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The Relationship Between Physical Activity and Body Mass Index (BMI) of Young Children

PAJU VOL 7 NO 1 APRIL 2025
JURNAL PAJU PENJAS FIKES UNSOED
Universitas Jenderal Soedirman

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Physical Activity Journal (PAJU)
Volume X, Number. X, October 2023
e-ISSN : 2686-5807 | p-ISSN : 2686-5793

The Relationship Between Physical Activity and Body Mass Index (BMI) of Young Children

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: https://doi.org/10.20884/1.paju.2023.vx.nx.xxxx

Abstract

This study aims to analyze the relationship between physical activity and Body Mass Index (BMI) in early childhood children at the PAUD Center. The research uses a quantitative approach with a correlational design. The sample consisted of 32 young children and their parents, selected using purposive sampling. Data on physical activity was collected through a questionnaire filled out by the parents, while BMI data was obtained by measuring the children's weight and height, which were then converted based on BMI standards according to age and sex. Spearman *Rank correlation. Data analysis was carried out using the* Spearman *Rank correlation test because the data were not normally distributed. The analysis results showed a correlation coefficient (Spearman's rho) of -0.331 with a significance value (p) of 0.065. These results indicate that there is a negative relationship with a weak correlation between physical activity and Body Mass Index, but the relationship is not statistically significant. This finding suggests that physical activity is not the only factor affecting the Body Mass Index of young children. Other factors such as diet, nutritional intake, genetics, and environment are also suspected to play a role in determining children's nutritional status. Therefore, comprehensive efforts are needed to support the optimal growth and development of children.*

Keywords: *Physical activity, body mass index, early childhood,* Spearman *Rank correlation.*

INTRODUCTION

Increasing the prevalence of nutrition problems in early childhood in Indonesia is one of the public health issues that requires serious attention. According to data from the World Health Organization (WHO) and national reports like the Basic Health Research (RIKESDAS), the prevalence of stunting in toddlers in Indonesia is still relatively high, around 21.6% in 2022, while the prevalence of poor nutrition and undernutrition reached around 17%. On the other hand, the prevalence of overweight and obesity in children has also continued to rise. This situation indicates that Indonesia is facing a double burden of malnutrition, meaning both undernutrition and overnutrition are happening at the same time. This issue is influenced by various factors, including an unbalanced diet, lack of

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physical activity, as well as environmental and socio-economic factors. (Kesehatan Kementrian, 2021)(WHO., 2020)

Childhood obesity isn't just about personal looks; it's a chronic condition that can have long-term effects on quality of life. Kids who are obese from an early age have a higher risk of staying obese into adulthood and are more likely to develop various metabolic and degenerative diseases. On top of that, childhood obesity is linked to a higher risk of cardiovascular issues and high blood pressure. (Anggraini, et al., 2014). That's why preventing obesity should start in early childhood by managing different modifiable factors.

Early childhood refers to individuals aged 0-8 years and is known as the golden age, which is the period when growth and development happen very rapidly and lay the foundation for development in later stages of life (Rahman et al., 2022). During this time, children experience rapid increases in height and weight, along with development in various areas, such as moral and religious values, gross and fine motor skills, language, cognitive abilities, and social-emotional skills, all developing optimally (Puspojudho et al., 2025). A child's physical growth is marked by continuous changes in height and weight, although the growth rate of both doesn't always progress evenly because it's influenced by the development of the skeletal system, muscles, and various other organs (Siregar, 2018).

One of the indicators commonly used to assess a child's nutritional status is the Body Mass Index, which is a method of evaluating a child's nutrition based on the comparison between weight and height. Body Mass Index is influenced by direct factors, such as age, gender, and genetics, as well as indirect factors including diet, environment, psychological conditions, technological development, and physical activity (Herawati et al., 2025). Therefore, Body Mass Index can be used as an indicator to identify a child's nutritional status early on.

