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## The Analysis of Factors in Children's Dietary Patterns That Affect Physical Fitness



<sup>CA</sup>Thatit Nurmawati<sup>1</sup>, Anita Rahmawati<sup>1</sup>, Yeni Kartika Sari<sup>1</sup>, Oni Puji Lestari<sup>2</sup>

<sup>1</sup>STIKes Patria Husada Blitar, Indonesia

<sup>2</sup>Public Health Kepanjen Kidul Blitar, Indonesia

<sup>CA</sup>Corresponding Author

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### Abstract

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Fitness for children is related to optimal physical condition. Fitness influences mental and social development, especially children's concentration and learning abilities. Fitness must be maintained to support activities. Diet is a supporting factor for children's physical fitness. Diet is the foundation for long-term health. The research aimed to determine factors related to eating patterns that influence children's physical fitness. The research design was cross-sectional. The research population was school children aged 10-12 years totaling 96 students in 2023 using the total sampling method. The independent variables were BMI (Body Massa Index), physical activity, and rest, and the dependent variable was the child's physical fitness. The instrument used the Physical Activity Questionnaire to measure activity, eating patterns using Food Frequency, rest using The Pittsburgh Sleep Quality Index, and physical fitness, calculated using the Technical Guidelines for Health Screening and Periodic Examination of School-Age Children and Adolescents in 2018. The analysis test used linear regression ( $P < 0.05$ ) to determine the relationship between factors related to eating patterns and influencing children's physical fitness. The results of the study showed that there was no relationship between BMI ( $p = 0.661$ ), physical activity ( $0.783$ ), and rest ( $p = 0.756$ ) on eating patterns. An eating pattern is a significant mediator for physical activity and rest but not for BMI ( $p = 0.733$ ) on children's physical fitness. Rest ( $p = 0.000$ ) and physical activity ( $p = 0.004$ ) influence children's physical fitness. BMI does not measure the position and location of fat, so people with the same BMI have different fitness levels.

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✉ Correspondence Address:

STIKes Patria Husada Blitar – East Java, Indonesia

Email: [thatitnurmawati4@gmail.com](mailto:thatitnurmawati4@gmail.com)

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## INTRODUCTION

Fitness is the condition of a person's body with optimal physical ability to carry out daily activities without feeling excessively tired. Physical fitness is the human ability to carry out activities and still have the energy to do additional activities. Fitness includes various aspects, such as muscle strength, cardiovascular endurance, flexibility, balance, and coordination. In children, fitness not only affects their physical health but also their mental and social development, especially concentration and ability to learn at school ([Sánchez-Delgado et al., 2023](#)),

Children with high activity are not included in the low fitness category ([Sénéchal et al., 2021](#)). Children with low physical fitness are at risk of developing chronic diseases such as obesity, type 2 diabetes, hypertension, and heart disease. Decreased immune system often occurs in children with poor fitness so children become tired easily and less enthusiastic ([De Miguel-Etayo et al., 2014](#)). Ultimately, the immune system declines, resulting in various infections and diseases in children. East Java has the third lowest fitness level. As many as 82.7% of elementary school students in Indonesia showed poor or deficient fitness levels in 2020. In 2023, only 6.79% of children aged 110-15 will have good physical fitness or more ([Mutohir et al., 2023](#)). Low fitness levels are a problem of great concern. The number of elementary school students will be 2,075 in Kepanjen Kidul, Blitar City in 2022. Based on random measurements of 200 students, it is known that 45 students have the good fitness category, 30 are in the moderate category, 102 are in the poor category, and 25 are in the very poor category.

Studies prove that physical fitness influences children's interest in various activities ([Utesch et al., 2018](#)). Physical fitness in junior high school students can be influenced by several factors such as nutritional factors, rest patterns, healthy living habits, the influence of gadgets, and environmental factors ([Prianto et al., 2022](#)). Good fitness can be achieved through good eating patterns. An eating pattern is a person's habit of managing their food intake, including the type of food, meal times,

frequency, and portions ([Pujari, 2023](#)). Consuming adequate nutrition and containing various nutrients such as carbohydrates, protein, healthy fats, vitamins and minerals from fruit, vegetables or whole grains supports children's growth. In children, proper nutrition supports physical formation, body recovery, chronic disease prevention, and long-term health to achieve optimal fitness ([Chatterjee & Nirgude, 2024](#)). So, a good diet will be the main factor in building fitness because the nutrients that enter the body support all functions and systems necessary to achieve and maintain physical fitness.

Physical activity, rest, and BMI (body mass index) factors can influence eating patterns. Regular physical activity helps maintain a healthy weight, improving cardiovascular health. Regular physical activity will help regulate optimal eating patterns to achieve fitness. Sleep that is not optimal impacts fatigue, resulting in decreased motivation for physical activity and impaired cognitive function. BMI is an instrument for measuring health based on weight and height regardless of limitations. BMI describes the potential health impact on children ([Khanna et al., 2022](#)). A child's BMI serves as a predictive method to assess health and disease risk later in life, helping to identify potential obesity-related chronic conditions and thereby aiding early intervention strategies to encourage healthier lifestyles and prevent future health problems ([Khanna et al., 2022](#)).

