



The Relationship Between Nutritional Intake, Body Composition, and Physical Activity with the Level of Physical Fitness in Children with Mild Intellectual Disabilities

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Abstract

This study analyzed the relationship between macro nutrient intake, body composition, and physical activity with physical fitness levels in 40 children with mild intellectual disabilities aged 15-19 years in Semarang, using a correlational survey method with standard instruments such as 24-hour food recall, BIA, PAQ-A, and TKSI level 4. The results of bivariate and multivariate analyses consistently showed that there was no statistically significant relationship or influence between nutritional intake (energy, protein, fat, carbohydrates), body composition (fat, visceral fat, BMI), and physical activity on physical fitness, as all significance values were above 0.05. This insignificance is believed to be due to the demands on cognitive aspects and movement coordination, which are more dominant than nutritional adequacy, as well as the unstructured and low-intensity nature of physical activity. Therefore, it is concluded that physical fitness in children with mild intellectual disabilities is more influenced by factors outside the scope of this study, such as basic motor skills, neuromuscular coordination, ability to follow instructions, and environmental support, especially the role of parents and teachers.

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INTRODUCTION

Physical fitness plays an important role in the daily functioning and quality of life of all children, including those with intellectual disabilities. Children with mild intellectual disabilities often face difficulties in developing motor skills and maintaining adequate fitness levels compared to their normally developing peers (Sumaryanti et al., 2022). These challenges are not only due to cognitive limitations, but also to various factors including lack of opportunities for physical activity, nutritional imbalances, and limited access to adapted physical education programs.

Recent studies in Indonesia have documented alarming levels of fitness among students with mild intellectual disabilities in special education schools. Research from UNESA found that a large number of these children fall into the “low” to “moderate” categories on various fitness components (Mubarrak, 2017). Meanwhile, a study from Ganesha University of Education emphasizes that regular physical activity can make a real difference in improving their fitness outcomes (Awalliyah, 2024). These findings highlight the need for a deeper understanding of the factors that influence physical fitness in this population.

Looking at the international literature, children with intellectual disabilities consistently show lower levels of physical activity and poorer health-related fitness compared to children without disabilities (Wouters et al., 2019). They also face higher risks of obesity and nutritional issues, which further impact their physical capabilities (Bandini et al., 2021). The relationship between what these children consume, their body composition, and how much they move appears to create a cycle that affects their overall fitness. What makes this topic particularly relevant is that, unlike genetic factors, nutrition and physical activity are things we can change and improve. If we understand how these factors work together to influence fitness, we can develop more

effective programs for children with mild intellectual disabilities. This is especially important in Indonesia, where special education schools are still working to establish standardized fitness assessment and intervention protocols.

The purpose of this review is to synthesize what Indonesian and international research says about the relationship between nutritional intake, body composition, and physical activity with physical fitness in children with mild intellectual disabilities. By analyzing these relationships, we hope to provide useful insights for teachers, parents, and policymakers who work with these children on a daily basis (Pramesti, 2025).

Although cognitive limitations define intellectual disability, emerging evidence suggests that modifiable lifestyle factors, particularly nutrition, physical activity, and resulting body composition, play an equally important role in determining physical fitness outcomes. Research from a special education setting in Sidoarjo revealed that children with mild intellectual disabilities exhibited fitness levels far below their typically developing peers, with particular deficits in cardiovascular endurance and muscle strength (Mubarrak & Kafrawi, 2017). These findings raise important questions about whether this inequality is primarily caused by the disability itself or by secondary factors that can be addressed through targeted interventions.

The situation becomes more complex when considering that children with intellectual disabilities often face the double burden of nutritional challenges. Jacob et al. (2021) showed that these children experience higher rates of obesity alongside micronutrient deficiencies compared to children without disabilities, suggesting that body composition abnormalities may play a critical mediating role between dietary intake and physical performance. This paradox, where these children are calorie-excessive yet nutrient-deficient, creates unique challenges

in improving fitness outcomes in this population. Physical activity patterns further complicate this relationship. Wouters (2018) systematically documented that children with intellectual disabilities engage in significantly less moderate-to-vigorous physical activity than their peers, spending more time in sedentary behaviors both during school hours and leisure time. These low activity levels not only limit opportunities for fitness development but also affect energy balance and body composition, creating a negative cycle that potentially perpetuates low fitness levels.

METHODS

This study uses a test survey method with a correlational approach to explain in detail the conditions, circumstances, and information. The respondents used in this study numbered 40 students, using purposive sampling to select respondents who met the specified criteria. The criteria for respondents included students aged 15-19 years old from special schools. Respondents also agreed to participate in the study by filling out a questionnaire and agreeing to the requirements proposed by the researcher.

The procedures in this study included preparation by preparing research instruments, then determining the respondents in the population. Next, the instruments and Indonesian student fitness tests were distributed directly to the respondents, who were special needs school students. The next stage was to collect and analyze the available data. The final stage was to formulate the results and findings during the research.