Among the various factors that affect Body Mass Index, physical activity is one that can be changed through developing a habit of staying active. Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure, while exercise is a type of physical activity that is planned, structured, and repetitive with the goal of improving fitness or health (Daniati, 2020). Regular physical activity plays an important role in maintaining energy balance, which can help prevent overweight and obesity in young children.

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e-ISSN : 2686-5807 | p-ISSN : 2686-5793
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Physical activity plays a very important role in supporting the growth and development of young children. Besides improving muscle strength, movement coordination, and overall fitness, physical activity also contributes to the development of motor skills, cognitive abilities, and social-emotional aspects of children. Through physical activities, children get the chance to interact with their environment and develop social skills needed in everyday life (Ateş, 2018). Activities that involve full-body movements like running, jumping, and playing with peers can also improve balance, agility, and body coordination. Optimizing these physical activities requires support from parents and educators so that children get opportunities to move according to their age and developmental stage (Astri, 2025).

The relationship between physical activity and Body Mass Index is closely related to the body's energy balance. Children who have high levels of physical activity tend to burn more energy, which helps prevent excessive fat accumulation. On the other hand, low physical activity means the energy consumed isn't balanced with energy expenditure, which can potentially increase Body Mass Index. Various studies show that low physical activity is one of the main risk factors for overweight and obesity in early childhood, so physical activity plays a protective role in maintaining a healthy nutritional status. (de Onis, 2017).

Even so, the activity levels of young children today are still influenced by various factors, such as learning patterns at school, the types of games available, and the role of parents in encouraging children to stay active. Advances in technology also lead many children to spend more time in sedentary activities, like watching TV and using gadgets, rather than engaging in physical activity. This condition has the potential to affect children's nutritional status, which is partly measured through Body Mass Index (BMI). (Fahdani, 2025).

Various studies have examined the relationship between physical activity and Body Mass Index, but research that specifically involves young children is still relatively limited. In fact, early identification of factors that affect Body Mass Index is very important as an effort to prevent overweight and obesity from an early age. Based on this explanation, research on the relationship between physical activity and Body Mass Index in young children needs to be conducted to add scientific evidence regarding the connection between these two variables. The results of this research are expected to serve as a basis

https://doi.org/10.20884/1.paju.2020.vx.nx.xxxx
e-ISSN : 2686-5807 | p-ISSN : 2686-5793

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for efforts to prevent nutritional problems as well as support children's growth and development optimally.

METHOD

This study uses a quantitative approach with a correlational method. The quantitative approach is used to obtain data that can be measured objectively and analyzed statistically, while the correlational method aims to find out the relationship between Physical Activity (X) and Body Mass Index (BMI) (Y) in early childhood without giving any treatment to the variables being studied.

The research was carried out at the PAUD Post involving 32 young children and their parents as research respondents. The sample was selected using a purposive sampling technique, which is based on certain criteria set by the researcher according to the research objectives.

Data was collected using two techniques. Physical activity data was obtained through a questionnaire filled out by parents to describe the child's level of physical activity. Meanwhile, Body Mass Index (BMI) data was obtained by directly measuring the child's weight and height using calibrated measuring tools. The Body Mass Index value was calculated using the formula weight (kg) divided by height squared (m^2), then classified according to BMI standards based on age and gender.

Data analysis started with a descriptive analysis to show the characteristics of the respondents and the distribution of each variable. Next, a normality test was conducted to see the data distribution. The results of the normality test indicated that the data were not normally distributed, so the relationship between physical activity and Body Mass Index was analyzed using the Spearman Rank correlation test (Spearman's rho) with the help of IBM SPSS Statistics. The significance level used was $\alpha = 0.05$. The correlation coefficient value was used to determine the direction and strength of the relationship between variables, while the significance value was used to determine whether there was a statistically meaningful relationship or not.

