Research Article

Colour preference on Picture Therapy Cards in Children With ASD

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Abstract.

Children with Autism Spectrum Disorder (ASD) have difficulty understanding and concentrating. Several studies have explained that using visual therapy media, one of which is therapy cards, can help teachers and therapists maintain children's concentration and motivation during learning. Previous research also states that ASD children have patterns of visual interest/preference for certain visual displays, in theory also explaining that visual displays affect children's understanding and attention. One of the visual aspects on the therapy card is the colour used in the illustration on the card. This study aims to find out how colour combinations can affect children's attention. We use a quantitative methodology with an experimental method by Chazin & Ledford. The results of the study found that autistic children prefer warm colour combinations, compared to illustrations with cool tone and monochrome combinations. Children also have better attention and motivation with cards with warm colour combinations in the illustrations. This research is expected to be useful input for teachers and therapists and can be used as a reference in making and developing visual media for children with autism.

Keywords: autism, color, pictorial therapy cards

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1. Introduction

Autism Spectrum Disorder (ASD) has been defined as a developmental disability that can cause significant social, communication and behavioral challenges with some characteristics such as subject a child to problems such social communication, difficulty interacting, concentrating and responding and repetitive body movements or behaviors [1]. Some autistic children have good photographic memory but tend to be selective about certain visual stimuli [2]. In further research conducted on this selective pattern, it was found that the tendency towards visual stimuli leads to children's visual preferences [3] [4]. Visual preference is closely related to attention, motivation and comprehension skill. Previous research has proven that carrying out activities and using media that are

according to children's preferences will help in the process of therapy and children's learning [5]. The use of visual media with a stimulus according to their preferences will help the child's attention and the child will be able to understand the lesson well, so that the learning process runs more effective.

From the results of previous studies there are several visual support for learning such as think in pictures, Picture Exchange Communication System, pictorial therapy cards [6]. Factors that affect children's attention include: Aspects of the stimulus itself (intensity, appearance, regularity, duration and arrangement), knowledge, stimulation (state and disturbance) [3] [7] . Currently, many visual media have been developed, including therapy cards which are developed in various visual appearances, sizes, and materials. In previous research, it was explained that color is an important aspect that influences their psychology, warm colors in the therapy room can provide calm so that the psychological hope of children with autism will be calmer [8]. Other studies regarding color preferences in autistic children also show that children with ASD have color preference categorized by their ages [9]. However, there is no research that discusses the use of color combinations for children's learning media, especially picture therapy card media, even though the color in the picture therapy card is one of the design elements that can influence children. The aims of this study were: 1. To find out the preferences of children with ASD for color combinations in the illustrations on the picture therapy cards 2. To identify the the relation of the color combinations that children with ASD like on children's attention and behavior when learning. Hope this research could be useful in education and therapy for children with ASD and become one of the considerations in selecting cards to be used by therapists or teachers for children. This Reseach result also could become reference for designers in making visual media for autistic children.

2. Method & Procedure

In order to identify the relationship of color combinations on illustrations of picture therapy cards toward attention in children with ASD, this study used quantitative experiment method. The independent variables in this study were the combination color of illustrations found on therapy cards such as warm tone color, cool tone color and monochrome color. The dependent variables in this study is attention with definition aspects such as fixation time, response time, sustain attention, trials and engage time.

The experimental method used is the Preference Assessment Tool by Chazin, K.T. & Ledford, JR [7]. The research procedure was approved by the ethical commission of the Faculty of Medicine UNPAD. The experimental results obtained were analyzed and described descriptively. Experimental data is non-parametric data with abnormal distribution, so the test used is a non-parametric test. The data was tested by Chi Square test and Spearman correlation test.

The research was carried out at the Suryakanti Foundation, Bandung – West Java, Indonesia. There were 9 respondents aged 5-13 years old, they are student in SDLB Suryakanti. Participants were diagnosed as children with ASD according to the American Psychiatric Association's DSM-5 and records of screening that conducted by psychologists at school. Respondents who have poor vision, eye disorders, and children who do not understand basic regulations are not included in this study.

