Research Article

Head Size and Intelligence Quotient (IQ) in Elementary School Students

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ABSTRACT

Superficially, Intelligence is an ability to planning, thinking, talking, rationalization, comparing, and understand with other. One of many methods to rate for intelligence, is Draw-A-Man test, it's introduced by Goodenough in 1926 to researching children's creativity, mental age, and visual and motoric intelligence with some code based on picture that the children drew. The aim of this study was to determine the correlation between head circumference and head length with Intelligence Quotient of the 3rd grade Karang Mekar 1 Banjarmasin elementary school's student. The methodsof this study used observational analytics with a cross-sectional approach. The sampling technique was total sampling with a sample of 65 students aged 7 to 10 years and fulfilling the inclusion and exclusion criteria. The results of data analysis using the Spearman correlation test showed that the correlation point on the head circumference and head length with IQ were $p=0.888$ and $p=0.985$. Based on the results of this study, it can be concluded that there is no significant correlation between the the head circumference and head length with Intelligence Quotien in elementary student.

Keywords: Head circumference, Head length, Intelligence Quotient, Karang Mekar 1 Banjarmasin Elementary School.

Background

Intelligence will always be a debatable topic. Much research has been done, but until now there is no clear definition of intelligence. Superficially, intelligence is the ability to plan, think, speak, rationalize, compare, and

understanding each other's. Although as if intelligence is a difficult thing to understand, it is actually not like what we all imagine (Imlahi, 2015).

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One of the existing drawing test methods, Draw-A-Man Test or drawing people, was first introduced by Goodenough in 1926 to examine children's creativity, children's mental age, and children's visual and motor intelligence by assessing some codes based on those drawn by child. Points that are considered in the picture are body organs, for example, ears, and the quality of the image, if the picture is more detailed, the results will be better (Crusco, 2015).

The development of children, especially the depiction of child intelligence through drawing has been studied extensively since the end of the 19th century, proven the results of drawing by children can be investigated and related to visual and motoric development, the level of cognitive function and intellectual maturity, projection of personality and self-concept, and the emotional level of a child. In short, drawing can be used as part of a diagnostic tool to control cognitive development and emotional development, as well as problems not seen in children (Crusco, 2015).

In general, anthropometry means the size of the human body, related to various measurements of body dimensions and body composition at various age levels and nutritional levels. Anthropometry is commonly used to monitor the growth status of a child and can be used to monitor the nutritional state of a child, so that the growth rate of a child can be monitored and if there are abnormalities it will be easily detected. Anthropometry generally measures three things, namely head size, weight, and height (Gozali, 2010).

In the mid-1900s it began to be known that there was an association between abnormal head size (too large or too small) and mental development barriers. Chronic malnutrition in the early months of life or IUGR, can damage brain development and will result in abnormal head circumference. Although the size of the head circumference is only the size of the skull and not the size of the brain, it can represent brain size even if indirectly. This is due to the closeness of the conformity between the brain and the tissue that surrounds and protects it, and the dominant role of the brain in determining the size of the head (Putra, 2012).

The head length is also included in the head anthropometry, and if a comparison is made

with the head width, you will get a cephalic index. Therefore the measurement of head length cannot be released from other head anthropometry measurements (Rivani et al., 2017).

Although many methods for measuring intelligence have been developed, research on the relationship of head circumference and head length with children's IQ intelligence is still very limited in Indonesia. Thus, it encourages researchers to examine the relationship between head anthropometry and IQ levels in elementary school students.

Research Method

This research is an observational analytic study with cross sectional method. The population of this study were third grade elementary school students in Karang Mekar 1 Elementary School Banjarmasin in 2018-2019. For the samples studied will use the Total Sampling method, which is the sample taken from the entire population found in the Karang Mekar 1 Banjarmasin Elementary School, namely the third grade students of the elementary school. Inclusion criteria from research subjects included 7-10 years old and were willing to take part in the study by signing an informed consent sheet signed by parents of students. Whereas the exclusion criteria for this study subject were having or were experiencing trauma or injury to the skull and brain bones and showing abnormalities in the skull structure, macrocephalica and microcephalica (hydrocephalus, scaphosefalus, acrocephalus or brachicephalus) (Notoatmodjo, 2012).

