Palang, with samples taken from students who were overweight. Samples were selected through random sampling, and anthropometric measurements were used to calculate Body Mass Index (BMI). A total of 20 students were selected as respondents, with the gender distribution listed in Table 1.

Table 1: Gender of Research Respondents

Gender of Respondents	Total
Male	8
Female	12
Total	20

This section contains research results or data, analysis of research data, answers to research questions, and analysis of findings during the research.

The physical activity instrument follows the guidelines of the International Physical Activity Questionnaire (IPAQ). The questionnaire is a long form that provides scores for various activities such as walking, moderate-intensity and high-intensity activities in the areas of work, transportation, housework, gardening and leisure time. The total score is calculated by summing the duration (minutes) and frequency (days) of each activity. IPAQ data are presented as minutes-MET (Metabolic Equivalent of Task) per week. According to Cahyati et al. (2023) , the quantification of MET-minutes/week uses a specific formula.

a) To calculate MET-minutes/week for walking activity, use the formula: 3.3 x walking duration in minutes x walking frequency in days.
b) For moderate intensity activities, MET-minutes/week is calculated by the formula: 4.0 x duration of moderate activity in minutes x frequency of moderate activity in days.
c) As for high-intensity activities, the formula used is: 8.0 x duration of strenuous activity in

minutes x frequency of strenuous activity in days.

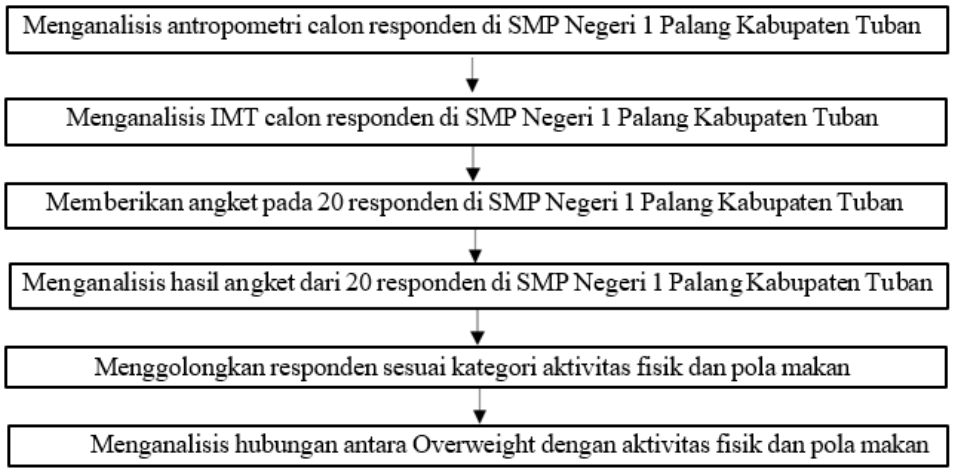
d) Total MET-minutes/week from all physical activities was obtained by summing the MET-minutes/week results from walking, moderate and vigorous activities.

Table 2. Categorization of total MET-minutes/week

Physical Activity Level	Value
Low	<600
Medium	600-1499
Weight	≥1500

Source: (Cahyati et al., 2023)

While the instrument on diet uses the 24-Hour *Food Recall* questionnaire (Sirajuddin et al., 2018). The questions in the questionnaire correspond to a person's diet in a diet, poor diet, type of food, portion of food, frequency of food consumed. Explanation of research variables on the relationship between diet and physical activity on BMI (*Body Mass Index*).



Flow of Research and Data Collection at SMP Negeri 1 Palang, Tuban Regency

This study on the relationship between diet and physical activity to BMI (Body Mass Index) in extracurricular basketball students of SMP Negeri 1 Palang, Tuban, used quantitative data analysis. Univariate analysis was used to look at the frequency of each variable, while bivariate analysis was used to assess the relationship between overweight and physical activity and diet. Fisher's Exact test was conducted, followed by gamma correlation analysis to measure the strength of the association between overweight, physical activity and diet.

RESULTS AND DISCUSSION

Results

This study was conducted at SMP Negeri 1 Palang with a sample consisting of male and female students who were overweight and participated in extracurricular basketball. Samples were selected using simple random sampling technique.