Based on the analysis results, the Spearman's rho value was -0.331 with a significance (p) value of 0.065, indicating a negative relationship with a weak strength between physical activity and Body Mass Index, but this relationship is not statistically significant at the 5% significance level. Therefore, the hypothesis stating that there is a

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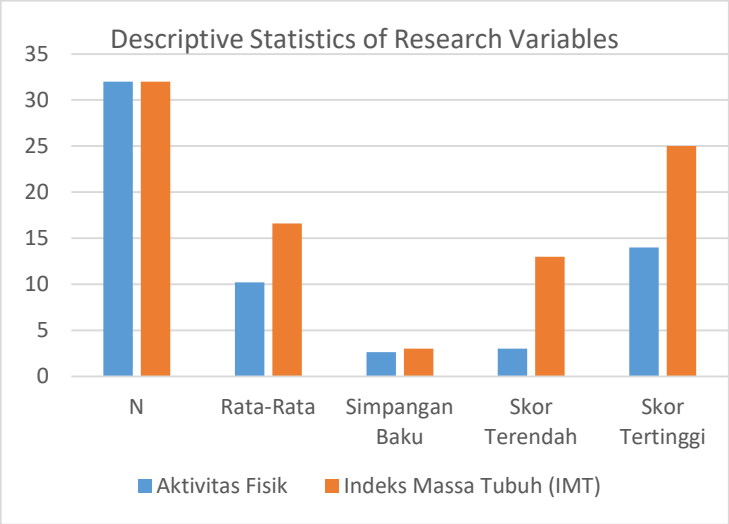
significant relationship between physical activity and Body Mass Index in early childhood cannot be accepted.

RESULT

This study involved 32 young children from three early childhood education centers. Descriptive analysis was conducted to give an overview of the respondents' physical activities and Body Mass Index (BMI).

Table 1. Descriptive Statistical Results of Research Variables

Variabel	N	Mean	Std. Deviation	Minimun	Maximum
Physical Activity	32	10,20	2,628	3	14
Body Mass Index (BMI)	32	16,60	3,019	13	25



Based on Table 1, the average physical activity of children is 10.20 ± 2.63, while the average BMI is 16.30 ± 3.04. These results show that most respondents have a fairly good level of physical activity, with an average BMI still in the normal range. The standard deviation for both variables is relatively small, indicating a fairly uniform data spread.

Tabel 2. Shapiro-Wilk Normality Test Results

Variabel	Statistic	df	Sig.

https://doi.org/10.20884/1.paju.2020.vx.nx.xxxx
e-ISSN : 2686-5807 | p-ISSN : 2686-5793

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Variabel X	0,899	32	**0,006**
Variabel Y	0,833	32	**0,001**

The significance values for both variables are less than 0.05, so the data is not normally distributed. Therefore, the analysis of the relationship between physical activity and BMI was done using the Spearman Rank correlation test, which is suitable for nonparametric data.

Tabel 3. Spearman Rank Correlation Test Results

Correlations

			Physical Activity	Body Mass Index (BMI)
Spearman's rho	Physical Activity	Correlation Coefficient	1.000	**.331**
		Sig. (2-tailed)	.	**.065**
		N	32	**32**
	Body Mass Index (BMI)	Correlation Coefficient	.331	**1.000**
		Sig. (2-tailed)	.065	**.**
		N	32	**32**

Based on Table 3, the Spearman's rho value is -0.331 with a significance value of 0.065. This coefficient indicates a negative relationship with a low level of association between physical activity and Body Mass Index. However, since the significance value is greater than 0.05, this relationship is not statistically significant. Therefore, the research hypothesis stating that there is a significant relationship between physical activity and BMI in early childhood cannot be accepted.

Tabel 4. Determination Test Results

Tabel 4.5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

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1	,245[a]	,060	,029	2,975

a. Predictors: (Constant), Physical Activity

An R Square value of 0.060 shows that physical activity only contributes about 6% to the variation in BMI for young children. On the other hand, around 94% of the BMI variation is influenced by other factors not analyzed in this study, such as diet, nutrient intake, genetic factors, sleep quality, health conditions, sedentary behavior, and family environment.

