COLOR PREFERENCE FOR BLACK AND WHITE IN INFANTS AND YOUNG CHILDREN

by

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During the past ten years there has been a great deal of research on color preference and color meaning in young children and adults. Emphasis has been on black/white color preference. Investigators in this area have suggested that children and adults prefer the color white to the color black and that this preference for white is a universal one. Some researchers have suggested that the evaluations placed on the colors black and white also influence attitudes toward black and white people.

The purpose of this study was to determine whether the preference for the color white was present in infants and young children; and if the preference existed, did the age, race, sex of the subject or the type of toy presented determine the strength of the color preference.

A pilot study conducted by the present investigator examined color preference in Afro infants and toddlers, ranging in age from six months to three years. Results indicated that there was a significant tendency toward white preference, that this preference increased as the subjects advanced in age, and that this trend toward white preference should be further investigated.

The present study presented a design in which the investigator administered a color preference test to 160 subjects who attended day care centers and who ranged in age from six months to 4.5 years. There were an equal number of males and females and an equal number of Afro and Euro subjects. Ages of subjects were controlled so that there were 20 subjects in each six-month age interval.

Data were obtained from a 12-item test in which pairs of toys were presented to each subject. The toys were identical except that one was black and the other was white. The toy the subject selected was considered the subject's preference, and the color of that toy was recorded. Each subject received a score from 0 to 12 which represented the number of times the subject chose the white toy; there were a total of 1,920 responses from the 160 subjects.

A chi-square test and analysis of variance were used to analyze the data. Results indicated that, as a group, subjects did have a color preference and this preference was for the color black. Analysis also indicated that age was a factor in determining color preference, with a shift toward white bias appearing as the subjects advanced in age. Regression analysis revealed there was a linear relationship between age and color preference with the subject's score increasing on an average of .43 each year.

When scores were classified both by color chosen and race of the subject, results indicated that race was a factor in predicting color preference; the Afro subjects preferred the color white more than the Euro subjects did. Results indicated that neither sex of the subject nor type of toy was a predictor of color preference.

A two-way analysis of variance was employed to examine the collective effect of age and race on the variation in test scores. Results indicated that the two variables, age and race, as a whole had a statistically significant effect on the test scores. That is, age differences did not produce the same effect on the test scores for Euros as it did for Afros. The significant interaction also

implied that the effect of race on test scores was not uniform across different categories of age. The F value for the Euro was not significant; for the Afro, the F value was significant at the .01 level. That is, Afro scores increased by .74 each year, whereas the Euro score increased by .12 each year.

Results which, in general, did not support existing literature in that there was no preference for the color white detected in the subjects refute the idea that white preference is inborn and is a universal quality in all human beings. The fact that there were racial differences in color preference further suggests that color preference is a cultural phenomena. The linear relationship between age and preference for white was predicted by the pilot study and confirmed in this study.

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CHAPTER I

INTRODUCTION

Purpose of the Study

During the past ten years there has been a great deal of research on color preference and color meaning in young children, with emphasis on black/white color preference. The primary investigator in this area has been John Williams of Wake Forest University who has suggested that the preferences children have toward the colors black and white may also affect their attitudes toward black and white objects and people. Two separate areas of research have merged to form Williams' basic thesis. The first is the general area of color preference and the second concerns itself with the evaluations which subjects may place on color.

Research has indicated that infants do show color preferences, although no specific studies have been conducted to determine whether infants prefer white or black. Staples (1932) and Fantz (1962) conducted visual preference tests in which fixation time was designated as a measure of preference. For instance, two colored disks were presented to an infant and the time the infant spent looking at each stimulus was recorded. The investigators then suggested that the stimulus color which had the longest fixation time was the preferred color. However, Bond (1972) has suggested that fixation time measurements have poor inter-rater reliability.

There is also research evidence on the evaluations people place on colors. Most of the evaluative studies (also called color meaning studies) required that subjects be able to understand language. For instance, subjects were shown two animal pictures that were identical except for color. The subject was asked to point to the "bad" animal. If enough subjects pointed to the black animal as the bad one, then the assumption was made that subjects placed a low evaluation on the color black and that the word black has some evaluative meaning. In general, the studies have indicated that adults and children place a high evaluation on the color white and a low evaluation on the color black.

Williams' research has been concerned primarily with children who are five years and older. His subjects placed higher preferences for and evaluations on the color white than they did on the color black. There were, however, some racial differences reported indicating that a white bias may be less noticed in Afro subjects (Williams, 1964). Williams also reported that the positive evaluation placed on the color white may become stronger as the subject ages.

A pilot study conducted in October, 1975 by the present investigator examined color preference in infants and toddlers. A color preference test (CPT) was constructed in which six pairs of toys were presented to children. The toys were identical except that one toy was black and one was white. Each pair of toys was presented to the child twice. In the 20 Afro subjects ranging in age from six months to three years, there was a significant tendency toward white preference. The preference increased as the subjects advanced in chronological age.

These results suggested that this trend should be further investigated in a research design which involved not only a larger number of Euro subjects but also a group of Afro children. (The complete pilot study appears in Appendix A.)

The purpose of the present study was to expand the pilot study by examining the tendency toward white color preference in Afro and Euro children younger than five years of age. The study raises the following questions:

1. Is there an observable preference for the color white in infants and young children?
2. If a color preference exists, does the age of the child determine the strength of the color preference?
3. If a color preference exists, does the race of the child determine the strength of the color preference?
4. If a color preference exists, what, if any, is the interaction between race, age, and sex on the strength of the color preference?
5. If a color preference exists, is the toy type a factor influencing color preference? (For example, is the color preference for a toy in the shape of a human figure the same as the color preference for a ball?)
6. If there are color preference differences for toy type, does the race, age, or sex of the child affect the strength of the preference?

The research project project presented a design in which the investigator administered a color preference test to 160 subjects ranging in age from six months to 4.5 years. Black and white toys were used as test items. This cross-sectional study was designed to reveal whether the preference for white is one which exists at six months of age or whether the preference is gradually acquired as the subject advances in age.

Assumptions

The proposed study is based on the following assumptions:

1. That infants as well as older subjects can discriminate between colors.
2. That infants as well as older subjects have preferences for colors.
3. That subjects who reach for a toy (when two toys are present) are indicating a preference for the toy.
4. That subjects who reach for one toy (when two toys are present) are not indicating an aversion to the toy not selected.
5. That subjects ranging from six months to 4.5 years of age can take the same color preference test.
6. That results of the study will reveal a developmental aspect to color preference if one exists.

Definitions

Afro - refers to a member of the Negro race.

Euro - refers to a member of the Caucasian race.

b+/w- - indicates a black bias. That is, there is a preference for the color black.

w+/b- - indicates a white bias. That is, there is a preference for the color white.

Unbiased - indicates there is no preference for either color as determined by some predetermined level of significance.

Color preference test (CPT) - refers to the instrument constructed by the investigator to test the subject's preference for the colors black and white.

Hypotheses

Independent variables used in the analysis were the age, race, and sex of the child and the type of toy. The dependent variable was color preference. The following null hypotheses were tested.

Hypothesis I

In the absence of all independent variables, there will be no significant differences in preference for the colors black and white.

Hypothesis II_a

When age is the independent variable, there will be no significant differences in preference for the colors black and white.

Hypothesis II_b

When race is the independent variable, there will be no significant differences in preference for the colors black and white.

Hypothesis II_c

When sex of the child is the independent variable, there will be no significant differences in preference for the colors black and white.

Hypothesis II_d

When toy type is the independent variable, there will be no significant differences in preference for the colors black and white.

Hypothesis III

In the presence of each independent variable, when the remaining independent variables are controlled, there will be no significant differences in color preference.

Strengths and Limitations of the Study

Strengths. This study included a larger number of subjects than has been the case in previous studies. It was the first study to use a toy selection test with as many as 12 items.

The research design was the first study that attempted to test black/white color preference in infants. In addition, a longer age span (six months - 53 months) was used for analysis.

Research in this area of color preference has generally employed unsophisticated methods of analysis; for instance, percentages and chi-square analysis have been employed. This study was the first to use analysis of variance in order to determine what, if any, interaction exists between the variables of sex, race, and color preference. Multiple regression, as well as chi-square analysis, was employed.

The major strength of this study was the redesigning of some aspects that were not effective for the pilot study. For example, more subjects were selected and more appropriate toys were presented in the study than in the pilot study; the background surface of the toy presentation was changed; and the score sheet was redesigned. In addition, more controls on the subjects were included for data collection. A device was designed for toy presentation which standardized the manner of presentation. The toys in the proposed study were presented in random order. (The pilot study presented toys in an order selected by the investigator.) Light intensity was controlled.

Limitations. Selection of subjects was not a random selection. Since the investigator located subjects who were enrolled in day care centers, any statements that could be made about the population in general were necessarily limited.

The reliability and validity of the research instrument (the CPT) have not been established because this particular test has not been used in a research design.

Test length for color studies (Williams and Morland, 1976) has often been determined by ease in scoring and analyzing a binominal distribution. The six-item test, for instance, generates a score of 0 through 6 and simplifies the ease with which one can determine the .05 significance level which occurs with a score of 0 or 6. A twelve-item test was designed for the subjects in the present study, since a longer test might have proved tiring or boring for the younger subjects. On this test a score of 12, 11, 10 or 0, 1, 2 yielded a significant ($<.05$) color preference for that subject. A 24-item test would have yielded an even wider range of scores and one could have spoken not only of a significant bias, but also of degrees of significance. Although a longer test would have given more information, it would have been impractical to administer to infants, toddlers, and preschoolers.

The nature of the stimulus materials may have served as a limitation. Since the youngest subjects were not able to utilize language, visual materials had to be used. There was no way to ask the youngest subjects why they selected the stimulus.

Although the assumption was made that if the child reached for a toy he was indicating a preference for the toy, this assumption in fact may not have been true. The pilot study revealed that some babies seem not to focus on both toys, but focused on only one and selected that one to manipulate. Also, some subjects were apparently not interested in either toy, and when they finally selected a toy, they did not seem to be expressing a preference. Occasionally a subject, when reaching for one toy, would inadvertantly touch the other toy; then the subject would focus on the toy he had touched and select that toy. Some of these limitations were partially controlled for in the present study.

The scoring procedure generated scores that could be easily misinterpreted. For instance, one might conclude that a child who selected 12 white toys is demonstrating an extreme white bias. This score must be understood, instead, as a relative bias. This child may not feel the same about the color white as any other child receiving the same score would. Perhaps the child with the high score indicating w+/b- had a more consistent bias (as opposed to a more intense bias) than a child with a moderate score. The forced choice procedure required the child to make some response to every test item; thus, preference scores are more difficult to interpret.

Summary

The report of this research project is divided into five chapters. Chapter II is a review of the literature that has reported on color preference. Chapter III presents the research design. The final chapters present the results of data analysis and a discussion of these results. This study concludes with a summary of the research with some suggestions for further research.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter presents a review of the literature in two research areas. The area of color preference includes citation of studies which give empirical information on an infant's preference for any given color. Some general statements will be made about infant research methodology.

The second section of this chapter reports on color meaning studies; i.e., the connotations people place on color. Studies using adults and children as subjects will be cited. Some animal studies which investigate preference for light and dark, as well as preference for white and black, are also reported.

Research on Color Preference in Infants

Research methodology used in color preference studies has varied. Thomas (1973) reported that more than a decade had passed since the first experiments involving infant responses to visual stimuli. He maintained, however, that there had been little progress toward development of a theory of visual stimulus selection in infants. Thomas believed that the best way to understand an infant's response was through a theory of choice. Thus, the baby's looking behavior belonged properly to a theory of preferential choice behavior. The theory is a general one in that it makes no assumptions about the form or subject matter of the stimuli. Thomas reported that

measurement problems are especially troublesome in infant research. He suggested that the preferential choice theory is appropriate for infant testing.

There are two basic procedures used in infant visual testing. One is to present a single stimulus at a time and record the infant's visual fixation time on the stimulus. The other is to use paired stimuli, in which the experimenter records the time spent fixating on each stimuli and compares the results. Ranking procedures are often used in reporting results. Thomas warned the investigator to remember that in compilation of infant data individual differences are greater between subjects than for older subjects. Thus, interpretation of results is more difficult.

Infant preference studies. It has been suggested by Brian and Goodenough (1929) that very young children prefer shape to color. Their research involved an experimental situation in which subjects were required to choose between two alternatives in matching a series of objects. When the objects chosen were similar in form, they were invariably dissimilar in color; when color was the same, forms could not be matched. Each situation offered equal opportunity for matching upon the basis of either form or color, but a choice always had to be made. In this experiment, children under two years of age showed a perseverative tendency in about one half of their responses. For instance, a child who had chosen a certain block on the first trial (indicating a preference for shape) was very likely to choose the same one on the second trial (which could have indicated a preference

for color), thus apparently reversing the basis for his choice. The tendency toward perseveration decreased steadily until it disappeared at age five years. Brian and Goodenough reported that color had a greater significance at a certain period of life (from age three to six years) than at any other age level, with the maximum tendency appearing at 4.5 years. Children below the age of three years exhibited a marked tendency to match upon the basis of form rather than color, and by age six the children had again expressed a preference for form. Spears (1964) conducted a study in which several series of stimuli, varying in shape, in color, or in both were presented according to the method of paired comparisons to separate groups of infants four months of age. Visual fixation time served as a measure of preference. Spears reported that in his experiments shape dominated color as a basis for preference and his infant subjects preferred the bull's-eye pattern to all others.

Fantz (1963) suggested that infants prefer pattern to color. He conducted a study in which he used five-day-old infant subjects. He used fixation time as a measure of preference as infants looked at three black and white patterned disks and three colorful disks. Fantz reported that infants prefer black and white patterns to colored surfaces; that infants have acute pattern vision; that infants can differentiate among patterns of similar complexity; and that infants show the most visual interest in a pattern similar to the human face. This study called for a revision of the then-traditional views that the world of the infant was formless and chaotic.

It has been suggested by Fagan (1974) that infants prefer novel stimuli. He conducted a study in which five-month-old subjects looked at a novel stimulus longer than at a familiar stimulus when familiarity had been created by a habituation procedure. He used a visual preference apparatus which consisted of a pivoting stimulus presentation stage mounted between side, top, and bottom panels. He outlined his apparatus with light blue felt material which provided a contrasting and light-diffusing background for the stimulus targets. He also controlled for illumination by using miniature, high-intensity bulbs.

Some investigations have suggested that infants can discriminate between colors. In Fagan's (1974) investigation of five-month-old infants, he was interested in determining whether infants could make discriminations between color hues. He found that the greater the disparity in hue, the more easily it could be discriminated.

Spears (1964) suggested that infants preferred the colors red and blue to the color gray when fixation time was designated as the measure of preference. Spears used stimulus cards presented to the infant in an 18-inch cubicle box with the inside painted black.

Infants were reported to prefer an intermediate amount of light. Hershensen (1964), in a series of experiments, further analyzed the dimensions of the Fantz (1963) study. Hershensen presented six stimulus pairs using Kodak slides of varying brightness. Using a paired comparison design, he measured stimulus fixation preferences on newborn subjects. The pairs differed only in a single dimension: brightness. The brightness experiment indicated that the infants' order of preference was (1) intermediate, (2) bright, and (3) dim.

In a complexity investigation, Sigman and Parmelee (1974) used as subjects 40 four-month-old infants (20 full-term babies and 20 premature babies with an equal number of males and females). The investigators presented stimuli of two-dimensional black and white figures on Kodak slides with a paired comparison technique. The slides varied as to complexity. Results indicated that both infant groups preferred complex to simple stimuli, and full-term infants preferred faces. Sigman and Parmelee suggested there was some developmental cognitive preference in the full-term infants.

Studies indicated that infants have color preferences. Staples (1932) conducted a series of experiments in which 262 subjects under two years were observed. She divided her subjects into three groups according to age and varied her experiments so that they would be age appropriate for her subjects. She presented to the infants of five months or younger a colored and a gray disk of equal brightness and used fixation time as a measure of preference. A 222-watt bulb was used to illuminate the stimuli which were placed 12 inches from the babies' eyes. There were four test items presented to subjects. The second group was composed of infants from six months to two years. These subjects were brought into a well-lighted room out of the sunlight. The experimentor presented identical stimulus cards except they were smaller and the one the infant grasped was considered a preference. (Infants who failed to pass a preliminary test to determine their ability to grasp were not included in the study.) Her third experiment presented two colored disks to all subjects and each of four colors was compared with every other color. Positions

of left and right were alternated to avoid a favorable position for one color. Babies who pushed the cards away were not included in the study. Staples reported that all her subjects showed a preference order of red, yellow, blue, and green.

