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The Effect of Numbers Puzzle Games on the Cognitive Development of Preschool Children Aged 5-6 Years at RA Nurul Hidayah Malang

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ABSTRACT

Various factors, including the lack of stimulus from parents, can influence deviations in cognitive development in children. A number puzzle game is one of several stimuli in improving children's cognitive development. This study aims to determine the effect of a number puzzle game on the cognitive development of preschool children aged 5-6 years. The type of research used in this study is a pre-experimental design with one group pre-test and post-test designs. The research instrument used was a checklist for assessing the cognitive abilities of children aged 5-6 years. The sampling technique used in this study is the total sampling technique of 22 children. The data analysis technique used the Wilcoxon signed rank test using the SPSS application. The results showed an effect of number puzzle games on the cognitive development of preschool children aged 5-6 years at RA Nurul Hidayah Pemalang (p-value 0.000, p-value <0.05). Based on the results of the study, it can be concluded, namely: 1.) Age and gender characteristics obtained the results of most respondents aged six years as many as 12 children (54.5%), with the majority being male as many as 12 children (54.5%). 2.) Children's cognitive development before puzzle game therapy was carried out, the results were that almost most children were in the undeveloped category

Keywords: Number Puzzles, Cognitive Development, Preschooler.

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INTRODUCTION

Preschool education is a basis for the development of behaviour, intelligence, ability to solve problems and adaptation of children to the surrounding environment (Delgoshaei & Delavari, 2012). Preschool education is educating a child, which involves teaching children in a way that helps them develop physically, mentally and socially so that they are ready for elementary school (Indrawan, 2020). Developmental milestones of preschool children in physical, linguistic, cognitive, and emotional growth. Cognitive development is an ability possessed by children both in knowledge and skills and the ability to use memory and skills in solving problems in their environment (Khadijah, 2016).

According to the Ministry of Education and Culture, the national preschool education rate for 2019 is still low, only 32.53 per cent. The world's most significant number of child development delays is concentrated in Sub-Saharan African countries. More than 60% of early childhood children risk not achieving age-appropriate development. In contrast, according to UNICEF data in 2019, developmental delays in Indonesia amounted to 11.7%. At the same time, the Ministry of Health stated in 2015 that data on children's cognitive development showed that around 8% of 9.4 million Indonesian children experienced communication difficulties. One in six children between the ages of 5 and 6 has some form of language disorder (6.4% have a speech delay, 6% have an attitude delay, and 4.6% have a speech-language delay) (Ministry of Health, 2020).

Deviations in child development can be influenced by many factors, including the lack of parental stimulation, which goes along with environmental and developmental factors. This is one of several crucial indicators to be considered. The Indonesian Ministry of Health suggests that children's needs, such as those related to socialization and independence, must be addressed as early as possible.

Children's cognitive capacity can be displayed through play activities using play tools or approaches that integrate educational and fun values (Lee-Cultura et al., 2022). A number puzzle is an educational game method by assembling pieces of numbers into a complete form that can help children's cognitive development (Manurung, 2019).

Indiana (Natari et al., 2021) suggests that puzzles with lots of bright colours and unique shapes hold children's attention longer when they play, allowing learning activities to continue without disturbing fun. The benefits of playing number puzzles according to Levina (Natari et al., 2021), Children's independence, social skills, language development, cognitive capacity, and motor skills can all benefit from playing this game.

Based on Rahima's research (2017) regarding the effect of educational games on improving the cognitive development of preschool children in terms of shape and colour recognition when compared to puzzle games is an exciting research question and one that has been partially discussed by research examining the impact of educational games using media In addition, by Khatimah (2018) it is safe to say that children's brain power can be obtained from exposure to educational video games and other media. Think carefully Diana (2019) demonstrated that preschoolers whose parents encouraged them to play puzzles saw a positive effect on their growth.

Martini (Hayati et al., 2017) found that children between the ages of 5 and 6 years show signs of cognitive growth, including (1) the ability to understand numbers and the size of numbers; (2) interest in letters and numbers and basic writing, copying, and arithmetic skills. They can (3) identify most colours, (4) tell the time and identify the days of the week, (5) recognize fields and relocate areas accordingly, and (6) by the time they reach the end of their sixth year, most children have mastered the basics of reading, writing, and arithmetic.

