



# The Effect of Emotion Change Puzzle Media on Visual-Spatial Intelligence for Early Childhood Education

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## Abstract

**Purpose** – This study aims to determine the effect of emotion change puzzle media on visual-spatial intelligence in children aged 5-6 years at TK ABA 39 Malang City.

**Design/methods/approach** – The method used in this study is an experimental method using a pre-experimental design by choosing an Intact-Group Comparison design. The research subjects totaled 30 children who were children aged 5-6 years in TK ABA 39 Malang City. The Analysis used in this study is a normality test, homogeneity test, and hypothesis test.

**Findings** – The results of data analysis, and the validity test obtained. The validity test obtained the  $t_{count}$  test  $0.053 \geq$  from  $t_{table}$   $-0.601$  which means there is an increase in visual-spatial intelligence in children aged 5-6 years. The standard value of the post-test results is higher than the standard value of the pre-test results, namely the experimental pre-test 7.12, pre-test control 7.38, experimental post-test 10.79, and the control post-test 10.26.

**Research implications/limitations** – This study concluded that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years in TK ABA 39 Malang City.

**Practical implications** – The results show that using media emotion change puzzle to children's learning media can be done by watching animated videos telling stories about various kinds of expressions.

**Originality/value** – This study highlight that emotion change puzzle media can be alternative learning tools that improve children's visual-spatial intelligence.

**Keywords:** Emotion change Puzzle media; Visual-spatial intelligence; Early childhood

**Paper type:** Research paper

## Introduction

Early childhood is a golden age or often known as the golden age, where at this time the child's brain will experience very rapid development (Fauziddin & Mufarizuddin, 2018). Parents and the environment around children play an important role in helping children grow and develop optimally. Many ways can be done to stimulate children's growth and development so that various aspects of development such as cognitive, language, physical motor, social-emotional, moral spiritual, and art in children can develop properly (Fika et al., 2019). One way that can be done to improve various aspects of development in children is by providing education. Education in early childhood is the provision of guidance from birth to six years of age, this is done by providing stimulation that can foster physical and spiritual development so that children have readiness for the future (Lasaiba, 2016). Early childhood education can optimize various aspects of development in children, which can be psychological or physical (Harmonis et al., 2022). Therefore, education has a very important role in improving all aspects of development in children and can optimize the existing intelligence in children.

Intelligence is the highest ability possessed by humans. Intelligence has been possessed since human birth and can continue to be developed into adulthood (Nuraini & Sujiono, 2010). Deary et al., (2010) define intelligence as an ability that involves understanding, reasoning, learning, and problem-solving (Peng et al., 2017). Gardner (1999) initially described seven bits intelligence that show different intellectual competencies, then adden to eight aspects of intelligence consisting of linguistic, logical-mathematical, physical or kinesthetic, visual-spatial, musical, intrapersonal, interpersonal, and naturalist intelligence. However, in its application in Indonesia, it is added to nine, namely spiritual intelligence (Nuraini, 2019). The nine intelligence that have been mentioned, in this study will be examined is visual-spatial intelligence. Casey et al., (1995) defins visual-spatial intelligence as the ability to make and change colors (Kahl et al., 2022).

According to Wahyuni (2018), visual-spatial intelligence is a person's ability to visualize in the form of pictures, designs, and graphics what is in the mind and imagination, fantasy or concept. Therapy for spatial intelligence can be done by: (1) drawing and coloring, (2) freedom of expression of ideas or imagination, (3) freedom of expression of form, (4) freedom of expression of color in the world of drawing and coloring, (5) free expression of techniques, and (6) creative (Bryant et al., 2019; Kotsopoulos et al., 2019). Visual-spatial intelligence can help children in various ways, such as finding ideas to solving problems with creativity (Syafa'at et al., 2022). Visual-spatial intelligence refers to the ability to shape (Alkouri, 2022; Greenburg et al., 2019; Mercan & Kandır, 2022). Individuals with strengths in this area rely on visual thinking and are highly imaginative (Tadzkirah, 2020). This is in following the opinion of Rosidah (2014), which states that children who have spatial intelligence have visualization learning methods based on their vision. Children will get stimulation of visual-spatial intelligence if the child is in an environment that provides opportunities for children to carry out visual-spatial activities according to their development, for example, activities for imagination.

