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The relationship between body mass index and frog jumping ability in elementary school students

Hubungan antropometri dan status gizi terhadap kemampuan motorik siswa kelas tinggi sekolah dasar

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ABSTRACT

The development of fundamental movement skills during childhood plays a crucial role in enhancing physical activity and maintaining overall health throughout life. This study aims to analyze the relationship between Body Mass Index (BMI) and children's motor skills, particularly in the frog jump test. The study employs a correlational approach with a sample of 120 upper-grade elementary school students (grades 4, 5, and 6) from SDN Gadingkasri and SDN Oro-Oro Dowo in Malang City. The subjects consist of 63 students from SDN Gadingkasri and 57 students from SDN Oro-Oro Dowo, with a balanced gender composition and an age range of 9–12 years. Measurements include body weight and height. The results indicate a significant relationship between anthropometric measurements and children's frog jumping ability. Children with a normal BMI demonstrate better motor skills compared to those who are underweight, overweight, or obese. The implications of this study highlight the importance of regular nutritional status monitoring and the development of children's motor skills through appropriate nutritional interventions and structured physical exercise programs in schools. Collaboration between schools, parents, and communities is essential to ensure optimal motor development in elementary school-aged children.

Keywords: index mass body; ability motor; nutritional status.

Perkembangan keterampilan gerak dasar selama masa kanak-kanak memainkan peran penting dalam meningkatkan aktivitas fisik dan menjaga kesehatan secara keseluruhan sepanjang hidup. Penelitian ini bertujuan untuk menganalisis hubungan antara indeks massa tubuh (IMT) dan kemampuan motorik anak, khususnya dalam tes kemampuan motorik. Penelitian ini menggunakan pendekatan korelasional dengan subjek penelitian sebanyak 120 peserta didik kelas tinggi (kelas 4, 5, 6) di SDN Gadingkasri dan SDN Oro-Oro Dowo Kota Malang. Subjek terdiri dari 63 siswa dari SDN Gadingkasri dan 57 siswa dari SDN Oro-Oro Dowo, dengan komposisi jenis kelamin laki-laki dan perempuan yang seimbang serta rentang usia 9–12 tahun. Pengukuran yang dilakukan meliputi berat badan dan tinggi badan. Hasil penelitian menunjukkan hubungan yang signifikan antara hasil pengukuran antropometri dengan kemampuan kemampuan motorik anak. Anak dengan IMT normal memiliki kemampuan motorik yang lebih baik dibandingkan dengan anak yang memiliki IMT kurang, kelebihan berat badan, atau obesitas. Implikasi dari penelitian ini menunjukkan pentingnya pemantauan status gizi dan pengembangan kemampuan motorik anak melalui intervensi gizi yang tepat serta program latihan fisik yang terstruktur di lingkungan sekolah. Kolaborasi antara sekolah, orang tua, dan masyarakat sangat diperlukan untuk memastikan perkembangan motorik yang optimal pada anak usia sekolah dasar.

Kata kunci: indeks massa tubuh; lompat katak; status gizi.

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INTRODUCTION

The prevalence of obesity in children has increased from year to year. Based on the results of the 2018 Riskesdas report according to the calculation of BMI/U in children aged 5-12 years, it states that the nutritional status in Indonesia is very thin 2.4%, thin 6.8%, fat 10.8%, and obesity 9.2% (Kemenkes RI, 2018). In the East Java region, the distribution of nutritional conditions in children aged 5-12 years according to the body mass index (BMI/U) is as follows: underweight 2.2%, thin 5.8%, overweight 13%, obesity 11.1%, the data also states the prevalence of nutritional status in the Malang area aged 5-12 years, namely very thin 1.8%, thin 5.9%, fat 9.9%, obesity 9.1% (Kemenkes RI, 2018).

The problem of obesity is closely related to the child's willingness to do physical activity. Children who are overweight tend to be lazy to move. Activity physique affects motoric child. Skills motor classify into two, namely, motor gross and motoric fine. Motor rough is skills movements involving all over or as body use muscles big. Children who tend to be lazy to move will own ability poor motor skills (Thufailah & Mailani, 2023).