Respondents were given an explanation of the research to be conducted and given an informed consent sheet as their readiness as a respondent. Data collection was carried out giving the respondent a sheet containing the respondent's identity and fulfilled inclusion criteria.

After data collection, IQ tests were conducted to respondents with the Draw A Person Test method and the results were collected. In addition, the results of the IQ test assessment were also used to analyze the relationship between head circumference and head length in this study.

Measurements of the head circumference are found in the right frontal plane above the

glabella (the midpoint between the protrusions of the eyebrows) to the opisthocranium perpendicular to the midsagittal plane of the subject in a sitting position. The tape must be pulled firmly to press the hair of the person to be measured. While the middle finger on the side of the head is used to prevent the tape from falling past the head. In the measurement process, make sure that there are no hairpins, clips, or similar objects stuck to the hair as long as the measurement and ears are tried not to be inserted (Indriati, 2010).

The measurement results are then written in the head circumference column on the head circumference measurement sheet.

The head length is measured from glabella (prominentia on the forehead between the right and left eyebrows) to opisthocranium in the occipital region. Measurements are made using spreading caliper (Gupta, 2013).

The measurement results are written on the head length column on the head length measurement sheet. The data obtained were then statistically analyzed by computerization using the Pearson method if the data met the requirements. If the data does not meet the requirements, continue using the Spearman method.

Results and Discussions

Table 1. Gender Distribution of Research Subjects

Gender	Frequency	Percentage
Male	27	41,5%
Female	38	58,5%
Total	65	100%

Based on the data above, it can be seen that the research subjects were more with female gender as many as 38 people (58.5%).

Table 2. Distribution of Circumference Size of Head of Research Subjects

Head Circumferences (cm)	Frequency	Percentage
48,5	2	3,1%
49	3	4,6%
50	6	9,2%
50,5	4	6,2%
51	17	26,2%
51,5	2	3,1%
52	8	12,3%
52,5	2	3,1%
53	7	10,8%
53,5	2	3,1%
54	7	10,8%
54,5	1	1,5%
55	2	3,1%
56,5	2	3,1%
Total	65	100%

Based on the data above, it can be seen that the size of the head circumference of the study subjects was 51 cm, as many as 17 people (26.2%) and the average circumference of the head of the subject was 51.85 cm.

Table 3. Distribution of Length Measures of Research Subjects

Head Length (cm)	Frequency	Percentage
13,125	1	1,5%
13,75	5	7,7%
14,375	2	3,1%
15	11	16,9%
15,625	10	15,4%
16,25	10	15,4%
16,875	7	10,8%
17,5	10	15,4%
18,125	5	7,7%
18,75	4	6,2%
Total	65	100%

Based on the data above, it can be seen that the length of the head of the research subject was the most 15 cm as many as 11 people (16.9%) and the average length of the head of the subject was 16.2 cm.

Table 4. Distribution of IQ Scores of Research Subjects

Intelligence Quotient	Frequency	Percentage
Low (<90)	19	29,2%
Average (90-109)	34	52,3%
High (>109)	12	18,5%

Based on the data above, it can be seen that the IQ scores of the most research subjects were at the average level, namely as many as 34 people (52.3%) with an average IQ score of 96.29.

