

A STUDY TO DISCOVER COLOR PREFERENCE

IN

PRESCHOOL CHILDREN

by

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CONTENTS

| | Page |
|----------------------------------|------|
| I. Introduction and Purpose | 1 |
| II. Review of Literature | 2 |
| III. Methods and Procedure | |
| A. Preliminary Experiment | 20 |
| B. Reliability of Observers | 21 |
| C. Subjects | 22 |
| D. Procedure | 22 |
| IV. Statistical Analysis of Data | 25 |
| V. Summary and Conclusions | 32 |
| VI. References | 36 |

FIGURES

| | Page |
|----------|------|
| Figure 1 | 22 |
| Figure 2 | 24 |

TABLES

| | Page |
|-----------|------|
| Table I | 25 |
| Table II | 27 |
| Table III | 28 |
| Table IV | 28 |
| Table V | 30 |
| Table VI | 31 |

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I. Introduction and Purpose

Since the latter part of the nineteenth century, scientific studies and investigations have been made on children's recognition of color choice or preference for color and the relation of color preference to emotional characteristics. Casual observation has, in addition, been made of children's color patterns in painting, needlework, crayon and other media. The largest number of studies have used school age children and adults as subjects. In more recent years interest has centered upon the color choice of preschool children.

Materials which have been used to determine preferred colors include color cards made of construction paper, ribbon, worsted, food, flowers and just the names of the colors. In general the children simply made a choice and then did nothing further with the material presented. Alschuler and Hattwick, however, who reported on children's easel painting and crayon drawings, allowed their subjects to work creatively with these media. This was the only study found in the literature that allowed the children to create with the material they selected.

The present study was planned to allow children to select and paint with any of three colors, red, blue and yellow, arranged for them at easels. Observers recorded the spontaneous order of color choices and the predominant color in the finished paintings. Specifically, the purpose of this investigation was to discover the color preference of preschool children based on:

- I. The predominant color of the finished painting.
- II. The order of colors selected in the painting process.
- III. The number of times a color is selected during the rendering of each painting.
- IV. Interactions between:
 - A. Order of choice of color and age.
 - B. Order of choice of color and sex.
 - C. Order of choice of color, sex, and age.

II. Review of Literature

As long ago as 1894, Tracy points out in his summary of work on color discrimination that children are able to discriminate colors properly even though they may not be able to use a name of a color that has been given them.

Major, in 1895, used the Bradley construction paper series of 137 colors with his subjects and concluded that saturated colors were the most pleasant.

In 1897, Preyer found that children 112 weeks old preferred yellow to blue. In the 114 to 116th weeks, red and yellow were found to be the preferred colors.

The results of Jastrow's investigation to discover single color and color combination preferences of 4,500 persons were published in 1897. He used Prang's construction papers in the colors red, orange, yellow, green, blue and violet with six intermediate colors, all displayed at the same time. Blue, the most preferred color, was chosen by approximately one-fourth of the subjects. Red, the next preferred color, was chosen by only one-eighth of the subjects. The least preferred colors were orange

and its shadings toward yellow and red. A general preference was found for "dark colors" above "transitional" ones. Jastrow draws the conclusion that blue is the masculine favorite and red the feminine favorite.

Aars, in 1899, conducted an experiment with four boys and four girls about six years of age. Red, blue, green and yellow paper rings were used against a gray background, by the method of paired comparisons. Blue was chosen 55 times, red 45 times, green 46 times and yellow 45 times. Aars found the preference for color combinations to be in order: blue and yellow, blue and green, blue and red, green and red, yellow and red, and yellow and green.

In 1900 we are given the results of Holden and Bosse's study. Their purpose was to determine the attractiveness of colors and the change in preference which takes place with increasing age. The conclusion was drawn that the order of preference develops from the red toward the blue end of the spectrum until at eight years blue becomes the preferred color.

Titchener, 1901, found that there are two different kinds of observers, those who prefer saturated colors and those who prefer them unsaturated. The former group was found to make up a majority.

Baldwin in his book, Mental Development in the Child and the Race, 1906, gives the order of color attractiveness to children as first blue, with red, white, green, and brown following in order. He states that newspaper is more attractive than color.

In 1907 and '08 three studies dealt with color preference of infants. Shinn allowed infants between six months and one year old to grasp colored ribbons dangled before them. She concluded that there is a preference for colors lying at the red end of the spectrum.

McDougall, experimenting by the method of paired comparisons, presented colored flowers, balls, worsted, and paper to two infants. It was found that in the fifth month red, green and blue were preferred to white, while in the sixth month no preference could be found for any of these colors. Myers confirmed McDougall's results. From his own experiments and from McDougall's, he concludes that before the sixth month children are susceptible to small differences in brightness. He states that at this age, red and yellow are distinctly preferred to other colors and to colorless objects.

In the following year, 1908, Winch carried out an experiment on color preference of children and adults. His method was to write the words white, black, green, blue, red and yellow on the board and to ask the subjects to write the color they liked best on a slip of paper. After this they were asked which they liked next best, and so on to the one preferred least. The results showed that blue was the most preferred color of school children. Red was preferred second and black least. Preferences were found to change with age and to ^{be} affected by social status and environment.

In 1917 Dashiell presented six colors of the Milton Bradley series to school children and asked them to select the colors in order of their preference. Some sex and age differences were found but the results on the whole agreed with Winch.

Grath, 1924, carried out an extensive piece of work with 1,000 white children from the first through the tenth grades. Materials were colored discs $\frac{1}{2}$ inch in diameter and mounted on white cards $1\frac{1}{2}$ by $\frac{3}{4}$ inches. The discs were made of Milton Bradley construction paper in the

colors white, yellow, orange, violet, green, red and blue. Children were allowed to arrange the cards in the order of their preference. Both sexes placed blue in the first position, violet fourth, yellow sixth and white seventh. There were sex differences in the placement of the other colors. Boys preferred red more than the girls while the girls preferred orange more than the boys. The preference sequence for the study was given beginning with the most liked color: blue, green, red, violet, orange, yellow and white. Grath supports the view that education seems to produce a tendency toward suppression of preference for all colors except blue.

