

December 2021

The Relationship Between Color Shade and Emotion Association in Pre-School Aged Children

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Recommended Citation

Miles, Emily; Goodmon, Leilani B.; Del Monte, Gianna M.; and Saunders, Trey (2021) "The Relationship Between Color Shade and Emotion Association in Pre-School Aged Children," *Modern Psychological Studies*: Vol. 27 : No. 1 , Article 6.

Available at: <https://scholar.utc.edu/mps/vol27/iss1/6>

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Abstract

Color choices can be emotion-driven (Jonaskaite et al., 2019). Because there is evidence that the color shade - emotion association may develop through socialization and enculturation, the current purpose was to determine if color shade was associated with emotion in very young children (i.e., preschoolers) who have experienced lower levels of socialization / enculturation. Participants were read a story about a happy, sad, or angry character and were then asked to pick specific crayons to color a picture of the story character. Inconsistent with the hypotheses, emotion depicted in the story did not correlate with color shade choice (e.g., lighter color shades for the happy character). The results imply that the color-emotion association may be less evident in younger children who have less exposure to those color-emotion associations.

The Relationship Between Color and Emotion in Children

The basic purpose of color vision is to differentiate objects; however, color has also become a translation of emotion, evoking certain emotions based on hue and saturation (Zener, 2001). The field of color psychology has been explored since its first empirical study in 1894 and is the study of colors as a determinant of human behavior or perception (Eysenck, 1941). Eysenck proposed three fundamentals within the subtopic of color preference: one, there is a general preference of colors among all people; two, there is a preference between shades and tints or saturated and unsaturated hues; and three, there is a difference in preference based on gender.

Research reveals that college students and children as young as four years of age associate certain colors with certain emotions (Annamary et al., 2016; Boyatzis & Varghese, 1994; Burkitt & Sheppard, 2014; Jonauskaite et al., 2019; Umamaheshwari et al., 2013). For example, Jonauskaite and colleagues (2019) found college students (age range 18 to 29) associate lighter (or brighter) and more chromatic colors (e.g., bright yellow, bright green) with emotions such as joy and relaxation, over emotions such as sadness and fear, which were associated with achromatic hues (e.g., black, grey, dark red). Additionally, Boyatzis and Varghese (1994) found compelling evidence of emotional and color association in children ages 5 to 6. They asked children to tell them “[h]ow the color made [them] feel” in response to randomly shown colors. Children exhibited a distinct difference in shade preference as a majority reported positive associations in response to brighter colors and negative associations in response to darker colors.

Burkitt and Sheppard (2014) also found evidence that children as young as 4 years 11 months age have formed emotion color associations. They asked children to use one color crayon

to color a picture of themselves in a neutral, happy, or sad mood. Similar to Boyatzis and Varghese (1994), Burkitt and Sheppard (2014) found that the children (ages 4 years 11 months to 8 years 1 month) used more chromatic colors to portray happy emotions and more achromatic colors to portray more negative emotions. Additionally, Umamaheshwari and colleagues (2013) explored the association between colors and emotion association in order to inform how children's dental offices should be decorated in terms of colors used. Using a sample of 300 children between the ages of 6 and 12, they found that happiness was most associated with the colors yellow and blue, while fear was most associated with colors black and red. Similarly, Annamary and colleagues (2016) examined color and emotion association in 382 children, ages 6 to 12 years. They found that the children associated blue and pink with happiness and black and red with sadness. Taken together, these studies on color and emotion association provide evidence that children as young as 4 years and 11 months of age have developed some specific associations between colors and emotions.

Gil and Le Bigot (2016) suggested children may have “experienced sufficient contingencies” in the color-meaning association as young as age five (Gil & Le Bigot, 2016, p. 1092). Thus, social and cultural experiences have taught children these specific color emotion associations. For example, through cultural experiences, children may associate the color red with anger, caution, sex, and love or they may associate red with happiness, joy, luck, and prosperity. Specific colors may have different meanings in Eastern countries versus Western countries due to “cultural significance” (Kuloğlu et al., 2009, p. 118). Colors may have different influences on preferences and mood depending on societal and cultural experiences.