The results of interviews with researchers with RA Nurul Hidayah's teacher showed that the number of students in one class at RA Nurul Hidayah was 24 children aged between 5-6 years. Based on teacher RA Nurul Hidayah's information, 20.83% (5 children) out of 24 could not name colours, shapes and numbers, and 70.83% (17 children) could name colours, shapes and shapes, and numbers. In comparison, 8.3% (2 children) can very well name colours, shapes, and numbers. Learning activities so far have only used blackboards for writing and ordinary play activities but have yet to use puzzle games. Based on the background above, the researcher is interested in conducting a research entitled "The Effect of Number Puzzle Games on the Cognitive Development of Preschool Children Aged 5-6 Years at RA Nurul Hidayah, Pemalang Regency". The purpose of this research is that the research aims to determine the effect of number puzzle games on the cognitive development of preschool children aged 5-6 years.

METHOD

The type of research used is quantitative research with *a pre-experimental design*. This study used a design, namely *one group pre-test* and *post-test,* where the researcher conducted initial observations (pre-*test*) on children/respondents to determine children's cognitive abilities before treatment/number puzzle games were carried out and then made final observations (*post-test)* after treatment was conducted to determine the effect of number puzzle games on children's cognitive development.

The research instrument used in data collection was in the form of checklists for assessing the cognitive abilities of children aged 5-6 years. This checklist consists of 2 indicators, namely getting to know the concept of numbers and getting to know the concept of color which consists of 6 questions, which are modified from Putri Intan Rahayu's research (2018); this checklist consists of 4 scores, namely scores 1, 2, 3 and 4. According to (Nuraini, 2019), the time used in puzzle games is around 10-15 minutes per child; this time rule aims so that children do not play around and can concentrate more on completing the number puzzle.

1. (BB): Not Developed, that is, if the child does the game as exemplified by the teacher.
2. (MB): Starting to develop when children play games with the teacher's help.
3. (B): Growing as expected, that is if the child can do the game alone without being exemplified or assisted by the teacher.
4. (BSB): Develops very well, that is, if the child can carry out without assistance properly and correctly.

The percentage of assessment indicators used in the research instrument uses the formula:

$$X\% = \frac{n}{N} \times 100\%$$

Information :

X% = Percentage sought

n = number of abilities acquired

N = Maximum score

Table 1. Percentage of Assessment Indicators

Assessment criteria	Percentage Value
Not Developed (BB)	0 – 25 %
Start Developing (MB)	2 6 – 50%
Growing As Expected (BSH)	51 – 75 %
Significantly Well Developed (BSB)	7 6 – 100 %

Source: Bungin (Nurrahma, 2021)

The data analysis technique used the Wilcoxon signed rank test using the SPSS application. This study used the Wilcoxon test because there were two monitoring indicators, namely before (pre-test) and after (post-test), to determine the effect of the puzzle game treatment on the cognitive development of preschool children aged 5-6 years.

RESULTS AND DISCUSSION

A. Results

Based on the observations and data analysis that researchers have carried out during the pre-test to the post-test, the following results are obtained:

1. Characteristics of respondents based on Age and gender

Table 2. Frequency Distribution of Respondents by Age

Age	N	%
Five years	10	45.5 %
Six years	12	54.5 %
Total	22	100 %

Table 2 shows that some of the respondents in this study were children aged six years (54.5%).

Table 3. Frequency Distribution of Respondents by Gender

Gender	N	%
Man	12	54.5 %
Woman	10	45.5 %
Total	22	100 %

Table 3 shows that most of the respondents in this study were male (54.5%)

2. Cognitive development of preschool children before number puzzle game therapy.

Table 4. Growth Frequency Distribution Cognitive Respondents Before Number Puzzle Therapy

Indicator	Category	N	%
Children can count the number of objects	BB	12	54.5%
	MB	8	36.4%
	BSH	2	9.1%
	BSB	0	0%
Children can name the order of numbers from 1-10	BB	3	13.6%
	MB	13	59.1%
	BSH	6	27.3%
	BSB	0	0%
Children can count numbers by pointing to objects	BB	12	54.5%
	MB	9	40.9%
	BSH	1	4.5%
	BSB	0	0%
Children can make a sequence of numbers 1-10 with objects	BB	11	50%
	MB	9	40.9%
	BSH	2	9.1%
	BSB	0	0%
Children can name the colour of objects	BB	2	9.1%
	MB	5	22.7%
	BSH	15	68.2%
	BSB	0	0%
Children can classify objects by colour	BB	2	9.1%
	MB	8	36.4%
	BSH	12	54.5%
	BSB	0	0%

Based on table 4 shows that the majority of children are in the BB category (Not yet Developed), namely in indicators 1 (54.5%), 3 (54.5%), and 4 (50%). In comparison, the majority of children develop according to expectations (BSH), namely in indicators 5 (68.2%) and 6 (54.5%). Most children are in the starting to develop category (MB) seen in indicator 2 (59.1%). From the table above, it can also be seen that of the six indicators; none has shown children's cognitive abilities in the very well-developed category (BSB) (0%).