In the same year, the results of Michael's study to determine color preference according to age were published. Subjects were 535 boys, 6 to 15 years of age, who came from homes of similar environment in the working classes. A circular chart was made of white unglazed paper, 63 inches in circumference. Pure colors, violet, green, blue, yellow, orange and red of the 1921 Wilton Bradley colored paper series were mounted on the chart. A space of $\frac{3}{4}$ inch separated each color. The children were shown the chart and given ten seconds to write the color they liked most on a paper. Ten seconds were allowed for the writing of each succeeding preference. Blue, red and green were found to be the most reliable colors in the series. Blue was the most preferred by all groups except the six year group. The conclusion was drawn that beyond this group, age is a more dependable factor in color preference.

The following tabulation gives the order of preference for the various groups.

| | 6 yrs. | 7 yrs | 8 yrs | 9 yrs | 10 yrs | 11 yrs | 12 yrs | 13 yrs | 14 yrs | 15 yrs |
|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| Violet | 4 | 5 | 4 | 3 | 4 | 2 | 2 | 3 | 5 | 5 |
| Green | 3 | 3 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 2 |
| Blue | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Yellow | 1 | 6 | 3 | 5 | 5 | 5 | 5 | 6 | 4 | 4 |
| Orange | 6 | 4 | 5 | 4 | 3 | 3 | 3 | 4 | 3 | 6 |
| Red | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 2 | 2 | 3 |

Dorcas, 1926, published the results of his study on color preference and color associations. The subjects included: 430 men from colleges, 401 women from colleges, 19 men from psychopathic hospitals, 48 women from psychopathic hospitals, 15 men from aged people's homes, 25 women from aged people's homes, 49 boys and 62 girls eight years of age, 63 boys and 55 girls nine years of age and 38 boys and 62 girls ten years of age. Saturated and unsaturated colors were presented. The difference in the order of preference for the various groups was narrow. The most decided preferences appeared in the college group. On the whole, the order determined by this group is representative of all, with the exception of the aged women whose first choice was purple. Dorcas concluded that saturation and brightness have little effect in determining the order of preference. The tabulation gives the preference of the college group as follows:

| Saturated Colors | | | Unsaturated Colors | |
|-------------------------|-----------------------|------------|-----------------------|-------------------------|
| Male | Female | | Male | Female |
| Blue | Blue | 1st Choice | Blue | Blue |
| Green) Purple) tie | Green | 2nd Choice | Purple | Purple) Green) tie |
| Red | Purple) Red) tie | 3rd Choice | Green | Red |
| Orange | Orange | 4th Choice | Red) Orange) tie | Orange |
| Yellow | Yellow | 5th Choice | Yellow | Yellow |

Staples, in 1932, used a preference method in testing color discrimination of infants. Materials were pieces of gray cardboard on which colored discs were pasted six inches apart. The different colors appeared an equal number of times on the right and on the left. Two colors of equal brightness were paired together and single colors were paired with a gray which was brighter than the background.

In Part I of the study, 23 infants, 10 to 143 days old were subjects. They were shown gray and colored discs which were mounted on cards. In every comparison, eye fixation measured in seconds was higher for the colored than for the gray disc.

In Part II of Staples' study, 124 infants 5½ to 24 months old were subjects. The procedure was similar except that reaching movements rather than eye fixations were observed. Reaching movements were greater in every case for the colored disc than for the paired gray disc. There was a tendency toward an increasingly greater response to color as age increased. Red and yellow were selected more often than green and blue.

In Part III of the same study equally bright colors were paired and presented to 121 infants 6 to 24 months old. Pointing and reaching responses were recorded as these infants were shown the cards of paired discs. The color combinations were: red and yellow, red and green, red and blue, yellow and green, yellow and blue, and green and blue. Red received more responses than any color with which it was paired. Blue when paired with green received more responses. With the exception of blue, there was less indication of a color preference with increasing age. From 6 to 15 months the response to the different colors varied. However, the following preferential order was consistent throughout the experiment: red, yellow, blue, and green.

A supplementary experiment was conducted by Staples to determine possible change in color preference beyond two years of age. The order of preference for preschool children was: red, green, blue and yellow; for grade school children, blue, red, green and yellow; for adults, blue, green, red and yellow.

In 1933 a report is given on Gale's investigation to discover children's preference for color, color combinations and color arrangements. The study was conducted in the Chicago elementary schools with children from the third through the eighth grades. A test was given to discover preference for specific color combinations and another for color combinations arranged from a given number of colors by the child. There was a preference for blue, red violet and orange for near rather than exact complementary color combinations and for tried combinations of the six basic colors. Gaining experience in school did not effect preference after the third grade.

The results of a study to determine color preference made by Walton, Guilford and Guilford were published in the same year. Subjects were 1,279 university students. Five to 15 students at a time were grouped closely around the experimenter who showed them color cards. Those cards were of a dull finished gray, 20 by 30 centimeters. Colored papers, 9 centimeters square were paired and mounted 2 centimeters apart on the cards. Eighteen spectral hues in the Milton Bradley colored paper series were used. There were 153 pairs of stimuli, each being paired with every other one. The colors were used equally often on the right and on the left. Each card was exposed five seconds in daylight illumination before a gray cloth. The subjects showed their preference on a prepared blank by means of a key. Data was collected from the school year 1910-'11 through 1920-'21 and again from the school year 1928-'29 through 1930-'31. The more familiar colors, red, orange, yellow, green, blue and violet had slightly higher effective values than less familiar colors, especially with the men. In spite of yearly fluctuations, some sex differences appeared consistently. Women's preferences fluctuated more than the men's. The men usually preferred orange to yellow while the women preferred the colors in reverse. The conclusion is drawn that in spite of yearly fluctuations, sex differences, social conditioning and other environmental factors, there may be underlying biological factors that help to determine color preference.