Respondent Characteristics

Table 3. Respondent Characteristics

Description	*Frequency*	*Percent*
Gender		
Male	8	34.8
Female	12	52.2
Total	20	100.0
Age		
13 Years	1	4.3
14 Years	9	39.1
15 Years	10	43.5
Total	20	87.0
Height		
Minimum Male	2	8.7
Maximum Male	11	47.8
Maximum Female	7	30.4
Total	20	100.0
Body Weight		
Minimum Male	5	21.7
Minimum Female	15	65.2
Total	20	87.0
Body Mass Index		
Overweight	13	56.5
Ideal	7	30.4
Total	20	87.0
Diet		
Very Less	0	0
Less	0	0
Normal	7	30.4
More	13	56.5
Total	20	87.0
Physical Activity		
Low	1	4.3
Medium	7	30.4
Weight	12	52.3
Total	20	87.0
***Overweight* Level**		
Less	0	0
Normal	7	30.4
Overweight	12	52.2
Obesity Level 1	1	4.3
Total	20	87.0

Of the 20 respondents, the majority were women (12 people or 60%), while there were 8 men (40%). The proportion of women is higher with a difference of 20%. This data illustrates the gender composition that can influence further analysis. Most respondents were 15 years old (50%), followed by 14 years old (45%), and only 1 person (5%) was 13 years old. The sample was dominated by adolescents aged 14-15 years (95%), reflecting an adolescent developmental phase relevant for analysis

of diet and physical activity.

Height showed differences between males and females. 69.6% of men were in the maximum height category, while 100% of women were in the minimum height category. This difference is influenced by genetic factors, diet, and physical development. The majority of respondents with minimal body weight were female (15 people or 75% of valid data), while only 5 people (25%) were male. This finding shows a significant difference that could be influenced by diet, physical activity or genetic factors, and opens up opportunities for further analysis related to weight and other variables such as age or education.

Of the 20 respondents, 13 (65%) were overweight, while 7 (35%) were of ideal weight. The majority of respondents were overweight, which poses health risks. Factors such as diet, physical activity and lifestyle influence this condition. Respondents with ideal weight show that a small proportion of the population is successful in maintaining weight balance. Interventions such as nutrition education, exercise facilities, and healthy lifestyle support are needed. From the dietary data, all respondents had adequate food intake. A total of 30.4% had a normal diet, while 56.5% exceeded the recommendation, which risks health problems such as obesity. These findings indicate the need for awareness of healthy eating patterns through education and management of food consumption.

In the aspect of physical activity, 12 respondents (52.3%) had high activity, 7 people (30.4%) moderate activity, and 1 person (4.3%) low activity. This data shows that most respondents are aware of the importance of physical activity in maintaining health. Most respondents (52.2%) were overweight, 30.4% were normal weight, and only 4.3% were in the T1 obesity category. The majority of the sample faced weight problems, especially being overweight. Education and weight loss programs need to be conducted to help respondents reach their ideal weight.

Relationship between Overweight Level and Physical Activity

Table 4. Relationship of Overweight Level with Physical Activity and Diet

		Physical Activity		
		Medium	Weight	Total
Overweight Level	Normal	7	0	7
	Overweight	0	11	13
	Total	7	11	20

		Medium	Weight	Total
Overweight Level	Normal	2,4	3,8	7,0
	Overweight	4.6	7,2	13,0
	Total			20,0

Rate of Overweight with Physical Activity

	Value	Exact Sig. (2-sided)
Fisher's Exact Test	19.761	.000

N of Valid Cases	20

The table above shows the frequency of being overweight based on the physical activity of the respondents. No overweight individuals had low physical activity; instead, 7 people with moderate activity and 11 people with vigorous activity were recorded as overweight. This suggests that higher physical activity may be associated with lower levels of overweight.

In the normal weight group, 7 people had moderate activity, while there were no individuals with low or heavy activity. This suggests that moderate physical activity could play a role in maintaining normal weight. Also, the absence of overweight individuals with low activity could mean that lack of physical activity increases the risk of being overweight

Taken together, these data emphasize the importance of physical activity in maintaining health and preventing overweight, and point to a potential link between physical activity levels and weight status.