3. Cognitive development of preschool children after number puzzle game therapy.

Table 5. Growth Frequency Distribution Cognitive Respondents After Number Puzzle Therapy

Indicator	Category	N	%
Children can count the number of objects	BB	0	0%
	MB	12	54.5%
	BSH	9	40.9%
	BSB	1	4.5%
Children can name the order of numbers from 1-10	BB	0	0%
	MB	9	40.9%
	BSH	12	54.5%
	BSB	1	4.5%
Children can count numbers by pointing to objects	BB	0	0%
	MB	13	59.1%
	BSH	8	36.4%
	BSB	1	4.5%
Children can make a sequence of numbers 1-10 with objects	BB	0	0%
	MB	12	54.5%
	BSH	9	40.9%
	BSB	1	4.5%
Children can name the colour of objects	BB	0	0%
	MB	3	13.6%
	BSH	9	40.9%
	BSB	10	45.5%
Children can classify objects by colour	BB	0	0%
	MB	2	9.1%
	BSH	10	45.5%
	BSB	10	45.5%

Based on table 5 shows that the majority of children are in the MB category (Starting to Develop), namely in indicators 1 (54.5%), 3 (59.1%), and 4 (54.5%), while the majority of children develop very well (BSB) namely in indicators 5 (45.5%) and 6 (45.5%) and the majority of children are in the developing category according to expectations (BSH) seen in indicator 2 (54.5%). This shows an increase in children's cognitive abilities score after being given the number puzzle game treatment.

4. The effect of number puzzle game therapy on the cognitive development of preschool children.

Table 6. Distribution of Pre-test and Post-test Scores Respondent's Cognitive Development

Child Name	Statistical Value		Difference (O2-O1)
	Pre-test (O1)	Post-test (O2)	
An. K (5 years)	11	14	3
An. H (5 years)	10	14	4
An. H (6 years)	18	24	6
An. A (5 years)	11	16	5
An. A (6 years)	16	20	4
An. V (5 years)	9	13	4
An. I (5 years)	9	14	5
An. C (5 years)	10	14	4

An. N (6 years)	14	18	4
An. S (6 years)	15	20	5
An. G (6 years)	9	14	5
An. E (6 years)	15	18	3
An. D (6 years)	14	19	5
An. C (6 years)	12	20	8
An. B (6 years)	10	17	7
An. A (5 years)	9	14	5
An. A (6 years)	13	18	5
An. AN (5 years)	7	15	8
An. AR (5 years)	10	16	6
An. AK (5 years)	9	14	5
An. GA (6 years)	15	20	5
An. M (6 years)	11	17	6

Table 6 shows that puzzle games can improve children's cognitive development, which can be seen from the difference between the pre-test and post-test; namely, it appears that all 22 respondents experienced an increase in cognitive ability scores with an increasing difference of 3 - 8.

Table 7. Results of Game Therapy Influence Analysis Number Puzzle on Respondents' Cognitive Development

	Post-Test – Pre-Test
Z	-4.159b
asymp. Sig. (2-tailed)	,000

Based on the table above, the Asymp Sig value is obtained. (2-tailed) of 0.000, the value is less than <0.05, so Ha is accepted, and Ho is rejected, so it can be concluded that there is an effect of number puzzle games on children's cognitive development.

B. Discussions

1. Characteristics of Respondents Based on Age and Gender

Research on Age showed that children aged five amounted to 10 (45.5%). Children aged six years amounted to 12 children (54.5%). At the Age of 5-6 years, children enter the pre-operational stage (2-7 years), where at this stage, children learn from words and pictures. This follows Piaget's theory (Fitriana, 2018) that the stages of cognitive development according to Age are divided into four stages, namely the sensorimotor stage (0-2 years) is the stage where babies build an understanding of the world through sensory experience, the pre-operational stage (2-7 years) is the stage where children begin to represent the world with words and pictures, the concrete operational stage (7-11 years) is the stage where children can think logically about concrete events, and the operational stage Formal formal (11-15 years) is the stage where children's thinking becomes more idealistic.

Research results about gender, namely that most male respondents were 12 children (54.5%) while female respondents were ten children (45.5%). According to the data obtained, respondents of the male gender experienced a higher increase in cognitive development than respondents of the female gender. This follows the opinion of Tran, Hofer & Voracek (Murtafiah et, 2018) that, in general, boys' intelligence is higher than girls.

2. Cognitive Development of Children Before Giving Puzzle Game Therapy (Pre-Test)

   Based on the results of early observations of children's cognitive development in table 4, it shows that out of the six indicators, there have not yet been a child's cognitive abilities that fall into the very well-developed category (BSB). However, two indicators fall into developing as expected (BSH). In comparison, the -4 other indicators fall into the category of undeveloped (BB) and starting to develop (MB).