Grath and Potter in 1934 report an investigation to determine the color preference of 1,032 young children in urban and rural Colorado and Arizona. Making up this number were 439 preschool children, 381

kindergarten children and 188 first grade children. The age range was for preschool children, 1 - 4.9 years, kindergarten children, 5 - 5.9 years and first grade children, 6 - 6.9 years. Members of the first group were found in homes, at Sunday School and on playgrounds. The others attended public and private schools. Six saturated Milton Bradley colors, red, green, orange, violet, blue, yellow and white were presented. These were in the form of discs one-half inch in diameter and mounted on small white cards. All seven cards were given to a child at one time. He was asked to pick out the one he liked best, then from the remaining six and so on until the color liked least was left. All the children placed white last and yellow usually in sixth place. Red was high in preference in all age groups and in most cases was placed before blue. Blue was preferred with advancing age.

Psychological Abstracts reports the German study, "The Farbe in der Experimentellen Charakterforschung" by Thomaschewski in 1933. Subjects were 700 school children, 4 to 16 years of age. The author concluded that color preference has a consistent relation to social adjustment, mental capacity, special abilities, temperament and initiative. The subjects were asked to select the five most liked and the three most disliked colors from the twenty-five hues presented them. Reliability was measured by a retest after three months. Blue, black and violet were found to signify calm; orange, erotic tendency; dark green, reserve; light blue in young children, nervousness; green and violet, sensitivity; red tones persistently chosen, feeble mindedness or abnormality; and strong red, health, vigor and happiness. Sharp distinction between the five

most liked colors was found to indicate clear thinking and uprightness.

Hildreth, in 1936, reports a study to discover color and picture choice of young children. Children in two groups were used, 3 - 4 years of age and 5 - 6 years of age. The members of both groups were asked to name ten colors, to express preference for picture subjects among a series of sixteen pictures and to express preference for reproductions of a single picture in four styles: monotone, outline, colors and silhouette. The three most preferred colors for both groups were in order, orange, pink, and red. Both groups preferred a picture of a boy and girl feeding a rabbit, indicating a probable preference to action pictures which include animals and children in the subject matter. A strong preference was shown for colored pictures.

In 1939 the findings of a study by Feige concerning the knowledge and use of color among first grade children was published. In repeated experiments the choice of a given color remained the same. The order of preference was first for bright, next dull and last for dark shades. Girls' preferences were more decided than boys'. In combining colors, both sexes usually contrasted a bright with a dark color. Boys preferred black and brown more often than girls and showed more variety in color combinations.

Alschuler and Hattwick, 1943, report on their experiment with preschool children. The purpose of this study was to determine (1) if and in what way the free activities with certain creative media (easel paints, crayons, clay, blocks and dramatic play) may be related to given insight into individual personalities and (2) what general tendencies may be found between activities with those media and personality. The experiment was conducted in eight different nursery groups, using 150

children from two to four years of age. Records of all the children were kept for a year by saving the art products, making sketches, taking photographs and recording behavior in the school situation and at home. Twenty children were studied daily for two years. Crayons were found to be the media for expressing ideas while painting was found to be the media for expressing feelings. Red, considered by the investigators to be the most emotionally toned of all colors, was preferred during the early preschool years when children functioned on an impulsive will. Interest in cooler colors tended to increase as children developed better reasoning and greater emotional control. Emphasis on red was associated with both love and hate. Red and yellow masses paralleled emotional disturbances while emphasis on blue was associated with drives toward control. Children who emphasized this color tended to give evidence of very strong underlying emotions. Those who emphasized green tended to function on a relatively controlled level and to show few strong emotional reactions.

In a study to determine color preference conducted in the Virginia Polytechnic Institute nursery school, 1943, by Reed and Warriner, red, yellow and green jello was served to children with the noon lunch on six different days. The analysis of the data showed no significance between the choices of color. Position was highly significant and accounted for the order of preference. The jello nearest the child was that selected most often.

The reader may see at a glance the results of color preference studies classified as to:

1. Determination of preferential order
2. Relation of color preference to sex
3. Relation of color preference to age
4. Relation of color preference to emotions
5. Relation of color preference to miscellaneous aspects.

1. Determination of Preferential Order

| Investigator: | Subjects | : | Methods | : | Findings |
|---------------|---------------------|---|--|---|--|
| Major 1895 | : | : | | : | Saturated colors most pleasant |
| Preyer 1897 | :Children 112-116 | : | | : | R and Y were preferred colors |
| | : weeks old | : | | : | |
| Jestrow 1897 | :4,500 persons | : | Displayed construction papers, | : | B chosen by 1/4 subjects, R chosen by 1/8 |
| | : | : | R, O, Y, G, V and 6 intermedi- | : | subjects, O and shadings toward R and Y |
| | : | : | ate colors all at same time | : | liked least. B - masculine favorite, R |
| | : | : | | : | feminine favorite |
| Aars 1899 | :4 boys and 4 girls | : | R, B, G and Y paper rings shown | : | B chosen 55 times. G chosen 46 times |
| | : 6 yrs. old | : | against gray background by | : | R chosen 45 times, Y chosen 45 times |
| | : | : | paired comparisons | : | |
| Tichner 1901 | : | : | | : | Majority of observers prefer saturated |
| | : | : | | : | colors |
| Baldwin 1906 | :Children | : | | : | Order of preference: R, R, W, G and B. |
| | : | : | | : | Newspaper more attractive than color. |
| Shirm 1907 | :Infants 6-12 mos. | : | Dangled ribbons before subjects | : | Preferred colors lay at red end of spectrum. |
| | : old | : | | : | |
| McDonald 1907 | :2 infants, 5 mos. | : | Colored balls, worsted and | : | In the 5th mo, R, G and B preferred to |
| | : old | : | papers presented by paired com- | : | white. In 6th mo., no preferences |
| | : | : | parisons | : | |
| Myers 1908 | :Infants | : | | : | R and Y preferred colors. At 6 mos, sus- |
| | : | : | | : | ceptable to small differences in brightness |
| Winch 1908 | :Children and | : | Wrote words white, black, green | : | School children preferred B 1st, R 2nd, |
| | : Adults | : | blue, red and yellow on board. | : | Bl last |
| | : | : | Asked for order of preference | : | |
| Grath 1924 | :1,000 1st-10th | : | Presented $\frac{1}{2}$ " colored discs on | : | Preferential order: B, G, R, V, O, Y and W. |
| | : grade children | : | small white cards. Colors W, Y | : | Education has tendency to suppress color |
| | : | : | O, V, G, R and B. Subjects ar- | : | preference except for B. |
| | : | : | ranged cards in order of pref- | : | |
| | : | : | erence | : | |