Frequency of overweight levels by physical activity. In the low activity category, there were no overweight individuals. At moderate physical activity, there were 2.4 normal weight individuals and 4.6 overweight individuals. When physical activity increased to heavy levels, the number of normal individuals rose to 3.8, while those who were overweight became 7.2. The total number of normal weight and overweight individuals was 7.0 and 13.0, for a grand total of 20.0 individuals. This data shows a trend that the higher the physical activity, the more overweight individuals. This indicates the importance of physical activity in preventing overweight and supporting the health of the community.

The Fisher's Exact test results showed a statistical value of 19.761 with a significance of 0.000, indicating a significant relationship between physical activity and overweight in the sample studied. This reveals that the level of physical activity has an effect on the risk of being overweight, where individuals who are less physically active are more likely to be overweight. This finding supports previous research showing that adequate physical activity can prevent excessive weight gain and reduce the risk of obesity. Therefore, increasing participation in regular physical activity is an important step in preventing overweight and obesity, especially in more vulnerable groups.

Relationship between Overweight Level and Diet

Table 5. Observed Frequency of *Overweight* Level with Diet

		Diet				
		Very Less	Less	Normal	More	Total
Overweight Level	Normal	0	0	7	0	7
	Overweight	0	0	0	12	13
Total		0	0	7	12	20

Diet

		Very Less	Less	Normal	More	Total
Overweight Level	Normal	0	0	2.4	4.2	7.0
	Overweight	0	0	4.6	7.8	13.0
Total		0	0	7.0	12.0	20.0

Rate of *Overweight* with Physical Activity

	Value	Exact Sig. (2-sided)
Fisher's Exact Test	26.538	.000
N of Valid Cases	20	

The table shows the relationship between diet and overweight in respondents. No respondents with a "very less" or "less" diet were overweight, while seven people with a "normal" diet were not overweight. In contrast, all 12 respondents with a "more" diet were overweight, suggesting that an unhealthy diet has a high risk of causing obesity. The expected value for the overweight category in the group with a "normal" diet was lower (4.2), while in the group with a "more" diet, the expected value reached 7.8, confirming the importance of a balanced diet in preventing obesity. Overall, the total expected frequency for being overweight reached 13.0, indicating a close relationship between diet and the degree of overweight. In conclusion, these results suggest that interventions in diet are essential to prevent overweight and promote better health in society.

The table above presents the results of Fisher's Exact Test used to analyze the relationship between the level of overweight and diet. The Fisher's test value obtained is 26,538, with a significance value (Exact Sig.) of 0.000. This result shows that there is a significant association between the level of overweight and diet in the population studied, with a p value that is much smaller than the commonly used significance level of 0.05. In other words, diet can play an important role in determining an individual's weight status, and changes in eating habits can affect an individual's risk of becoming overweight. Considering that the number of valid cases in this analysis was 20, it is important to consider that even though the sample size is small, the results obtained still indicate a strong association and should be considered in efforts to prevent and treat overweight. Therefore, the development of better nutrition education programs and emphasis on the importance of a healthy diet is crucial in addressing the problem of overweight in the community.

The Power of Relationships

Table 6: Strength of association between overweight and physical activity

Strength of association between overweight and physical activity	
Gamma	*Value*
Ordinal by Ordinal	.692
N of Valid Cases	20
Strength of association between overweight and diet	
Gamma	*Value*
Ordinal by Ordinal	1.000

N of Valid Cases	20

The table above shows a strong association between overweight status and physical activity, with a Gamma value of 0.692. This means that individuals who are more physically active tend to have a lower risk of being overweight. This finding supports the importance of physical activity to prevent obesity. The data was taken from 20 cases, which strengthens the claim that physical activity plays an important role in weight management.

In addition, the table also shows a very strong relationship between overweight and diet, with a correlation coefficient of 1.00, meaning there is a very strong and positive relationship between the two variables. This means that unhealthy diets, such as consumption of foods high in calories, fat and sugar, contribute directly to weight gain. Therefore, it is important to raise awareness of healthy eating patterns to prevent obesity. However, further studies with larger samples and other variables such as physical activity and genetic factors are needed for more comprehensive results.