Valentine (1914) reported that his subject indicated marked preferences for red and yellow. He also reported that some earlier studies revealed light gray was preferred over dark gray; yellow was preferred to white; green, red, and blue were preferred to gray and white; yellow was preferred to red. Findings from these studies are tentative as the subjects were few in number and experimental methods were unsophisticated. Valentine reported the following ranking of color preferences in his study: yellow, white, pink, red, brown, black, green, blue, violet. Valentine reported that over a period of six days the preference for red decreases as some sort of habituation took place. Spears (1964) used fixation time as a measure of preference. His four-month-old infants significantly preferred the colors red and blue to the color gray. Boswell conducted a study using two-year-old Euro subjects. The subjects were timed as they played with a variety of black and white toys. There was a weak tendency toward preference for white (Williams & Morland, 1976). Since Boswell's study is unpublished, statistical data are unavailable.

Bond (1972) reported that a gradual stimulus change was preferred to a radical stimulus change. Infants also seemed to prefer intense colors to cool, weak ones and an intermediate amount of light over extremes of intensity.

Color preference studies have been conducted on adults. Some early studies (Garth, Moses, & Anthony, 1938; Gesche, 1927; Mercer, 1925; Shen, 1937) focused on racial differences in color preferences. Mercer's study of over 1,000 Negroes indicated that white was the least preferred of seven colors (not including black) and for 1,000 Caucasians white was the most preferred color. This study suggested that sex differences were also significant in determining color preference.

Research on Color Meaning

Color connotation using adults as subjects. Adams (1973) reported a cross-cultural study in which he asked subjects in 20 countries to rate colors according to preference, potency, and activity using a semantic differential. Blue was the most preferred color; green and white were also highly preferred. Gray and black were least preferred. Black was the color receiving the highest potency score; red was second; yellow, white, and gray showed the lowest potency scores. Activity was evaluated highest for red and lowest for black and gray. Adams concluded that black is the most consistently agreed upon color and that the color concept is bad, strong, and passive.

In another six-country cross-cultural study, Williams, Morland, and Underwood (1970) reported on color evaluations of six groups of college students (American Caucasians, American Negroes, Germans, Danes, Chinese, Asiatic Indians). The semantic differential was used as a rating scale; the color white was rated most positively by all cultures and both sex groups. Black, brown, and gray received

negative ratings. The potency dimension revealed that the colors yellow, gray, and white were rated weak; red and black were strong. The activity dimension rated black as passive, whereas red, white, and yellow were rated as active. The color evaluations remained the same regardless of whether the subject was rating the color as he saw it or the color as he read it (Williams and Foley, 1968). Williams and McMurtry (1970) reported that seventh graders as well as college students demonstrated a high degree of similarity in rating white as good, weak, passive.

Williams (1964), using Negro and Caucasian subjects from the South and Midwest, conducted a study in which he tested color connotation. Williams' interest centered around the color names black and white, although red, yellow, and brown were also included in the study. The semantic differential procedure was one in which each of ten color names was printed at the top of a separate page and there were seven-point scales defined by pairs of adjectives such as "pleasant-unpleasant" or "foul-fragrant." In both groups the color names white and black were shown to differ markedly in evaluative meaning with the former being rated quite "good" and the latter somewhat "bad."

Adams and Osgood (1973), Williams, Boswell, and Best (1975), and Naylor (Williams and Morland, 1976, p. 82) all reported results in wh[illegible]er subjects indicated a positive evaluation for the color wh[illegible]The Adams and Osgood study reported that among the seven color names four were race related (white, red, yellow, black). Their subjects from all 23 cultures rated white most positively and 21 cultures rated black most negatively.

Color connotations using children as subjects. Research results on preschool children have generally been similar to those obtained from adults. Stabler, Johnson, and Jordan (1969, 1971) reported that white and Negro preschool children picked white boxes in which to put objects with a positive value (gum, toy, money) and that the subjects placed negative objects (spider, vomit, garbage) in a black box; in addition, they reported that children assigned good self-concept statements ("I am good.") to the talking white box and that poor self-concept statements ("I am dumb.") were attributed to the talking black box. Research data also revealed that when preschool subjects were asked the question, "Which do you like best, black or white?" 81% of the white subjects responded that they liked white; 52% of the Afro subjects reported that they liked white. Morland (1962) reported that black and white elementary age children attending newly integrated schools said they preferred a white playmate to a black one, although the children would accept a black playmate. He reported little measurable racial prejudice in his subjects. The lower socioeconomic white was more willing to accept an Afro playmate than the upper-class Caucasian was.

Williams and Rousseau (1971) reported on 89 Afro preschool children ranging in age from 3.2 to 6.5 years. They reported these children tended to associate positive evaluative adjectives (good) with the white figures and negative evaluative adjectives with the black figures. On the self-identity question, these children tended to identify with the white figure rather than with the black figure.

Williams and Renniger (1966) found that color meaning awareness (as tested by evaluative adjectives) increased with age. Thirty percent of their three-year-old subjects had color meaning awareness, whereas 73% of the four-year-olds had color meaning awareness, and 81% of the five-year-old group had color meaning awareness.

The Color Meaning Test is not appropriate for children as young as three years. Williams and Morland (1976, p. 86) reported an approach taken by Boswell with three-year-old subjects in which she simultaneously presented six pairs of black and white toys. The children were invited to play with the toys while the experimentor observed their behavior. The subjects were also given the Color Meaning Test. Children who displayed the w+/b- on CMT also tended to play with the white animals more than with the black ones.

Changes in color connotation. In a series of experiments, Filler and Williams (1971) used black and white human figures for rating. Subjects rated the white figures significantly more positively than they did the same figures that were black, a fact which was consistent with other studies that report a high evaluation of the color white and a low evaluation for the color black. In their second study, the investigators paired colors with positive evaluations with white and black human figures. The ratings of the figures were systematically affected by the color names with which they had been paired.

In 1973 Williams, Best, Wood, and Filler replicated a study conducted in 1963 in which Caucasian and Afro subjects rated white as

a more positive color than black. They hypothesized that the black identity movement may have changed the color concepts. There were no appreciative changes in the meanings of color concepts. Hraba and Grant (1970) did report a change in that black children now prefer black dolls to white dolls if the children are in an interracial setting.

Williams and Morland (1976) reported on a study which investigated whether there has been a color shift in evaluative meanings for black and white as a result of the "black is beautiful" black identity movement. There was no difference in the Caucasian evaluation. Afro students, however, demonstrated a shift in evaluative meaning. The sixth graders rated white more positively; eighth graders rated the two equally; and tenth and twelfth graders rated black more positively than white. The shift in color meaning appears to occur during the junior high school years. Some studies replicated in the last seven years have not demonstrated this shift.

Harbin and Williams (1966) demonstrated that the connotative meaning of color names may be conditioned to terms with which they are associated. In a paired associate learning task, CVC (consonant-vowel-consonant) trigrams served as stimuli for color name responses. Subsequent ratings of trigrams on a semantic differential varied according to the color names with which they had been associated. Williams and Edwards (1969) conducted a study using Caucasian preschool subjects who had learned to evaluate the color black negatively. They found the Caucasian preschoolers also evaluated members of the Afro race negatively. In their study reinforcement procedures were used

successfully to weaken the black/white concept attitudes of subjects. Following the treatment, there was a reduction in the tendency to attribute negative adjectives to pictures of Negroes.

Studies in color meaning have related to research that involves racial identification (Clark and Clark, 1939; 1940), racial awareness (Clark and Clark, 1958), and racial preference (Asher and Allen, 1969). In fact, Williams and Morland (1976) suggested that there is a positive correlation between preference for white and preference for the Euro race. There was no attempt, however, to relate the white or black preferences of subjects in this study with any racial attitude.

Animal Studies

Using the squirrel monkey as a subject, Parker (1966) conducted an experiment involving light intensity. The experimental situation was one in which the only way the monkey could get food was to leave his perch which would cause his cage to be in total darkness. The monkey would not go to food or water. Although the monkey was not "tested to death," Parker surmised that the monkey might starve to death rather than endure total darkness.

Zimmerman (1973) presented a black/white discrimination reversal problem to a group of rhesus monkeys. The monkeys spent 20 days of learning on the original problem. Reversing to the white stimulus was significantly faster than reversing to the black stimulus. The preference persisted over repeated reversals. Thus, stimulus preference played an important role in development of the learned behavior.

Lockard (1963) stated that the intensity of illumination determined whether light was reinforcing to animals. He reported

on several studies that revealed a high rate of illumination to be an aversive stimulus; a dimmer light was more reinforcing for rats. Thus, apparently an intensity of brightness in the mid-range of intensity was best for learning.

The Pilot Study

A preliminary study to test whether there was a developmental aspect to preference for the color white was conducted by the writer in October, 1975. Procedures were utilized in this study to obtain black/white color preference from a group of Afro infants and toddlers.

Subjects. Twenty Afro children attending the Model Cities Infant Day Care Center in Winston-Salem, North Carolina, were subjects for the study. There were ten males and ten females ranging in age from four months to 36 months.

Procedure. Six identical pairs of toys were used to determine the infant's preference for white or black. One toy of each pair was painted white; one was painted black. The toys were horses, cars, planes, elephants, bears, dogs. Toys were placed on a background of red material prior to the infant's selection.

The test environment varied. Children who could not walk were tested in their cribs; toddlers were tested in their rooms in the presence of their caretakers; the older children were tested in a hallway just outside their rooms. (Older children were tested away from their rooms because their peers would influence the subject's selection by verbalizing or gesturing their own preferences.) The

test rooms were spacious and well lighted. Light intensity in the rooms was constant for each trial.

A test sheet designed by the experimentor was used for the study. Each pair of toys was presented to the subject. For the youngest subjects, toys were placed three to six inches apart and approximately six or eight inches from the subject. The subject was placed in the prone position for maximal visual scanning. The toy the subject crawled toward, touched, and manipulated was the toy recorded as the preferred stimulus. For the toddlers, toys were placed over three feet from the subject, and these toys were placed approximately three feet apart. This placement was selected in order to create a forced choice condition and to eliminate the possibility of simultaneous selection with both hands.

Each pair of toys was presented twice. One time the white toy was on the left; the second time the white toy was on the right. The change from left to right was to assure that neither handedness nor a response set influenced choices. The toys were presented in the same order for every subject.

Every subject had an opportunity to respond 12 times. The subject received one point each time he selected a white toy. The scores for each subject ranged from zero to 12. A score of zero indicated the subject picked the black toy every time; a score of five indicated the subject picked the white toy five times, etc.

Data Analysis. The test results were ordered according to age groups, and scores were submitted to chi-square tests. This analysis

was made to determine if there existed sufficient evidence to indicate that the fraction of responses favoring white was a function of the selected age group. In addition, a linear regression and correlation analysis was made to determine if change in the preference for white was gradual with respect to age, as opposed to an abrupt change at some age level. Percentages were also used in data analysis.

Results of the pilot study. The results of the study suggested that the fraction of a subject's "white responses" was dependent upon the age of the subject. White color preference had its strongest dependence on age when age was measured in 12-month intervals (significant at .10).

The regression analysis revealed that the number of white responses increased in a gradual linear manner as age increased (significant at .05). This result was interpreted to mean that, on the average, an increase of one white response will occur for each 11-month increase in age.

Percentages revealed that under 18 months of age some Afro infants had a preference for the color black but that older Afro subjects showed a preference for white.

Critique of methodology. All 20 subjects in the study were Afros. Thus, no statements could be made about the developmental preference for color in the population at large.

Some of the toys used in the study were inappropriate for the subjects. The horses were made of hard plastic and some subjects could have harmed themselves if not carefully supervised by the

experimentor. In addition, the horses were so tall that infants in the prone position would usually focus on the horse's feet, and the horses frightened several of the subjects. The large stuffed animals were not as interesting to the younger subjects as were the smaller toys with more intricate designs and moving parts. It was believed necessary to select some new toys for the major research project.

The test sheet used for scoring was not appropriate to the study. There was confusion as to the order in which the toys were presented. A revised score sheet appeared to be necessary.

The correlational analysis and percentages were appropriate statistical procedures for these data. However, an analysis of variance would have been more appropriate than the chi-square analysis was to determine factors related to the variation in the scores.

Summary

A review of the literature, including the pilot study, has resulted in a sizable body of knowledge concerning the development of color preference. Some conclusions can be drawn regarding color preference and color meaning. In general, infants can discriminate between colors and prefer warm, intense colors to cool, weak ones. Adults generally rate the color white higher than the color black. This fact appears to be true in all cultures, and it appears to be true regardless of racial characteristics. Children five years old and over place positive evaluations on the colors white and negative evaluations on the color black. Research suggested there may be a developmental factor in preference for white; however, this fact has

not been clearly demonstrated. There is evidence that shifts in color meaning and color preference do occur throughout the life cycle.

The overall picture regarding color preference is still incomplete and several questions remain unanswered. If a preference for the color white does exist in young children, at what age does this preference appear? Is the preference for white one which develops slowly or over a long period of time, or is it one which suddenly appears at a particular age? Do Afro children and Euro children show the same color preferences, or are there racial differences? What, if any, sex differences exist in color preference?

Little is known concerning the responses of very young children because the techniques developed for assessing color concepts have required verbal comprehension. There has been no color preference study with children younger than 24 months of age, and only one study has been conducted with children between the ages of two and three years.

The present study was one which tested infants' color preference with a nonverbal test in order to begin to answer some of these research questions. A large number of subjects (N=160) were administered the same test under controlled conditions. This is the first time such a large number of subjects and such a wide range of ages has been included in one color preference research project.

CHAPTER III

METHODS OF PROCEDURE

Research conducted to date has resulted in the development of a sizable body of knowledge concerning the development and modification of race and color concepts in young children (Williams, 1976). The present research project added to the existing body of knowledge by the use of a cross-sectional study which tested for black/white color preference in infants, toddlers, and preschool children.

The basic design was one in which subjects were required to select one of two toys (identical except that one was black, the other white). The color of toy the subject grasped was considered a preference for that color of toy on that test item.

The Sample

A purposive (nonprobability) sampling procedure was used. Subjects selected for the study were located in day care centers in Greensboro and Winston-Salem, North Carolina. Subjects known to be mentally retarded or who had any known visual or motor impairment were not included in the study. Subjects were given an unsophisticated preliminary test to determine whether they had the ability to reach for and manipulate an object. On this brief test, the experimentor approached the subject with a brightly colored toy from the day care environment; if the child reached for and grasped the toy, he was considered an appropriate subject. Subjects not demonstrating this

ability were not included in the sample. The sample size was large (N=160) because there were some uncontrolled variables and small differences were anticipated. Nine day care centers provided subjects for the study. Each center director received a copy of the abstract of the research design for his files. (A copy of this abstract may be found in Appendix B.) Two day care centers required signed parental permission slips. (A copy of the permission slip may be found in Appendix C.)

One hundred sixty subjects were tested ranging in age from six months to 53 months of age. There were an equal number of Afro and Euro subjects and an equal number of males and females. The age groupings were partialed into subgroups as shown in Table 1 so that groups could be analyzed in terms of age, race, and sex. Table 2 describes the subjects secured from each of the nine day care centers.

The subgroups A, B in each of the four groups insured an age balance within each grouping. A 12-month age interval was selected for analysis because results of the pilot study revealed color preference had its strongest dependence on age when measured in 12-month intervals.

Table 1

Grouping of Subjects by Sex, Age, and Race

Group	Sub-Group	Age Range (months)	Type of Subject
I	A	6-11	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
	B	12-17	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
II	A	18-23	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
	B	24-29	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
III	A	30-35	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
	B	36-41	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
IV	A	42-47	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females
	B	48-53	5 Afro Males 5 Afro Females 5 Euro Males 5 Euro Females

Total N=160

Table 2

Grouping of Subjects by Day Care Center, Sex, Race, and Age

Center	Sex		Race		Age Group								Total
	Male	Female	Afro	Euro	I		II		III		IV		
					A	B	A	B	A	B	A	B	
1	31	26	17	40	7	4	12	6	10	5	7	6	57
2	1	1	2	0	2	0	0	0	0	0	0	0	2
3	4	7	10	1	6	3	0	2	0	0	0	0	11
4	7	12	19	0	0	3	2	4	3	6	1	0	19
5	16	17	10	23	3	4	3	4	6	6	6	1	33
6	3	1	4	0	0	0	0	3	0	1	0	0	4
7	4	2	6	0	0	0	0	0	0	2	4	0	6
8	5	4	9	0	0	0	0	0	0	0	1	8	9
9	9	10	3	16	2	6	3	1	1	0	1	5	19
TOTAL	80	80	80	80	20	20	20	20	20	20	20	20	160

Note. I represents the group of subjects 6 months to 17 months. Group II, 18 months to 29 months; Group III, 30 months to 41 months; Group IV, 42 months to 53 months.