R-red, P-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white.

| Investigator : | Subjects : | Methods : | Findings |
|----------------|---------------------------------|-----------------------------------|---|
| Staples 1932 | :32 Infants, 10- | :Presented colored discs paired | :Fixation higher for color than gray |
| Part I | : 143 days old | :with gray. Eye fixations meas-: | |
| | : | :ured | |
| Part II | :124 Infants, 5 $\frac{1}{2}$ - | :Same as Part I. Reaching move-: | :Colored discs received greater response than |
| | : 24 mos. old. | :ments recorded | : |
| Part III | :121 Infants, 6- | :Paired colored discs on gray | :Preferential order: R, Y, B and G |
| | : 24 mos. old | :cards. Reaching responses re- | : |
| | : | :corded. | : |
| Supplement- | :Preschool child- : | | :Preferential order: Preschool - R,G,B,Y |
| ary Experi- | : ren, grade school | | : Grade school - B,R,G,Y |
| ment | : children, adults: | | : Adults - B,G,R,Y |
| Dorcas 1926 | :430 college men | :Presented saturated and unsatu-: | :B preferred by all groups except aged women |
| | :401 " women | :rated colors to numbers of all | :who chose P. Saturation and brightness had |
| | :19 men pscopath | :groups | :little effect. |
| | : hospitals : | : | : |
| | :45 women Pscopath | : | : |
| | : hospitals : | : | : |
| | :15 aged men : | : | : |
| | :25 aged women : | : | : |
| | :49 boys, age 8 : | : | : |
| | :62 girls, age 8 : | : | : |
| | :63 boys, age 9 : | : | : |
| | :55 girls, age 9 : | : | : |
| | :38 boys, age 10 : | : | : |
| | :30 girls, age 10 : | : | : |
| Gale 1933 | :Children, 3rd- | :Six basic colors presented | :Preferential order: B,R,V,O. Preference for |
| | : 8th grades | :singly and in combinations | :triad combinations, for near rather than ex- |
| | : | : | :act complements. Experience in school did |
| | : | : | :not effect preference after 3rd grade |

R-red, P1-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white

| Investigator : | Subjects : | Methods : | Findings : |
|------------------|---|--|--|
| Grath and Porter | : 1,032 young children; 439 pre-school-4-4.9 yr.; 381 kindergarten; 5-5.9 yrs.; 188; 1st grade, 6-6.9 yrs; 700 school children: | : Subjects shown white cards mounted with colored discs - R: G, O, V, E, Y and W | : R preferred to B in most cases. All groups preferred Y least |
| Hildreth 1936 | : Children, 3-4 yrs. 5-6 yrs. | : Subjects asked to name 10 colors to express preference for picture subjects from series of 16 presented and to express preference for reproductions of a single picture in 4 styles, monotone, silhouette, outline and color | : O, P1, and R were preferred colors |

R-red, Pi-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white

2. Relation of Color Preference to Sex

| Investigator : | Subjects : | Methods : | Findings |
|---|--|--|--|
| Jastrow 1897 (See 1) | :4,500 persons : : | :Displayed construction papers, :R, O, Y, G, V and six intermed- :iate colors all at same time : | :B, masculine favorite; R, feminine :favorite |
| Dashiell 1907 | :School children : | :Presented six Milton Bradley :colors : | :States some sex differences found |
| Grath 1924 (See 1) | :1,000 children, : 1st-10th grades : : : | :Presented $\frac{1}{2}$ " colored discs on :small white cards. Colors W, Y, :O, V, G, R and B. Subjects ar- :ranged cards in order of pref- :erence : | :Boys prefer R more than girls :Girls prefer O more than boys |
| Walton, Guil- ford and Guilford 1933 | :1,279 University : students : : | :Colored cards of 18 spectral :hues shown 5-15 subjects at a :time. Cards exposed 5 sec. : | :Men prefer O to Y :Women prefer Y to O, their preference :fluctuates more than men. R, O, Y, G, B, :V have higher affective values on men |
| Feige 1939 | :1st grade child- : ren : : : : : : : : : : | : : : : : : : : : : : | :Subjects preferred 1st bright colors, 2nd :dull, last dark shades of colors. Girls' :preferences more decided than boys. Boys :showed more variety in combining colors :and preferred black and brown more often :than girls : : : : : : : : : : |

