THE RELATIONSHIP OF GROSS MOTOR ABILITY TO EARLY CHILDHOOD COGNITIVE ABILITY

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Abstract
This study aims to find out and explain the picture of gross motor skills in early childhood, cognitive abilities of early childhood and the relationship of gross motor abilities with cognitive abilities in early childhood. The research method used in this study is the correlational method. The sample in this study was 16 grade B students of Tunas Cempaka Kindergarten who had an age of 5-6 years. The data collection instruments in this study used TGMD-2 for gross motor ability and observation sheets for cognitive abilities. The conclusion of the data analysis results is that gross motor ability is in the average category, cognitive ability is in the category of developing according to expectations (BSH) and positively there is a relationship between gross motor ability and cognitive ability in early childhood.
Keywords: gross motor ability, cognitive ability, early childhood

INTRODUCTION

Education for early childhood is claimed to be the most basic education that affects children's growth and development at an early age, this is based on the fact that children's growth and development at a later age is strongly influenced by various stimuli provided at an early age (Ministry of National Education, 2014). Therefore, there are not a few children who are unable to display their greatest potential because of the limited abilities they have not been touched at an early age (Lumintuarso, 2013). Even though the *golden age* only occurs once in a lifetime, namely at an early age, so the main role of parents and then the environment has a big hand in this golden age period.

It is a very reasonable reason when ECCE is considered to have an important role for children togrow and develop optimally. One of the targets of ECCE in realizing optimal child growth and development is the development of physical-motor aspects and cognitive aspects (Ministry of National Education, 2014). Physical aspects of motor are related to body development, gross motor and fine motor abilities, while cognitive aspects are related to children's ability to think in solving problems or making decisions (Suyanto, 2005; Zeng et al., 2017)

The results of research conducted by (Sibley & Etnier, 2009) explained that it turns out that between physical activity and cognitive function there is a very significant relationship. The same thing is also explained by (Lopes et al., 2013) that boys or girls who are categorized as having low motor abilities are likely to get low achievement results as well. Likewise with the opinion (Coe et al., 2006) which states that although academic achievement is not directly related to physical education, children who have a high level of physical activity have high academic achievement scores as well and their motor skills become good (Arisman & Agun Guntara, 2021).

The results of this expert research are a valid basis and relevant to the purpose of early childhood education in Indonesia which makes early education as a basic education to form children to be ready to study in the next tahap. The more dominant emphasis in early childhood education must actually be holistic and integral so that it will be able to optimize the goalsset out in the ECCE curriculum (Ministry of National Education, 2014).

In reality in the field based on the results of researchers' observations, early childhood education emphasizes more on how to educate and make children to be able to master reading, writing, and counting (calistung) as a demand for children to enter elementary school. In fact, referring to the early childhood education ECCE curriculum must be holistic and integral so that the targets set, namely cognitive aspects, physical motor aspects, religious and social aspects, language and art aspects can be explored and developed optimally.

Sports education, which is one of the media for children's learning through motion, is often regarded as just a compulsory lesson that must be carried outwithout any learning objectives to be achieved. Whereas in sports learning, thematically teachers can include aspects that are targeted in ECCE education and can also be used as a pedagogical teaching approach (Barnett et al., 2016).

Whether you realize it or not, at an early age, there is an important phase in a child's life, namely physical and mental growth accompanied by social and cognitive growth. *Neuroscience* experts agree that brain cell tissues that are the basic capital for children's intelligence grow and develop rapidly when the child is at an early age (Suminah et al., 2015). Therefore, education for early childhood not only emphasizes how children are able to master reading, writing, and counting but also must pay attention to other aspects that are targeted in the ECCE curriculum.

Based on the researcher's presentation which refers to the results of previous studies and the results of researchers' observations in the field, the researcher wants to know and explain the relationship between gross motor ability and cognitive ability in early childhood.

METHOD

In this study, the method used is a quantitative research method, using a correlational approach. (Jack R Fraenkel & Wallen, 2008) explains that correlational research is used to study two and or more variables without giving treatment so that it will not affect the variables studied. In this correlational study, data collection was carried out at the same time. The research design used in this study can be seen in figure 1 below
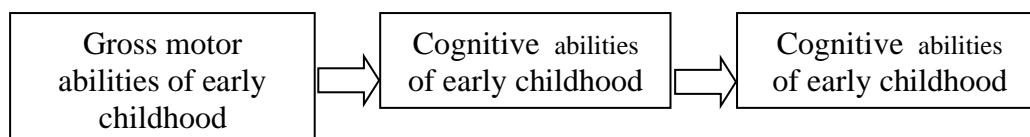
| Gross motor abilities of early childhood | → | Cognitive abilities of early childhood | → | Cognitive abilities of early childhood |

Figure 1. Research design

The samples used in this study were all grade B children of Tunas Cempaka Kindergarten as many as 16 children. The sample technique in this study uses a total sampling technique, namely the research sample used is the entirety of the total population.