Consistent with the influence of society and culture, one could predict that younger children (under the age of five) may exhibit weaker color emotion associations. However,

because there is limited research on the specific color emotion associations in pre-school aged children specifically (ages 4 – 5 years) (i.e., Boyatzis & Varghese, 1994; Burkitt & Sheppard, 2014), more research in this area is warranted. Furthermore, to date there is no published research on color emotion association in younger pre-school aged children (ages 2 to 4 years). Additionally, while there is some research on color and emotion associations in children (Annamary et al., 2016; Boyatzis & Varghese, 1994; Burkitt & Sheppard, 2014; Umamaheshwari et al., 2013), little is known about what associations children have regarding emotion and shade (light vs. dark). Additionally, to date there is no published research on color shade emotion association in pre-school aged children. Preschool-aged children have less experience with societal norms and constructs (Bakker et al., 2015). Therefore, societal influence may have less of an impact on preschooler's color preferences and choices. Previous researchers examined color psychological concepts in children four years and 11 months of age and up and thus have studied individuals who have been influenced more by social factors through the experiences people gain as they age (Gil & Le Bigot, 2016).

Given the aforementioned gaps in the research and the paucity of research on color, shade, and emotion association in very young children (ages 2 to 5 years), the purpose of this study was to explore the specific types of color shade emotion associations in a sample of younger, pre-school aged children (age range = 2 to 5 years of age). The experimenters determine each child's shade color preference and then randomly assigned pre-school aged children to read one of four stories about a puppy who was neutral, happy, sad, or angry. Children then colored a neutral-faced puppy on a coloring page, using three self-chosen colors. The percent of darker vs. lighter shades of the colors chosen served as the dependent measure. We improved the scientific rigor of the previous research studies and reduced social and cultural

influence by utilizing children younger than five years of age, increasing the number of color shade options, and determined whether a child's utilization of a favorite color varied as a function of the emotion depicted in the story of the puppy.

Based on previous research by Jonauskaite and colleagues (2019), suggesting lighter and more chromatic colors are associated with emotions such as joy and relaxation, we developed the following hypotheses: 1. If exposed to stories that involved positive emotions such as happiness, the participants would be more likely to utilize lighter color shades when coloring pictures of the story character. However, if exposed to negative emotions such as sadness and anger, participants would be more likely to utilize darker color shades; 2. It was also predicted that participants would be more likely to utilize their favorite colors in the positive emotionally-valenced story condition.

Method

Design

This experiment was formed as a 2 x 4 between-subjects experimental design with shade preference (light, dark) and emotional valence of the story (happy, sad, angry, neutral) as the between-subjects' factors and type of color shade chosen by the children as the dependent measure.

Participants

The sample consisted of 21 preschool children from a small, private preschool in the Southeastern United States. There were 7 female and 14 male children between the ages of two and five years of age with an average age of 3.74 ($SD = .86$).

Materials

Shade Preference Questionnaire. Prior to the experimental phase of the study, all participants completed a questionnaire designed to determine their shade preference. Using a forced choice method of shade selection, participants indicated which two shades (of the same color hue) they preferred. Participants made a forced choice of shade preference for six different color hues. Each of the six color hues was shown within two circle shapes, one circle colored the lighter shade of that color hue and the other circle colored with the darker shade of that color hue. Participants were only shown one color pair at a time. The colors used in the shade preference questionnaire were the same colors the participants were given to color the character picture used in the experimental phase of the study.

Emotionally Valenced Stories. Participants were randomly assigned to one of four emotionally “valenced” story conditions (happy, sad, angry, and control - neutral). The experimenter played a pre-recorded audio of one female experimenter reading the story aloud. The experimenters created the stories for the purposes of the current experiment. Each story was designed to portray a specific emotion experienced by the character without mentioning any words directly relating to the emotion type.

Control Story: Can you color the puppy using three colors?

Happy Story: This puppy had a really good day! Puppy got a new toy that they have wanted for its whole life, a squeaky ball! The puppy got to play with all of its friends and show them their new ball! Puppy played all day and then got home where their owner gave it a bunch of puppy treats! The Puppy then got to sleep in a comfy bed by the fireplace! Can you color the puppy using three colors to show me how they feel?

