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The purpose of this study was to investigate the stimulus characteristics of wall colors in a nursery school setting utilizing a structured group period. Behavioral indexes were calculated on orienting behavior, noise level, relevant behavior, and disruptive acts within the group in order to find out if these were influenced by changes in wall color. The possibility of an interrelationship between the behavior of the child and the color of the walls was determined with the use of a direct observation schedule and time card, sound-level meter, tape recorder, and teacher's comments. Basic information about the subjects was secured by means of a color blindness and color preference test, Behavior Profile, and a questionnaire to parents for general identification of the background colors in the child's home.

Within the experimental setting the wall structure was constructed by taping polyurethane panels 2' x 8' x 2" into 6' high panels. These panels were taped and braced in four corners in a rectangular shape, leaving a 5' passageway in one side and a 3' x 7' window opening along the top of another side. The floor of this enclosure of 168 square feet was covered with two strips of white paper 6' x 14'. Natural and artificial lighting varied from 30 to 50 foot-candled according to the daylight conditions and specific wall color being tested. The subjects were seated in a semi-circle facing the teacher and the investigator, who recorded their behavior on the direct observation schedule and time cards. An observer with the sound level meter sat behind the children.

For a period of three weeks twenty-three children were tested as Group I and Group II. Group I, the experimental group, was read to for fifteen minutes within a room of colored walls and Group II, the base line group, was read to within a room of white walls. Each child was observed daily and comparisons were made between and within Groups I and II. Group II behavior data served as a comparison for discussing behavior data of Group I. Scores for the base line and the experimental group were analyzed by a two-factor mixed design repeated measure on one factor analysis of variance. A simple analysis of variance was used to determine the difference between the number of vocal interruptions in Group I and Group II. The t test was used to determine the relationship between the behavior profiles of the experimental and the base line group.

The conclusions were: the null hypothesis that wall color will have no effect upon relevant behavior, orienting response, disruptive behavior, vocal interruptions, or noise level in a strucutred group session in the nursery school was rejected. An analysis of variance was performed on the data collected from the direct observation schedule and time card, sound-level meter and tape recorder and in each test there was a significant difference between the behavior of Group I and Group II. The baseline group was less noisy and less disruptive, and paid better attention than did the experimental group. The analysis performed on the sound-level meter and relevant behavior indicated a significant difference between the behavior of Group I and Group II, which occurred when certain colors were on the walls. This difference disclosed that color did make a difference in the noise level of the groups and in the amount of relevant behavior in the groups. There was

not a significant difference in the behavior of the groups for the two groups for the amount of orienting responses or disruptive behaviors when the wall colors were changed. When the interaction analysis for trials x conditions was performed on the data, there was no significant difference between the behavior of the groups, indicating that it was not possible to tell which of the seven colored walls made the difference.

A STUDY OF WALL COLOR AND ITS EFFECTS ON THE CLASSROOM SOCIAL BEHAVIOR OF NURSERY SCHOOL CHILDREN

by

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APPROVAL PAGE

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CHAPTER I

INTRODUCTION

Scientists have believed for centuries that human behavior is directly affected by the physical environment, yet relatively little experimental evidence exists to confirm the truth of this belief. Using little more than intuition, planners, architects, interior designers, and product designers have had profound influence upon the behavior of people by the manner in which they have manipulated environmental variables. More often than not they have only superficially understood, if at all, the consequences of their design efforts.

Recently a number of researchers have turned their attention toward the examination of human psycho-physical responses to color in the environment. The main focus of these studies was on color mood, color preferences, and color sensation. Most of the studies which came to the attention of this investigator appeared to be concerned with object color or color in small areas, while wall color or the colored environment seems to have received relatively little attention. Subjects for most color studies appear to have been primarily adults and school children, while few studies have been concerned with the effects of color upon the behavior of preschool children. There appears to be a need, therefore, to examine systematically the manner and the degree to which the physical interior environment may affect a preschool child in the learning situation.