DISCUSSION

A primary contributor to the non-significant outcome lies in the high degree of homogeneity among the sample. As revealed by the descriptive statistics, the children's mean physical activity score was 10.20 ± 2.63, reflecting generally adequate active play habits, while their mean BMI was 16.60 ± 3.02 kg/m², placing the majority firmly within normal body composition standards. Because very few children exhibited extreme physical inactivity or severe adiposity/malnutrition, the data range was restricted. In statistical correlation analysis, low variance across independent and dependent variables inherently dampens the mathematical sensitivity of correlation coefficients. This empirical pattern reinforces the findings of (Ma & Luo, 2023), who demonstrated that in preschool cohorts where physical activity habits and physical growth parameters are uniformly normal, the direct linear correlation between physical activity and BMI attenuation becomes minimal.

The sample size of 32 children, while appropriate for exploratory local PAUD evaluations, places constraints on statistical power. Non-parametric rank-based tests like Spearman's rho require larger sample sizes ($N > 50$-100) to detect weak-to-moderate effect sizes (such as $r = -0.331$) at $p < 0.05$. In smaller cohorts, subtle physiological correlations are frequently masked by minor individual variations in growth rates (Maryati, 2025;Hajar et al., 2026).

The determination analysis ($R^2 = 0.060$) demonstrated that physical activity accounts for a mere 6.0% of BMI variation, leaving 94.0% of body composition variance dictated by unmeasured determinants. According to guidelines by the (Organization, 2020) and studies by (Herawati et al., 2025), early childhood BMI is an intricate outcome of energy intake versus energy expenditure, intertwined with biological, environmental,

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and behavioral drivers. Even when a young child engages in high physical activity, an excessive intake of energy-dense, high-sugar, or high-fat foods can override active energy expenditure, resulting in elevated BMI (Banjarnahor, 2022; Abdelhak, 2022). Conversely, children with moderate physical movement can maintain an ideal BMI if their dietary intake is balanced and regulated Sanusi, (2020).

Furthermore, secondary lifestyle factors play decisive roles in early childhood metabolic health. Research by Ramdhan, (2024) and Wiersma, (2020) highlights that nocturnal sleep duration (recommended 10-13 hours/day) and sleep quality regulate appetite hormones (ghrelin and leptin); inadequate sleep promotes weight gain regardless of physical exercise. Similarly, sedentary screen time—such as viewing televisions or smartphones-promotes passive snacking behavior and metabolic slowdown (Fahdani et al., 2025;Widodo et al., 2025). Genetic factors, parental weight status, domestic culinary habits, and socio-economic context also exert profound impacts on growth trajectory (Loviyani, 2020;Solihatin, 2018;Yarni, 2024).

Consequently, these findings strongly imply that physical activity alone cannot serve as a standalone intervention for weight management in early childhood. Instead, pediatric health promotion in PAUD institutions must adopt a multi-component lifestyle framework combining unstructured active play (Agisah, 2025;Astri, 2025), nutrient-dense dietary guidelines, strict screen-time boundaries, proper sleep hygiene, and active family engagement.

CONCLUSION

This study shows that there is no significant relationship between physical activity and Body Mass Index (BMI) in early childhood children. The Spearman Rank test resulted in a correlation coefficient of -0.331 with a significance value of 0.065 ($p>0.05$), meaning that physical activity is not significantly related to BMI. Even though the relationship found is negative, physical activity only contributes 6% to the variation in BMI, while 94% is influenced by other factors, such as diet, nutritional intake, genetics, sleep quality, and the environment. Therefore, efforts to maintain the nutritional status of young children need to be carried out comprehensively through a healthy lifestyle and family support.

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