Research Instruments and Apparatus

The color preference test (CPT) consisting of 12 items was developed by the investigator for this study. The majority of race and color concept measures have been of a two-choice variety and have contained test items in multiples of six. According to Williams and Morland (1976, p. 287), a six-item test must generate a score of either 0 or 6 to conclude with any confidence that the color preference cannot be attributed to chance. Thus, one random choice in a subject

may skew the results. A 24-item test would establish two ranges of significant scores (17 and up and 7 and down). Thus, this 12-item test is preferred to the six-item test. The test for this research design was a 12-item test which Williams and Morland (1976) suggest is minimally adequate for the purpose of correlating differences in color preference with differences in age, race, or sex. The 12-item test was selected because some subjects were quite young (six months) and the attention span and fatigue threshold was considerably shorter than it was for their four-and-one-half-year-old peers. A nonliterate test was constructed since about one half of the subjects were at a prelanguage level of development. The forced choice procedure is one which has been used in several preference studies (Brian and Goodenough, 1929; Spears, 1964; Staples, 1932). In this procedure, the investigator waits until the child selects a toy. The scores on the 12-item test were interpreted to mean that if the subject scores a white bias that this reflected a relative bias only. The scores were not interpreted as a negative attitude toward black; nor did they reflect the intensity of the white preference (Williams and Morland, 1976, p. 291).

Six pairs of toys that would be attractive to young children were chosen. The toys were identical except that one was painted white, the other was black. Several of the toys used in the Boswell study were planes, cars, airplanes, elephants, dogs, bears. The toys for this study included cars, planes, elephants, balls, birds, and human figures. (Photographs and brief descriptions of the toys are shown in Appendix D.)

Toys were placed on a background of pale blue, which resembled a neutral color. This pale color was used as a contrast because the toys appeared equally attractive on that surface and because pale blue was the background color used for the animal pictures in some of Williams' studies (Williams, 1969; Williams, Best, Woods, and Filler, 1975) and for the Fagan study (1974). To control for light intensity, a 30-watt fluorescent desk lamp was used to illuminate the toys.

The background fabric was a washable polyester material. A table the size of a card table was constructed with a height of 24 inches. The table was covered with the blue fabric. A blue fabric backdrop was constructed that was 18 inches by 3 feet so that the children viewed the toys against a blue background regardless of the angle of fixation. Toys were placed against the backdrop about six inches apart. Children who reached for toys with both hands simultaneously were given another choice with the toys placed in another predetermined location 18 inches apart; this procedure forced them to choose one toy.

All subjects were tested in a test room apart from their peers so that other children could not influence their selection. The separate test area also eliminated some extraneous stimuli in the environment.

The 12-item score sheet was designed by the investigator and is reproduced in Appendix E. Each subject was assigned an identification number; the score sheet also included space for the subject's name, chronological age, and birthdate. There were spaces on the score sheet for the name of the parent or caretaker, the race of the caretaker,

the name of the school, and a telephone number. The test dates were recorded. Children who for some reason did not complete the 12-item test on one day were tested the next consecutive school day. If a span of three days had elapsed prior to completing the CPT, then that subject would have been eliminated from the study. (Rejection did not occur in any instance.) There was a space on the score sheet to record each child's color preference for each toy as well as space for the total number of times white was chosen.

Although socioeconomic status was not a variable specifically controlled for, this information could have produced some additional statistical insight. Therefore, a rough estimate of socioeconomic class was secured whenever possible. For instance, in profit making day care centers where parents pay as much as $25 per week, subjects were designated high SES. In some centers, children were DSS clients and these subjects were given a low SES rating. In cases where this information was not known, no SES level was assigned. (There were only two SES levels assigned, either high or low.)

The testing took place in a variety of day care settings. There was some variation in the research atmosphere because more than one day care center was needed in order to secure the appropriate number of subjects.

Method of Data Collection

Appointments were made with directors of day care centers. The research plan was described and demonstrated. If the experiment was approved, the subjects were tested within the next few days. A copy of the results was sent to the directors who requested them.

Some studies have indicated that the race of the examiner affects test scores (Katz, Henchy, and Allen, 1968; Trent, 1954; Sattler, 1970). Hraba and Grant (1970), on the other hand, found no effect. If there is a race-of-experimentor effect, the scores of the Afro children appear to be most affected by white experimentors. To control for this effect, two experimentors were used for data collection. The director of this research project (and one of the experimentors) was a mature female Euro graduate student; the other experimentor was an Afro female. Four of the nine centers provided their own research assistant by choice. These centers felt children would be less disturbed if they were always in the presence of someone who was familiar. In cases where the centers did not provide an Afro experimentor, the research director employed (at a minimum wage) an Afro female who was an early childhood education graduate of Winston-Salem State University.

In each test environment, the investigator and the assistant spent several minutes playing with and talking to the children in their day care setting prior to the actual testing. When subjects appeared comfortable and cooperative toward the investigators, the experiment began. In cases where children were still fearful, fretful, or uncooperative after a 30-minute period, they were not tested on that day. The investigator returned to test that child on the next consecutive school day. If that subject had still been uncooperative on the third day, he would have been eliminated from the study and another child his age, sex, and race would have been substituted.

All 160 children took the same test. Afro subjects were tested by the Afro investigator while the white investigator presented the toys and recorded the results; Euro subjects were tested by the Euro investigator while the Afro assistant recorded results. In every instance, both a Euro and an Afro investigator were present. (This procedure is similar to one used by Asher and Allen in 1969).

Infants were held by the appropriate investigator and toys were placed on the table by the other research assistant. Each of the six pairs of toys was presented twice. One time the black toy was on the right, and the next time the black toy appeared it was on the left. Toys were alternated to right and left positions in order to control for handedness and response set. To further control for handedness, when the car and the bird were presented, the same color was placed on the subject's right for both responses. The existence of dominant handedness caused the distribution of subjects' responses to be different than for the other four toys. The toy presentation was randomized and the order of presentation was as follows:

car	white on right
plane	white on right
elephant	white on left
ball	white on left
bird	white on left
car	white on right
plane	white on left
bird	white on left
ball	white on right

human figure	white on right
elephant	white on right
human figure	white on left

All four age groups took the color preference test. The groups were subdivided into six-month age increments to insure an age balance within each group. Chronological age was computed in such a way that the six-month interval was complete for a child to qualify for that age group. For instance, if a child were five months and 27 days old, he would not qualify as a subject for the study because he had not reached six months of age. For a child to be a subject for Group II, he must have completed his 19th month; otherwise, he would qualify as a Group I subject.

Infants who could not sit in chairs alone were held by the investigators. The investigator would say, "Look at the planes. Which plane do you want to look at? Which plane do you want to play with?" These words were repeated if the subject failed to respond. If the subject failed to respond again, after five minutes the toys were changed to the second toy order and the instructions were repeated. If there was still no response, the toys were changed to the third toy order; if the subject failed to respond, the test was discontinued and another subject was substituted. If the second or third toy order was presented before the first response could be recorded, the test was continued consecutively down the score sheet, and the first and second items were presented again at the conclusion of the test.

Children who could sit alone sat in a chair and the same questions were repeated by the investigator. Failure to respond was treated in the same manner for the older subjects as was described for the younger subjects.

After the toy was placed on the test apparatus, the investigator waited until the subject reached for and manipulated a toy. The test did not begin until the assistant reported that both toys had been sighted by the subject. If the subject fixated on and reached for only one toy, this was not recorded as a preference and that test item was repeated at the end of the test. In cases where the subject was reaching for one toy and inadvertantly moved the other (and both the tester and assistant agreed this had occurred), the item was presented again as the final test item. (No reliability scores were obtained on experimentor agreement.)

If the subject selected the white toy, the assistant circled the w on the score sheet. Subsequently, new toys were placed on the test table by the assistant and the old toys were taken away. Toys were presented to the subject in the random order listed on the score sheet (Appendix E). The left on the score sheet indicated the direction to the infant's left as he faced the toy.

The test continued until the subject made all 12 selections. When the test was completed, the score was recorded in terms of the number of times the color white was chosen.

Several different experimental settings were used in order to obtain the required amount of data. Every effort was made, however, to achieve consistency in the experimental setting:

(1) All subjects attended day care centers.

(2) The same research investigator was present for each of the 160 subjects.

(3) In cases where infants were held, an Afro experimentor held the Afro infants while the Euro experimentor held the Euro infants.

(4) For all subjects, a separate test room was used to collect data.

(5) The same "instructions" were verbalized to all subjects, regardless of age.

(6) The same toys were presented to all subjects.

(7) The toys were presented on the same test table to all children.

(8) The toys were presented to each subject in the same order.

(9) The toys were placed at the same angle for each subject so that the visual stimulus was the same for each child.

(10) The same light intensity was present for illuminating the toys (fluorescent desk lamp, 30-watt daylight).

Data Analysis

The statistical methods to be used in analyzing the response data are described below. The statistical package SPSS was utilized to perform needed computations. Response data were obtained from the color preference test. For the CPT, a subject received one point each time he selected a white toy. Each subject responded 12 times and thus may have received a score of 0 to 12.

Independent variables used in the analysis were the age, race, and sex of the child and the type of toy. The following null hypotheses were tested.

Hypothesis I. In the absence of all independent variables, there will be no color preference for the colors black and white.

Method: CPT distributions were regarded and derived from binomial experiments with 12 trials per experiment (each trial either black or white). Each experiment was classified as either black bias, unbias, or white bias. Under the null hypothesis, the probability of choosing white on each trial is .5 (no color bias). An expected distribution of scores was computed. This information was then compared with the observed distribution of scores. After all subjects had been scored, a chi-square test was used to compare the observed and expected frequencies. The computed chi-square value is a measure of how much the observed frequencies deviate from those expected in the three categories. If the computed chi-square value was significantly greater ($p < .05$) than the critical value, then the null hypothesis was rejected. The level of significance is the probability that the hypothesis which is actually true has been rejected.

Hypothesis II. In the presence of each independent variable (considered separately), there will be no color preference.

Method A. Each of the 1920 CPT responses from the 160 subjects was classified both by color chosen and the independent variable (e.g., age). A chi-square analysis tested the hypothesis, H_o: the fraction of white responses is independent of the variable under analysis.

Method B. Through the use of standard formulas, a least squares regression equation was generated. This equation displayed the best possible linear relationship that existed between the independent variables--age, race, sex, and toy difference--and the dependent variable, test score. Each regression coefficient in the equation represented the expected change in test score when the corresponding independent variable was changed on unit (all other independent variables held constant). From this point of view, regression coefficients provide a means of evaluating the contribution of particular independent variables on the change of test scores.

Hypothesis III. In the presence of each independent variable, when the remaining variables are controlled, there will be no color preference.

Method A. Using analysis of variance, the total variation of test scores was partitioned into components which were attributed to the main factors, to interaction between factors, and to a remainder that was associated with random error. The variation associated with each of these components was compared to the variation

because of error. This comparison is expressed as an F ratio. If a component's F ratio exceeds a critical value, then that component has a significant (.05) effect on the test scores.

Method B. Multiple regression is an extension of ideas used in a two-variable linear regression. Partial correlation coefficients are computed. These values measure the strength of the linear relationship between test scores and a particular independent variable when then effect of the remaining variable has been removed.

After statistical analysis was complete, the investigator discussed the findings of the study in terms of (1) whether the hypotheses may be accepted or rejected; (2) implications that the results may have on theories of infant visual preference; and (3) some areas for further research.

CHAPTER IV

DATA ANALYSIS

This chapter describes the statistical analysis that was performed on the response data. For the color preference test (CPT), a subject received one point each time he selected a white toy. Consequently, each subject received a score from 0 to 12. The dependent variable used in the analysis was the subject's score. Independent variables were the age, race, and sex of the child and the type of toy. The statistical package SPSS (Nie et al, 1970) was utilized to perform needed computations.

Color preference was evaluated by testing null hypotheses. In the following analysis, each hypothesis is stated with a description of the statistical methods used to perform the test. A statement of results is also associated with each hypothesis.

Hypothesis I. Without reference to any independent variable, there will be no significant differences in color preference for the colors black and white.

Method A. The 1920 CPT responses from the 160 subjects were divided according to the color chosen. A chi-square test at a .05 significance level was conducted to test the hypothesis that, as a group, the subjects had no preference concerning the color chosen. Under this hypothesis, the probability of a white response is .5. Table 3 shows the observed and expected frequency of responses for

black and white. The computed chi-square value was 9.06 ($p < .005$). Hypothesis I was rejected.

Table 3

Expected and Observed Frequency of Responses for Black and White

	Chose White	Chose Black
Expected Number	960	960
Observed Number	894	1026

$p < .005$

Method B. The distribution of subjects with respect to their scores is represented in a bar graph in Figure 1.

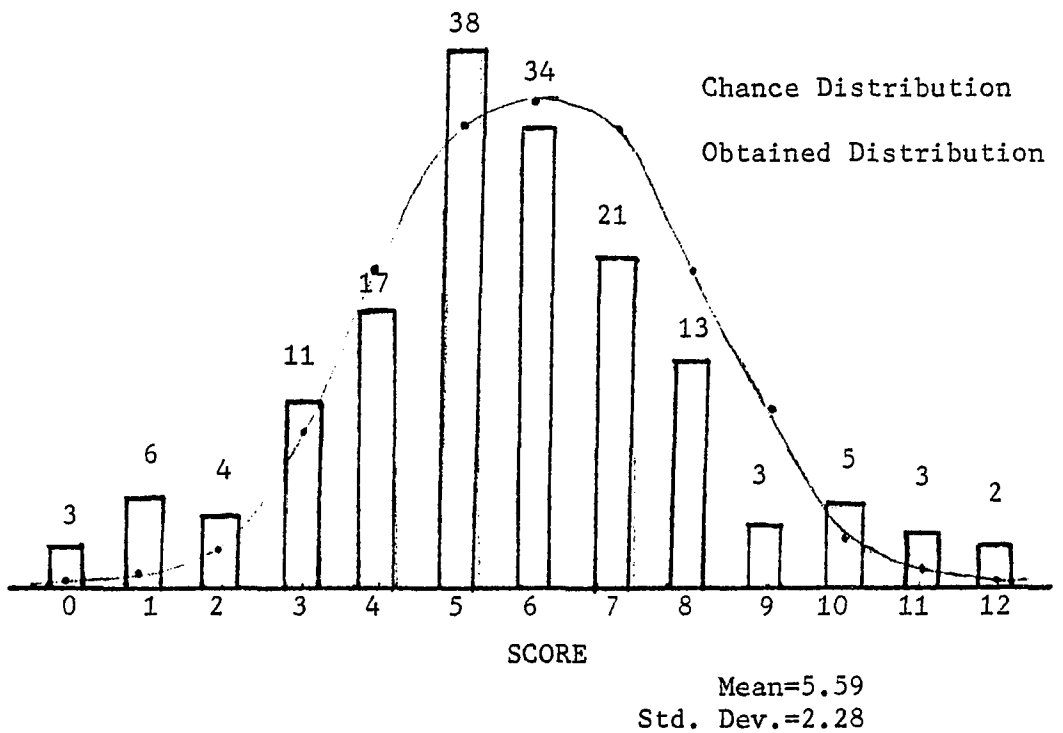


Figure 1. Actual distribution of subjects with respect to test scores and normal approximation to expected distribution of subjects.

This distribution was assumed to be derived from 160 binomial experiments with 12 trials per experiment (each trial producing either black or white). Under the null hypothesis, the probability of white on each trial is .5 (no color bias). Table 4 displays the resulting probabilities of obtaining each of the possible scores and the expected number of subjects obtaining each score. A normal curve approximating this expected distribution appears in Figure 1. A brief comparison of expected and observed distributions reveals an unexpectedly large number of subjects obtaining extreme scores (either low or high). Further, the observed distribution was generally shifted toward less than expected scores (observed mean 5.59, expected mean 6.00).

Table 5 represents a grouping of subjects into three bias categories. Each subject was classified as either black bias, unbias, or white bias. Under the null hypothesis, the probability of obtaining each classification is given as well as the expected number of subjects. Also given is the observed number in each group. A chi-square test was used to compare the observed and expected frequencies. The computed chi-square value was 14.50 which is significant at the .005 level. Consequently, Hypothesis I was rejected.

Table 4

Expected Number and Observed Number of Subjects Attaining Specific Test Scores

Score	0	1	2	3	4	5	6	7	8	9	10	11	12
Probability	.000	.003	.016	.054	.121	.193	.226	.193	.121	.054	.016	.003	.000
Expected Number	.00	0.48	2.56	8.64	19.4	30.9	36.2	30.9	19.4	8.64	2.56	0.48	0.00
Observed Number	3	6	4	11	17	38	34	21	13	3	5	3	2

$p < .01$

Table 5

Chi-square Table of Expected Number and Observed Number of Subjects Attaining Three Bias Categories

	B+/W- Bias	No Bias	W+/B- Bias
Group	1	2	3
Scores	0,1,2,3	4,5,6,7,8	9,10,11,12
Probability	.073	.854	.073
Expected Number	11.68	136.64	11.68
Observed Number	24	123	13

$p < .01$

As a further refinement, subjects were grouped into five categories. Each subject was classified as either definite black bias, probable black bias, unbias, probable white bias, or definite white bias. Table 6 represents the results of this grouping. The computed chi-square value of 53.96 is significant at the .005 level. It is apparent that color preferences for black and white existed within the 160 subjects.