Background for the Study

There appears to be very little agreement among researchers as to when a child first begins to develop a perception of and preference for color. Beebe-Center (1932) concluded from his studies of infantile preference that in the first half-year, preference depends only upon saturation and brilliance. Birren (1961, p. 175) stated that, "At the age of six months, the infant may be able to distinguish the primary colors." Josephine Smith, in working with infants, noted that blue light tended to lessen activity and crying (Birren, 1969). Katz (1935) noted that color rather than form is primary in the young child.

Some researchers stated that children preferred warm colors such as red, yellow, and orange to cool ones such as blue, green, and purple. Hansen, Child, and Hornbeck (1968), from their study with children of grades 1-12, refuted this finding and observed, "When children choose between colors differing only in hue, they usually prefer the cooler" (p. 246). These writers also noted that changes in cognitive differentation between birth and the age of seven are greater than those in the following eleven years. They seemed to think that color preference change resulting from increased differentation would be even more rapid and conspicuous at the lower ages.

If, as the Hansen, Child, and Hornbeck study suggested, color preferences are a result of a cognitive growth pattern, the present investigator wonders whether the environmental setting (wall colors) of the nursery school classroom could have an influence on the child's mental growth and behavior. Whether a child was being submitted to an

enclosure which for his mental growth was appropriate or not might either stimulate or depress the child. Furthermore, one might speculate that since motivation is a necessary ingredient in learning and since color has been shown to affect motivation (stimulate or depress), then background or environmental wall color could possibly have direct impact upon learning. Therefore, the value of environmental stimuli in eliciting desired social behaviors as well as academic performance should not be overlooked as an important part of learning theories based upon conditioned response.

In order to better explain the proposed problem, the author cites the work of Nelson (1970, personal communication) in which the following classroom paradigm was suggested:

Stimulus	Response
1 Classroom Social	2 Behavior
3 Classroom Academic	4 Behavior

Nelson, in this paradigm of classroom behavior, divided the experiences of learning into four equal quadrants: (1) the stimulus appropriate to classroom social behavior (chair arrangement, color of walls, brightness factor), (2) the response appropriate to classroom social behavior (sitting up, attending to teacher, being quiet), (3) the stimulus appropriate to classroom academic behavior (teacher, book, visual aids), and (4) the response appropriate to classroom academic behavior (right answers to questions). Each quadrant is equally important in the quest for a better classroom experience, yet very little is known about

wall color in the classroom or it's effect upon the classroom social responses. Wall color is but one of these stimuli, but this investigator feels that it is a very important one.

Purpose of the Study

The purpose of this study was to investigate the stimulus characteristics of wall colors in a nursery school setting utilizing a structured group period. Behavioral indexes were calculated on orienting behavior, noise level, on-task behavior, and disruptive acts within the group in order to find out if these were influenced by changes in wall color.

Because this study was exploratory, with little prior research to aid in selecting pertinent variables and sensitive measures, it was not expected that the results would have strong implications beyond this specific setting. Yet, the study was a step toward being able to identify more accurately what occurs within the "elusive area of individual-environmental interactions" (Kohn, 1967, p. 2).

Basic Assumptions

The basic assumptions made in relation to this study were the following:

1. The subjects of the study are typically middle class children.
2. Warm colors and cool colors are assumed to cause differences in the behavior of children surrounded by walls in these colors.
3. A laboratory situation with nursery school children in a structured group session can be used to determine the degree

of behavioral changes as influenced by changes in wall color.

4. A direct behavioral schedule and time rating scale can be constructed to measure relevant behavior, orienting response, and disruptive acts which are assumed to be dependent measures of the manipulative wall color variable.
5. A sound-level meter can be used to measure the noise level of the children in the group sessions.
6. A tape recorder can be used to detect the number of vocal interruptions during a structured group session.

Limitations of the Study

The subjects did not constitute a random sample and it was not possible to have equal numbers of children in Group I and Group II with regard to age and sex. All of the children were Caucasian from upper and middle socio-economic levels. The relatively short experimental period of three weeks was a limiting factor. Originally both groups contained twelve children, but after several days of the study it was deemed necessary to remove one subject from Group I because he had not reached the level of maturity of the others.

Hypothesis of the Study

The hypothesis of this study was as follows:

Wall color will have no effect upon relevant behavior, orienting response, disruptive behavior, vocal interruptions, or noise level in a structured group session in the nursery school.