R-red, P1-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white

3. Relation of Color Preference to Age

| Investigator : | Subjects : | Methods : | Findings |
|-------------------------------|---|---|---|
| Holden and Bosse 1900 | :Children : | : | :Preference develops from R toward B end of spectrum until at 8 yrs, B is preferred color |
| Winch 1908 (See 1) | :Children and adults : | :Wrote words white, black, green, blue, red and yellow on board. :Asked for order of preference : | :Preference changes with age - is effected by social status and environment. |
| Dashiell 1907 (See 1) | :School children : | :Presented 6 Milton Bradley colors : | :Results on white agree with Winch |
| Gale 1933 (See 1) | :Children, 3rd. to 8th. grades : | :Six basic colors presented singly and in combinations : | :Gaining experience in school does not effect preference after third grade |
| Grath and Porter 1934 (See 1) | :1,032 young children. 439 pre-school, 4-4.9 yrs. 381 kindergarten, 5-5.9 yrs. 188 1st grade, 6-6.9 years 700 school children : | :Subjects shown white cards mounted with colored discs - R, G, O, V, B, Y and W : | :B preferred with advancing age |
| Alschuler & Hattwick 1943 | :150 preschool children, 2-4 years old : | :Twenty children studied daily for 2 years. Records of all children kept for 1 year. Case studies made, follow-up work, drawings, paintings, kept. :Photographs made of children's work, sketches made of building. Behavior recorded : | :R preferred during early preschool years :Interest in cooler colors increases as child develops and learns to function on a relatively more controlled level |

R-red, P1-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white.

4. Relation of Color Preference to Emotions

| Investigator : | Subjects : | Methods : | Findings |
|--------------------------------------|---------------------------------------|--|---|
| Thomaschewski 1935 | 700 school children | Presented 25 hues. Subjects asked to select 5 most liked and 3 most disliked | B and V signify calm; O exotic tendency; dark G reserve; light B in young children, nervousness; G and V, sensitivity; R tones persistently chosen, abnormality; strong R, health, vigor, happiness. Sharp distinction between 5 most liked colors, clear thinking, uprightness |
| Alschuler & Hattwick 1943 (See 3) | 150 preschool children, 2-4 years old | 20 children studied daily for 2 yrs. Records of all children kept for 1 yr. Case studies made of follow-up work. Drawings, paintings kept. Photographs made of children's work. Sketches made of building. Behavior recorded | Crayons, media for expressing ideas. Painting, media for expressing feelings. Emphasis on R associated with love and hate. R and Y masses in painting paralleled emotional disturbances. B associated with drives toward control. Those who emphasized B gave evidence of strong underlying emotions. Those emphasizing G, functioned on relatively controlled level, evidence of few strong emotional reactions. |

5. Relation of Color Preference to Miscellaneous Aspects

| | | | |
|--------------------------|-----------------------------------|---|--|
| Tracy 1894 | Children | : | Able to discriminate colors when unable to use name of color after it is given them |
| Mildreth 1936 (See 1) | Children 3-4 yrs old; 5-6 yrs old | Subjects asked to name 10 colors; to express preference for picture subjects from series of 16 presented; for reproductions of a single picture in 4 styles: monotone, silhouette, outline and color were asked to express their preference | Preferred picture subject, action with children and animals. Colored pictures preferred to other reproductions |

R-red, Pi-pink, O-orange, Y-yellow, G-green, B-blue, P-purple, V-violet, Br-brown, Bl-black, W-white

III. Methods and Procedure

A. Preliminary Study

During the summer of 1943, the investigator conducted a series of preliminary experiments in the Virginia Polytechnic Institute nursery school in an effort to ascertain the children's reactions to different creative media. The media included painting with brushes at easels, finger painting, mural painting with brushes, clay modeling, paper tearing, paper cutting and picture mounting. In painting at the easel, red, yellow blue, green and brown poster paints were used. It was noted that the children preferred this medium to creating in any of the others mentioned. Because of this, easel painting was the medium finally chosen. The colors selected were the three primary colors, red, blue and yellow.

A check was made to see if the children could match colors. Three identical bird houses and posts were cut from red, yellow and blue Milton Bradley construction paper. The posts (rectangular shapes) were mounted on light gray cards. Lying on a table were the cards and the bird houses separated from them. The investigator interested one child at the time in the cards by saying, "Jack, I have a new puzzle. How quickly can you put a matching bird house on each post?" When the puzzle was solved, the cards and bird houses were again separated and shown to another child. The puzzle was solved very quickly by all the children in the nursery group except on three year old boy who could not match the colors or did not understand the problem. His paintings were not used in the data.

B. Reliability of Observers

Three student assistants trained with the writer to become reliable observers. All made records together of individual children's order of color selection and the number of times they changed color while painting. This practice was continued two weeks until a high percent of agreement was reached. It was determined in the following manner: The observers watched two children and recorded their changes in the use of color during a ten minute painting period. Tallies were added and the agreements recorded for two observers. When the tally totals were identical the number was taken as in agreement. For example, if child A received eight tallies by observer N and eight tallies by observer V, the number in agreement would be eight. When the numbers were not identical, the lower one recorded by either observer was taken to be the number of observations in agreement. If for example, observer N recorded ten tallies and observer V recorded eight, the number of observations in agreement was taken as eight. The percentage of agreement of the observers was computed by dividing twice the total number of tallies in agreement by the sum of the tallies of the two observers.

Percentage of agreement for each observer was checked against the writer, V. Reliabilities are as follows:

| <u>Observers</u> | <u>% of Reliability</u> |
|------------------|-------------------------|
| V with N | 94 |
| V with C | 97 |
| V with H | 97 |

These were considered high enough percentages for each person to proceed recording color choice independently.