Table 6

Chi-square Table of Expected Number and Observed Number of Subjects Attaining Definite, Probable, and No Bias Scores

	Definite B+/W-	Probable B+/W-	No Bias	Probable W+/B-	Definite W+/B-
Scores	0,1,2	3,4	5,6,7	8,9	10,11,12
Probable	0.019	.175	.612	.175	.019
Expected	3.04	28.0	97.92	28.0	3.04
Observed	13	28	93	16	10

$p < .005$

Hypothesis IIa. When age is the independent variable, there will be no significant differences in preference for the colors black and white.

Method A. Each of the 1920 CPT responses from the 160 subjects was classified both by color chosen and age. Table 7 presents the responses tabulated with respect to six-month age groups. A chi-square test was conducted to test the hypothesis that, by six-month age groups, the subjects had no color preference. The computed chi-square is 35.93 ($p < .005$). Therefore, the hypothesis was rejected. Table 8 represents the responses tabulated with respect to 12-month age groups. In this case, the computed chi-square value was 21.44. This value is significant at the .005 level. The hypothesis was rejected that, by 12-month age groups, the subjects had no color preference.

Table 7

Chi-square Table of Black and White Responses
Within Six-Month Age Groups

Color Choice	Age in Months								
	6-11	12-17	18-23	24-29	30-35	36-41	42-47	48-53	Total
Chose White	83	101	110	111	113	139	132	105	894
Chose Black	157	139	130	129	127	101	108	135	1026
Total	240	240	240	240	240	240	240	240	1920

$p < .005$

Table 8

Chi-square Table of Black and White Responses
Within Twelve-Month Age Groups

Color Choice	Age in Months				
	6-17	18-29	30-41	42-53	Total
Chose White	184	221	252	237	894
Chose Black	296	259	228	243	1026
Total	480	480	480	480	1920

$p < .005$

Method B. Each of the 160 subjects was classified according to age group and bias category. Table 9 shows the tabulation for 12-month age groups and three bias categories. A chi-square test was employed to test the hypothesis that the number of subjects appearing in each bias category was independent of age group. The computed chi-square value was 17.60 (p .007). The hypothesis was rejected.

Table 9

Chi-square Table for Twelve-Month Age Groups and Three Bias Categories

Age Group	B+/W-	No Bias	W+/B-	Total
I 6-17 months	12	27	1	40
II 18-29 months	3	36	1	40
III 30-41 months	5	28	7	40
IV 42-53 months	4	32	4	40
Total	24	123	13	160

$p < .007$

A brief examination of Table 9 revealed (1) in the youngest age group the 40 subjects were skewed toward a black bias, (2) as groups increased in age, there was a general shift toward white bias, (3) in moving from age group III to age group IV, there was a slight reverse shift toward black bias. The statistical coefficient Gamma was computed to measure the strength of this shift. A Gamma value of +.359 represents a fairly strong relationship.

Table 10 shows the tabulation of subjects for 12-month age groups and five bias categories. The computed chi-square value is 21.35 which is significant at the .05 level. A Gamma of .331 shows a fairly strong shift from black bias toward white bias as subjects progress in age. Again, the reverse shift toward black bias for the oldest age group may be observed.

Table 10

Chi-square Table for Twelve-Month Age Groups with Definite, Probable, and No Bias Categories

Age Group	Definite B+/W- Bias	Probable B+/W- Bias	No Bias	Probable W+/B- Bias	Definite W+/B- Bias	Total
I 6-17 mo	6	12	19	3	0	40
II 18-29 mo	1	8	27	3	1	40
III 30-41 mo	2	6	22	5	5	40
IV 42-53 mo	4	2	25	5	4	40
Total	13	28	93	16	10	160

$p < .05$

Method C. One-way analysis of variance was employed to examine the variation in test scores associated with age (see Table 11). Table 11 reveals a pattern of the age effect that was previously observed in Method B. For the youngest age group, a deviation of -.99 means the average number of white choices was less than the grand mean. Deviations increased and became positive by the third group. Although positive, the deviation for the oldest group decreased.

Table 11

Analysis of Variance by Twelve-Month Age Groupings

Source of Variation	Mean Square	F	P
Age	21.34	4.37	.006
Explained	21.34	4.36	.006
Residual	4.89		
Total	5.2		

Table 12 represents the results of an analysis of variance when six-month age groups were employed. The F value is significant at the .003 level. Deviations increased through the third age group and then declined becoming negative for the oldest age group.

Table 12

Analysis of Variance Score by Six-Month Age Group

Source of Variation	Mean Square	F	P
Age	15.32	3.24	.003
Explained	15.32	3.24	.003
Residual	4.73		
Total	5.20		

Method D. A regression analysis was employed to test the hypothesis that there is no linear relationship between test score and the age of the subject (see Table 13).

Table 13

Regression Analysis Representing the Relationship Between Test Score and Age

Analysis of Variable	DF	Mean Square	F	r	r^2
Regression	1	41.609	8.373	2.24	
Residual	158	4.969			.050

Variable	B (Regression Coef.)	Standard Error B	F
Age	.036	.013	8.373
Constant	4.517		

The regression equation is SCORE=.036AGE+4.517. When age changes by one month, then the subject's score is expected to change by .036. Hence, a subject's score is predicated to increase by .43 each year. The computed F Value is significant at a .01 level. Hypothesis IIa, that there is no linear relationship between age and test score, was rejected. The standard error of 2.229 represents the average error in predicting a subject's score from the equation. Figure 2 presents a graph representing the linear relationship between age and test score.

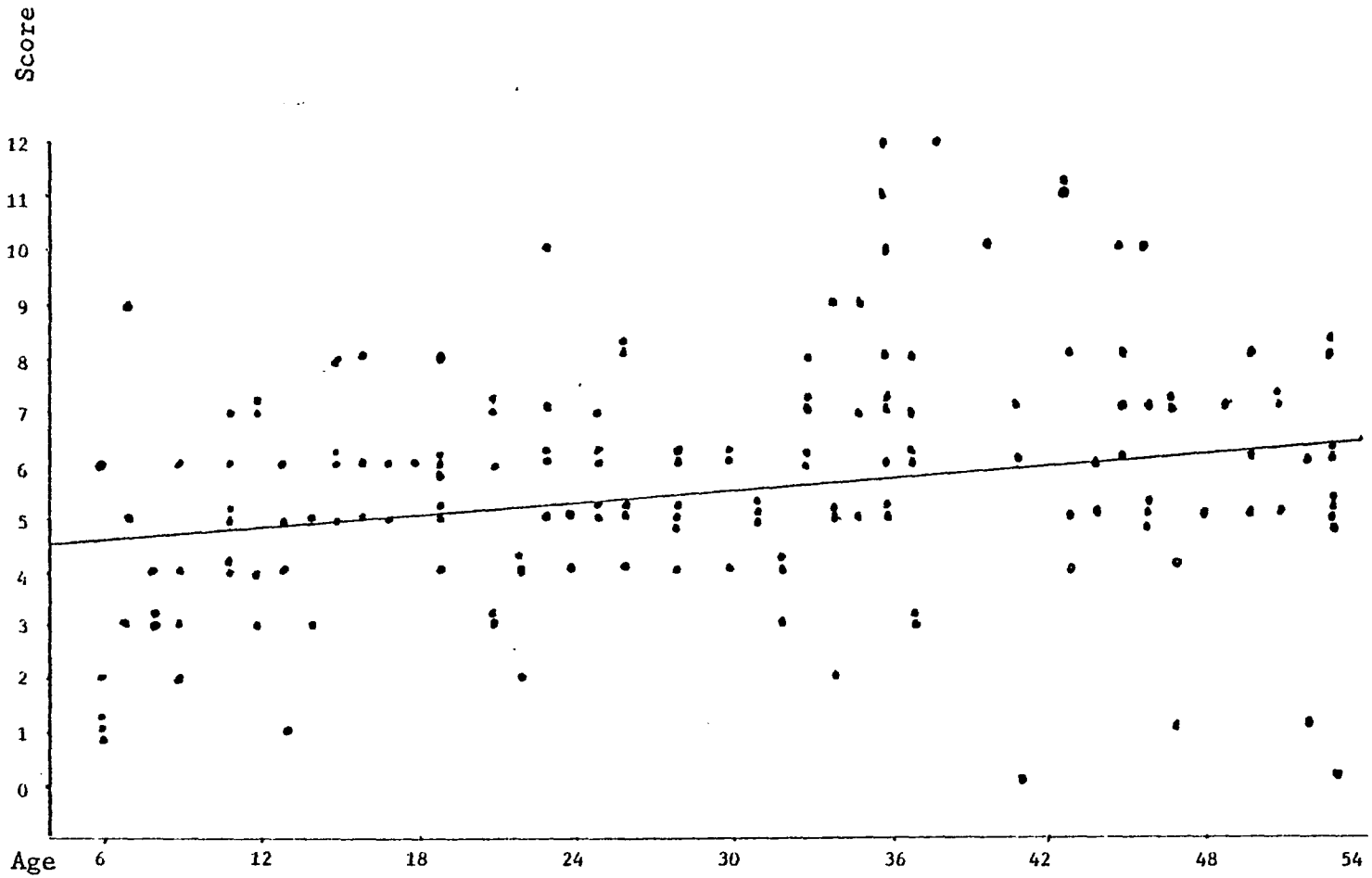


Figure 2. The linear relationship between age and test score.

Hypothesis IIb. When race is the independent variable, there will be no significant differences in preference for the colors black and white.

Method A. Each of the 1920 CPT responses was classified both by color chosen and race of the subject. Table 14 displays the tabulation. A chi-square test was conducted to test the hypothesis that, when grouped by race, the responses showed no color preference. The computed chi-square was 6.10. This value is significant at the .05 level. Hypothesis IIb was rejected.

Table 14

Chi-square Table for Number of White Choices by Race

Race	Number of White Choices												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Euro	2	4	4	6	7	20	18	8	6	2	2	0	1
Afro	1	2	0	5	10	18	16	13	7	1	3	3	1

$p < .05$

Method B. Each of the 160 subjects was classified according to race and bias category. Table 15 represents the scores for three bias categories with a computed chi-square of 3.56 which is not significant at the .05 level. Table 16 contains five bias categories. The chi-square value of 5.52 is not significant at the .05 level. When Euros and Afros were distributed with respect to bias categories, no significant differences appeared between the two distributions.

Table 15

Chi-square Table for Bias and No Bias Categories by Race

Race	B+/W- Bias	No Bias	W+/B- Bias
Euro	16	59	5
Afro	8	64	8

$p < .05$

Table 16

Chi-square Table for Definite, Probable, and No Bias Categories by Race

Race	Definite B+/W-	Probable B+/W-	No Bias	Probable W+/B-	Definite W+/B-
Euro	10	13	46	8	3
Afro	3	15	47	8	7

$p < .05$

Method C. An analysis of variance was conducted. Table 17 displays the results. The computed F value fails to be significant at the .05 level. Thus, Hypothesis IIb was not rejected.

Table 17

Analysis of Variance Scores by Race

Source of Variation	Mean Square	F	P
Race	18.225	3.56	.06
Explained	18.225	3.56	.06
Residual	5.117		
Total	5.20		

Hypothesis IIc. When sex is the independent variable, there will be no significant differences in preference for the colors black and white.

Method A. Each of the 1920 CPT responses was classified both by color chosen and sex of the subject. Table 18 displays the tabulation. A chi-square test was conducted to test the hypothesis that, when grouped by sex, the responses showed no color preference. The computed chi-square was 1.42. This value is not significant at the .05 level. Hypothesis IIc was not rejected.

Table 18

Chi-square Table for Number of White Choices by Sex

	Number of White Choices												
Sex	0	1	2	3	4	5	6	7	8	9	10	11	12
Male	0	4	2	7	10	17	19	11	6	0	3	1	0
Female	3	2	2	4	7	21	15	10	7	3	2	2	2

$p < .05$

Method B. Each of the 160 subjects was classified according to sex and bias category. Table 19 shows the tabulation for three bias categories with a computed chi-square of 2.16. This value is not significant at the .05 level. Table 20 contains five bias categories. The chi-square value of 2.77 is not significant at the .05 level. When males and females were distributed with respect to bias categories, there were no significant differences between the two distributions.

Table 19

Chi-square Table for Bias and No Bias Categories by Sex

Sex	B+/W- Bias	No Bias	W+/B- Bias
Male	13	63	4
Female	11	60	9

$p < .05$

Table 20

Chi-square Table for Definite, Probable, and No Bias Categories by Sex

Sex	Definite B+/W-	Probable B+/W-	No Bias	Probable W+/B-	Definite W+/B-
Male	6	17	47	6	4
Female	7	11	46	10	6

$p < .05$

Method B. Each of the 160 subjects was classified according to sex and bias category. Table 19 shows the tabulation for three bias categories with a computed chi-square of 2.16. This value is not significant at the .05 level. Table 20 contains five bias categories. The chi-square value of 2.77 is not significant at the .05 level. When males and females were distributed with respect to bias categories, there were no significant differences between the two distributions.

Table 19

Chi-square Table for Bias and No Bias Categories by Sex

Sex	B+/W- Bias	No Bias	W+/B- Bias
Male	13	63	4
Female	11	60	9

$p < .05$

Table 20

Chi-square Table for Definite, Probable, and No Bias Categories by Sex

Sex	Definite B+/W-	Probable B+/W-	No Bias	Probable W+/B-	Definite W+/B-
Male	6	17	47	6	4
Female	7	11	46	10	6

$p < .05$

Method C. An analysis of variance was conducted. Table 21 displays the results. The computed F value is not significant at the .05 level. The variation in scores associated with sex was not significant when compared with the variation due to error. Thus, Hypothesis IIc is not rejected.

Table 21

Analysis of Variance Scores by Sex

Source Variation	Mean Square	F	P
Sex	4.23	0.812	.999
Explained	4.25	0.812	.999
Residual	5.206		
Total	5.200		

Hypothesis IId. When toy type is the independent variable, there will be no significant differences in preference for the colors black and white.

Method. For a specific toy type, each subject could choose the white toy either 0, 1, or 2 times. Table 22 displays for each toy type the distribution of the 160 subjects according to the number of times the white toy was chosen. A chi-square test was employed to test the hypothesis that the number of times the white toy was chosen is independent of the toy type.

When the car and bird were presented, the same color was placed on the subject's right for both responses. The existence of dominant handedness would cause the distribution of subjects for these two toy types to differ from the distributions for the other four toy types. Consequently, the car and bird columns of Table 22 were excluded from the chi-square test.

Table 22

Number of Times White Toy Was Chosen by Toy Type

Number Times Chose White	Plane	Elephant	Ball	Human
0	40	43	41	36
1	93	89	87	95
2	27	28	32	29

$p < .05$

Using the columns of Table 22 for plane, elephant, ball, and human, a chi-square value was computed. The value is not significant at the .05 level. The number of times a white toy was chosen is independent of the type of toy presented to the subject. Hypothesis IId was not rejected.

Hypothesis III. In the presence of each independent variable--age, race, or sex--when the other two variables are controlled, there will be no significant differences in color preference.

From Hypothesis IIc, it was concluded that sex showed no significant relationship with color preference. In order to determine whether or not sex should be retained as a variable in Hypothesis III, a matrix of correlation coefficients was established. This matrix appears in Table 23. It may be observed that sex has a low correlation with each of the other variables. Consequently, the sex variable was removed from further consideration.

Table 23

Correlation Matrix of Score, Age, Race, and Sex

	Score	Age	Race	Sex
Score	1.000	0.224	0.148	0.071
Age	0.224	1.000	0.003	-0.016
Race	0.148	0.004	1.000	0.00
Sex	0.071	-0.016	0.000	1.000

Method. A two-way analysis of variance was employed to examine the collective effect of age and race on the variation in test scores. Table 24 displays the results when 12-month age groups were used. Examination of the table reveals the following information:

(1) The main effects are significant at the .002 level. The two variables, age and race, as a whole have a statistically significant effect on the test scores.

(2) There is a significant interaction between age and race. Age differences did not produce the same effect on test scores for Euros as it did for Afros. The significant interaction also implies that the effect of race on test scores was not uniform across different categories of age.

Table 24

Analysis of Variance by Age and Race

Source of Variation	Mean Square	F	P
Main Effects	20.562	4.445	.002
Age/12 months	21.342	4.613	.004
Race	18.225	3.939	.046
2-Way Interaction Age/Race	13.775	2.978	.033
Explained	17.654	3.816	.001
Residual	4.626		
Total	5.200		

(3) A significant F value was computed for age and race when the two variables were considered separately. However, because of their significant interaction, emphasis should be placed on examining the differences between Euro and Afro scores across age groups.

A two-way analysis of variance was also employed for six-month age groups and race. Table 25 represents the results. The same three observations can be made using six-month age groups as were made for 12-month groups.