The stimulus used in this experiment was a visual stimulus in the form of a picture therapy card with 15 sets of pictures of objects, with a total of 45 cards measuring 15x15cm. and 12 color cards with a size of 9x9 cm. The content of the object images used in the cards are pictures of everyday nouns that have been mastered by the child. The use of the hue color spectrum is intended to determine children's interest in certain color combinations, so that when using other color variables such as brightness or saturation it is influenced by other things apart from the aspect of color preference so that it is not used in experiments and becomes one of the limitations in research.

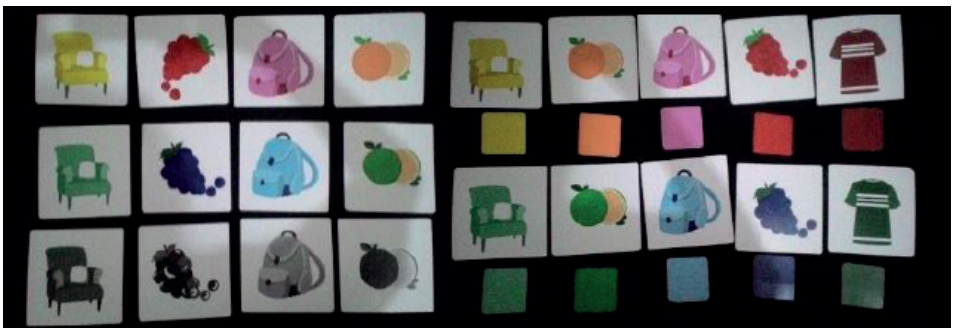

Figure 1: The Stimulus : Picture Therapy Cards (2019).

3. Finding and Discussion

3.1. Color Preference in Children with ASD

From the results of statistical calculations of the chi square test, it was found that the Aismp.Sig value was 0.034, because the Asimp.Sig value was 0.034 < 0.05, it can be concluded that H0 is rejected and Ha is accepted ”there is a significant relationship between visual preferences of children with ASD and color combinations on therapy cards”. From the results of experiments that have been carried out concerning visual style preferences for color combinations on therapy cards, it is found that children with ASD tend to choose cards with warm tone color combinations. This is in line with previous research conducted by Grandgeorge and Masataka [9], regarding color preferences in children in ASD, but in their experiment it was not applied to illustrations or pictures, only the preferences of each color were seen.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	27.789[a]	16	.034
Likelihood Ratio	30.288	16	.017
Linear-by-Linear Association	.608	1	.435
N of Valid Cases	135		

a. 18 cells (66.7%) have expected count less than 5. The minimum expected count is 1.78.

Figure 2: Chi-Square Test Result.

From the experimental results it was found that 7 children which aged ranged from 8-11 liked therapy cards with warm tone color combinations, while other 2 children who liked the cool tone color combination, both were 13 years old. Number of cards with warm color combinations has the highest voting value. Warm tone colors, especially red, have more light intensity so that children with ASD find it easier to focus and be attracted to these colors [9]. The study by Grandgeorge and Masataka [9] also explained preference of children with ASD is associated with age and hyper-sensitivity of children with ASD. The results of their study explained that children with ASD aged 8-11 years preferred red color and children aged 12-17 years preferred blue color compared to the other colors tested. It can be seen that the age of the child is one of the aspects of

color preference in Children with ASD. The study by Grandgeorge and Masataka [9] also explained preference of children with ASD is associated with age and hyper-sensitivity of children with ASD. children with ASD aged under 11 years prefer red, while children with ASD aged 11-17 years prefer blue. The two age groups both avoid yellow due to hyper-sensitivity. In this experiment we also showed respondents aged 8-11 years prefer warm tone combinations and liked red the most, while respondents aged 13 chose cards with cool color combinations and liked blue the most. However, these two groups did not avoid yellow, instead dark colors such as brown and dark blue were the colors that children preferred the least

Warm tone color combination also well liked by normal children, in the study of normal children it was also found that children chose red as the preferred color [9]. Furthermore Myatt & Carter explained that both children at a young age to children at an older age preferred colorful pictures compared to black-and-white pictures [10]. The results of this experiment are the same as the results of previous study, it can be seen that both children with ASD and normal children are prefer colourful pictures compared to black-and-white pictures.