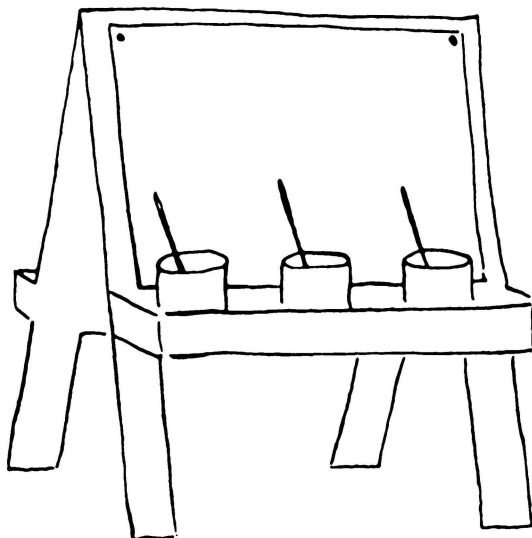
C. Subjects

Subjects in the experiment were nine children enrolled in the nursery school during the fall and winter quarters of the 1943-'44 session. They were divided into three groups on the basis of age. The younger, designated reindeer, was composed of two boys and one girl 2.5-3.4 years of age. Members of the middle age group, called giraffs, were two boys and one girl, 3.5-4.4 years of age. The older age group, designated zebras, had two boys and one girl, 4.5-5.4 years old.

D. Procedure

The children worked at three double easels 38 inches high and 29 inches wide. They were allowed to choose places while reliability of observers was being established. The places remained permanent throughout the experiment. Thumbtacked to the easel boards were quantities of news print sheets, 17 by 22 $\frac{1}{2}$ inches. In the three inch deep troughs of the easels sat number two tin cans containing red, yellow and blue poster paint. A long handled brush, size six, stood in each can. The following is an illustration of the arrangement of materials:

Figure I.



Paint was mixed from pure red, yellow and blue Milton Bradley powdered colors with a small amount of Farbo calcoimine added to give a milk like consistency. The proportions were as follows:

Yellow

1/4 cup No. 2 yellow calcoimine
3/4 cup yellow powdered poster paint
Water to make one quart of mixture

Red

1/4 cup pink calcoimine
3/4 cup red powdered poster paint
Water to make one quart of mixture

Blue

1/4 cup No. 2 King's Blue calcoimine
3/4 cup blue powdered poster paint
Water to make one quart of mixture

The colors were bright although very slightly paled by the calcoimine. They were arranged in the six possible positions and randomized for each child on twelve experimental days.

Identical cards (see Figure 2) were made for each child. Color arrangements for the week were given on the cards. The space below was ample for checking order of color selection and the number of times colors were chosen during the painting process.

Figure 2

| Name | | | | | | Group | | |
|----------|---|---|----------|---|---|----------|---|---|
| Day | | | Date | | | Day | | |
| R | Y | B | Y | B | R | B | R | Y |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Observer | | | Observer | | | Observer | | |

The cards were thumbtacked to small boards which the investigator and observers held in their hands. At the ringing of a signal bell, the children in any one group were invited to put on identical oil cloth aprons and to paint as many pictures as they wished for a ten minute period. During this time one teacher changed or helped to change the paper as a child completed his painting. Observers stood beside the easels and recorded without comment the order and number of times each child selected the different colors. They rotated positions so that no one observer recorded all the data on any child.

The investigator alone checked the predominant color of the finished painting. Predominance was measured by the color occupying the largest space in the finished painting.

Only the first painting done by each child in a ten minute period was used in the data. These were displayed on the walls of the nursery school until the next experiment day.

Any conversation between the teacher who helped to change the paper and the children at the easels consisted of standardized statements:

You will be told when it is your turn (if a child wished to paint before his group).

You may have a turn now.

Your paint will be ready when you are ready.

This is the way we keep them (referring to paint arrangement).

Colors are prettier when they aren't mixed (stated if child started pouring colors together).

We keep each brush in its color.

Let's see if this brush doesn't belong here.

If you use less paint and wipe your brush like this, (demonstration) your picture will be just as pretty and not get so wet.

We paint on the paper here.

The turn for your group will come (order given here) today.

You are forgetting (if materials were misused).

You may be excused now and paint another day when you can remember. (Stated upon third offense).

You may help me wipe up the paint. (A damp cloth placed on easel at beginning of period available for accidents.)

Find a place to stop because your turn will soon be up.

Your turn is up now.

The clock says it's time to stop.

IV. Statistical Analysis of Data

The data was analyzed by the analysis of variance method.

Colors were represented by the approximate wave length values of the regions of the spectrum at which they occurred. The wave length value of red was approximately 6,500 angstroms; yellow 5,800 angstroms; and blue, 4,700 angstroms. Tables I, II, III, and IV, which deal with color predominance and the order in which the colors were selected, were computed from the wave length value totals.

Table V, which shows color selected most often, was computed thus: Suppose a child employed one color, say red, throughout his painting. Of course, red would be the color used most often, and the painting would be scored 6,500, the wave length value of red. Suppose on another

day, he painted an equal number of times with red and blue. The wave length values 6,500 and 4,700 would be averaged and the result 5,600 would be taken as the score. If three colors should be selected, an equal number of times, they would be averaged in the same way. If red were selected four times, blue selected two times, and yellow once, the wave length value of red, 6,500, would be used.

Table I

Color Preference Based on Predominant Color of Finished Painting

| Sources of Variation | Degrees of Freedom | Sum Squares | Mean Squares Averages | F | |
|----------------------|--------------------|-------------|-----------------------|-------|----|
| Age | 2 | .0055 | .0032 | | |
| Sex | 1 | .0767 | .0767 | 12.57 | 5% |
| Sex x Age | 2 | .0072 | .0036 | | |
| Within Males | 3 | .0996 | .0332 | 5.44 | 5% |
| Days | 11 | .0537 | .0488 | | |
| Days x Sex x Age | 22 | .1221 | .0555 | | |
| Days x Within Males | 33 | .1822 | .0552 | | |
| Days x Classes | 88 | .5375 | .0061 | | |
| Total | 107 | .7663 | | | |

Averaging wave length values in the data from which Table I is derived was unnecessary since no two colors occupied equal amounts of space in a finished painting. Hence, scoring for predominance of color was easy and invoked no difficult weighting or balancing.

In the analysis of variance of color preference based on the predominant color of the finished painting, a significant sex difference

at the five percent level is apparent. Boys preferred blue and girls preferred red.