Definition of Terms

For the purpose of clarifying the meanings of specific terms used in the study, the following are defined:

Relevant behavior - Continuation with a given activity without external persuasion.

Orienting response - A child turned his head or head and body to attend to another child.

Disruptive behavior - A direct, hostile, primitive act which was either physical or verbal, obvious or subtle (Arnote, 1969).

Noise level - Noise produced by the children and registered on the sound level meter in decibels.

Vocal interruption - The teacher stopped her reading of the story because a child talked or she gave a command or called a child's name to get his attention.

Structured group session - The teacher engaged the children in discussion of the book she had read and lead finger play and songs.

Group I - Eleven children engaged in a structured group session who experienced seven changes in wall color over a fifteen day period.

Group II - Twelve children engaged in a structured group session who experienced only white wall color over a fifteen day period.

Wall structure - Six, 8' x 6' x 2", polyurethane panels that were set up in the existing room to define the enclosure of 168 square feet to provide a surface to which colored paper was attached.

Colored walls - Colors painted on paper surfaces 52' x 6' and attached to the wall structure. Dark blue, red, pink, light blue, red

dots on pink background, dark blue stripes on light blue background, were used in this sequence in the study (Appendix A).

Hue - Dimension of color which refers to a scale of perception ranging from red through yellow, green, blue, and circularly back to red (Burnham, 1963, p. 14).

Value - Lightness or darkness of a color compared to a gray scale.

Chroma - Strength, intensity, or purity of a color.

Tint - Light value of a color achieved by the addition of white.

CHAPTER II

REVIEW OF LITERATURE

The review of literature pertinent to this study is organized into six major areas: early experiments on color, research on color with child subjects, research on color with adult subjects, environmental effects of color, direct observation procedures, and summary.

Early Experiments on Color

In a survey of the literature on color experiments, Pressy (1921) stated that environmental color studies were ignored and the emphasis was placed on color-mood and color-affect. His conclusions were: (1) both introspectively and observationally color seems to influence efficiency and mental work through its "richness and complexity"; (2) experiments tend to vary in their findings of how color affects humans organically and introspectively; (3) most studies stress that emotion plays a large part in color mood and color affect. Symbolism, association, and convention all influence the perception of the hue and brightness of a color.

Morgensen and English (1926), through the use of subjective reports of male and female college students about the warmth of colors, asked whether or not the warmth judgments of colors affected the judgment of objects tactually perceived? In the experiment, six primary saturated colored pieces of paper were wrapped around cylinder-like objects of equal weight and constant temperature of 42^{o}. The subjects were told

to handle these cylinders for one second each while observing the color and to give their judgement of temperature within the next second. They were told that the temperature of the objects would be changed although it was not. Morgensen and English found that purple was judged to be the coldest whereas there was little difference in the judgment of warmth of red, yellow, orange, blue, or green.

Hevner (1935) in a study designated to test the meaning, mood effect or affective state which might be aroused in observers by various colors and lines--circles, squares, angles, etc.--found a very high degree of consistency among the college subjects he tested:

Red--happy, exciting

Blue--serene, sad, dignified

Curves--serene, graceful, tender, sentimental

Angles--robust, vigorous, and somewhat more dignified

In 1941, Eysenck experimented with a factor analysis study of color preference. Two experiments were run to try to determine the degree of correlation between two groups of subjects. The subjects were asked to rank color preferences for a combination of six saturated colors and six tints and shades. Eysenck found that the degree of significance was at least as high as for several of the mental test which are considered valid; there were two distinct groups of subjects, those who preferred saturated colors, and those who preferred tints and shades of colors; and there was no significant sex difference in preference except for a slight preference of females for yellow over orange.

Through the use of chromatic illumination, Lewinski (1938) examined the relationship between color and affect. He used a scale of "pleasantness-unpleasantness", "stimulating-depressing", and "cold-hot". His findings significantly indicated that the colors which were judged warm colors--red, yellow, and orange, were also considered stimulating. He found that purple was judged depressing and blue and green were considered pleasant and cold.