3.2. Color Combinations and Children with ASD's Attention

As explained in several previous studies, eye movements, gaze, head and body gestures are signs of a child's attention. Research on visual preferences of children with ASD mostly uses eye-tracking movement measures as a method for calculating children's attention and direction of attention [11] [12]. In addition, there are also several studies that calculate the time children start paying attention to objects (response time) and duration of the child's attention to the stimulus [4] [5]. One aspect of attention is child's ability to focus attention, also shows the child's motivation to receive the stimulus [13]. During the experiment, the response time ranged from 1 – 2.4 seconds after the command was given to the child. From the experimental results it can be seen that non-verbal children with ASD respond by matching the colors on objects with the color cards provided by the researchers. From the results of the experiment, the child responded to the command by pointing to the color according to the color in the picture ordered by the researcher (matching the color of the card with the color in the illustration). From the experimental results, children respond faster to warm tone color, children are also able to recognize objects even though these objects are black and white, but the response

time is much longer than cards with warm tone and cool tone color combinations. This shows that children more easily recognize using colourful pictures compared to black and white pictures.

Table 1: Spearman Test Result: Table of Correlation of Color Preference with Attention.

	Engange Time	Response time	Fixation Time	Sustain Atensi	Trials
Color Preference	0,534*	-0,495*	-0.404	0,534*	-0.341

The value contained in the table is the value of the correlation coefficient, the greater the value, the closer the correlation. Data marked with (*) is data that has a significant correlation

From the results of the Spearman Test above, it can be seen that color preference in children with ASD greatly influences their attention. It show color preference has significant correlations with engage time, response time, sustain attention but has no significant correlation with fixation time and children's trials. So the greater the child's color preference, the child also showing better attention such as interaction time also increases, they showing motivation and interest, they also can maintain concentration with cards that have color combinations they like.

Based on the results of Spearman Test on Table.1 the correlation coefficient of color preference with sustained attention, the positive value is 0.534*, it showing the significant effect of preference color during the child's sustain attention. Bowler explained that sustained attention is the capacity to maintain focused attention on a task over a long period of time [12]. Children showing enthusiasm by waiting for the therapy card to be shown is also a form of child behavior interested in cards, they also observing the card for a long time, holding, playing and also explaining the card. Meanwhile, based on the results of the correlation coefficient of color visual style preference with fixation time, the negative value is -0.404, this means the color preference has no effect on the child's speed to focus attention. According to the test results at Table.1 also show color preference has no significance for the childern's trial which means color preference will not have much impact on comprehensive capabilities, but has significance for response time. So it can be concluded that either cards with warm and cold color combinations does not affect the child's ability to recognize objects and they will be able to recognize colors even the cards are not using the color combination that children like. However, children respond more quickly to cards that use the color combination they prefer.

During the experiment, children showed confusion over some of the cards, because the colors of the objects and the background color of the cards did not differ much. Several respondents were confused when asked about the color of the balls, because

the colors of the balls on the cards were white-red, white-blue, and white-black while the background colors were the same. - the same white, so the child is a bit confused. So it is highly recommended to use a color with a high enough contrast between the image object and the background.

4. Conclusions

In the color combination experiment, the results showed a significant effect on children's attention, especially in the aspects of motivation, maintaining attention, and the child's speed in responding. However, it did not show a significant effect on children's ability to recognize objects on cards & recognize the color of objects on cards. This is because children with ASD have not been able to associate colors with images of objects, emotions or common sense or color reasoning on objects. So that the application of color combination preferences is more impactful if used as a stimulus for children to be more interested and maintain children's concentration. We highly recommend not to use black and white color combinations on pictorial therapy cards. Because children will not give a response, this is not because children do not recognize objects on cards but because children are not interested in black and white cards, so children refuse to see objects or do not want to respond as if they cannot.

The implementation of the learning and therapy process, the use of color preferences on the application pictorial therapy cards will make it easier for children to concentrate. If autistic children are able to maintain the attention, it will help children in the learning process in the classroom.

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