   Almost the majority of respondents fall into the category of underdeveloped (BB). This is related to children's learning activities, and the environment greatly influences children's cognitive development. The results of interviews with teachers said that teaching and learning activities only used blackboards for writing and ordinary play activities but had yet to use puzzle games. Learning media that are more creative and varied must be used. Hence, children feel energized during the learning process, such as number puzzle game media, so children can assemble puzzles and count several colourful numbers (Tu et al., 2022).

   This is consistent with the theory from Lestari et al. (Mulyaningsih et al., 2020) that the important thing that teachers and parents must understand is how each Learning activity must be made exciting and not boring for children. Meaningful and fun learning activities can be done as a game. Playing is an activity that can provide a valuable learning experience because children can develop through play, imagination, and ideas (White et al., 2022).

3. Cognitive Development of Children After Being Given Puzzle Game Treatment (Post-Test)

   Based on the research results in table 5 shows that there are differences in the pre-test and post-test scores. The difference is that the average value of children's cognitive abilities development has increased after number puzzle game therapy. None of the respondents is included in the undeveloped category (BB). It can be assumed that number puzzle game therapy changes children's cognitive development. The game is an enjoyable thing for preschool-age children, especially if the game is interesting because the benefits of playing not only make children feel happy but also can make children quickly learn what they are doing.

   This follows Fadlallah's theory (Muloke et al., 2017) that playing in early childhood is very important. By playing, the learning process will be effective and faster caught while they are playing. Well, one of the benefits of playing well is for children's cognitive development.

4. The Effect of Number Puzzle Games on the Cognitive Development of Preschool Children Aged 5-6 Years

   The results of the study regarding the pre-test and post-test scores showed a difference between the pre-test and post-test, namely that the post-test statistical value experienced a significant increase, which has the effect of puzzle games on children's cognitive development. Then based on the results of statistical tests using the Wilcoxon test, the results obtained are the *Asymp Sig value. (2-tailed)* of 0.000, the value is less than <0.05, which means that there is an effect of number puzzle games on the cognitive development of preschool children aged 5-6 years at RA Nurul Hidayah Pemalang. Children's cognitive abilities increase after the *treatment* of puzzle games because puzzles are an effective game method in helping stimulate children's cognitive development.

   This is supported by Yuniati's theory (Mubarok et al, 2019), namely that puzzles are a form of game that can hone creative skills. Thinking, making it easier for children to remember and understand concepts, being more creative, and other benefits of playing puzzles impact their cognitive development. In playing puzzles, children are required to reason so that the brain of the child will be honed.

   In this study, number puzzle therapy was given for three days with a *treatment time of* 15 minutes for 11 respondents. Therefore, the total *treatment time was* 30 minutes for 22 respondents.

Besides being used as games, they also have the benefit of helping to improve children's cognitive development because children will try to complete the number puzzle by thinking and counting when they see the numbers in the puzzle. The results of this study show that puzzle games affect children's cognitive development (p-value 0.000; this value is smaller than the p-value <0.05).

This research is in line with (Rahima, 2018) on "The Influence of Educational Games with Puzzle Media on Cognitive Development in Recognizing Shapes and Color in Preschool Children in Aisyiyah IV Kindergarten, Jambi City" the result is that p-value = 0.000, thus the p-value is <0.05, which means there is an influence educational games with media puzzles on cognitive development.

Puzzle games can improve children's cognitive development because puzzle activities are not only carried out as games but are also used in solving problems so that children will think about putting together puzzles according to a complete shape using their hands (Aral et al., 2012). This is per the theory from Maruti (Permata, 2020) that playing puzzles for children improves cognitive skills *(cognitive skills)* related to skills for learning and solving problems. Playing activities using puzzle media will imply cooperation between hands and eyes so that children can understand and have expertise in exploring things according to the abilities and interests of children.

CONCLUSION

Based on the results of the study, it can be concluded, namely: 1) The characteristics of Age and sex obtained from the results of the majority of respondents aged six years as many as 12 children (54.5%) with the sex of the majority being male as many as 12 children (54.5%). 2) Children's cognitive development before the puzzle game therapy was carried out showed that most children were in the undeveloped category (BB). 3) Children's cognitive development after the puzzle game therapy was carried out; the result was that the average value of children's cognitive development increased, so no respondents were in the undeveloped category (BB). 4) The results showed an effect of number puzzle games on the cognitive development of preschool children aged 5-6 years at RA Nurul Hidayah Pemalang with an Asymp Sig value. (2-tailed) of 0.000, the value is less than <0.05

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