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# Body Fat Composition as A Determinan of Cognition Functions in Elementary School Students

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## ABSTRACT

The prevalence of over nutrition problems which include overweight and obesity shows an increasing tendency also =experienced by school-age children. This condition causes excess energy which is then stored in the form of fat tissue. Cognitive is one of the important aspects of the development of generations that are directly related to the learning process, and greatly determine their success in school. Excessive adipose tissue in the body will affect the development of cognitive function through the mechanism of secretion of cytokines and growth hormones. The purpose of this study was to examine the composition of body fat as a determinant of the development of cognitive functions in school-aged children in Mojokerto. The study design used is correlation analysis with cross sectional approach. The population were all 4-5 grade students at Mlirip II Elementary School in Mojokerto. The sampling technique used total sampling of the entire population. Data analysis used Rank Spearman test. The result that the significance value (2-tailed) is 0.008 that less than 0.05, so there is a significant composition of body fat is one determinant of cognitive abilities. Macronutrients associated with cognitive function are fat levels. Fat levels can affect cognitive function through the mechanism of secretion of cytokines and growth hormones.

**Keywords:** *Body fat composition, Cognitive function*

## INTRODUCTION

The growth and development of a child are two different events but take place the same <sup>(1)</sup>. Growth and development are interrelated so that it is difficult to separate. In developing countries like Indonesia, nutritional problems are one of the big problems faced from year to year. The prevalence of over nutrition problems that include overweight and obesity shows an increasing tendency not only in the adult age group, but also in children <sup>(2)</sup>. The group of children to early adolescents (9-14 years) is an age group that is at risk of experiencing problems with malnutrition and over nutrition <sup>(3)</sup>. Obesity occurs because of an imbalance between energy intake and output so that excess energy

occurs which is then stored in the form of fat tissue <sup>(4)</sup>. Excessive fat tissue can contribute to several diseases such as excess blood cholesterol levels, hypertension and diabetes mellitus, which currently has not a small amount suffered by early adolescents and school-age children <sup>(5)</sup>.

Cognitive is one of the important aspects of the development of generations that are directly related to the learning process, and greatly determine their success in school <sup>(6)</sup>. Nutritional factors play an important role in achieving a quality generation that is healthy, intelligent and has a strong and productive attitude<sup>(7)</sup>. In simple terms, it can be understood that cognitive ability is the ability possessed by children to think more complex, as well as reasoning and problem solving abilities<sup>(8)</sup>. In subsequent developments, the term cognitive became popular as one of the realms of human psychology including mental behavior related to understanding, information processing, problem solving and belief. in school-age children, the development of cognitive functions is very important to be considered for the success of the nation later. The purpose of this study was to determine whether the composition of body fat as one of the determinants of cognitive function of school-age children.

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## RESEARCH METHOD

The research design used correlation analysis with cross sectional approach. The populations were all students in grades 4-5 in Mlirip II Elementary School Mojokerto. The sampling technique used total sampling. The research was carried out at the Mlirip II Elementary School in Mojokerto. All respondents were given an explanation

of the purpose of the study and asked for approval to become research respondents. All respondents measured their body fat composition using the Body Fat Hydration Monitor tool. Then all respondents were examined for cognitive function using a scale A CFIT Type 2 instrument. Decreased IQ Test (cognitive function) was carried out by Psychologists from Loyalogy Consulting engaged in the psychology test.

## RESULT

**Table 1: Cross tabulation "Body fat composition as a determinant of cognitive function of children in SDN Mlirip II Mojokerto"**

| Kategori | Cognitive Function      |     |            |      |               |      |         |      |               |       |          |      | TOTAL |      |
|----------|-------------------------|-----|------------|------|---------------|------|---------|------|---------------|-------|----------|------|-------|------|
|          | Intellectual deficiency |     | Borderline |      | Below average |      | Average |      | Above average |       | Superior |      |       |      |
|          | n                       | %   | n          | %    | n             | %    | n       | %    | n             | %     | n        | %    | n     | %    |
| Too lean | 2                       | 2,1 | 1          | 1,05 | 8             | 8,4  | 7       | 7,3  | 2             | 7,7   | 0        | 0    | 20    | 21,0 |
| Lean     | 1                       | 1,0 | 1          | 1,05 | 0             | 0    | 7       | 7,3  | 1             | 7,7   | 0        | 0    | 10    | 10,5 |
| Normal   | 0                       | 0   | 0          | 0    | 2             | 2,1  | 35      | 36,8 | 10            | 38,7  | 2        | 2,1  | 49    | 51,5 |
| Fat      | 0                       | 0   | 1          | 1,05 | 2             | 2,1  | 4       | 4,2  | 2             | 4,4   | 0        | 0    | 49    | 9,4  |
| Obesity  | 0                       | 0   | 0          | 0    | 2             | 2,1  | 3       | 3,15 | 1             | 3,2   | 1        | 1,05 | 37    | 7,3  |
| TOTAL    | 3                       |     | 3          | 3,15 |               | 14,7 | 56      | 58,9 | 16            | 62,04 | 3        | 3,15 | 95    | 100  |

Source: Primer Data, 2018

Processing statistical data used the Spearman rank statistical test. There are 3 test results, the first is the significance value (2-tailed) of 0.008 where it is less than 0.05, that the composition of body fat is a significant determinant of cognitive abilities. The second is that the correlation coefficient is 0.270, it can be stated that the correlation between two variables is sufficient. For the third result, where the correlation coefficient number on the result is positive (0.270), it means that the relationship between the two variables is unidirectional (kind of unidirectional relationship). The more normal composition of body fat is as good as cognitive abilities.

## DISCUSSION

Fat in the body functions as an energy source, a hormone raw material, helps transport fat-soluble vitamins<sup>(10)</sup>. Metabolic fat is a fat that undergoes metabolic changes, produces special substances that have biological and nutritional significance, cholesterol also undergoes changes in the adrenal glands (kidneys) to various types of steroid hormones<sup>(11)</sup>. The function of fat as a hormone is also very influential on physiological

processes in the body, for example, the production of reproductive hormones<sup>(12)</sup>. According to Piaget, cognitive development is a genetic process that is a process based on the biological mechanism of the development of the nervous system<sup>(13)</sup>. With the increasing age of a person, the more complex the arrangement of nerve cells and the more their abilities increase<sup>(14)</sup>. When individuals develop toward maturity, they will experience biological adaptation to their environment which will cause qualitative changes in their cognitive structure<sup>(15)</sup>. Cognitive development is not something that can be defined quantitatively<sup>(16)</sup>. Thinking power or mental strength of children of different ages will be qualitatively different macronutrients associated with cognitive function are fat levels<sup>(17)</sup>. Fat levels can affect cognitive function through the mechanism of secretion of cytokines and growth hormones<sup>(18)</sup>.

## SUMMARY

The significance value (2-tailed) is 0.008 where it is less than 0.05, so there is a significant composition of body fat which is one of the determinants of cognitive

ability. The second is that the correlation coefficient is 0.270, it can be stated that the correlation between two variables is sufficient. The number of correlation coefficients on these results is positive (0.270), which means that the relationship between the two variables is unidirectional (type of unidirectional relationship). The more normal composition of body fat is as good as cognitive abilities. Thus it can be concluded that the composition of body fat is a determinant of children's cognitive function.

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