Children with Excess Body Mass Index (BMI) have big experience problems with health. Children who are overweight normal body weight No exercise, which has an impact on ability motor rough they (DuBose et al., 2018). Body Mass Index (BMI) is comparison ratio lots of weight and height used For measure a person's ideal body weight, aim know whether heavy his body enter the level less, normal, more or obesity (Diyono, 2019).

One of factor main factors influencing development motors is nutritional status children, which is often measured through index mass body weight (BMI). BMI is an important indicator for evaluating proportion weight against height, which describes balance intake nutrition received child. Research show that child with an ideal BMI (good in normal range) tends to own ability more motor Good compared to children who experience problem nutrition, such as obesity or malnutrition (Rico-González et al., 2024). In the study Fitria *et al*. (2024) showed that child with growth proportional physique and balanced nutritional status tend own ability more motor Good compared to with children who experience problem nutrition, such as obesity or malnutrition. Balance between growth physical and nutritional status is very important in support development skills motor, because this factor influences child in do movement complex.

Development of motor child age school base is fundamental aspects that play a role in support activity physical, fitness physical and health in a way Overall. Good motor skills enable children to move efficiently, participate in a variety of physical activities, and improve sports skills that contribute to an active and healthy lifestyle. motor is interesting thing for discussed (Samodra et al., 2024). At Age school basic, especially for participants educate class height (age 9–12 years) is period crucial in development skills motor rough, like

balance, coordination, and strength muscle. One of the skills motor the essential basics is ability jump, which reflects strength muscles and coordination body (Ushtelenca, 2024).

One of the form skills motors that requires strength muscles and coordination tall is ability motor or *standing broad jump.* This exercise often used For measure Power explosive muscle legs as well as flexibility body (Jasmani, 2021). Ability motor used as valid indicators for evaluate strength explosive body part lower as well as development motor skills in children (Putri & Damri, 2020). Based on study previously by Diyono (2019) that there is significant relationship between BMI and motor child.

The problem in study this leaves from the impact caused by excess and deficiency nutrition in children, which is not only influential to growth physique but also towards ability motor they. Imbalance nutrition can cause low energy for activity, disruption system immunity, as well as delay in development motor. SDN Oro-Oro Dowo and SDN Gadingkasri in Malang City have participant educate with characteristics growth diverse physical and nutritional status. This diversity has the potential to affect students' motor skills in performing various movements. Anthropometric measurements, such as height and weight, are important indicators in assessing children's physical growth, while nutritional status measured through the Body Mass Index (BMI) can provide an overview of the balance of nutritional intake received by students.

However, until now, there has been no research that specifically examines the relationship between BMI and frog jump motor skills. This is important because motor skills are relevant indicators for measuring leg muscle strength and body coordination, which are highly dependent on nutritional status and BMI. More continue, not yet known in a way Certain How factor growth physical and nutritional status, which is measured through IMT, affects ability motor This in context environment school elementary school in Malang City, especially at SDN Oro-Oro Dowo and SDN Gadingkasri which have diversity in growth physical and nutritional status participant educate. Therefore that, research This done for answer gap said, with analyze connection between BMI and ability ability motor skills in participants educate grades 4, 5, and 6 at SDN Oro-Oro Dowo and SDN Gadingkasri. The research this expected can give contribution to understanding deeper about factors that influence development motor skills in children age school base.

METHOD

This study uses a correlational research approach. According to Arikunto, (2021) correlational research is a research method that aims to analyze the extent of the relationship between two or more variables, using available data without making any modifications or interventions. The correlation analysis

method is used to test the existence of a relationship between variable X and variable Y and its level of significance. In this study, correlation analysis was used to test the relationship between variable X (Body Mass Index) and variable Y (motor ability in the form of motor ability).

This research was conducted in two elementary schools, namely SDN Oro-Oro Dowo and SDN Gadingkasri, located in Malang City. Data collection was conducted in the period 11-18 October 2024, considering the suitability of the lecture schedule and the relevance of the location to the research context.

1. Measurement variables

a. Height: Measured microtoice.

b. Weight: Measured use digital scales

Classification of respondents' nutritional status is assessed by calculating the Mass Index. Body (BMI). BMI is calculated with formula. BMI is then categorized according to table 1.