Based on the results of initial observations made by researchers at TK ABA 39 Malang City, the visual-spatial intelligence of children aged 5-6 years is in the developing category. At this institution, it was found that the lack of learning media used during daily learning activities, especially in improving visual-spatial intelligence in children. This institution still uses magazines as a medium for learning activities. This is what causes the development of foster children in the category of starting to develop. Therefore, researchers are trying to improve visual-spatial abilities in children through learning media. There are various learning media to improve children's visual-spatial intelligence, one of which is the emotion change puzzle media. The puzzle is a learning medium that is used by placing a random image into a complete picture.

According to Wardhani et al., (2014), a puzzle is a game that can train children's visual-spatial intelligence, because puzzles can train children's thinking abilities and can encourage children to be able to solve a problem. Emotion change puzzle media is made by using a board made of flannel cloth. This media can be removed according to the needs of the child. Apart from

that, the emotion change puzzle media can introduce children to the shape of the eyebrows, eyes, and mouth according to a concept. This is following the opinion of Hikmawati et al., (2022), the use of flannel boards in improving visual-spatial intelligence in children can be created and adapted to the needs of the child to be achieved. Through flannel boards, children can recognize shapes, and colors, arrange concepts, make constructions, and can provide ideas related to the concepts given by the teacher.

The way to apply emotion change puzzle media in improving children's visual-spatial intelligence is by using a tool in the form of a simple video story then the child is asked to apply what is in a story according to the child's imagination. This is following the opinion of Kusumawardani (2018), which states that in assisting the learning process that can attract children's attention and make learning effective, it is necessary to use varied and interactive media by utilizing learning media that are following technological developments. One of the interesting learning media so that children don't feel bored is the use of learning video media. According to Fadhli (2016), video media is used as a tool to convey information and messages, many people take advantage of the use of video media for commercial purposes, the use of which becomes very dominant for its users. Therefore, in optimizing visual-spatial intelligence in children, it can be stimulated through various media.

The results of the research by Senawati et al., (2016) based on the analysis of data management and the results of the percentage show that there is a significant effect on the visual-spatial intelligence of children aged 5-6 years. It can be seen in the learning process that children can memorize directions, children can to memorize street names, children can to memorize house plans, children can to draw correctly, children are able to make several buildings with different media and the resulting images are usually quite good. This proves that sand puzzle games are proven to improve visual spatial intelligence. The results of the research by Prasetyoningrom et al., (2015) showed that based on the data obtained, the spatial-visual intelligence of group B children in Pertiwi 02, Boyolali Regency increased by the action of using picture puzzle media. This has been proven to increase visual-spatial intelligence, as seen in children who experience improvements in each cycle, such as being able to distinguish shapes, determine images, and solve simple problems.

In accordance with the explanation above, the researchers used the emotion change puzzle media in optimizing the visual-spatial intelligence of children aged 5-6 years. The use of emotion change puzzle media aims to make learning activities fun, active, and effective.

## Methods

The method used in this research is quantitative research using experimental methods. The research design used was a pre-experimental design by selecting the Intact-Group Comparison design. In this design, there is one group used for research but divided into two. One group for the experiment (which was given treatment) and one group for the control (which was not given treatment). the two groups were given a pretest or initial test, then given treatment (X) in the experimental group and finally, the posttest was given to the two groups. Thus, the results of the treatment can be known more accurately, because they can be compared with the conditions in the control group. The research design can be seen as follows.

Table 1. Research Method Design

Class	Treatment	Measurement
Experiment	X	O <sub>1</sub>
Control	-	O <sub>2</sub>

Source: (Sugiyono, 2015: 111)

This research was conducted at TK ABA 39 Malang city and was conducted in 8 meetings. The research subjects totaled 30 children who were children aged 5-6 years in TK ABA 39 Malang City. Data collection techniques are in the form of observation sheets and documentation. Observation in a study is defined as focusing attention on an object by involving all the senses to

obtain data. Observation is direct observation using sight, smell, hearing, touch, or if necessary by taste. Data collection techniques by observation are used during research on human behavior, natural phenomena, and work processes (Sugiyono, 2015). Documentation is a technique of collecting data and information through searching and finding evidence in the sense of a method of collecting data that comes from non-human sources. According to Sugiyono (2017), documents are records of past events. Documents can be in the form of writings, drawings, or monumental works of a person. In this study, the documents collected will assist researchers in understanding the phenomena that occur at research locations and assist in interpreting data, as well as in developing theories and conducting data validity. The following is a grid of visual-spatial intelligence for children aged 5-6 years.