Discussions

Analysis of the Relationship between Overweight and Physical Activity

The results of statistical analysis using Fisher's Exact Test showed an Exact Sig. value of 0.000, which indicates a significant relationship between overweight and physical activity level, as this value is smaller than the significance limit of 0.05. The statistical value of 19.761 also indicates a strong correlation between overweight and physical activity intensity. From the observation frequency table, it can be seen that 11 out of 13 overweight respondents engage in vigorous physical activity, while normal weight respondents only engage in moderate intensity physical activity. This indicates that overweight individuals are more encouraged to increase the intensity of their physical activity, perhaps in an effort to control weight or improve physical health.

Physical activity is important in weight management because the higher the intensity of physical activity, the more energy the body burns. Overweight individuals tend to have excess energy reserves in the body, and increased physical activity can help burn this excess energy. Studies show that overweight individuals are more likely to increase their physical activity if they are aware of the health risks (Ogden et al., 2007) . Social support also plays an important role in motivation to participate in intensive physical activity (Białkowski et al., 2024) . Therefore, interventions that promote motivational factors and social support may increase adolescents' participation in physical activity and help improve their BMI status.

Analysis of the Relationship between Overweight and Diet

The results of the analysis using Fisher's Exact Test showed a significant association between diet

and overweight, with a significance value of 0.000 which is smaller than 0.05. This indicates that overeating patterns are closely associated with the incidence of overweight in respondents, where 60% of respondents with overeating patterns are overweight. This finding is in line with previous studies, such as by (Kansra et al., 2021) . , which found that a high-calorie diet, especially from fat and sugar, increases the risk of overweight, especially in adolescents. In addition, environmental factors, food culture and food preferences also influence unhealthy eating patterns (Pineda et al., 2024) .

However, this study has the limitation of a limited sample, so the results may not be widely generalizable. Further research with larger samples and considering other factors such as physical activity is needed. Recommendations for further research include focusing on educational programs to increase awareness of healthy eating patterns, reducing consumption of high-calorie foods, and involving support from parents and schools to create better eating habits among adolescents.

Power Analysis of the Relationship between Overweight and Physical Activity

The analysis showed a strong positive association between overweight and physical activity, with a Gamma value of 0.692. This finding indicates that increasing the intensity of physical activity has the potential to reduce overweight in respondents, in line with previous studies which also found a significant relationship between lack of physical activity and increased body weight (Mangopa et al., 2023; Mutia et al., 2022) . Research conducted by Lestari (2022) also showed a similar correlation, where higher physical activity was associated with a lower risk of overweight.

However, this study has limitations in that the sample size was limited and focused on one age group. Further research with larger samples and involving other factors, such as diet, is needed. Recommendations for future research include the design of structured physical activity programs, a comprehensive approach to health education, and long-term strategies to support the reduction of overweight among adolescents.

Power Analysis of the Relationship between *Overweigh* t with Physical Activity and Diet

Based on the results of the analysis using the Gamma value, a value of 0.692 was obtained, indicating a strong positive relationship between overweight and physical activity in the study subjects. This value is in the range that signifies a fairly strong relationship, indicating that as the intensity of physical activity increases, there is a tendency to reduce the level of overweight among respondents.

While the perfect relationship between diet and overweight with a Gamma value of 1.000, which indicates that changes in diet directly affect overweight status. This finding confirms the importance of a healthy diet in preventing overweight, especially among extracurricular basketball students at SMP Negeri 1 Palang, Tuban Regency. This finding is consistent with previous studies, such as by Pereira et al. (2023) , which found a high-calorie diet as a risk factor for overweight in adolescents. However, this study showed a stronger association than previous studies, which generally found a strong but imperfect

correlation.

The limitation of this study lies in the limited sample, which may affect the generalizability of the results. Further research with a larger sample and considering other factors, such as physical activity levels, may provide a more comprehensive understanding. Recommendations for future research include a focus on diet-based interventions and policies that support adolescent dietary changes. Education on healthy eating and integrated approaches that include physical activity will be essential to reduce overweight and improve health among adolescents.

CONCLUSION

The results of the analysis in this study indicate a strong and significant relationship between diet and physical activity with Overweight status among students who participate in extracurricular basketball at SMP Negeri 1 Palang, Tuban Regency. This means that a balanced diet and regular physical activity have a major influence on the BMI condition of these students, emphasizing the importance of their combination in maintaining health and ideal body weight.

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