Table 25

Analysis of Variance by Six-Month Age and Race

Source of Variation	Mean Square	F	P
Main Effects	15.687	3.586	0.001
Age/Six Months	15.325	3.503	0.002
Race	18.225	4.166	0.041
2-Way Interaction Age/Race	10.182	2.327	0.028
Explained	13.118	2.999	0.001
Residual	4.375		
Total	5.200		

A regression analysis was employed to determine the extent to which age differences did not produce the same effect on test scores for Euros as for Afros. Table 26 displays the results.

Table 26

Regression Analysis Representing the Relationship Between Test Score and Race

	Euro	Afro			Mean Square		F Value	
Corr. Coef. R	.067	.391	Analy. of Var.	DF	Euro	Euro	Euro	Afro
R Square	.004	.153	Regression	1	1.84	61.0	.351	14.1
Stand Err.	2.290	2.077	Residual	78	5.24	4.31		

	B (Regression Coef.)		Std. Error B		F Value	
Variable	Euro	Afro	Euro	Afro	Euro	Afro
Age	.011	.062	.018	.017	.351	14.14
Constant	4.935	4.069				

Regression Equation

Euro: SCORE=.011AGE+4.935 (Not significantly different from SCORE=5.250)

Afro: SCORE=.062AGE+4.069 (Is significantly different from SCORE=5.925)

The F value for Euro was not significant. The regression equation for Euro does not deviate significantly from the Euro mean score of 5.250 when age is not a factor. The F value for Afro is significant at the .01 level. The regression equation is SCORE=.062AGE+4.069. (This equation may be compared to the regression equation established in Hypothesis IIa for Euro and Afro combined: SCORE=.036AGE+4.517.) For Afros, when age changes by one month, the subject's score is expected to change by .062. Hence, an Afro subject's score is predicted to increase by .74 each year. The standard error of 2.077 represents the average error in predicting an Afro subject's score from the equation.

Figure 3 and Figure 4 present the Afro and Euro scores when plotted with respect to age. Also shown are graphs of the Afro and Euro regression equations. Hypothesis III is rejected. In the presence of age, Afros show a preference for color. No such preference exists for Euros.

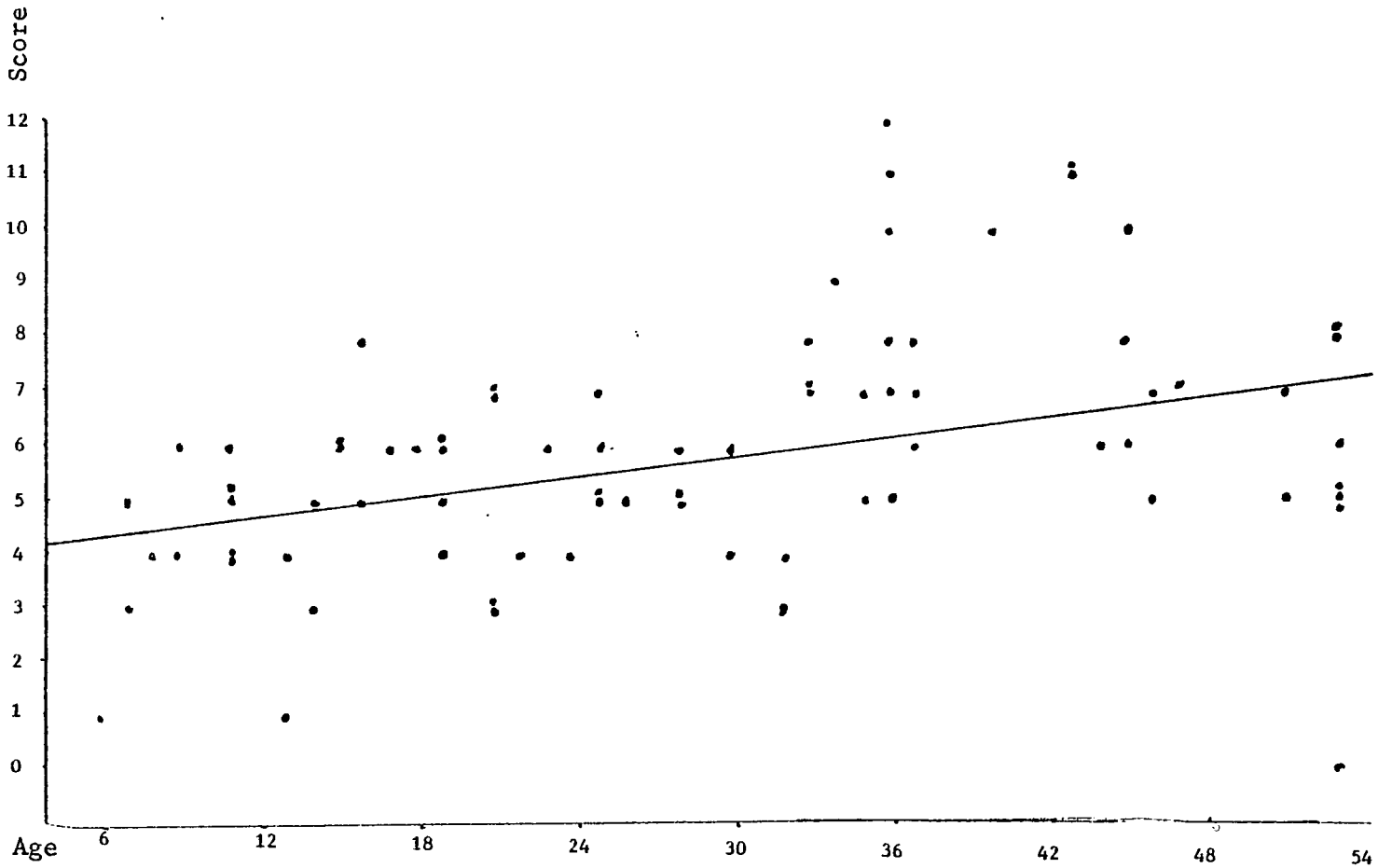


Figure 3. The linear relationship between age and Afro subjects' scores.

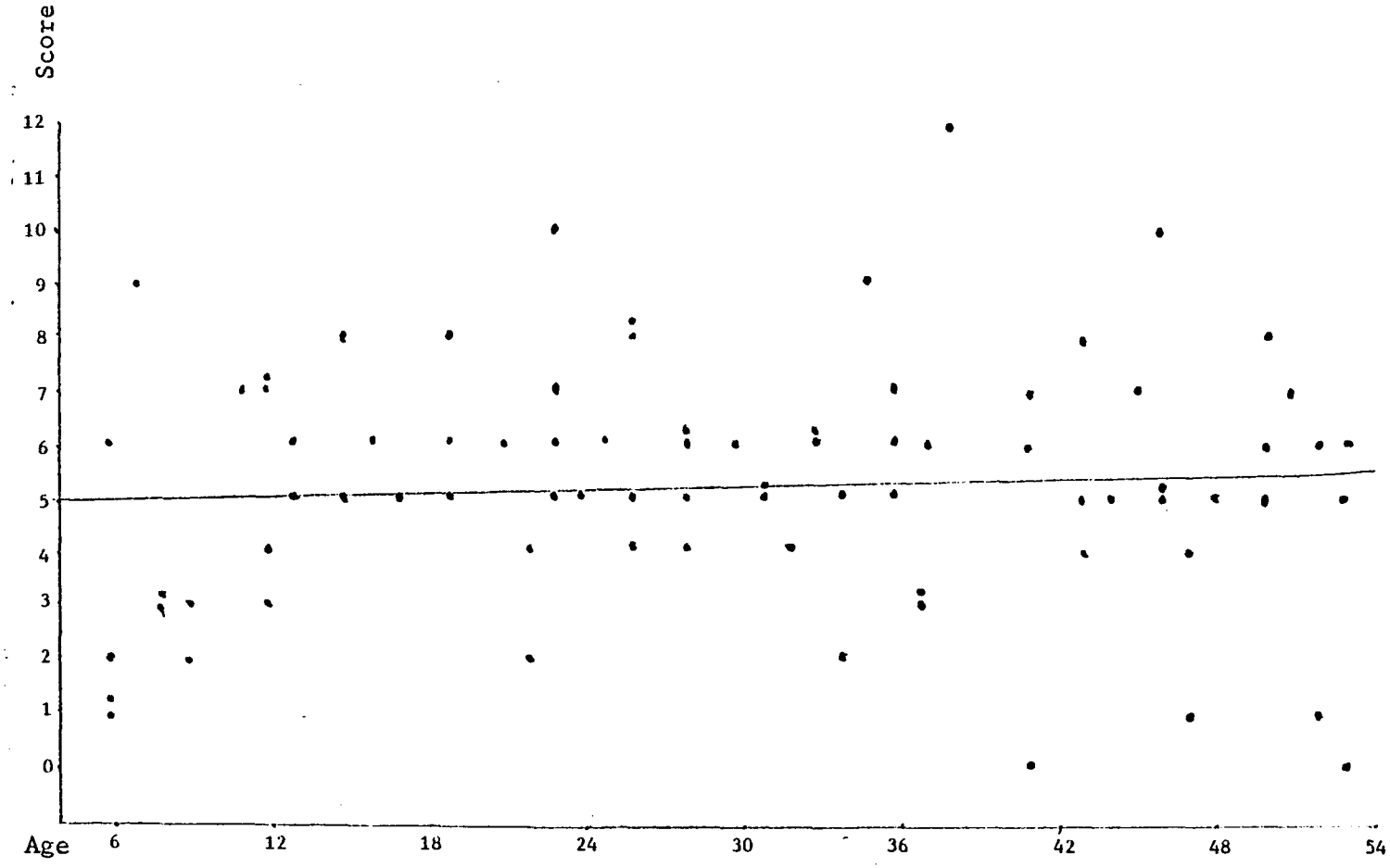


Figure 4. The linear relationship between age and Euro subjects' scores.

CHAPTER V

DISCUSSION OF RESULTS

The purpose of this study was to add to the existing body of knowledge on color preference of infants and young children. The basic design was one in which subjects were required to select one of two toys (identical except that one was black, the other white). The color of toy the subject grasped was considered a preference for that color of toy on that test item.

The study was designed to determine whether there was, in fact, an observable color preference in infants and young children. The study was designed to determine whether, if such a preference existed, the age of the child determined the strength of the color preference. An age range of six months to 47 months was used in the study so that any developmental trend which may have existed would become evident. Racial and sex differences in color preference would be detected if such differences existed. Finally, the toy type was analyzed to determine whether the test item was a factor in selection of a black or a white toy.

The null hypothesis used in the study is that there would be no differences in color preference between subject, regardless of age, race, or sex, and that there would be no difference between any group of subjects in responses to individual toy test items.

The results will be discussed in the order of the stated hypotheses in Chapter I (p. 6). Each hypothesis will be named and will be designated as accepted or rejected. More specific information on data will be referred to in the results section.

The discussion for each hypothesis will be divided into two separate sections. The first section will be a discussion of group scores. These data reflect the total number of responses for all subjects; for instance, 160 subjects made 12 responses each which totaled 1,920 separate responses. Group scores, then, will reflect the 1,920 responses of all subjects.

Individual scores will also be discussed. For instance, each of the 160 subjects had a single score which represented the number of times the subject chose white. Thus, discussion of individual scores reflect only 160 scores.

This chapter concludes with some other considerations that were included in analysis but were not a major part of the study. The socioeconomic status and race of the subject's caretaker were recorded and analyzed to determine whether these variables affected the results. Some comments regarding how hand dominance affected the scores will also be included.

Hypothesis I: Without reference to any independent variables, there will be no significant differences in preference for the colors black and white.

A. Group Score: Reject the hypothesis at .005. When all scores for all subjects were combined, black was chosen significantly more times than white was.

B. Individual scores: Reject the hypothesis at .01. Subjects demonstrated a color bias higher than chance on either end of the distribution of scores. For example, individual color preferences were shown for black, as well as for white.

Discussion. These results were somewhat surprising since results of most color preference research suggest that the very opposite is true. Adams and Osgood (1973) studied 23 separate cultures to test the cross-cultural validity of color concepts. They suggested that there were some universals in the color domain and one of these was that white was preferred over the color black. Hurlock (1927) reported black was the least preferred color. Studies using infants, children, and adults have reported that there is a preference for the color white over the color black (Clark & Clark, 1958; Morland, 1962; Morland & Underwood, 1970; Valentine, 1912). Williams and Morland (1976) reported that it was "very uncommon to encounter a child with a reverse bias, even among Afro-American children."

These findings may, at first, appear to be inconsistent with the present study. Williams and Morland (1976) are careful to point out, however, that young subjects have not been included in their studies and that younger children may behave differently from preschool or school age subjects.

Perhaps investigators should reexamine the less quoted studies which have suggested there may be a preference for the color black. Ball and Cantor (1974) reported white boys preferred black human photographs over white ones. Gregor and McPherson (1968) found that

black children preferred a black doll, a fact confirmed by Hraba and Grant (1970). In both these studies, the racial names for white and black were under discussion rather than the color names for white and black.

The pilot study for this research project suggested that at a young age Afro subjects exhibit a preference for the color black. The results generally confirm this finding.

Hypothesis IIa: When age is an independent variable, there will be no significant differences in preference for the colors black and white.

A. Group Scores: Reject at .005. Color preference is dependent on age. Whether scores were analyzed by six-month or 12-month groupings, there was a shift toward white preference as age increased.

B. Individual Scores: Reject at .01. When scores were analyzed by 12-month age intervals, there was an increase in the number of times the subject chose white. This increase in white preference continued until the oldest group was analyzed (42 months to 53 months). In this group there was a significant shift toward preference for the color black. The strength of the shift to black is a moderate one (according to the Gamma coefficient). The regression equation revealed that a subject's score is predicted to increase by .43 each year.

Discussion. These results are consistent with some previous research findings that suggested age and color preference are related. In 1932 Staples reported that in five groups of infants (six months-24 months) color preferences changed with age. Although the colors black and white were not used, the color gray (when paired with primary colors) was less preferred as age increased. These results are consistent with the pilot study which reported an increase in the number of white responses with an increase in age.

The idea that preference for white may increase and at a certain age decrease has been suggested in other studies. Clark and Clark (1958) reported that the majority of their Negro subjects preferred a white doll to a black one; their subjects were divided into four age groups (three years to seven years), and as age increased in the three youngest groups, the preference for white increased. Then, at age six years, the preference for white decreased. Morland (1972) reported his sixth, eighth, tenth, and twelfth grade Negro subjects placed a more positive evaluation on the color white than on black until the tenth grade when a shift toward black preference was noted. Williams and Rousseau (1971) studied three age groups of Negro subjects in which they administered the Color Meaning Test. The age group averages were four years-three months, five years-five months, and six years. They reported a tendency toward white bias in all three groups. The white bias increased from the youngest to the middle groups but decreased from the middle group to the oldest group. Since Williams and Rousseau did not carefully control the ages of their subjects, it is difficult to compare with the present study.

Brian and Goodenough (1929) also reported shifts in visual preferences with age. Their subjects preferred form to color by age three; subsequently there was a shift to form preference until the subjects were age four when color preference was again stronger. This shift from form to color occurred at exactly the same age that the shift from W+ to B- occurred in the subjects in this study.

Clark and Clark (1939) used three age groups of Negro children as subjects. They used black and white line drawings and asked which drawing of a human figure the subject preferred. There was an increase in black preference from the youngest group (three years old) to the middle group (four years old), but there was no increase when scores from the middle group to the oldest group (age five years) were compared. This study seems to contradict the findings in the Clarks' study except for the idea that age does affect color preference, and when the children are about four years of age, there seems to be some sort of change in the type of preference.

In general, results of the current study confirm findings that age does affect color preference. However, studies are contradictory in reporting the direction of color preference with regard to age.

Hypothesis IIb. When race is the independent variable, there will be no significant differences in preference for the colors black and white.

A. Group Scores: Reject at .05. Afro subjects chose white more frequently than Euro subjects did.

B. Individual Scores: Accept the null hypothesis. Results indicated that the large number of subjects

in the mid-range who scored no color bias outweighed any individual differences which were noted.

Discussion. Racial differences have been reported in a number of studies. However, there have been no studies which reported that Afro subjects preferred white more than did Euro subjects. In fact, the results of the present study appear contradictory to studies previously conducted. Kilman (1977) reported that Negro subjects preferred playing with a black doll and Euros preferred playing with a white doll. Stabler (1972) reported Euro children assigned more positive statements to the talking white box than did Afro subjects. Stevenson and Steward (1958) reported that their Afro children assigned more negative roles to pictures of Negro children than Euro children did to pictures of white children. A cross-sectional study using adult subjects revealed that over a six-year period Afros viewed black more positively; there was no change in the positive evaluation of white in Euro subjects (Williams & Tucker, 1971). Williams and Morland (1976) reported racial differences in shifts from one color preference to another. No racial differences were reported in color preference studies of Hyrlock (1927), Morland (1962), Stabler (1969), Williams (1964).