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

2. Motor test (motor skills)

Motor skills are tested with a motor skills test *(standing broad jump)* which is used to measure leg muscle strength and body coordination. This test is done by jumping as far forward as possible, and the measurement results record the distance of the jump achieved by the participant. The research instrument used in this test is *the Standing Board Jump* (Nurhasan & Cholil, 2014). For children aged 10 years to college students, men and women are used to measure leg power, by jumping forward. The test is carried out by the testee preparing to jump by standing on the starting line and not being allowed to cross the line, then the knees are bent to form a 45 degree angle, both arms are straight back and jump as far as possible using both feet and landing with both feet together, the data taken is the result of the furthest jump after doing two opportunities.

Table 1. Classification of nutritional status

Classification	IMT
Malnutrition	< 18.5
Normal	18.5-24.9
Overweight	25-29.9
Obesity	> 30

Population study is participant educated from second school base with sample taken from classes 4, 5, and 6 totaling 120 participants educated.

Table 2. Total participant gadingkasri elementary school education

Class	Man	Woman	Amount
IV	5	6	11
V	14	12	26
VI	15	11	26
	Total Participants educate		63

Table 3. Number of students at oro-oro dowo elementary school

Class	Man	Woman	Amount
IV	9	12	21
V	10	8	18
VI	7	11	18
	Total Participants educate		57

Data collected will analyze with use distribution frequency for describe BMI distribution and capability's ability motor. For tests connecting BMI and ability ability motor, statistical tests are used Pearson correlation with SPSS version 27 help.

RESULTS AND DISCUSSION

Research result

Results obtained after observation and calculation with SPSS on participants educate grades 4, 5, and 6 at SDN Oro-Oro Dowo and SDN Gadingkasri show different conditions. At SDN Oro-Oro Dowo the conditions his children have nutritional status the most overweight as can be seen in Table 4. Meanwhile that, at SDN Gadingkasri his children have nutritional status good (normal) the most as can be seen in Table 5. Then For number correlation between anthropometric and motor tests at SDN Gadingkasri show connection currently with shown the number 0.556 and and significance with the number 0.00. Meanwhile, at SDN Oro-Oro Dowo it shows strong connection with shown the number 0.744 and significance same 0.00. The correlation test value can be seen in Table 6. below.

Table 4. Nutritional status values of children at oro-oro dowo elementary school

No.	Nutritional status	Amount	Presentation
1.	Malnutrition	-	-
2.	Normal	20	35%
3.	Overweight	22	39%
4.	Obesity	15	26%

Table 5. Nutritional status values of children at gadingkasri elementary school

No.	Nutritional status	Amount	Presentation
1.	Malnutrition	11	17%
2.	Normal	35	56%
3.	Overweight	13	21%
4.	Obesity	14	6%

Table 6. Relationship correlation of weight, height, and ability motor

No.	Classification	R (Coefficient Correlation)	Sig F (Significance)
1.	Gadingkasri Elementary School	0.556	0.00
2.	Oro-Oro Dowo Elementary School	0.744	0.00

Discussion

Under observation used BMI value for knowing the status of the condition nutrition in children of SDN Gadingkasri and Oro-Oro Dowo. Body Mass Index (BMI) is one of the references for categorizing composition weight. BMI measurement is also related to nutritional status that affects health someone. Sequence categories that become BMI value are underweight/thinness, normal, overweight, and obese. In terms of this, the person who has BMI value is higher or not enough from normal can own possibility problem health in the body (Ramadany & Pasaribu, 2021). According to the Indonesian Ministry of Health in 2018, in Indonesia there were child aged 5–12 years with 18.8 % being overweight and 10.8% being obese.

BMI is a standard parameter for evaluating a person's weight. IMT is one of them required reference for see nutritional status composition health somebody based on its classification. With count combination between weight in the form of kilogram (kg) that is measured use scales body weight and divided with height in square meters (m^2) is measured with using stature meter will produce classified values in kg/m^2) (Suciati et al. , 2019). Several factors that can affect BMI namely age, genetics, pattern eating, and activities physique.

According to Noviyan and Nasution (2018) in his research state that nutritional status is condition health body acquired from consume intake food.