Variability within males was equally significant. The variation was due to one boy in the middle age group who used red predominantly throughout the experiment. Whether or not this color predominance has any relationship to emotional stability at the time of the painting is an interesting speculation. Alschuler and Hattwick indicate that choice of red is related to frustration and anger in a child, whereas blue is associated with calmness and poise. In the case of this little boy, there were several mornings when he did not wish to paint during the experimental period. He needed considerable urging and suggesting from the teacher and experimenter before he would come to the easel. He was loath to leave his play with the children and the equipment. It is possible that he was frustrated at being urged to paint. If red is associated with anger, the child may have been following this pattern.

Table II

Color Preference Based on Color Chosen First

| Sources of Variation | Degrees of Freedom | Sum Squares | Mean Squares |
|----------------------|--------------------|-------------|--------------|
| Age | 2 | .0207 | .0103 |
| Sex | 1 | .0016 | .0016 |
| Sex x Age | 2 | .0150 | .0075 |
| Within Males | 3 | .0115 | .0038 |
| Days | 11 | .0229 | .0020 |
| Days x Age | 22 | .1424 | .0064 |
| Days x Sex | 11 | .0894 | .0081 |
| Days x Sex x Age | 22 | .1088 | .0049 |
| Days x Within Males | 33 | .1719 | .0052 |
| Days x Classes | 88 | .5125 | .0058 |
| Total | 107 | .5842 | |

Table III

Color Preference Based On Color Chosen Second

| Sources of Variation | Degrees of Freedom | Sum Squares | Mean Squares | F | |
|----------------------|--------------------|-------------|--------------|---------|----|
| Age | 2 | .6350 | .3175 | 10.0475 | 5% |
| Sex | 1 | .0419 | .0419 | | |
| Sex x Age | 2 | .0027 | .0013 | | |
| Within Males | 3 | .8491 | .2830 | 8.9556 | 5% |
| Days | 11 | .3487 | .0317 | | |
| Days x Age | 22 | .6350 | .2886 | | |
| Days x Sex | 11 | .2902 | .2638 | | |
| Days x Sex x Age | 22 | 1.6795 | .7634 | | |
| Days x Within Males | 33 | .1734 | .0052 | | |
| Days x Classes | 88 | 2.7781 | .0316 | | |
| Total | 107 | 4.6551 | | | |

Table IV

Color Preference Based on Color Chosen Third

| Sources of Variation | Degrees of Freedom | Sum Squares | Mean Squares | F | |
|----------------------|--------------------|-------------|--------------|---------|-----|
| Age | 2 | 1.4292 | .7146 | 10.4780 | 5% |
| Sex | 1 | .0637 | .0637 | | |
| Sex x Age | 2 | .0126 | .0063 | | |
| Within Males | 3 | .4406 | .1602 | 2.3489 | 10% |
| Days | 11 | .5215 | .5650 | | |
| Days x Age | 22 | 1.6243 | .7381 | | |
| Days x Sex | 11 | .4919 | .4471 | | |
| Days x Sex x Age | 22 | 1.6549 | .7522 | | |
| Days x Within Males | 33 | 2.2329 | .6766 | | |
| Days x Classes | 88 | 6.0040 | .0682 | | |
| Total | 107 | 8.6116 | | | |

Tables II, III, IV, indicating colors used by each child in the order first, second and third, respectively, are grouped together for discussion. Table II, Color Preference Based on Color Chosen First, indicates no significant differences in color selected first.

Table III, Color Preference Based on Color Chosen Second, shows significant differences at the five percent level for age and for within males. Table III also indicates significance at the five percent level for age and at the ten percent level for within males.

It must be pointed out here that all children necessarily chose a first color but many children failed to use a second or a third color. In other words, a painting might be in one color only or just in two colors. On 5 occasions, the children of the older group, and on 12 occasions, members of the younger group failed to use a second color. Children in the middle group, on the other hand, always chose a second color. Failure to use a third color occurred 12 times in the older group, 5 times in the middle group, and 24 times in the younger group. This may mean that the significance which appeared in the Tables was due to the children's failure to select a second or a third color, rather than indication of a second color preference, or a third color preference.

The middle age group, then, used more variety of colors than the older or the younger age group. These children, ranging from 3.5 to 4.4 years, always used two colors, and in only five of the thirty-six opportunities possible did they fail to use three colors.

Table V

Color Preference Based on Color Chosen Most Often

| Sources of Variation | Degrees of Freedom | Sum Squares | Mean Squares | F | |
|----------------------|--------------------|-------------|--------------|------|------|
| Age | 2 | .0048 | .0024 | | |
| Sex | 1 | .0062 | .0062 | 3.10 | 10% |
| Sex x Age | 2 | .0009 | .0004 | | |
| Within Males | 3 | .0236 | .0078 | 3.90 | 2.5% |
| Days | 11 | .0282 | .0025 | | |
| Days x Age | 22 | .0592 | .0027 | | |
| Days x Sex | 11 | .0394 | .0036 | | |
| Days x Sex x Age | 22 | .0527 | .0024 | | |
| Days x Within Males | 33 | .1104 | .0033 | 1.65 | 2.5% |
| Days x Classes | 88 | .1749 | .0020 | | |
| Total | 107 | .3254 | | | |

Table V, Color Preference Based on Color Chosen Most Often, was derived in the following way. As a child painted, he may have selected first red, then blue, then have gone back to using red, then yellow, blue, and red. In this case, the observer would have recorded three choices for red, two for blue and one for yellow. If one color were used throughout the observation, only one selection was recorded. As explained earlier, in case of a tie the score was the average of colors used equally often.

Table V indicates that within males there is a highly significant difference on the basis of color selected most often. This may be attributed to one boy in the younger group who failed to make a second color choice on eight occasions, and to make a third color choice on nine occasions.