Sad Story: The puppy had a hard day. Puppy's favorite toy got lost and the puppy could not find it. Puppy looked all over the house, but their toy was gone. Then the puppy was not allowed to go and play with their friends outside because it was raining. The Puppy ended the day in bed without their toy that it normally sleeps with. Can you color the puppy using three colors to show me how they feel?

Angry Story: The puppy had a rough day. The puppy's owner yelled at the puppy, so the puppy went and tore up the cushions! Then the puppy went outside to play with their friend, but the puppy and their friend fought over sharing a toy! Puppy stomped their way inside. Can you color the puppy using three colors to show me how they feel?

Crayola© Crayons. Appendix A lists the hexadecimal color codes and pictures of the specific Crayola© crayon colors used in the study. Following the story condition, the experimenter provided each participant with the following selection of light (L) and dark (D) Crayola© crayons and told the participants they had to pick three color they thought the puppy should be colored to show how the puppy feels (except for the control condition: where they were told to just pick three colors to color the puppy):

Red: Brick Red (D), Red (L)

Orange: Orange (D), Peach (L)

Yellow: Goldenrod (D), Yellow(L)

Green: Forest Green (D), Yellow Green (L)

Blue: Bluetiful (D), Sky Blue (L)

Purple: Violet (D), Orchid (L)

Coloring Page. After making their color selection, participants were given a sheet of coloring paper that contained a neutral-faced puppy copied onto a one-centimeter grid paper and were asked to color it with a selection of crayons to choose from.

Procedure

Prior to the experiment being conducted, an informed consent form was sent to the parents of the participants. Those who chose to be involved in the study returned the forms to the director of the preschool. The experiment took place in a classroom setting. Participants were administered the shade preference questionnaire prior to the experimental coloring portion of the study. The questionnaire was given to participants one color hue pair (light and dark) at a time. The participants used a dry erase marker to mark which shade was their preferred shade out of the colors. They were also asked to indicate which of the 12 color/shade choices was their favorite. The grouping variable of prior shade preference was determined by percent majority. For example, if participants picked lighter shades more often than the dark shades across the six color hue pairs, they were grouped into the lighter shade preference category. The participants were randomly assigned to one of the four emotional valence story conditions about a puppy (happiness, sadness, anger, or control). Control participants were simply asked to color the image of the puppy, while those in the emotional valence conditions were read a story that depicted the puppy character within circumstances designed to portray different emotions (e.g., the happy condition included a description of a puppy who had a good day and received a toy and was able to play with his friends, etc.). Participants listened to a pre-recorded audio of the assigned story being read by one of the female experimenters. Because each story audio was the same between participants, we were able to control confounds associated with differences in voice and inflection and timing between participants within the same emotional valence story condition.

Following exposure to the story, participants picked three crayons from the selection of 12 color hues / shades depicted in the shade preference phase of the study. They were specifically told to choose the colors that they felt the puppy should be colored. Participants then saw the coloring page and were given approximately five minutes to color the image. Following exposure to the condition, participants were read a debriefing script, and they were desensitized by being rewarded with a sticker color of their choice. A debrief was sent home to the parent or guardian explaining that their child may have been exposed to a condition that could affect their mood.

Results

A univariate ANOVA was conducted with mood groups (happy, sad, angry, control) as the between-subjects factor and percent dark shades chosen after the story as the dependent measure. Results reveal insufficient evidence that mood group had an effect on the percent of dark shades chosen after the story, $F(3, 17) = .32, p = .81$. As shown in Table 1, there was no difference in the percent of dark shades chosen after the story as a function of mood group.

Table 1. *Average percent of dark shades chosen after the story as a function of mood group.*

Mood Group	Mean	Std. Deviation	N
happy	.3900	.32955	6
sad	.3325	.23571	4
anger	.4433	.34535	6
control	.5340	.36164	5
Total	.4286	.31079	21

A 2 x 4 mixed-subjects factorial ANOVA was conducted with mood group (happy, sad, angry, control) as the between-subjects factor and percent dark shades chosen before and after the story as the repeated, dependent measures. Results reveal insufficient evidence that mood group had an effect on the percent of dark shades chosen, $F(3, 17) = .32, p = .81$. There was also no significant change in the percentage of dark shades chosen between the baseline and after story exposure, $F(1, 17) = 2.75, p = .12$. There was also no significant interaction between the

mood group and change in the percentage of dark shades chosen between the baseline and post-story exposure, $F(3, 17) = .72, p = .55$. As shown in Table 2, planned pairwise comparisons revealed that there was no significant change in the percent of dark shades chosen between the baseline and post-story exposure for any of the mood group conditions, $ps > .23$.