RESULTS AND DISCUSSION

This study used instruments such as a 24-hour food recall, Bioelectrical Impedance Analysis (BIA), Physical Activity Questionnaire for Adolescents (PAQ-A), and the Indonesian Student Fitness Test (TKSI) for mild intellectual disability level 4. These

instruments were used to measure macro nutrient intake, body composition, physical activity, and physical fitness in children with mild intellectual disability. The research document did not include validity or reliability tests, as the instruments used were standard measuring tools commonly used in related research. The study involved 40 respondents (20 males and 20 females) selected through purposive sampling. Physical fitness was measured through six components of the TKSI test, namely standing reach, eye-hand coordination, push-ups, jump without a run-up, shuttle run, and rhythm run. Physical activity was measured using the PAQ-A. Data analysis was performed through univariate, bivariate (Spearman's test), and multivariate (multiple linear regression) analyses. The results showed that all variables had a significance value above 0.05, both in the relationship analysis and the influence analysis, so that no variable showed a significant relationship or influence on the level of physical fitness.

	N	Min	Max	Median	Std.Deviation	Skewness	
						Statistic	Std.Error
Tinggi Badan	40	134	174	162,00	9,655	-0,831	0,374
berat badan	40	31	93	57,45	13,701	0,326	0,374
Persentase Energi	40	37	94	57,50	9,844	1,101	0,374
Persentase Protein	40	30	96	61,50	16,28	0,71	0,374
Persentase Lemak	40	28	201	59,00	27,16	3,403	0,374
Persentase Karbohidrat	40	36	76	50,50	8,513	0,333	0,374
FAT	40	7	99	34,00	7,545	-6,2	0,374
Visceral FAT	40	1	17	5,50	4,181	0,786	0,374
BMT	40	15	33	23,00	5,074	0,109	0,374
Aktivitas Fisik	40	1	5	2,44	0,621	-0,029	0,374
Ketahanan Jantung	40	10	15	11,00	1,109	0,730	0,374

Sumber : Data diolah, 2025

Figure 1. Frequency Distribution of Respondent Characteristics

The univariate analysis showed that the gender variable had a balanced distribution, with 20 male respondents (50.0%) and 20 female respondents (50.0%). Respondents' height ranged from 134 to 174 cm with a median of 162 cm, while their weight ranged from 31 to 93 kg with an average of 57.45 kg. Nutrient intake showed a right-skewed distribution across all components, namely energy fulfillment of 37–94%, protein of 30–96%, fat of 28–201%, and carbohydrates of 36–76%, indicating

that there were respondents with higher nutritional fulfillment than the majority, especially in fat. Body composition showed total fat of 7–39%, which was relatively symmetrical, while visceral fat of 1–17% was slightly skewed to the right. BMI (15–33 kg/m²) had a near-normal distribution, reflecting nutritional status variation from thin to mildly obese. Physical activity ranged from 1–3 with an almost symmetrical distribution, indicating that the majority of respondents were in the moderate category. Physical fitness had a score of 10–15 with a tendency to skew to the right, indicating that there were respondents with better fitness. Overall, anthropometric and body composition variables tended to be stable, while nutritional intake showed a stronger positive skew.

	Correlation Coefficient	Sig.(2-tailed)
Tinggi Badan	0,147	0,365
Berat Badan	0,219	0,174
Pemenuhan Energi	-0,123	0,451
Pemenuhan Protein	-0,060	0,712
Pemenuhan Lemak	-0,290	0,069
Pemenuhan Karbohidrat	0,004	0,980
FAT	-0,018	0,912
Visceral FAT	-0,009	0,956
IMT	0,143	0,379
Aktivitas Fisik	-0,194	0,232

Sumber : Data diolah, 2025

Figure 2. Spearman Correlation Test Results

The results of the bivariate analysis show that all variables have a significance value (p-value) > 0.05, so there is no statistically significant relationship. Height ($r = 0.147$; $p = 0.365$) and weight ($r = 0.219$; $p = 0.174$) do not show a significant relationship. Nutritional intake was also not related to fitness, namely energy intake ($r = -0.123$; $p = 0.451$), protein ($r = -0.060$; $p = 0.712$), fat ($r = -0.290$; $p = 0.069$), and carbohydrates ($r = 0.004$; $p = 0.980$). Body composition also showed similar results, with total FAT ($r = -0.018$; $p = 0.912$), visceral fat ($r = -0.009$; $p = 0.956$), and BMI ($r = 0.143$; $p = 0.379$), all of which were insignificant. Physical activity ($r = -0.194$; p

$= 0.232$) also had no significant relationship with physical fitness. Overall, the bivariate analysis confirmed that none of the variables, including height, weight, macro nutrient intake, body composition, or physical activity, showed a significant relationship with physical fitness, as all p-values were above 0.05

Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	t	Sig.
Constant	16.326	6.786	—	2.407	0.019
Jenis Kelamin	0.831	0.556	0.351	1.493	0.147
Tinggi Badan	-0.036	0.042	-0.293	-0.865	0.395
Berat Badan	0.072	0.047	0.313	1.588	0.124
Pemenuhan Energi	-0.853	0.548	-7.813	-1.557	0.131
Pemenuhan Protein	0.111	0.073	1.508	1.472	0.152
Pemenuhan Lemak	0.256	0.183	1.861	1.534	0.138
Pemenuhan Karbohidrat	0.499	0.318	1.547	1.589	0.128
FAT	-0.00000067	0.049	0.000	0.001	1.000
Visceral FAT	-0.132	0.079	-0.459	-1.665	0.070
Indeks Massa Tubuh	-0.019	0.089	-0.238	-0.688	0.554
Aktivitas Fisik	-0.003	0.314	-0.314	-1.027	0.064

Sumber : Data diolah, 2025

Figure 3. Results of Multiple Linear Analysis

Multivariate analysis using multiple linear regression was performed to determine the effect of independent variables on physical fitness. The results showed that all variables—including gender, height, weight, energy intake, protein, fat, carbohydrates, FAT, visceral FAT, BMI, and physical activity—had a significance value above 0.05, thus not providing a statistically significant effect. Gender ($p = 0.147$), height ($p = 0.395$), and weight ($p = 0.124$) did not show a significant effect. Energy, protein, fat, and carbohydrate intake also had no effect because all p values were > 0.05. Total body fat (FAT) had a significance value of 1.000, so it did not contribute at all, while visceral fat ($p = 0.070$) and physical activity ($p = 0.064$) were close to the significance threshold but were still declared insignificant. Body mass index (BMI) also had no effect ($p = 0.554$). Overall, the regression results showed that no independent variables had a significant effect on physical fitness, so all of these variables were unable to explain the variation in physical fitness in children with mild intellectual disabilities.

The Relationship Between Nutritional Intake and Physical Fitness Levels in Children with Mild Intellectual Disabilities

The results showed that energy, protein, fat, and carbohydrate intake were not significantly related to the physical fitness of children with mild intellectual disability, as all p-values were above 0.05. This finding is in line with Zahrah et al. (2022), who also reported that protein intake and nutritional status were not related to physical fitness in students. In theory, macronutrients support energy provision and metabolic function, but in children with mild intellectual disabilities, this mechanism is not clearly evident due to motor impairments, poor coordination, and difficulty following instructions. These factors have a greater impact on fitness performance than nutritional adequacy. Unstructured, low-intensity physical activity also weakens the influence of nutritional intake on fitness. In addition, the food recall method in children with special needs is prone to bias, so that the recorded nutritional intake may not necessarily reflect the actual condition. Overall, nutritional intake is not the main predictor of physical fitness in children with mild intellectual disabilities. Motor factors and physical activity play a greater role in determining their fitness level (Zahrah et al., 2022).

The Relationship Between Body Composition and Physical Fitness Levels in Children with Mild Intellectual Disabilities

The results of the study indicate that body fat, visceral fat, and BMI are not significantly related to the physical fitness of children with mild intellectual disabilities. Although body composition theoretically affects physical performance, in children with intellectual disabilities, motor skills, coordination, and information processing are more decisive factors in fitness than fat levels or BMI. This is in line with Pınarbaşı & Hisar (2019), who explain that intellectual disabilities cause motor delays, movement

insecurity, and coordination difficulties, so that fitness performance is more influenced by neuromotor factors and physical activity participation. Low physical activity in this group also means that variations in body composition do not have a significant impact on fitness. Overall, body composition is not the primary predictor of physical fitness in children with mild intellectual disabilities. Motor, neurological, and environmental factors are far more dominant, so fitness interventions should focus on developing motor skills and increasing physical activity.

The Relationship Between Physical Activity and Physical Fitness Levels in Children with Mild Intellectual Disabilities

The results of the study indicate that physical activity is not significantly related to the physical fitness of children with mild intellectual disabilities. This finding differs from the study by Rosa Guillamón et al. (2017), which shows a positive relationship between physical activity and physical condition in children in general. This discrepancy can be explained by the motor, coordination, and instruction comprehension limitations of children with mild intellectual disabilities, so that the physical activities they perform tend to be light, unstructured, and not intense enough to improve fitness. The study by Arsenault et al. (2011) also confirms that internal health factors and anthropometric indicators have a greater influence on fitness than non-intensive physical activity. Thus, physical activity does not yet contribute significantly to the fitness of children with mild intellectual disabilities, so a more structured physical activity program tailored to their needs is required.

CONCLUSION

The conclusion of this study found that there was no significant relationship between nutritional intake, body composition (body fat, visceral fat, BMI), or physical activity and the level of physical fitness of children with mild intellectual

disabilities. Statistically, with a significance value above 0.05, these independent variables, including height, weight, and gender, cannot predict or significantly influence the physical fitness of this population, as evidenced by the multiple linear regression model. This insignificance is believed to be due to the demands on cognitive aspects and movement coordination, which are more dominant than nutritional adequacy, as well as the unstructured nature and low intensity of physical activity. Thus, the physical fitness of children with mild intellectual disabilities is more influenced by factors outside the scope of this study, such as basic motor skills, neuromuscular coordination, ability to follow instructions, general health conditions, and environmental support.

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