Table 5. The Correlation Between Head Circumference and Head Length with IQ Levels in Third Grade Students of Karang Mekar 1 Banjarmasin Elementary School

Variable	p
Intelligence Quotient	
Head Circumference	0,888
Head Length	0,985

After processing the data using the Spearman correlation test p value = 0.888 ($p > 0.05$) on the correlation between head circumference and IQ level, while the results obtained in the correlation test between the head length and IQ level, $p = 0.985$ ($p > 0.05$). The two results of the analysis of the data indicate that the significance value between variables is $p > 0.05$ so the conclusion obtained is that there is no significant correlation between variables. Thus, the hypothesis proposed by the researcher is not acceptable, with the conclusion that there is no relationship between head circumference and head length with IQ level in third grade students of Karang Mekar 1 Banjarmasin Elementary School.

Based on the theory that there is already growth and development influenced by various factors, such as family factors, genetics, socio-economic, parental education, parenting and so on, then in this case, the results of this study are also influenced by many factors as mentioned, and these factors cannot be controlled by the researcher.

The results of this study on the relationship of head circumference with IQ are in

accordance with the results of previous studies conducted by Dewi (2013) with a sample of 25 students, using binary scoring methods for IQ measurement, that there was no relationship between the head and IQ of mental retardation students in SLB Yogyakarta ($p = 0.897$).⁹ On the other hand, the results of this study are not in accordance with the results of the Bakhiet et al (2016) study, with a sample of 1812 elementary school students aged 6-12 years, using the IQ Standard Progressive Matrice Plus (SPM +) has the final conclusion that there is a strong relationship between head circumference and IQ level in elementary school students in Saudi Arabia.¹⁰ As for the results of the study regarding the relationship between head length and IQ level, the results of this study are not in line with the results of research by Pahlavi (2017), who used the method of assessing IQ of the Wechsler Intelligence Scale for Children IV (WISC-IV), stating b that there is a significant correlation between head length and IQ level in mental retardation students in Pringsewu District SLB with a total sample of 40 respondents (Pahlevi, 2017).

The limitations of this study are, the difficulty in measuring head length, because the tool used is a large size caliper spreading, which is commonly used for pelvic measurements, because spreading calipers specifically used for heads are not available in the market. However, the tool uses a cm length unit in its measurement and has the same mechanism as the standard spreading caliper for the head. Then, the next limitation is, the use of the draw a person test method to measure students' IQ, because the method is less accurate, when compared to IQ measurement methods that use conventional questionnaires that are widely used in the current era. Because there are many confounding factors that affect the accuracy of the draw a person test method. The use of the draw a person test method is chosen because of practical considerations, which are easy to do and do not require a long time in the calculation process, and are suitable for children who tend not to be interested in the questionnaire method, but prefer the method of drawing., the factors that influence intelligence, are divided into two, namely genetic factors, namely congenital birth, which affect intelligence by 30-

80% different each person, and natural factors, including environment, nutrition, parenting, education, etc (Oommen, 2014)

Based on data from the 2013 RISKESDAS, South Kalimantan occupies the fifth highest position, in the number of cases of malnutrition in Indonesia, this certainly affects the results of this study, considering that nutritional factors also influence the intelligence of a child. Furthermore, still based on RISKESDAS 2013 data, South Kalimantan is one of the highest, in water and sanitation issues in Indonesia, this certainly also affects the results of this study, both directly and indirectly. And in the current digital era, parenting tends to give children gadgets at an early age and is not right rather than choosing to play with their children, this also affects this research, because parenting and parental love also indirectly influence development children's intelligence. In this study, the factors mentioned above cannot be controlled by researchers, so this is also a deficiency in this study (Badan Penelitian dan Pengembangan Kesehatan Kemenkes RI, 2013).

Conclusion

The conclusion of this study is that there is no significant relationship between head circumference and IQ level ($p = 0.888$) and between head length and IQ level ($p = 0.985$).

For better results, further research is recommended to conduct this study with a larger sample size, so that the results obtained are more accurate, using a more accurate standard head length measuring tool, namely spreading caliper, using more IQ measurement methods. Good, that is by questionnaire method, researching at the level of other classes, or in the age range of 6-12 years, researching on a wider population range, for example the city of Banjarmasin or the province of South Kalimantan.

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