Table 2. Average change in percentage of dark shades chosen between baseline and post-story exposure as a function of mood group.

Mood Group	Baseline Mean (SD)	Post-Test Mean (SD)	N	t stat
happy	.5283 (.16714)	.3900 (.32955)	6	$p = 0.32$
sad	.6675 (.27354)	.3325 (.23571)	4	$p = 0.23$
anger	.4433 (.29200)	.4433 (.34535)	6	$p = 1.00$
control	.5980 (.22287)	.5340 (.36164)	5	$p = 0.76$

A series of chi-square analyses were conducted in order to determine frequency differences in choosing lighter or darker color shades across the four mood group conditions. As shown in Table 3., results reveal that there were no significant differences in the frequencies of choosing lighter or darker color shades across any of the mood group conditions, $ps > .41$.

Table 3. *Percent of light and dark shades as a function of mood group within a chi-square.*

Mood Group	Color Shade Choice	Observed Percent	χ^2	Significance
Happy	Light	.33	.67	.41
	Dark	.67		
Sad	Light	.50	.00	1.00
	Dark	.50		
Angry	Light	.67	.67	.41
	Dark	.33		
Control	Light	.60	.20	.66
	Dark	.40		

A series of chi-square analyses were conducted in order to determine frequency differences in choosing one’s favorite shade (no preference, picked favorite, did not pick favorite) across the four mood group conditions. As shown in Table 4., results reveal that there were no significant differences in the frequencies of choosing a favorite shade across any of the mood group conditions, $ps > .61$. Qualitatively however, it is important to note that 100% of participants in the sad mood group did not pick their favorite shade, 50% of participants in the anger mood group did not pick their favorite shade, and only 33% of those in the happy mood group did not pick their favorite shade.

Table 4. *Percent of preference shade picked as a function of mood group within a chi-square.*

Mood Group	Color Shade Preference	Observed Percent	χ^2	Significance
Happy	No preference	.17	1.00	.61
	Picked Favorite	.50		
	Did Not Pick Favorite	.33		
Sad	No preference	.00	--	--
	Picked Favorite	.00		
	Did Not Pick Favorite	1.00		
Angry	No preference	.17	1.00	.61
	Picked Favorite	.33		
	Did Not Pick Favorite	.50		
Control	No preference	.40	.20	.66
	Picked Favorite	.00		
	Did Not Pick Favorite	.60		

A series of chi-square analyses were conducted in order to determine frequency differences in choosing one’s favorite hue (picked favorite, did not pick favorite) across the four mood group conditions. As shown in Table 5., results reveal that there were no significant differences in the frequencies of choosing a favorite hue across any of the mood group conditions, $ps > .18$. Qualitatively however, it is important to note that 100% of participants in the sad mood group and the anger group picked their favorite hue, while only 50% of participants in the happy mood group picked their favorite hue.

Table 5. *Percent of preferred hue picked as a function of mood group within a chi-square.*

Mood Group	Color Hue Preference	Observed Percent	χ^2	Significance
Happy	Picked Favorite	.50	.00	1.00
	Did Not Pick Favorite	.50		
Sad	Picked Favorite	1.00	--	--
	Did Not Pick Favorite	.00		
Angry	Picked Favorite	1.00	--	--
	Did Not Pick Favorite	.00		
Control	Picked Favorite	.80	1.80	.18
	Did Not Pick Favorite	.20		

Discussion

Color is often subconsciously associated with emotions. The current study aimed to explore the aforementioned association with the addition of other variables. Hence, the ground purpose of the study was to determine if there was a relationship between colors, light and dark, and emotions in addition to if the shade of a color, light or dark, influences those associations. Researchers hypothesized that positive emotions such as happiness would be linked to light colors, and negative emotions such as sadness and anger would be linked to dark colors and that shade preference would have an impact on what colors participants chose.