## METHODS

The research design is quantitative research with a cross-sectional approach. The research was conducted on elementary school children aged 10-12 years at SDN 2 Sentul Blitar who were physically and mentally healthy, totaling 96 students in 2023, using the total sampling method. The independent variables in this study are factors that influence eating patterns, such as BMI (Body Mass Index), physical activity, and rest. Independent variables (BMI, physical activity, and rest) were mediated by diet. The dependent variable is the child's physical fitness. The instrument used is a questionnaire containing general data about respondents. BMI is

measured using a simple method to determine whether a person's weight is within a healthy range based on their height. Physical activity was measured using the Physical Activity Questionnaire. Rest was measured using The Pittsburgh Sleep Quality Index which comes from the validity and reliability of the Indonesian version of the Pittsburgh Sleep Quality Index for adolescents (Setyowati, A., & Chung, M.H., 2021). Eating patterns were measured using Food Frequency and physical fitness was measured using the 2018 Technical Guidelines for Health Examinations and Periodic Examinations of School-Age Children and Adolescents. A regression analysis statistical test (p-value <0.05) was used to see the relationship between the influence of food

factors on children's physical fitness. Certificate of ethical conformity obtained from KEPK STIKes Patria Husada Blitar No. 06/PHB/KEPK/182/11.23 in November 2023. Analysis test using SPSS 23.

**RESULTS**

An objective description of the results of research and discussion. Clearly explained in the form of narration and data based on the purpose of the study, if necessary accompanied by illustrations (paintings, drawings, graphs, diagrams), tables, or photos that support data. Simple and not complicated. Results that have been described with tables or illustrations do not need to be explained complicatedly.

**Table 1.** Frequency Distribution of respondents according to age and gender of students aged 10-12 years (n=96)

Variable		Frequency	Percent (%)
Age (year)	10	47	49.0
	11	32	33.3
	12	17	17.7
Gender	Male	45	46.9
	Female	51	53.1

*Source: Primary Data*

Table 1 describes respondents based on age and gender. Data shows that the highest age is 10 years, with a percentage of 49%, followed by 11 years, with a percentage of 33.3%. It can be seen

that the youngest age has the largest percentage. The distribution based on gender shows that women make up the largest percentage, at 53.1%. The gender is more female than male.

**Table 2.** Factors that influence eating patterns and factors that influence physical fitness

	Factors that influence eating patterns			Factors that influence physical fitness		
	Std Error	t	Sig	Std Error	t	Sig
<b>BMI</b>	.016	-.440	.661	0,007	.343	0,733
<b>Physical Activities</b>	.090	-.276	.783	0,039	2.914	0,004
<b>Rest</b>	.048	.311	.756	0,021	3.870	0,000
<b>Eating Pattern</b>	-	-	-	0,045	2.053	0,043

*Source: Primary Data*

Based on Table 2, there is no significant relationship between all factors, including BMI (p 0.661), physical activity (p 0.783), and rest (p 0.756) which influence eating patterns. The negative sign indicates a negative relationship between that variable and the dependent variable

that is, when the predictor variable increases, the dependent variable tends to decrease, and vice versa. The sig value is far above p<0.05. There is no statistically significant relationship between these variables and the dependent variable. BMI, physical activity, and rest do not influence eating pattern

[Table 2](#) shows that there is no relationship between BMI and children's physical fitness after being mediated by eating pattern ( $p = 0.733$ ) while the factors physical activity ( $p = 0.004$ ) and rest ( $p = 0.00$ ) ( $p < 0.05$ ). The biggest influence is seen in the rest variable, followed by the physical activity variable. A positive relationship shows a large influence.

Based on the table above, it can be seen that children's physical fitness is influenced by eating patterns. Eating patterns are a mediator of BMI, physical activity, and rest which can impact the physical fitness of school children.

## DISCUSSION

The negative coefficient ( $-0.007$ ) indicates that there is an inverse relationship between BMI and eating patterns, meaning that increasing BMI slightly reduces eating patterns. However, the significance value ( $0.661$ ) is far above  $p < 0.05$  indicating that this effect is not statistically significant. This means that BMI did not have a significant impact on eating patterns in this study.

BMI is a simple method for measuring a person's nutritional status. Studies on students show that normal BMIs have almost the same eating patterns as excessive BMIs, a regular breakfast factor can be the determining factor ([Pineda et al., 2020](#)). The a high percentage of bad eating and sleeping habits, alcohol drinking, and smoking among students with normal BMI ([Pineda et al., 2020](#)). Adolescents tend to consume foods with a low glycemic index and their intake is much less than their needs ([Sutjiati & Saputri, 2022](#)). However, regular frequency of eating as an illustration of a good diet is not in line with a good BMI. Most of the respondents in this research were women. Some girls start to show signs of puberty earlier through hormonal changes. An increase in the hormone estrogen can affect body fat distribution and body weight without significant changes to eating patterns ([Hariani et al., 2016](#)). Each individual has a different metabolic process, some have an efficient metabolism so the calorie-burning process is very fast ([Burns et al., 2015](#)).