There is a highly significant difference for days times males which is due to this same little boy. At the ten percent level there is a sex difference.

Table VI

Number of Times Colors Were Chosen

| | <u>Older Group</u> | | <u>Middle Group</u> | | <u>Younger Group</u> | | <u>Totals</u> | <u>Averages</u> | |
|---------|--------------------|---------|---------------------|---------|----------------------|---------|---------------|-----------------|-------|
| | : Boys | Girls : | : Boys | Girls : | : Boys | Girls : | : | : Boys | Girls |
| | : | : | : | : | : | : | : | : | : |
| Blue | : 50 | 17 : | : 52 | 24 : | : 43 | 18 : | : 204 | : 24.16 | 19.67 |
| | : | : | : | : | : | : | : | : | : |
| Red | : 49 | 31 : | : 52 | 32 : | : 39 | 34 : | : 224 | : 23.33 | 28.00 |
| | : | : | : | : | : | : | : | : | : |
| Yellow: | 34 | 16 : | : 37 | 18 : | : 29 | 17 : | : 151 | : 16.66 | 17.00 |
| | : | : | : | : | : | : | : | : | : |

Red was used by the group more often than any other color. Blue ran a close second; yellow trailed behind. In the entire experiment, the total number of times red was chosen by all the children was 224, blue 204, and yellow 151. Boys actually chose blue oftener than they chose red, but the difference was only slight. Boys, on the average, chose blue 24.16 times, red 23.33 times, and yellow 15.67 times. On the other hand, the girls selected red on the average 28.00 times, blue 19.66 times, and yellow 17.00 times.

On the basis of frequency of selection, girls esteemed red highly above blue and yellow. These latter colors they selected about equally. On the same basis, the boys esteemed red and blue about equally and yellow considerably less.

In the entire experiment red was used the greatest number of times.

Several investigators have pointed out that as children grow older their color preference changes from the warm to the cool end of the spectrum. In this study, however, there is no evidence of a similar change in preference with increasing age.

V. Summary and Conclusions

This study was planned to allow nursery school children to select and paint at easels with any of three colors, red, blue and yellow. The specific purpose of the investigation was to discover color preference based on:

1. The predominant color of the finished painting.
2. The order of colors selected in the painting process.
3. The number of times a color is selected during the rendering of each painting.
4. Interactions between
 - a. Order of choice of color and age
 - b. Order of choice of color and sex
 - c. Order of choice of color, sex, and age.

The studies of various investigators agree only in part and disagree entirely at some points. Jastrow found that boys preferred blue and girls preferred red, whereas Grath states almost the reverse, that boys preferred red more than girls, and that girls preferred orange more than boys. Feige reports that boys preferred black and brown more than girls.

Color preference seemed to change with age development. The findings agree in general that with developing age, color changes from the red toward the blue end of the spectrum. Rosse states that blue becomes the preferred color by the age of eight.

A relationship between color preference and emotions reported by Alschuler and Hattwick, indicates that children who emphasized blue evidence strong underlying emotions. Those who emphasized green seemed to function on a relatively controlled level to show few strong emotional reactions. Red and yellow paralleled emotional disturbances.

In most of these studies colored construction paper was the medium from which choices were made. In no case, except the Alschuler-Hattwick study did a subject use the material after he had indicated his preference.

In the present study children were not asked to state their color preferences as was the case in so many of the studies of color preference in the literature. Rather, the children painted at easels and observers recorded the order and the frequency with which each of three near saturated colors, red, blue and yellow were used as they painted. The writer also checked the predominant color of the finished painting. Color preference was inferred as color selected first or most often and on the predominant color in the finished painting. Each child's first painting made in each painting period comprised the material for the data.

The subjects, nine nursery school children, were divided into three groups on the basis of age. Group I was comprised of two boys and

one girl, 2.5 to 3.4 years of age; Group II contained two boys and one girl 3.5 to 4.4 years of age; and Group III had two boys and one girl 4.5 to 5.4 years of age. The order in which the groups painted each day was randomized. Painting periods of ten minute length began at 9:00 o'clock and were scheduled on three days a week. These were continued until each child had participated on twelve days.

Thumbtacked to each easel board were quantities of newsprint (paper 17 by $22\frac{1}{2}$ inches). In the troughs of the easels were three number two tin cans containing equal amounts of red, yellow and blue poster paint. Standing in each can was a long-handled brush, size six. Arrangement of the cans of paint was randomized for each child on each experimental day.

Statistical analysis of the data reveals the following:

1. On the basis of predominant color in the finished painting, boys preferred blue and girls preferred red. This agrees with Jastrow's findings. Variability within males was significant, due to one boy in the middle age group who used red predominantly.

2. No significant differences were found on the basis of color chosen first.

3. The members of the middle age group, ranging from 3.5 to 4.4 years selected the greatest variety of colors. In only five of the thirty-six opportunities given did they fail to use three colors. In all cases they used two colors.

The children of the youngest age group, 2.5 to 3.4 years used the fewest colors. They failed to use a second color in one-third of the

opportunities given them. In two-thirds of their total opportunities, they failed to use a third color.

4. On the basis of color chosen most often, variability within males is again highly significant. This was due to one boy in the younger group who usually failed to make a second and third color choice. Significant variability appears again in the interaction of days times within males. This was due to the same child.

5. Without statistical analysis, averages of frequency of choice showed that girls preferred red far above blue and yellow. These latter colors they esteemed almost equally. On the basis of frequency of choice, boys esteemed blue and red almost equally. Yellow lagged far behind in preference. It might be said that based on averages of the number of times red, yellow, and blue were chosen, that girls made a sharper distinction between red and blue than did the boys. The boys made a sharper distinction between blue and yellow than did the girls. Red was chosen the greatest number of times by the group as a whole.

6. There is no evidence based on any of the data of a progressive age change from the use of warm to cool colors as several investigators have pointed out.

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