The instrument used in this study was the *Test of Gross Motor Development Second Edition* (TGMD-2) to measure children's gross motor skills (Ulrich, 2000). Children's cognitive abilities are obtained from the analysis of documents that refer to the Content Standards on the Level of Achievement of Child Development aged 5-6 years (Ministry of National Education, 2014) in the form of observation sheets and children's worksheets (LKA).

The data analysis technique in this study used a product moment correlation test with the help of SPSS software version 20.

RESULT AND DISCUSSION

The results of this study illustrate how gross motor skills in early childhood, early childhood cognitive abilities and also to determine the relationship between gross motor ability and cognitive ability in early childhood class B in Tunas Cempaka Kindergarten Cirebon. The average age of the children sampled in this study was 5-6 years. The results of collecting data sequentially can be seen in the following table and diagram below.

Table 1. Description of Values for Standard score subtests and GMQ
(Source: TGMD-2, Ulrich, 2000)

Subtest Standard Score	Gross Motor Quotient	Descriptive Ratings	Percentage Included
17-20	> 130	Very Superior	2.34
15-16	121-130	Superior	6.87
13-14	111-120	Above Average	16.12
8-12	90-110	Average	49.51
6-7	80-89	Below Average	16.12
4-5	70-79	Poor	6.87
1-3	< 70	Very Poor	2.34

Table 2. TGMD2 Test Results

No.	L/P	Lokomotor Score	Control Object Score	Standard Score	GMQ	Category
1	P	11	9	20	109	Average
2	P	13	7	20	100	Average
3	P	15	11	26	115	Above average
4	P	12	8	20	100	Average
5	P	9	12	21	103	Average
6	P	8	10	18	100	Average
7	L	13	7	20	100	Average
8	L	16	9	25	115	Above average
9	L	9	9	18	94	Average
10	L	15	9	24	115	Above average
11	L	10	6	16	85	Below average
12	L	14	12	26	118	Above average
13	L	12	11	23	109	Average
14	L	11	9	20	100	Average
15	L	14	10	24	112	Above average
16	L	11	9	20	100	Average
Average Values					103,94	Average

In table 2 above, you can find out the results of the TGMD2 test for each child. The category classification given refers to table 1 regarding the description of gross motor ability values of TGMD 2 test results (Ulrich, 2000). Overall, in the "average" category there were 10 children, in the "above average" category there were 5 children, and in the "below average" category there was as many as 1 child.

If presented, the gross motor skills of children in the "average" category are 62.5%, the "above average" category is 31.25%, and the "below average" category is 6.25%. The percentage results of each category can be seen in the following figure.
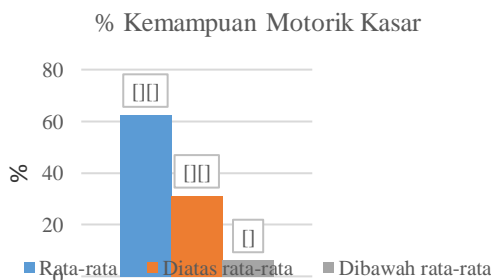

Figure 2. Percentage of Gross Motor Abilities

Overall, referring to table 2, the gross motor skills category of grade B children of Tunas Cempaka Kindergarten Cirebon is in the "average" category with a score of 103.94. Furthermore, the data on the results of early childhood cognitive abilities, according to the age of the research sample, namely the age of 5-6 years, the cognitive indicators refer to the reference to the Standard Level of Achievementn Child Development (STPPA) PAUD Curriculum 2013 (Ministry of National Education, 2014) namely problem solving, logical thinking and symbolic thinking. The filling of the observation form can be seen in table 4.

Table 3. Cognitive Assessment Observation Sheet
(Source: Dadapted from the Ministry of National Education, 2014)

No.	Observed Aspects	Activities	Assignment Methods	Observations			
				BB	MB	BSH	BSB
1	Troubleshooting	Practicing sweeping activities	Performance				
2	Logical Thinking	Sort pictures from small size to large size	LKA				
3	Symbolic thinking	Match the number of cleaning tool images with the number	LKA				

Table 4. Observation Sheet Filling

Number		Category
1	BB	Undeveloped
2	MB	Start Developing
3	BSH	Develop As Expected
4	BSB	Very Well Developed

The data from the cognitive ability assessment are then converted into a scale of 4 assessments. Basically, the conversion is carried out to find out the criteria for children's cognitive abilities based on content standards about the level of achievement of child development, namely Undeveloped (BB), Starting to Develop (MB), Developing As Expected (BSH), and Developing Very Well (BSB). Regarding the conversion to scale 4 with the classification of each category is described in table 5 below.

Table 5. Conversion of Cognitive Results

Category	Range
Undeveloped (BB)	0-25%
Start To Develop (MB)	26%-50%
Develop As Expected (BSH)	51%-75%
Very Well Developed (BSB)	76%-100%

The results of the child's cognitive assessment can be seen in table 6 below.