Table 2. Grid of Visual-Spatial Intelligence for Children Aged 5-6 Years

Variabel	Sub Variabel	Indikator	Instrumen
Visual-Spatial	Think through pictures	Be able to mention the shape of things that catch the eye through the story	Observation sheet
	Use imagination and interpretation of images creatively	Able to express imagination	
	Visualize in the form of pictures	Able to express shape	

In data analysis, the data collected will be in the form of scores or pretest and posttest scores from the control group and the experimental group, then these two values will be compared to see if there is a difference between the values between the control group and the experimental group after being treated. The data analysis used in this study is inferential statistical data analysis, which consists of an assumption test and a hypothesis test. An assumption test is carried out to find out whether the data is normally distributed and is homogeneous. The assumption test consists of a normality test and homogeneity test, then a hypothesis test.

## Result and Analysis

This research was conducted for 8 days, the first day was giving pre-test to 30 research subjects. The next day is the giving of treatment to groups that have been randomly selected by drawing 15 children to become the experimental group and 15 control groups. The treatment stage is given for 5 days. The final stage is to do a post-test of 2 groups, namely the experimental group and the control group. During the research, data collection was carried out using observation sheet guidelines obtained through visual-spatial intelligence for children aged 5-6 years in the form of a rating scale assessment with a score of 1-4. The results of the data are collected and analyzed. Data from the analysis of visual-spatial intelligence for children aged 5-6 years are described as follows:

Table 3. The results of the average data pretest and posttest

	Data		Indicator 1	Indicator 2	Indicator 3	Total
Average Group	Experiment	Pre-test	2,86	2,33	1,93	7,12
		Post-test	4	3,53	3,26	10,79
Average Control	Experiment	Pre-test	2,86	2,46	2,06	7,38
		Post-test	4	3,26	3	10,26

The results of the analysis of the average visual-spatial intelligence of children aged 5-6 years with 3 indicators, namely the ability to say the shape of things that are caught by the eye through stories, the ability to express imagination, and the ability to express shapes before getting treatment or care using emotion change puzzle media is still low. This can be seen from the average pre-test score of the experimental group in table 3 which is 7.12 and after getting treatment in the form of emotion change puzzle media, there is a difference, namely the average

post-test score of the experimental group increases by 10, 79. It can be interpreted that there is an increase in children's visual-spatial intelligence after using the emotion change puzzle media.

Next, the researcher conducted an assumption test, namely the normality test, homogeneity test, and hypothesis test.

#### Tests of Normality

Kelas	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.	
Hasil kecerdasan anak	pre test eksperimen	.270	15	.004	.882	15	.050
	post test eksperimen	.162	15	.200*	.915	15	.164
	pre test kontrol	.183	15	.188	.886	15	.059
	post test kontrol	.228	15	.034	.896	15	.082

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Figure 1. Normality Test Results

Figure 1 in SPSS 25.0 for windows using the Shapiro-Wilk Test. In Figure 1 it can be seen that the significant values of the pre-test and post-test of the experimental group are 0.050 and 0.164. Meanwhile, the significant values of the pre-test and post-test of the control group were 0.059 and 0.082. So, it can be concluded that all significant values are greater than 0.05, which means that the data distribution is normal.

The next stage after the normality test was carried out and the results of the research data were found to be normal, then the next analysis test was the homogeneity test. A homogeneity test was carried out to determine the variance of the data obtained, then the data was concluded whether to include homogeneous data or not.

#### ANOVA

##### Child Intelligence Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.533	1	.533	.361	.553
Within Groups	41.333	28	1.476		
Total	41.867	29			

Figure 2. ANOVA (Analysis of variance) Test Results

Based on the results of the analysis using ANOVA (Analysis of Variance) in Figure 2, it can be seen that the significant value is  $0.553 > 0.05$ , so it can be concluded that the data from each research subject has the same or homogeneous variance. After the results of the normality test and homogeneity test meet the requirements, then you can continue to test the hypothesis.

The results of the Independent Samples Test analysis after giving treatment in the form of emotion change puzzle media to the visual-spatial intelligence of children aged 5-6 years in TK ABA 39 Malang City, it is known that the sig. (2-tailed) shows 0.553 and  $t_{table}$  value -0.601. The test criterion is if the sig.(2-tailed)  $t_{count} \geq$  of  $t_{table}$  then  $H_0$  is rejected and  $H_a$  is accepted. In the validity test, it was found that the  $t_{count}$  test was  $0.053 \geq$  from  $t_{table}$  -0.601 which means that there is an increase in visual-spatial intelligence in children aged 5-6 years. This means that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years.