In general, the present research suggests that the variable of race does affect color preference, but not in the direction that previous studies indicated. That is, young Afro subjects given a forced choice color preference test prefer the color white more than the color black.

Hypothesis IIc: When sex of the subject is the independent variable, there will be no significant differences in color preference for the colors black and white.

A. Group Scores: Accept the null hypothesis. Although more girls chose white than boys did, the difference was not significant.

B. Individual Scores: Accept the null bypothesis. There were no sex differences in color preference.

Discussion. Some visual preference studies have reported sex differences. As early as 1932, Staples reported infant girls preferred bright colors to the color gray before infant boys demonstrated this preference; and when she ranked color preferences by sex, significant sex differences were present. Clark and Clark (1939) reported sex differences in a task that required Negro children to make self-identity choices when they looked at drawings. Allen and Guilford (1936) reported sex differences in judging color values, but the colors black and white were not included in the study.

More recent studies have also reported sex differences. In a study in which Negro children were to select a doll preference, Negro boys preferred the white doll more than did Negro girls. Stabler et al (1971) reported more male than female subjects heard more positive statements from the white talking box and more negative statements from the black talking box. Sigman and Parmalee (1974) found significant sex differences in infant visual preferences although the colors black and white were not used in their list of preferences.

Several color preference studies reported no sex differences (Child, Hansen, and Hornbeck, 1968; Clark and Clark, 1940; Garth, Moses, and Anthony, 1938). This study confirmed these studies when it indicated that the variable of sex had no effect on color choice.

Hypothesis IId: When toy type is the independent variable, there will be no significant differences in preference for the colors black and white.

Individual Scores: Accept the null hypothesis. The frequency of black or white responses is independent of toy type.

Discussion. There are no previous studies of this type that analyzed the toy type to determine whether it influenced preference for the colors black or white. Chow and Chen (1935) suggested that color preference is a function of the colored object and that general color preference exists only insofar as the preference is in reference to specific objects. Some studies have used human figures to determine color preference (Clark & Clark, 1939; 1940; 1958; Filler & Williams, 1971; Kilman, 1977). Filler and Williams (1971) suggested that subjects who rated white human figures more positively also rated the color white more positively than the color black. Kilman (1977) reported differences in toy type when adult dolls and peer dolls were used.

Results of the present study revealed that none of the toy types (human figure, animal, transportation toys) reflected that one color was preferred to the other. Apparently, for young subjects, the type of toy does not influence the type of response.

Hypothesis III. In the presence of each independent variable--age, race, sex--when the remaining independent variables are controlled, there will be no significant differences in color preference.

Results. Reject the hypothesis at the .002 level of significance. An analysis of variance revealed that sex did not affect color preference. There was, however, a significant effect on test scores when age and race are the main effects. In general, Euro subjects did not demonstrate color preference. Afros, however, presented significant color preferences; the preference in the youngest subjects was most often for the color black and the shift was toward the color white as the subject advanced in age. When scores were combined, a subject's score increased by .43 each year. When the races were analyzed separately, the Euro score increased by .12 each year; the Afro score increased by .73 each year.

Discussion. This study is the first one to date that has reported the interaction between age and race on test scores, a fact that is probably the most important finding in the study because racial differences found in color preference seem to indicate that cultural factors probably account for differences in color preference. It is interesting that when Euro and Afro scores were combined, there was preference for the color black which shifted to white bias as age increased. When scores were examined by race, only the Afros presented significant color bias.

Williams and Morland (1976) reported the absence of a clear age progression in white bias in the preschool years and a general cross-cultural tendency toward the positive evaluation of white relative to

black. The results of Hypothesis III indicate a need for a re-examination of this finding.

Some Other Considerations

The score sheet used in the study had spaces for some information which was additional to the age/race/sex/toy type variables. The investigator felt that some other variables may have affected the results of the study. Thus, for most subjects, the socioeconomic class was estimated and the race of the caretaker was recorded. In addition, there was an attempt to determine the number of subjects that presented a dominant handedness pattern so that the handedness effect of the study could be estimated.

Socioeconomic class. Children were classified in one of two socioeconomic classes according to whether parents or the Department of Social Services (DSS) paid the fee for day care. Those children whose parents paid fees were considered of "high" socioeconomic status; those children on DSS were rated "low." In cases where this information could not be obtained, the subjects were not included in the analysis. Results indicated there were no social class differences in black/white color preferences. Only two color preference studies have experimentally controlled for social class and their results were somewhat contradictory. Asher and Allen (1969) found no social class differences in a racial awareness study. Morland (1962), on the other hand, reported that low SES Euros were more likely to prefer an Afro human figure than were high SES Euros.

Race of caretaker. The present investigator felt that the race of the caretaker may have an effect on the results of the study since the race of the experimentor seems to affect results of some types of studies (Katz, Henchy, & Allen, 1968; Sattler, 1970; Trent, 1954). The investigator projected that black children with white caretakers may prefer the color white more than black children with black caretakers would. (Children who had both an Afro and a Euro caretaker were not included in the analysis.) Results indicated that the race of the caretaker did not significantly affect a subject's preference for the colors white or black.

The handedness effect. The toys were presented in an order so that handedness effects could be detected. The cars were presented so that the black car was on the right side for both presentations. The birds were presented so that the white bird was always on the right. If subjects demonstrated a hand preference, they would usually pick the opposite color birds from the cars. There were about 20 subjects who fell into this category; that is, about 20 subjects demonstrated they were picking toys according to hand dominance rather than color preference. Results indicated that if you took the responses of these subjects out of the study, the levels of significance would increase in Hypotheses I, IIa, IIb, and III.

Conclusion

A color preference test was administered to 160 subjects in which each subject was to choose between 12 pairs of toys. The toys were identical except that one toy was black and the other was white.

Chi-square tests, a regression coefficient, and an analysis of variance were used to determine whether subjects were demonstrating a color preference.

Results indicated that there are significant color preferences in infants and young children for both the colors black and white. In addition, age and race of the subject influenced the type of color preference. Results further suggested that sex, toy type, race of caretaker, and socioeconomic class had no effect on color preference.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The purpose of this study was to examine color preferences with emphasis on the colors black and white in very young children. Previous studies have indicated that children and adults do have preferences for these colors, and some have suggested that the preference for white is cross-cultural and is a universal certainty. Until this study was conducted, no research had been reported on the black/white color preferences of infants and toddlers.

Chapter II included a review of the literature related to color preference. Research findings generally indicated that infants do have color preferences and that they prefer warm intense colors to cool weak ones. Studies using preschool and school age children and adults report that the color white is usually rated more positively than the color black is. This idea appeared to be true cross-culturally and regardless of race. Some research suggested that there may be a developmental factor in the preference for white and that there may be shifts in color meaning and color preference throughout life.

A pilot study conducted by the investigator examined color preferences in Afro infants and toddlers. The investigator constructed and administered a toy preference test. On 20 Afro subjects ranging in age from six months to three years, there was a tendency toward white preference that increased as subjects advanced in

chronological age. Results of this study suggested that this trend should be further investigated in a more complex research design.

The Research Design

The present research project presented a design (described in detail in Chapter III) in which the investigator administered a color preference test to 160 subjects ranging in age from six months to 47 months of age. There were an equal number of males and females and an equal number of Afros and Euros. The test involved the presentation of 12 pairs of toys to all subjects.

The independent variables in the experiment were the age, race, and sex of the child and the type of toy presented. The dependent variable was color preference.

Three main hypotheses were stated in the null form and tested. The hypotheses were stated as follows:

Hypothesis I. In the absence of all independent variables, there will be no significant differences in preference for the colors black and white.

Hypothesis II. When age or race or sex or toy type is the independent variable, there will be no significant differences in preference for the colors black and white.

Hypothesis III. In the presence of each independent variable, there will be no significant differences in preference for the colors black and white.

Subjects for the study were children attending a day care program. Data for color preference were obtained by presenting a

12-item test to all subjects. The test consisted of 12 pairs of toys. The toys were identical except that one was black and the other toy was white. The toy the subject selected to play with was recorded as that subject's preference, and the color of that toy was recorded. All Euro subjects were tested by a Euro examiner, and all Afro subjects were tested by an Afro examiner.

Analysis

For the color preference test, a subject received one point each time a white toy was selected. Each subject responded 12 times and received a score of 0 to 12. These subject scores could be categorized into black bias, no bias, or white bias categories, and chi-square analysis was used to test whether the hypotheses could be rejected. Analysis was also computed for the 1,920 CPT responses from the 160 subjects, and responses were classified both by color chosen and an independent variable, such as age.

Through standard formulas, a least squares regression was generated to display the best possible linear relationship that existed between the independent variables and the test scores.

Using analysis of variance, the total variation of test scores was partitioned into components which were attributed to main factors, interaction between factors, and to error.

Results

Results indicated that there were preferences for color. When all scores were combined for all subjects, black was chosen significantly more times than was white ($p < .005$). Individual scores

indicated that subjects did present color bias for white and black on either end of the distribution of scores (.01).

When age was the independent variable, results of group scores indicated that color was dependent on age, whether the scores were analyzed by six-month or 12-month intervals (.005). Individual scores indicated that as age of the child increased, the number of times the subject chose white increased ($p < .01$). In the oldest groups, there was a significant shift toward black bias.

When race was the independent variable, results of group scores indicated that Afro subjects chose white more than did Euro subjects. No racial differences were noted on individual scores.

Results indicated that neither the sex of the subject nor toy type determined color preference.

Analysis of variance revealed that age and race were the main effects in color preference. In general, Euros did not demonstrate significant color preferences, nor was there a significant increase in color bias as age of children increased; Afros, on the other hand, presented significant color preference. Although the youngest Afro subjects most often preferred the color black, the shift was toward white as the subjects advanced in age.

Discussion

The remainder of this chapter will provide a discussion of some of the surprising results produced by this study. Statements will be made regarding support or refutation of some color preference theory. The reader must remember, however, that subjects did not comprise a sample which could result in making generalizations about

the entire population. Although the number was large and the sample was controlled for age, sex, and race, the subjects were all located in day care centers with caretakers other than their parents. It is possible, therefore, that what is true of these subjects may not be true of subjects who attend half-day kindergartens and part-time play schools, or who stay at home with parents or baby-sitters during the day.

There were several results of the study which were expected. The developmental trend toward white preference was noted in the pilot study and results of this follow-up study confirmed that finding. That is, for each year the subject increased in age, his number of white choices increased by about one half. No sex differences were expected.

Some results were surprising. For all subjects, there was a preference for the color black. When racial differences were analyzed, Afros demonstrated a more significant shift toward the color white than did the Euro subjects. There was also an age/race interaction in color preference with the youngest Afros preferring the color black and the older Afros shifting to white. No such effect was noted in Euro subjects.

Some of the theory building of Goldberg (1973) and Williams and Morland (1976) may need reexamination. Goldberg suggested that the psychological factors relating early experience with darkness as a fear arousing stimulus generates to a negative connotation toward dark and generalizes to the color black and black people. Since the subjects in this study preferred the color black and since they were

the very youngest subjects, it is unlikely that darkness or blackness is a fear-arousing stimulus. One would need to determine exactly what situations occur which are fear-producing that could account for a shift to white, and one would need to examine why there would be racial differences in the shift toward white bias since both races presumably experience darkness in the same amounts.

Williams and Rousseau (1971) suggested that man is, after all, a diurnal animal who is unable to cope with his environment under low levels of illumination, a condition which may be as aversive to young humans as to other diurnal primates. Williams and Morland (1976) speculated that the young human may have an innate aversion to darkness and blackness. Thus, this aversion to darkness would explain the w+/b- phenomenon in very young children. This present study suggests, however, that this w+/b- is not a phenomenon of the very young and the idea of a biological determinant of color preference should, perhaps, be reexamined.

Renneger and Williams (1966) suggested that by preschool age there is a concept that white is good and black is bad and suggested that researchers should determine at what age this concept exists. The youngest subjects in this study did not show white preference. A shift toward white preference could be noted but in Euro children it was gradual; in Afros the shift was more rapid. The shift appears to develop slowly, and one can not pinpoint an age at which the shift to white is complete. In fact, the shift back to black in the oldest group of subjects implies that the white preference does not develop in a consistent manner.

Implications for Further Research

There are several areas of research which should be investigated. Overall, the idea that there seems to be some shift in preference in children around four years of age needs to be examined. This is the age at which some complex language concepts have developed. Is it possible there is some sort of cognitive shift at this age that is comparable to some cognitive shifts that occur at about age seven or eleven years?

Racial differences should be reexamined. More studies using large numbers of subjects should compare visual preferences in order to determine whether this Afro bias from black to white occurs in other areas, such as color meaning.

An attempt should be made to correlate the findings of the CPT of this study and Williams' Color Meaning Test. For instance, the oldest subjects could be given the Color Meaning Test and the CPT to determine whether white preference is significantly the same for both tests.

Valentine (1913) suggested that his subjects changed in color preference as habituation for colors took place; that is, the more times infants observed the colors of their preference, the less they preferred them. This change in color preference occurred over a period of several days. This complete test could be administered to subjects over several time intervals to determine whether habituation changed color preferences.

Another method of determining color preference might be utilized. For instance, a test in which objects shaped in a variety

of geometric designs may reveal some varying results. Or a 12-item test using three or four different toy pairs (rather than the six used in the present study) may disclose interesting findings.

The present study actually deserves replication to determine whether results are stable. The replicated study should attempt to secure a random sample from the total population of infants so that generalization of findings could include a larger population.

Conclusion

This study was one in which the investigator attempted to contribute some new information to the field of child development. The study did present some interesting and surprising results which may cause color preference theories to be reinvestigated. The words of Bond (1972, p. 245) seem appropriate to conclude this study. He stated: "The perception of the infant is not qualitatively similar to that of the adult." Results of this research design indicated that the development of color preference in infants was not the same as it was in adults.

BIBLIOGRAPHY

Adams, F. M. & Osgood, C. E. A cross-cultural study of the affective meaning of color. Journal of Cross-Cultural Psychology, 1973, 4, 135-156.

Allen, E. C. & Guilford, J. P. Factors determining the affective value of color combinations. American Journal of Psychology, 1936, 48, 643-648.

Ammons, R. B. Reactions in projective doll-play interview of males two to six years of age to differences in skin color and facial features. Journal of Genetic Psychology, 1950, 76, 323-341.

Ary, D., Jacobs, L. C., & Razavieh, A. Introduction to research in education. New York: Holt, Rinehart, and Winston, Inc., 1972.

Asher, S. R. & Allen, V. L. Racial preference and social comparison processes. Journal of Social Issues, 1969, 25, 157-166.

Ball, P. M. & Cantor, G. N. White boys' ratings of pictures of whites and blacks as related to amount of familiarization. Perceptual and Motor Skills, 1974, 39, 883-890.

Banks, W. C. White preference in blacks: a paradigm in search of a phenomenon. Psychological Bulletin, 1976, 83, 1179-1186.

Bond, E. K. Perception of form by the human infant. Psychological Bulletin, 1972, 77, 225-245.

Boswell, D. A. An empirical investigation of some theoretical components of racial bias in young children. Unpublished masters thesis, Wake Forest University, 1974.

Boswell, D. A. & Williams, J. E. Correlates of race and color bias among preschool children. Psychological Reports, 1975, 36, 147-154.

Brian, C. R. & Goodenough, F. L. The relative potency of color and form perception at various ages. Journal of Experimental Psychology, 1929, 12, 197-213.

Campbell, D. & Stanley, J. Experimental and quasi-experimental designs. Chicago: Rand McNally and Company, 1963.

Cerbus, G. & Nichols, R. Personality variables and responses to color. Psychological Bulletin, 1963, 60, 566-575.

Clark, K. B. & Clark, M. K. The development of consciousness of self and the emergence of racial identification of Negro preschool children. Journal of Social Psychology, 1939, 10, 591-599.

Clark, K. B. & Clark, M. K. Skin color as a factor in racial identification of Negro preschool children. Journal of Social Psychology, 1940, 11, 159-169.

Clark, K. B. & Clark, M. K. Racial identification and preference in Negro children. In T. M. Newsomb, E. L. Hartley, & E. Maccoby (Eds.), Readings in Social Psychology (3rd ed.). New York: Holt, Rinehart, and Winston, 1958, 602-611.

Chou, S. K. & Chen, H. P. General versus specific color preferences of Chinese students. Journal of Social Psychology, 1935, 6, 290-314.

Choungourian, A. Color preference and cultural variation. Perceptual and Motor Skills, 1968, 26, 1203-1206.

Edwards, C. D. & Williams, J. E. Generalization between evaluative words associated with racial figures in preschool children. Journal of Experimental Research in Personality, 1970, 4, 144-155.

Fagan, J. F. Memory in the infant. Journal of Experimental Child Psychology, 1970, 9, 217-226.

Fagan, J. F. Infant color perception. Science, 1974, 183, 973-975.

Fantz, R. L. The origin of form perception. Scientific American, 1961, 204, 66-72.