Table 6. Cognitive Assessment Results

No.	%	Category
1	58%	Develop As Expected
2	67%	Develop As Expected
3	75%	Develop As Expected
4	67%	Develop As Expected
5	58%	Develop As Expected
6	50%	Start Developing
7	67%	Develop As Expected
8	75%	Develop As Expected
9	58%	Develop As Expected
10	50%	Start Developing
11	58%	Develop As Expected
12	83%	Very Well Developed
13	83%	Very Well Developed
14	50%	Start Developing
15	83%	Very Well Developed
16	75%	Develop As Expected
$\bar{X}$	66,06%	Develop As Expected

Overall in the "BSH" category there were 10 children, in the "MB" category there were 3 children, and in the "BSB" category there were 3 children. If presented, the gross motor skills of children in the "MB" category were 18.75%, the "BSH" category was 62.5%, and the "BSB" category was 18.75%.
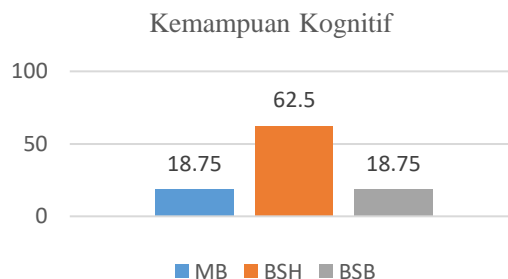
Figure 3. Percentage of Cognitive Abilities

Overall, referring to the results of cognitive assessment in table 6, it is known that the average cognitive ability of grade B children of Tunas Cempaka Kindergarten is in the category of "Developing As Expected (BSH)" with a percentage of 66.06%.

The last step in this study was to conduct a statistical test using SPSS version 20 to determine whether or not there is a relationship between children's gross motor skills and cognitive abilities. The results of the statistical test can be seen in table 7 below.

Table 7. Data Description

	Mean	Std. Deviation	N
Motorik_Kasar	21.31	3.005	16
Kemampuan_Kognitif	7.63	1.204	16

Table 8. Correlation Test Results

		Motorik_ Kasar	Kemampuan_ Kognitif
Motorik_ Rough	Pearson Correlation	1	.514[*]
	Sig. (2-tailed)		.042
	N	16	16
Kemampuan_ Cognitive	Pearson Correlation	.514[*]	1
	Sig. (2-tailed)	.042	
	N	16	16

Based on the results of pearson correlation test using SPSS software version 20, a significance value of 0.514 was obtained. The criterion in this test is accept Ho if the calculated r value is smaller than the table r value, this means that there is no relationship. Reject Ho if r counts greater than r of the table, this means that

there is a relationship between variables. The r value of the table with n=16 and α 0.05 is 0.4683. Referring to the criteria for acceptance and rejection of the hypothesis, the results of the correlation test obtained r count of 0.514 greater than r table 0.4683, this means that the hypothesis was rejected. Because the Hypothesis is rejected, there is a relationship between gross motor ability and early childhood cognitive ability.

DISCUSSION

The results of this study significantly showed that there was a relationship between gross motor ability and early childhood cognitive ability, this was proven by the results of statistical tests, namely the results of the correlation test with a calculated r of 0.514 greater than r table 0.4683. This is in line with the opinion (Burton & Rodgerson, 2001) which explains that motion skills are not only about the movements displayed, but also include a series of cognitive processes that can give rise to these movements. Therefore gross motor movement ability will be related to cognitive ability.

This cognitive ability is in line with motor ability, this is because in motor ability there is a term motor perceptual, which is an ability that psychologically involves perception, planning, decision-making, and motivation (Kuhn et al., n.d.) . Indirectly, early childhood learning with the context of play trains children's motor perceptual as well as children's cognitive, the use of technology can also train children's abilities (Okilanda et al., 2021).

Cognitive abilities in early childhood are related to developments that occur within the brain. This is based on the fact that the learning process will form a network of brain cells. In early childhood, it is a golden age for the formation of brain cell tissue which is a link between neuron cells that is claimed to be a determinant of intelligence. So, the more cell tissue that is formed, the better the child's brain development (Suminah et al., 2015).

he results of the study (Lopes et al., 2013) that boys or girls who are categorized as having low motor abilities are likely to get low achievement results as well. This is based on expert findings stating that the relationship between motor

ability and cognitive ability involves social, biological and psychological mechanisms. So that displaying motor abilities will result in the activation of the cerebellum which can affect motor function, child focus, language skills, and memory. In order to sharpen children's ability to learn, it is necessary to have movement activities in the scope of play (Murjainah et al., 2020).

CONCLUSION

Referring to the findings and discussions, it can be concluded that gross motor ability with cognitive ability in early childhood has a significant relationship. This is supported by the results of expert findings in previous studies. Therefore, this research is expected to be a reference or the first step to develop further studies on the relationship of children's physical activity levels to gross motor skills.

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