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		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hasil Kecerdasan Visual Spasial	Equal variances assumed	7.571	.010	-.601	28	.553	-.267	.444	-1.175	.642
	Equal variances not assumed			-.601	21.877	.554	-.267	.444	-1.187	.654

Figure 3. Independent Samples Test Test Results

In the validity test, it was found that the  $t_{\text{count}}$  test was  $0.053 \geq$  from  $t_{\text{table}} -0.601$  which means that there is an increase in visual-spatial intelligence in children aged 5-6 years. This means that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years.

## Discussion

### Development of Visual-Spatial Intelligence In Children Aged 5-6 Years Before Getting Treatment with Emotion Change Puzzle Media

Learning implementation activities are carried out by children aged 5-6 years, totaling 30 children. Before doing treatment, the child is given a pre-test first in the form of a worksheet. The purpose of giving the pre-test is to measure children's visual-spatial intelligence with an assessment in the form of observation sheets according to the indicators of visual-spatial intelligence of children aged 5-6 years. In this activity, the teacher is the collaborator and the researcher is the executor.

The development of visual-spatial intelligence of children aged 5-6 years before being given treatment emotion change puzzle media showed low, namely 7.12 for the experimental group and 7.38 for the control group. These results can be seen in the children who have difficulty in doing the pretest. The three indicators used in the assessment are being able to state what the eye catches in the story, being able to express imagination and being able to express shapes. Some children still have difficulty understanding the different forms, such as the shape of the mouth when crying and the shape of the mouth when angry.

Factors that can affect children's low visual-spatial intelligence are the lack of unsupportive learning media. The media is needed that can help children to improve the various bits of intelligences possess by children. This is following the opinion of Kusumawardani (2018), which states that in assisting the learning process which can attract students' attention and make learning more effective, it is necessary to use varied and interactive media by utilizing learning media following technological developments. One of the interesting learning media so that children do not feel bored is the use of learning video media. Therefore, in optimizing visual-spatial intelligence in children, it can be stimulated through various media. In PAUD institutions, visual-spatial intelligence is still at an alarming level. This can be seen from the learning activities in PAUD institutions which only focus on providing worksheets to improve cognitive and fine motor skills in terms of reading, writing, and arithmetic. There are several obstacles in this regard, namely the obstacle in stimulating visual-spatial intelligence is teachers who are less creative in designing learning activities and media provided by schools or schools that do not support teachers to be creative (Putriana et al., 2022).

### **Development of Visual-Spatial Intelligence In Children Aged 5-6 Years After Getting Treatment with Emotion Change Puzzle Media**

In this activity, the children have been given treatment with emotion change puzzle media, first, the children are given a pre-test in the form of working on worksheets. After the treatment, the child is then given a post-test in the form of the same assignment as the pre-test. The purpose of the post-test is to determine the level of development of visual-spatial intelligence in children after being given treatment. The assessment tool used on the assignment sheet is a rating scale with a score of 1-4.

Based on the results obtained from the post-test, it can be said that the child's visual-spatial intelligence has begun to increase. The three indicators used in the assessment are being able to state what the eye catches in the story, being able to express imagination and being able to express shapes. The results showed that the value in the experimental group was 10.79 and in the control group was 10.26. Therefore, it can be said that after being given treatment by giving emotional change puzzle media to children's visual-spatial intelligence there are good changes because the media can be an intermediary in conveying learning to children. Learning activities in early childhood are inseparable from learning media but have principles as a tool that can stimulate various aspects of children and can overcome boredom in children so that learning can run effectively (Dewi & Zaini, 2017).

### **The Influence of Visual-Spatial Intelligence of Children Aged 5-6 years Before and After Being Given Treatment with Emotion Change Puzzle Media**

The theory of multiple intelligences is a theory developed by Howard Gardner, which states that every human being has different intelligences. Multiple intelligence is something that can be developed early on. Developing children's spatial-visual intelligence can be done by observing pictures, assembling and assembling, cutting, folding, and making puzzles (Hasan, 2012). Visual-spatial intelligence is a person's ability to draw, graph, and artistic skills, as well as active imagination which involves sensitivity to identify objects or images, understand spatial relationships, and modify objects (Putri, 2021).