Fantz, R. L. Pattern vision in newborn infants. Science, 1963, 140, 296-297.

Fantz, R. L. Visual experience in infants: decreased attention to familiar patterns relative to novel ones. Science, 1964, 146, 668-670.

Fantz, R. L., Rody, J. M., & Udelf, M. S. Maturation of pattern vision in infants during the first six months. Journal of Comparative Physiology, 1962, 55, 907.

Fernberger, S. Note of the affective values of color. American Journal of Psychology, 1914, 25, 448-449.

Festinger, L. & Katz, D. Research methods in the behavioral sciences. New York: The Dryden Press, 1953.

Filler, J. W. & Williams, J. E. Conditioning the connotative meanings of color names to human figures. Perceptual and Motor Skills, 1970, 32, 755-763.

Garth, T. R. A color preference scale for one thousand white children. Journal of Experimental Psychology, 1924, 7, 233-241.

Garth, T. R., Moses, M. R., & Anthony, C. N. The color preference of East Indians. American Journal of Psychology, 1938, 51, 709-713.

Gesche, I. The color preferences of 1152 Mexican children. Journal of Comparative Psychology, 1927, 7, 297-311.

Goldberg, F. J. The question of skin color and its relation to Japan. Psychologia, 1973, 16, 132-146.

Gordon, L. H. & Williams, J. E. Secondary factors in the affective meaning system of the preschool child. Developmental Psychology, 1973, 8, 25-34.

Gregor, A. J. & McPherson, D. A. Racial attitudes among white and Negro children in a deep south standard metropolitan area. Journal of Social Psychology, 1968, 68, 95-106.

Harbin, S. P. & Williams, J. E. Conditioning of color connotations. Perceptual and Motor Skills, 1966, 22, 217-218.

Hayes, D. G., Margolis, E., Narall, R., & Perkins, D. R. Color term salience. American Anthropologist, 1972, 74, 1117-1121.

Hershenson, M. Visual discrimination in the human newborn. Journal of Comparative and Physiological Psychology, 1964, 58, 270-276.

Hershenson, M., Mussenger, H., & Kessen, W. Preference for shapes of immediate variability in the newborn human. Science, 1965, 147, 630-631.

Hevner, K. Experimental studies of the affective value of colors and lines. Journal of Applied Psychology, 1935, 19, 385-398.

Hogg, J. A principal components analysis of semantic differential judgements of single colors and color pairs. Journal of General Psychology, 1969, 80, 129-140.

Hraba, J. & Grant, G. Black is beautiful: a reexamination of racial preference and identification. Journal of Personality and Social Psychology, 1970, 16, 398-402.

Hurlock, E. B. Color preferences of white and Negro children. Journal of Comparative Psychology, 1927, 7, 389-404.

Katz, P. A. Stimulus predifferentiation and modification of children's racial attitudes. Child Development, 1973(a), 44, 232-237.

Katz, P. A. Perception of racial cues of preschool children. Developmental Psychology, 1973(b), 8, 293-299.

Katz, P. Henchy, T., & Allen, H. Effects of race of tester, approval-disapproval and need on Negro children's learning. Journal of Personality and Social Psychology, 1968, 8, 38-42.

Kerlinger, F. N. & Pedhazur, E. J. Multiple regression in behavioral research. New York: Holt, Rinehart, and Winston, Inc., 1973.

Kessen, W. Research design in the study of developmental problems. In P. Mussen (Ed.) Handbook of Research Methods in Child Development. New York: John Wiley and Sons, 1960, 36-70.

Kirk, R. Experimental design: procedures for the behavorial sciences. Belmont, California: Brooks/Cole Publishing Company, 1968.

Kilman, D. Racial preferences expressed for peers and adults by preschool children. Home Economics Journal, 1977, 5, 142-145.

Lockard, R. Some effects of light upon the behavior of rodents. Psychological Bulletin, 1963, 60, 509-527.

McMurtry, C. & Williams, J. E. The evaluation dimension of the affective meaning system of the preschool child. Developmental Psychology, 1972, 6, 238-246.

Mercer, F. M. Color preferences of 1006 Negroes. Journal of Comparative Psychology, 1925, 5, 109-146.

Michaels, G. M. Color preferences according to age. American Journal of Psychology, 1924, 35, 79-87.

Morland, J. K. Racial recognition by nursery school children in Lynchburg, Virginia. Social Forces, 1958, 37, 132-137.

Morland, J. K. Racial acceptance and preference in nursery school children. Merrill Palmer Quarterly, 1962, 8, 271-280.

Morland, J. K. & Williams, J. E. Cross-cultural measurement of racial and ethnic attitudes by the semantic differential. Social Forces, 1969, 48, 107-112.

Mussen, P. (Ed.). Handbook of research methods in child development. New York: John Wiley and Sons, 1960.

Nesselroade, J. & Reese, H. Life span developmental psychology: methodological issues. New York: Academic Press, 1973.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. Statistical package for the social sciences (2nd ed.). New York: McGraw Hill Book Company, 1970.

Nunnally, J. Research strategies and measurement methods. In J. Nesselroade and H. Reese (Eds.). Life Span Developmental Psychology: Methodological Issues. New York: Academic Press, 1974.

Parish, T. S. & Fleetwood, R. S. Amount of conditioning and subsequent attitude change in children. Perceptual and Motor Skills, 1975, 40, 79-86.

Parker, C. E. Total darkness as an aversive stimulus condition for the squirrel monkey. Psychonomic Science, 1966, 6, 111-112.

Renninger, C. & Williams, J. E. Black-white color connotations and race awareness in preschool children. Perceptual and Motor Skills, 1966, 22, 771-785.

Sattler, J. Racial "experimentor effects" in experimentation, testing, interviewing, and psychotherapy. Psychological Bulletin, 1970, 73, 137-160.

Shen, N. C. The color preference of 1368 Chinese students with special reference to the most preferred color. Journal of Social Psychology, 1937, 8, 185-204.

Sigman, M. & Parmelee, A. H. Visual preferences of four-month-old premature and full term infants. Child Development, 1974, 45, 959-965.

Spears, W. C. Assessment of visual preference and discrimination on the four-month-old infant. Journal of Comparative and Physiological Psychology, 1964, 57, 381-386.

Stabler, J. R., Johnson, E. E., Berke, M. A., & Baker, R. B. The relationship between race and perception of racially related stimuli. Child Development, 1969, 40, 1233-1239.

Stabler, J. R., Johnson, E. E., & Jordan, S. E. The measurement of children's self-concepts as related to racial membership. Child Development, 1971, 42, 2094-2097.

Staples, R. The responses of infants to color. Experimental Psychology, 1932, 15, 119-141.

Stevenson, H. W. & Stewart, E. C. A developmental study of racial awareness in young children. Child Development, 1958, 29, 399-409.

Stone, L. J. & Church, J. Childhood and adolescence: a psychology for the growing person. New York: Random House, 1973.

Thomas, H. Unfolding the baby's mind: the infant's selection of visual stimuli. Psychological Review, 1973, 80, 468-488.

Trent, R. The color of the investigator as a variable in experimental research with Negro subjects. Journal of Social Psychology, 1954, 40, 281-287.

Valentine, C. W. The colour perception and colour preferences of an infant during his fourth and eighth month. British Journal of Psychology, 1913-1914, 6, 363-386.

Washburn, M. F. Note on the affective value of colors. American Journal of Psychology, 1911, 22, 114-115.

Williams, J. E. Connotations of color names among Negroes and Caucasians. Perceptual and Motor Skills, 1964, 18, 721-731.

Williams, J. E. Connotations of racial concepts and color names. Journal of Personality and Social Psychology, 1966, 3, 531-540.

Williams, J. E. Individual differences in color name connotations as related to measures of racial attitude. Perceptual and Motor Skills, 1969, 29, 383-386.

Williams, J. E., Best, D., & Boswell, D. A. Children's racial attitudes in the early school years. Child Development, 1975, 46, 494-500.

Williams, J. E., Best, D., Boswell, D., Mattson, L. A., & Groves, D. J. Preschool racial attitude measurement II. Education and Psychological Measurement, 1975, 35, 3-18.

Williams, J. E., Best, D. L., Wood, F. B., & Filler, J. W. Changes in the connotations of racial concepts and color names. Psychological Reports, 1973, 33, 983-996.

Williams, J. E. & Edwards, C. D. An exploratory study of the modification of color concepts and racial attitudes in preschool children. Child Development, 1969, 40, 737-750.

Williams, J. E. & Foley, J. W. Connotative meanings of color names and color hues. Perceptual and Motor Skills, 1968, 26, 499-502.

Williams, J. E. & McMurtry, C. A. Color connotations among Caucasian seventh graders and college students. Perceptual and Motor Skills, 1970, 30, 707-713.

Williams, J. E. & Morland, K. Race, color, and the young child. Chapel Hill, North Carolina: The University of North Carolina Press, 1976.

Williams, J. E., Morland, J. K., & Underwood, W. L. Connotations of color names in the United States, Europe, Asia. Journal of Social Psychology, 1970, 82, 3-14.

Williams, J. E. & Roberson, J. K. A method of assessing racial attitudes in preschool children. Educational and Psychological Measurement, 1967, 27, 671-689.

Williams, J. E. & Rousseau, D. A. Evaluation and identification responses of Negro preschoolers to colors black and white. Perceptual and Motor Skills, 1971, 33, 587-599.

Williams, J. E. & Stabler, J. R. If white is good, then black... Psychology Today, July 1973, pp. 51-53; 98.

Williams, J. E., Tucker, R. D., & Dunhan, F. Y. Changes in the connotations of color names among Negroes and Caucasians: 1963-1969. Journal of Personality and Social Development, 1971, 19, 222-228.

Williams, K. H., Williams, J. E., & Beck, R. C. Assessing children's racial attitudes via a signal detection model. Perceptual and Motor Skills, 1973, 36, 587-598.

Winick, C. Taboo and disapproved colors and symbols in various countries. Journal of Social Psychology, 1963, 59, 361-368.

Zimmerman, R. R. Reversal learning in the neonatal rhesus monkey. Developmental Psychobiology, 1973, 6, 245-250.

APPENDIX A

A PILOT STUDY

A preliminary study to test whether there was a developmental aspect to preference for the color white was conducted by the writer in Winston-Salem, North Carolina, in October, 1975. The purpose of this chapter is to describe the methods used in obtaining the data and to report the results of the study. Some methodological problems of the study which will be resolved prior to conducting the major research project will be discussed.

The Research Method Is Described

Procedures were utilized in this study to obtain black/white color preference from a group of Afro infants and toddlers. This section will describe the method used in obtaining the data. In addition, statistical methods employed to analyze the data will be named.

A. Subjects. Subjects for this research project were 20 Afro-American children attending the Model Cities Infant Day Care Center in Winston-Salem, North Carolina. There were ten males and ten females. The ages of the infants ranged from four months to 33 months of age with a mean age of 14 months. Children were from below average socioeconomic backgrounds. Children attended the center daily while their mothers worked or attended school.

B. Apparatus. Six identical pairs of toys were used to determine the infant's preference for white or black. One toy of each pair was painted white; one was painted black. The toys were horses, cars, planes, elephants, bears, and dogs. The horses were made of plastic, approximately 12 inches in height and 14 inches in width and were able to stand alone. The cars were wooden, had moving wheels, and were approximately six inches by six inches by three inches. The elephants were made of a soft plastic and made a squeaking noise when light pressure was applied. The size of the elephants was approximately six inches by six inches by four inches. The planes were made of wood and had moving wheels and propellers. They were approximately six inches by six inches by three inches. The bear and the dog were larger, soft, stuffed animals. The bear was approximately twelve inches by six inches by four inches, and the dog was about sixteen inches by seven inches by five inches. The faces were removed from the bear and dog so that all toys were totally black or white. Toys were placed on a background of red material prior to the infant's selection. Red was chosen as the contrasting background for the stimulus because the toys appeared to be equally attractive on this surface. In addition, red was chosen because Hayes, Margolis, Narall, and Perkins (1972) reported that black, white, and red are the three colors which have the most saliency cross-culturally. (Salience relates to the observation that these colors are introduced earliest to children; they have brevity of expression as measured by phonemic length; there is a high frequency of environmental use of these colors; and they are more frequently mentioned in ethnographic literature.)

The test environment varied. Children who could not walk were tested in their cribs; toddlers were tested in their rooms in the presence of their caretakers; the older children were tested in a hallway just outside their rooms. (Older children were tested away from their rooms because their peers would influence the subject's selection by verbalizing or gesturing their own preferences.) Test rooms were spacious and well lighted. Light intensity in the rooms was constant for each trial.

A test sheet designed by the experimentor was used in the study. The sheet included spaces for name, race, and birthdate of the subject. Toys were listed in order of appearance and the examiner put a circle around b or w, depending on whether the subject selected the black or white toy. A sample of the score sheet may be found in Appendix E.

C. Procedure. The experimentor was a female Caucasian graduate student and a stranger to the children. In each room, the investigator spent several minutes (or hours) playing with and handling the children prior to testing. When subjects appeared to be cooperative, the data were obtained.

Each pair of toys was presented to each subject. For the youngest subjects, toys were placed three to six inches apart and approximately six or eight inches from the subject. The subject was placed in the prone position for maximal visual scanning. The toy the subject crawled toward, touched, and manipulated was the toy recorded as the preferred stimulus. For the toddlers, toys were placed approximately three feet apart and over three feet from the subject. This placement was used in order to create a forced choice

condition, eliminating the possibility of simultaneous selection with both hands.

Each pair of toys was presented twice: the first time the white toy would be on the left; the second time the pair was presented the white toy would be on the right. The change from left to right was to assure that neither handedness nor a response set influenced choices. The toys were presented in the following order for each subject. The order was arbitrarily set by the examiner.

horse	white on left
car	black on left
plane	black on left
elephant	white on left
bear	white on left
dog	black on left
horse	white on left
car	black on left
plane	black on left
elephant	white on left
bear	white on left
dog	black on left

In order to obtain 12 responses from each infant, the examiner presented the toys on at least two different test days. In cases where it was difficult to establish rapport, or in cases where infants were inattentive, the experimentor presented the stimulus pairs on as many as four occasions.

The investigator did not talk to the younger subjects. To the older children, the investigator would say, "Which one of these toys would you like to pick up?" The investigator did not attempt to place any evaluative connotations to objects presented.

In order to attract the visual interest of the children, the experimentor would manipulate the toy pairs simultaneously (i.e., squeaking the elephants, rolling the cars, twirling the propellers of the airplanes, or shaking the stuffed animals).

D. Compilation of the data and method of analysis. Each subject had an opportunity to respond 12 times. The subject received one point each time he selected a white toy. The scores for each subject ranged from zero to 12; a score of zero indicated the subject picked the black toy every time; a score of five indicated the subject picked the white toy five times, et cetera.

The children were placed in different age groups, and their responses were submitted to chi-square tests. This analysis was made to determine if there existed sufficient evidence to indicate that the fraction of responses favoring white is a function of the selected age group. In addition, a linear regression and correlation analysis was made to determine if any change in a preference for white was gradual, with respect to age, as opposed to an abrupt change at some point in time. Data were also analyzed using a method employed by Williams and Roberson (1967) in which percentages of children representing white or black bias are demonstrated using a bar graph.

Results of the Pilot Study Are Reported

This section will describe the statistical methods used in analyzing the response data. In addition, the results derived from this analysis are described.

A. Chi-square.

(1) Analysis. For the purpose of analysis, age groups were selected by the investigator. Each of the 240 responses from the 20 children was classified both by age group and by color chosen. These counts are displayed in contingency tables. For each table, the chi-square test investigates a contingency or dependence between the two classifications. Specifically, each test addresses the question: Does the fraction of white responses vary from group to group?

Three different age groupings were selected to be tested. This was done to determine what age interval would produce the strongest dependence.

With each contingency table is given the computed chi-square value and also the critical value at a .05 and .10 significance level.

Table 1

Contingency Table for Color Preference Test 1

Color Choice	Age by Month		
	0-18	19-36	Total
White	47	60	107
Black	73	60	133
Total	120	120	240

$p < .10$

Table 2

Contingency Table for Color Preference Test 2

Color Choice	Age by Month			
	0-12	13-24	25-36	Total
White	29	34	44	107
Black	55	38	40	133
Total	84	72	84	240

$p < .10$

Table 3

Contingency Table for Color Preference Test 3

Color Choice	Age in Months						
	0-6	7-12	13-18	19-24	25-30	31-26	Total
White	14	15	18	16	26	18	107
Black	34	21	18	20	22	18	133
Total	48	36	36	36	48	36	240

(2) Results. In each of the three tests the null hypothesis (H_o) was stated as follows: The fraction of white responses is independent of the age group. If the computed chi-square value is greater than the critical value, then we do not have sufficient evidence to make such a rejection. The level of significance, p, is the probability that an hypothesis has been rejected which is actually true.