If intake body will Healthy If fulfilled with well, possible for do activity daily in a way maximum. In case this is nutritional status plays a role for obtaining ability good motor skills in a person child for do its activities. High and low change or nutritional status depends on the pattern food consumed (Hermanto & Komaini, 2019) . Children whose nutritional status is not enough will impact on not optimal network muscles of course will influence ability motor child (Setianingsih et al ., 2020).

In another statement, according to Suyasmi et al. (2018) a person's diet greatly affects their nutritional status, if someone has a good, controlled and regular diet, they will have a normal Body Mass Index. Changing diets will cause wrong diets and this is due to lack of nutritional knowledge. In our own results, it can be seen in Table 5. which shows the highest good (normal) nutritional value and one of them is due to diet. While obesity and being overweight are caused by higher nutritional intake due to irregular or changing eating so that the energy expended by the body is not optimal. Gender is also one of the influencing factors to obesity. Men are at 1.4 times higher risk of obesity than women. Girls tend to restrict their diet for reasons of maintaining their appearance, so men are at higher risk of obesity (Wulandari et al., 2023).

Problems that often occur due to excess weight are musculoskeletal disorders, especially in the feet. Every individual's body part certainly has an important role in life. The feet are one of the body parts that have the responsibility to support the body. The soles of everyone's feet used for walking and maintaining balance have different structures. Balance is needed to maintain the center of gravity so that when moving it will reduce the risk of falling (Abrar, 2018).

One of the gross motor skills of the legs that is important to train during elementary school is motor skills (Asmuddin et al., 2022). Motor skills themselves can also be used as motor tests. Motor skills are movements of jumping forward using both feet simultaneously with maximum push (Putri & Damri, 2020). The ability motor Alone be one of form exercise strength muscle arms and flexibility (Masitoh et al., 2021). Children's motor skills measured by how far the child can jump are closely related to the child's nutritional status (Sepriadi *et al.* , 2017).

Based on results data analysis in Table 6 which has been done can known that there is connection significant between participant's weight and height educate with ability ability motor. There is correlated relationship positive between results measurement anthropometry and ability's ability motor participant educate from both elementary schools studied. Children with low BMI, overweight, or obesity tend to difficulty For jump compared to child with normal BMI (Jauza et al., 2023). More next, the child's BMI is not normal influenced by intake nutrition child those. Children and teenagers with poor

nutritional status will effect to life everyday, namely body become weak, lazy to do activities and easy tired or not enough Can concentrating and difficulty in activity physique (Nur & Nurhayati, 2024). With this, it is necessary done measurement anthropometry and test motor regularly for children as one of the form monitoring adequacy nutrition and nutritional status child.

Research results in this implying importance regular monitoring of nutritional status and development ability motor children, especially in schools basic. Children with abnormal nutritional status, either underweight or overweight, tend to have trouble in doing activity physique like ability motor, which reflects strength muscle legs and body coordination. Therefore, that's important for applying proper nutrition, with strengthen education good nutrition at school and home, as well as giving attention especially for children who have a low BMI or more. In addition, education teachers need physical designing a training program structured physically for support development motor children, followed with test routine motor for monitor progress they. Balance between intake proper nutrition and activity adequate physical fitness is essential for support development optimal motor skills, which can achieve through collaboration between schools, parents, and society.

CONCLUSION

Based on research that has been done there is significant relationship between the measured nutritional status use Body Mass Index (BMI) and ability motor children, in test ability motor. Research results show that child with normal BMI have ability more motor Good compared to with children who have a low BMI, are overweight, or obesity. In addition, the condition nutrition children at Gadingkasri Elementary School and Oro-Oro Dowo Elementary School demonstrate differences, with SDN Gadingkasri own more Lots Of children with normal nutritional status, while SDN Oro-Oro Dowo is dominated by children with overweight nutritional status. Therefore, it's important for monitor nutritional status children regularly through measurement anthropometry and testing motors as effort to ensure adequacy nutrition and support development optimal motor skills. Intervention proper nutrition and diet healthy eating, and exercise programs structured physical, can help increase ability motor children. Collaboration between schools, parents and society are very necessary for supporting achievement objective them.

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