The physical activity coefficient is negative ( $-0.025$ ), indicating that the relationship between physical activity and physical fitness is slightly in

the opposite direction, where increasing physical activity slightly reduces eating patterns. However, the significance value of  $0.783$  is much higher than  $p < 0.05$  indicating that in this study, physical activity does not have a significant impact on eating patterns.

Physical activity is any body movement that increases energy expenditure or energy and energy burning ([Westertep, 2013](#)). Physical activity can be seen through playing activities in children. Playing for children is a way to express themselves, explore, and learn. It is a habit for children to spend time playing or other activities such as sports. Continuous activity forces the body to adapt without needing to change diet. A diet that consumes protein without doing activity can maintain muscle mass and reduce fat mass ([Pesta & Samuel, 2014](#)).

A positive coefficient ( $0.015$ ) indicates that there is a positive relationship between rest and eating patterns, where increasing the quality or quantity of rest slightly improves eating patterns. However, the significance value ( $0.756$ ) is greater than  $p < 0.05$ , which means this effect is not significant. So in this study, rest also did not have a significant impact on eating patterns. Rest in the form of sleep does not reduce overall brain activity, even oxygen absorption increases beyond normal limits when awake during sleep. Sleep rest has a role in energy recovery, cell repair, and brain function, in contrast to eating patterns which have the task of providing energy and nutrients.

Based on this analysis, the factors that have a significant influence on children's physical fitness after receiving a dietary mediator are physical activity and rest. Rest appears to have the strongest influence (standardized Beta =  $0.359$ ), followed by physical activity ( $0.269$ ). However, the BMI factor did not have a significant influence on the physical fitness of children in this study.

Diet has an important role as a factor that has a significant influence on children's physical fitness, with a significance value of  $0.043$  ( $p < 0.05$ ). The coefficient value is  $0.093$  and the standardized Beta value is  $0.188$ , indicating that diet has a direct positive influence on physical fitness. So it can be said that a good diet will strengthen the positive

effects of physical activity and rest on children's physical fitness. Diet as a moderator can strengthen factors that influence it to be related to children's physical fitness. Energy as a result of metabolism is used to optimize physical activity by maintaining bone, muscle, and tissue strength, thereby reducing the risk of injury.

Patients with certain conditions, such as hormonal and metabolic disorders, will have a high BMI but it is not related to diet. BMI does not measure the location and position of stored body fat. Compared with visceral fat, subcutaneous fat in other areas poses a smaller health risk. Abdominal or central obesity is associated with increased cardiometabolic risk in children and adolescents. For waist circumference, there are regional and international growth references allowing adjustment for age and sex ([Jebeile et al., 2022](#)). This condition allows two individuals with the same BMI to have different health risks. Girls have a higher BMI than boys associated with low HDL cholesterol levels but high blood sugar levels ([Burns et al., 2015](#)).

Physical activity can improve mental health and mood through the release of endorphins. Endorphins are known to reduce stress and create a happy atmosphere ([Swanson, 2021](#)). Endorphins, especially beta-endorphins, play an important role in stimulating immunity, pain relief, and stress reduction, thereby benefiting the health of individuals of all ages ([TG, 2018](#)). This kind of mental fitness is often associated with choosing healthier foods because someone who feels good tends to choose nutritious foods. People with a healthy mindset have been proven to prefer healthy food because there is harmony between their physical and psychological health ([Wahl et al., 2017](#)).

The diet also strengthens the influence of rest on fitness. The quality and duration of sleep can influence a person's food choices and eating habits. Insufficient or low-quality sleep is often associated with a preference for foods high in sugar, fat, and simple carbohydrates, which ultimately hurt health and body weight ([Arslan et al., 2024](#)). On the other hand, a healthy diet with a high intake of fiber,

protein, and plant foods such as the Mediterranean diet has been proven to improve sleep quality and reduce sleep disorders. When the body doesn't get enough rest, the production of ghrelin, a hormone that increases hunger, tends to increase. At the same time, leptin, a hormone that suppresses appetite, decreases. As a result, a person tends to eat more, especially choosing high-calorie foods. Choosing foods with high calories leads to unhealthy eating patterns that have the potential to damage fitness ([García-Hermoso et al., 2022](#)). Good eating habits from infancy lead to good body composition and reduce obesity and chronic diseases in the future ([Martín-Rodríguez et al., 2022](#)).

## CONCLUSION

BMI, physical activity, and rest do not affect eating patterns. However, rest and physical activity affect physical fitness after receiving dietary mediators. The same BMI in different individuals has different fitness.

## SUGGESTION

Children must understand that factors in eating patterns that are related to fitness need to be improved to maintain children's fitness so that their concentration on learning becomes high.

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## CONFLICTS OF INTEREST

The author states that there is no conflict of interest with any party, whether financial, consultant, institutional, or other relationships that could cause bias.

## AUTHOR CONTRIBUTIONS

All research teams are involved in the entire research process, starting from planning activities,

data collection, analysis, and presentation of research results.

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