Test 1 χ^2=2.85 { 3.84 Don't reject H_o when $p < .05$; 2.70 Reject H_o when $p < .10$

Test 2 χ^2=5.75 { 5.99 Don't reject H_o when $p < .05$; 4.61 Reject H_o when $p < .10$

Test 3 χ^2=7.46 { 11.07 Don't reject H_o when $p < .05$; 9.24 Don't reject H_o when $p < .10$

(3) Comparative results. Test 1 and Test 2 used age intervals of 18 months and 12 months respectively. In each case the investigator may reject H_o and assume that the fraction of white responses is, in fact, dependent upon the age interval. There is a probability of .10 that an error has been made when H_o is rejected. In Test 3 an age interval of six months was used. In this case no age dependence can be claimed at either $p < .05$ or $p < .10$.

For these tests, the differences between the computed and critical chi-square values may be compared. It appears that white color preference has its strongest dependence on age when age is measured in 12-month intervals.

B. Linear Regression and Correlation.

(1) Analysis. Figure 1 contains a scatter diagram. The horizontal axis T represents the age at which the responses were made. The vertical axis N represents the number of responses which resulted in choosing white. Also contained in Figure 1 is a graph of the regression line which displays the best possible "fit" of the points to a straight line.

Through the use of standard formulas for the slope and N-intercept, the regression equation is given to be N=.096 T+3.65.

A coefficient of correlation was also computed as a measure of the strength of the linear relationship between T and N. The value of this coefficient is r=.53. Also given is the critical value $r_{.05}$=.44.

(2) Results. The correlation coefficient is used to test the hypothesis, H_o: N is not a linear function of T. Graphically, this would provide just as good a "fit" to the points in Figure 1 as a line where N changed with changes in T. Since $r \simeq .53 > .44$ we may reject H_o at a .05 level of significance. Hence, we may conclude that the expected number of white responses does increase in a gradual linear manner as age increases.

The regression line has a slope of .09. These results may be interpreted to mean that, on the average, an increase of one white response will occur for each 11 months increase in age.

C. Percentage.

(1) Analysis. Data were analyzed using a method employed by Williams and Roberson (1967). Statistically speaking, whenever a child obtains a score of nine or up, he is demonstrating a significant tendency toward a w+/b- bias. Conversely, a score of three or below shows a significant tendency toward a b+/w- bias.

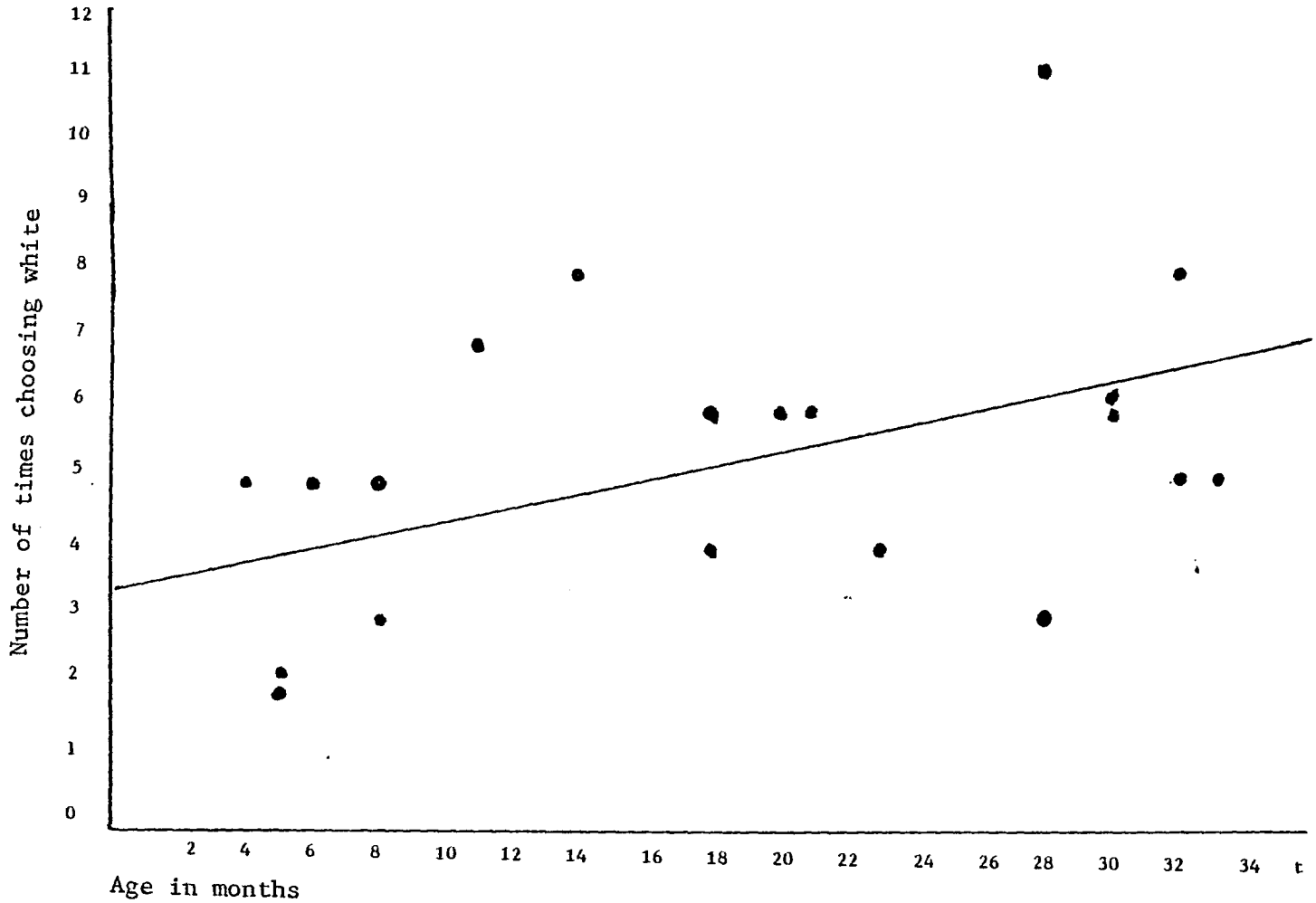


Figure 1. Regression Line

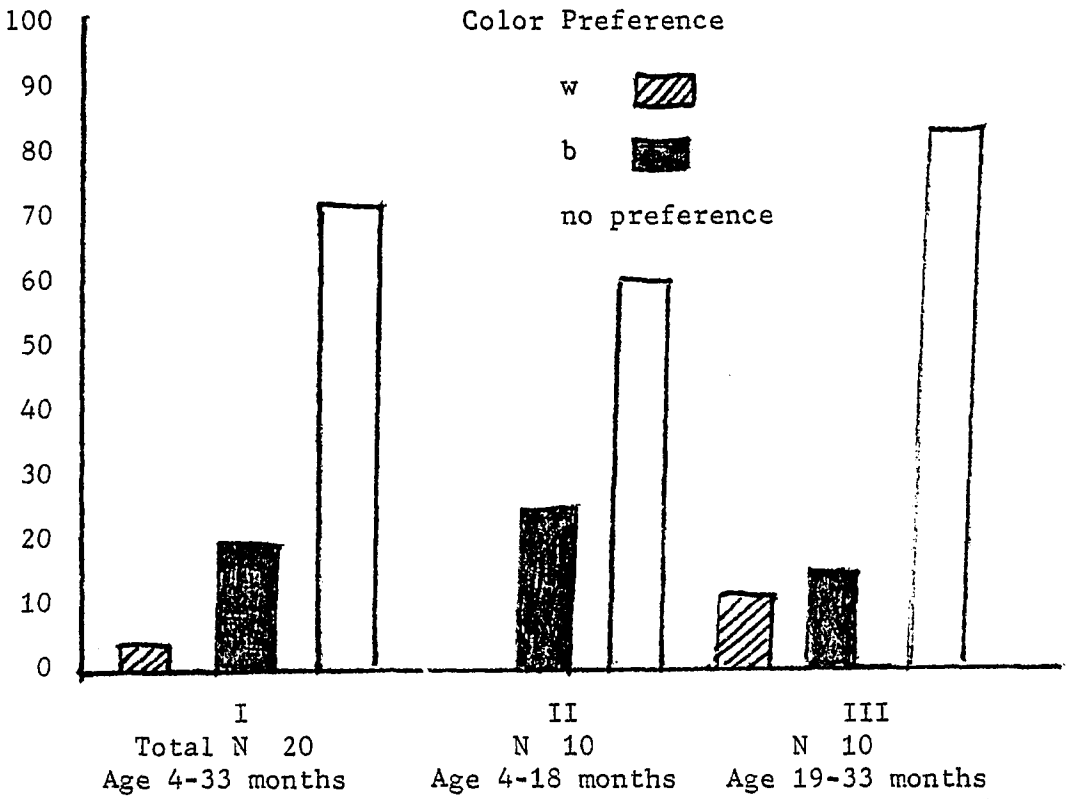


Figure 2: Percentage of subjects in combined age group and each of two age groups classified by level of black/white preference.

(2) Results. The bar graph in Figure 2 suggests that for Afro subjects there is generally no preference for either color. When age is divided into two increments (above and below 18 months of age), there appears to be no preference for white below 18 months old and a definite preference for black in some subjects. With subjects older than 18 months of age, a preference for white increases, whereas a preference for black decreases. This results suggests that some Afro infants may change color preference from black to white by the time they are 18 months old.

D. Summary of Results of the Pilot Study.

Chi-square analysis suggested that the fraction of a subject's white responses was dependent upon the age of the subject. White color preference had its strongest dependence on age when age was measured in 12-month intervals (significant at .10).

A regression analysis revealed that the number of white responses does increase in a gradual linear manner as age increases (significant at .05). This result was interpreted to mean that, on the average, an increase of one white response will occur for each 11-month increase in age.

Percentages revealed that some Afro infants have a preference for the color black when they are under 18 months old, and this may change to a preference for white later on.

Critique of Methodology in the Pilot Study

A. Subjects. All 20 subjects in the study were Afro-American children from low socioeconomic backgrounds. Thus, no statements could be made about the developmental preference for color in the population at large. A larger study should include both races and at least two socioeconomic groups, and the number of subjects should be increased.

B. Apparatus.

(1) Toys. Some of the toys used in the study were inappropriate for the subjects. Since the horses were made of hard plastic, some subjects would harm themselves if not carefully supervised by the experimentor. In addition, the horses were so tall that infants in the prone position would usually focus on the horses' feet.

The horses frightened several of the subjects, and the subjects did not wish to approach either the black or the white one. The large stuffed animals were not as interesting to the younger subjects as were the smaller toys with more intricate designs and moving parts. New toys should be selected for the major research project.

(2) The background. A red cloth was spread out under the toys. A cloth background was not a satisfactory one as it wrinkled and had to be washed after each use. In addition, an infant's limbs could get tangled up in the cloth and a toddler would slip on it. Some other medium should be used for the major research project.

(3) Test sheet. The test sheet used for scoring was not appropriate to the study. There was confusion as to the order in which the toys were presented; thus, a three-column score sheet should not be used. The blank space under each toy named was for the experimentor to record the time interval which lapsed from the moment the subject visually fixated on the toy and the time the toy was selected. These data were so difficult to obtain that the procedure was discontinued early in the pilot study. Data analysis was difficult as there was no space for chronological age of the subject nor was there a space for the final score. The teacher or caretaker was not named, and when the investigator had to return for subsequent testing, there was no systematic way of relocating the child.

C. Procedure. The order of presentation of toys was arbitrarily set by the investigator. In the major project, the toy selection order will be randomized.

D. Data analysis. The correlational analysis and percentages were appropriate statistical procedures for this data. However, an analysis of variance may have been more appropriate than was the chi-square analysis to determine what could account for the variation in the scores.

APPENDIX B

Research Design for Ph. D. Dissertation

Department of Child Development

University of North Carolina at Greensboro

Jo Whitten May, Investigator

Purpose of the Study. The purpose of this study is to test black and white color preference in infants and young children. During the past ten years, there has been a great deal of research on color preferences and color meaning in young children. A review of the literature suggests that the preferences children have toward the colors black and white may also affect their attitudes toward black and white objects and people. A pilot study conducted by the investigator in October, 1975 examined color preference in Afro infants and toddlers. Results of the study indicated a significant tendency toward white preference, and the preference increased as the subjects advanced in chronological age. The present study will expand the pilot study by examining the tendency toward white color preference in Afro and Euro infants and young children.

Method. Twelve pairs of toys will be presented (one pair at a time) to each child. Each toy will be identical except that one is black and the other is white. The investigator will record the color of the toy the child selects to play with.

There will be two examiners; one will hold the child, the other will record the toy preference. A table, chair, light, and the toys will be supplied by the investigator.

A test sheet on each child will be needed which includes the following information:

(1) The name of the subject, the day care center, the director, and the caretaker.
(2) The race of the caretaker.
(3) The race, sex, and chronological age of the child.

Names of subjects will remain confidential and will not be used in analyzing or reporting on the data.

In cases where subjects tire or become irritable, the test period will terminate.

A summary of research results will be sent to cooperating centers on request.

APPENDIX C

Permission Slip

Dear Parents:

A student at the University of North Carolina is interested in giving a Toy Preference Test to some children in the Winston-Salem area. She will present some toys to the children while they are in Day Care. The toy the child selects to play with will be recorded. If you will consent to your child taking this Toy Preference Test, please sign below.

* * * * * * * * * *

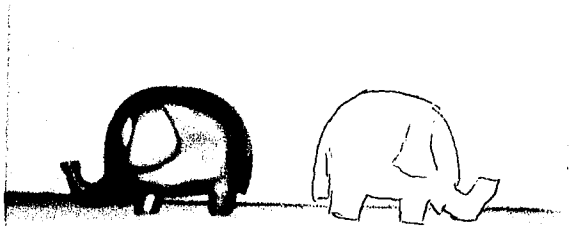
I give _____ permission to take the Toy Preference Test.

_____ _____

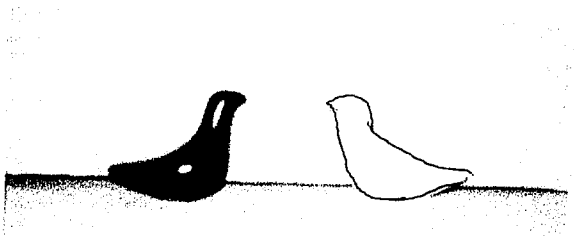
Name of Parent Date

APPENDIX D

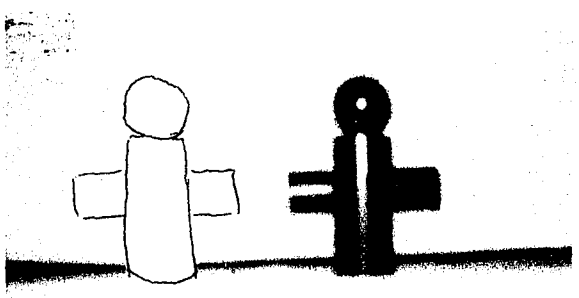
Photographs of Toys Used in the Color Preference Test



elephant

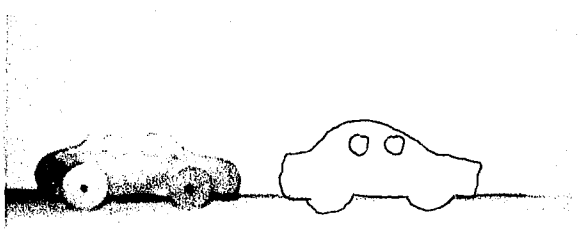


bird

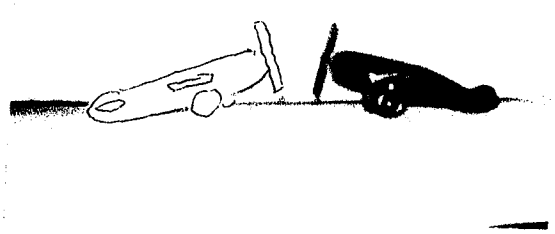


human figure

ball



car



plane

APPENDIX E

Score Sheet for Color Preference Test

Name of Subject _____ Subject # 1,2,3 ____

Day Care Center _____ Chose White 4,5 ____

Director of Center _____ Race: A E 6 ____

Caretaker _____ Sex: M F 7 ____

Race of Caretaker: Afro Euro Other

Parent Occupation _____

Date of Test _____

Birthdate of Subject _____ Chrono Age 8,9 ____

Toy	Left	Right	
Car	w	b	10 ____
Plane	b	w	11 ____
Elephant	w	b	12 ____
Ball	w	b	13 ____
Bird	b	w	14 ____
Car	w	b	15 ____
Plane	w	b	16 ____
Bird	b	w	17 ____
Ball	b	w	18 ____
Human Figure	b	w	19 ____
Elephant	b	w	20 ____
Human Figure	w	b	21 ____
			SES 22 ____

Race: E = 1 A = 2

Sex: M = 1 F = 2

Color: W = 1 B = 2

Race of Care 23 ____