Researchers have conducted research according to the stages of pre-experimental research (pre-experimental design) by selecting the Intact Group Comparison design which was carried out at TK ABA 39 Malang City involving 30 children aged 5-6 years. Emotion Change Puzzle media is a media that can help improve children's visual-spatial intelligence. This media can provide a stimulus to children on how children build their imagination and creativity through the help of learning videos. In this study, the first stage was giving a pre-test before being given treatment. After being given treatment, the child is given a post-test in the form of a worksheet that was previously given during the pre-test.

The results of data analysis using SPSS 25.0 version for windows, showed that the  $t_{count}$  test was  $0.053 \geq$  from  $t_{table} -0.601$  which means that there is an increase in visual-spatial intelligence in children aged 5-6 years. This means that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years. In this case, it can be seen from the increase in the results of the average pre-test and post-test data analysis in the experimental group, namely, the pre-test score was 7.12 and the post-test was 7.38. The data can be said to be normally distributed, so a normality test is carried out using the Shapiro-Wilk formula using SPSS 25.0 version for windows. The results of the analysis in Figure 1 show that the significant value is greater than 0.05, including the experimental pre-test value of 0.050; experimental post-test value 0.164; control pre-test value 0.059; and the value of the post-test control 0.082.

Furthermore, to test homogeneity using One Way ANOVA (Analysis of Variance) with SPSS 25.0 for Windows, in this hypothesis test the data obtained is also homogeneous or has the same variance. This can be seen in Figure 2 which shows the resulting significant value of  $0.553 > 0.05$ . After the normality and homogeneity tests, then the hypothesis test. Hypothesis testing in this study used the Independent Samples Test analysis which was carried out using SPSS 25.0 for windows. The results of the hypothesis test in Figure 3 show that the significant value is the sig.

(2-tailed) shows 0.553 and  $t_{table}$  value -0.601. The test criterion is if the sig.(2-tailed)  $t_{count} \geq$  of  $t_{table}$  then  $H_0$  is rejected and  $H_a$  is accepted. In the validity test, it was found that the  $t_{count}$  test was  $0.053 \geq$  from  $t_{table}$  -0.601 which means that there is an increase in visual-spatial intelligence in children aged 5-6 years. This means that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years in TK ABA 39 Malang City.

Erica et al., (2018) the specialty of visual-spatial intelligence lies in the ability to understand, think, and translate imagination into visual form. This intelligence involves color, line, shape, size, and relationship between existing elements. Children who have visual-spatial intelligence can see an object from various points of view. Children can record what they see, then imagine before visualizing it in the form of detailed pictures. Gardner (1993:15-16) states that intelligence is the ability to solve problems, create products of value in one or several cultural environments of society. The emphasis point of the theory of multiple intelligences is on the ability to solve problems and create products or works (Nuraini, 2019). Visual-spatial intelligence in children can develop if children are trained and stimulated through experiences gained from parents, educators, and the environment around children (Abidin & Kurniawati, 2020). Visual-spatial intelligence involves sensitivity to color, line, shape, size, and area (El Fiah, 2020).

Based on the results of the study, it can be concluded that the use of emotion change puzzle media can have an impact on improving the visual-spatial intelligence of children aged 5-6 years. According to Aisyah, et al., (2008) children who have visual-spatial intelligence are children who can visualize images in their minds and then find answers by visualizing shapes or images (Fitri & Ibrahim, 2019).

## **Conclusion**

Based on the results of the study, it can be concluded that the average value is the experimental pre-test 7.12, and Post-test experiment 10.79 which means visual-spatial intelligence has increased through the emotion change puzzle media. On the results of hypothesis testing using the Independent Samples Test with the testing criteria, namely if the sig. (2-tailed)  $t_{count} \geq$  of  $t_{table}$  Then  $H_0$  is rejected and  $H_a$  is accepted. In the validity test, it was found that the  $t_{count}$  test was  $0.053 \geq$  from  $t_{table}$  -0.601 which means that there is an increase in visual-spatial intelligence in children aged 5-6 years. This means that the emotion change puzzle media has a significant influence on the visual-spatial intelligence of children aged 5-6 years.

## **Declarations**

### **Author contribution statement**

Arini Mubarroroh conceived the presented idea. Nur Hidayah developed the theory of early childhood education, puzzle media, and visual-spatial intelligence. Pramono verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

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### **Data availability statement**

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

### **Declaration of interests statement**


The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.




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