There was no significant correlation between positive emotions and light colors and negative emotions and dark colors. Quantitatively there was little to no significant correlation

between shade choice and emotion. The results are therefore inconclusive on the association and emotion and color and emotion and shade. Although the quantitative data cannot support the hypothesis, implications of the qualitative data between emotion and shade indicate a need for further research. 100% of participants in the sad mood group did not pick their favorite shade, 50% in the angry mood group did not pick their favorite shade, and only 33% of those in the happy mood group did not pick their favorite shade. It appeared that favorite shade was chosen more often in the positive mood group, happiness. Another possible significance of qualitative data can be observed when choosing a favorite hue. The participants were more likely to choose their favorite color in a negative mood group. An assumption made by the researchers is that the participants were picking their favorite color as a defense mechanism or as compensation to the negative emotion. This could also be the young children's way of attempting to cheer up the "puppy" from the negative mood stories.

Another qualitative assumption observed is whether the lack of correlations was due to the children not yet having formed emotional connections with the colors. Results were inconclusive with no significant correlations between emotion and color shade usage, suggesting that the socialization process may contribute to the emotion-color shade association in people and preschoolers with less socialization and enculturation do not exhibit as strong of an emotion-color association as older children or adults who have been socialized and enculturated to a higher degree. Little societal influence in the children present questions on whether the color and emotion connections are purely a social construct. This can be seen in previous research showing the cultural significance of color across the world. Further research is needed to determine if these assumptions are valid. One future direction may be to include samples of children of various ages to determine if more social influence changes the outcomes of the experiment.

Researchers believe that the reason for lack of support for the hypotheses was due to a smaller sample size. Although consent forms were sent to over 40 families, only 21 preschoolers participated. Some participants were not able to complete the study due to absence and researchers were unable to reassess them later on in the month due to extenuating circumstances. As stated previously, participants had to be tested in groups, allowing for the children to interact and influence each other's actions. The study was conducted over multiple weeks and by different researchers and one assistant. Researcher bias and technique could be considered extraneous variables. Another possible limitation of the study was the unequal gender composition of our sample. Specifically, our sample included twice as many boys as girls. Given such a small sample of females in our study, it may be difficult to generalize our findings to other female preschoolers. Additionally, researchers have reported gender differences in color emotion association (Pope et al., 2012). Thus, future researchers should consider utilizing larger sample sizes with more equal gender distributions. Further research is needed to rectify this and the aforementioned limitations.

The results of this study oppose the results of Jonauskaite and colleagues (2019) who found that lighter and more chromatic colors are associated with emotions such as joy, over emotions such as sadness and fear, which were associated with achromatic hues. The results did not support the hypothesis that positive emotions are associated with light colors and negative emotions are associated with dark colors; also shade preference impacts the color used. Given the findings of this study, we cannot determine which color shades are associated with certain emotions and how additional variables can impact those relationships.

Real world implications cannot be determined by these results, however given previous research, the importance of these studies can provide insight to whether color will evoke positive

or negative emotions and improve or dampen mood depending on color in different settings. With further research practical environments for this implication include a classroom, office, restaurant, coffee shop, or retailer. Further testing could provide more data that could determine higher significance than this study provides, and therefore lead to specific colors that can be utilized in a methodical way in a class or work environment to improve attitude and performance. While this study does not provide significant information to determine whether color or shade choice will provide a positive or negative impact on mood, it does provide the foundation to further research that needs to be conducted. The implications made from the study's results are majorly qualitative due to a lack of participants available and data collected. Researchers question previous studies results and feel that it is important to contemplate the color psychology concept further.

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Appendix A

Crayon Crayola© Colors



Brick Red



Red



Orange



Peach



Goldenrod



Yellow



Forest Green



Yellow Green



Bluetiful



Sky Blue



Violet



Orchid

Brick Red: #C62D42

Red: #ED0A3F

Orange: #FF8833

Peach: #FFCBA4

Goldenrod: #FCD667

Yellow: #FBE870

Forest Green: #5FA777

Yellow Green: #C5E17A

Bluetiful: #3564E7

Sky blue: #76D7EA

Violet: #8359AE

Orchid: #E29CD2