Ross (1938) tried to get a measure of the emotional relationship to colors through the use of a theatrical stage. While asking his subjects to scale their reactions, he changed the arrangement of colored lighting on stage. His findings indicated that hue and brightness were identified separately. Brightness was more effective at stimulating behavior than was a particular hue. Brightness was associated with lively scenes and darkness was associated with "tragic, emotional, melodramatic, and romantic scenes" (p. 138). Saturated colors were connected with "emotional, tense, hot, comic, and melodramatic scenes" (p. 183).

Norman and Scott (1952) re-evaluated the early experiments on color, this time trying to find the semantic meaningfulness of color and affect. According to these writers, the degree of emotion or meaningfulness which was inherent in a color was placed on a continuum of pleasantness and unpleasantness. Therefore, the data received did not discover the actual feelings of a subject toward a color but only the choice which he made on the scale.

> The 'affective value' of color cannot be measured in the sense of determining how much effect the color has on 'mental processes'. It is only possible to measure the effect of color on the subjects behavior... (p. 198).

The writers concluded their evaluation by stating that mood and certain colors relate, yet none had a direct bearing on the "perception of color during certain moods" (p. 199).

Research on Color with Child Subjects

According to the literature which this investigator reviewed, there was very little agreement as to when a child first begins to develop a perception of and preference for color. Birren (1961) reported that, "Staples exposed disks to infants and measured the duration of visual concentration" (p. 175). He found that babies looked for longer periods of time and reached more frequently for colored objects especially red and yellow. Birren (1961) reported that Calentine also "exposed colored skeins two at a time to three month old infants, and noted that the eye fixation time was longest for yellow, then white, pink, and red" (p. 175). Beebe-Center (1932) concluded from his studies of infantile preference that, "in the first half-year, preference depends only upon saturation and brilliance" (p. 306). Faber Birren (1961) stated that "as the child grows, he will continue to be intrigued by color and will be more sensitive to it than to form" (p. 175).

Svancara (1968) presupposed that the genetic dispositions for the selection of certain color qualities could be ascertained. Using 19 Monozygotic twins and 59 Diozygotic twins of the same sex and 43 twins of different sex, the children were asked to mark colors by degree of

pleasantness or unpleasantness. The purple color was mentioned by more than fifty percent of the children as being the most pleasant and the black colors as most unpleasant. Of the girls, fifty percent expressed the feeling that purple was the most sympathetic color and black the least. There was a significant difference between the pairs of girls and boys in color evaluation. In conclusion, the findings upheld the hypothesis that "genetic determinants take part in the emotional apperception of colors" (p. 54).

Children's preferences for color, form, and size have been studied for over 50 years (Suchman and Trabasso, 1966). From these and other studies, a transition from color to form preference has been regarded as a correlate of cognitive growth, as there is a decrease in average preference for color over form with age. These authors also noted that preschoolers generally prefer color and shift to form at age 6.

Brain and Goodenough (1929), with a conflicting viewpoint, found that a child's preference for matching stimuli on the basis of color or form depends on his age. Three and four-year-olds prefer form and five-year-olds color. Kagan and Lemkin (1961) noted this same age preference in their study of color matching preferences. Lee (1965) also noted a difference in the sexes as related to color preference.

In a study of concept utilization in preschool children (Lee, 1965), the author indicated that the younger child (3.6 years old) relies more on the concepts of color and size than on number, form, sextype, and analytic concepts in sorting out his environment.

In 1966, Suchman and Trabasso undertook a study to investigate the "stability of a child's preference for form and color under conditions where hue, saturation, form, and contour were varied and compared. A second purpose was to see if a child's preference for stimuli is unidimensional by use of a longer test series than previously employed and allowing assessment of individual differences and consistency in preference" (p. 156). Their findings were in general agreement with previous studies that indicated young children tend to prefer color and older children tend to prefer form. It was found, however, that these preferences were mostly unidimensional and the group trends reflected the fact that more subjects preferred one dimension over another at different ages. Therefore, no specific age at which this transition occurs could be pinpointed. Lee (1965) suggested that reinforcement for form occurs when the child begins to need it in reading and other school activities. This he believed was responsible for the shift in preference to form and size and for differences between preschool and school age children in learning color and form concepts. "The influence of environmental variables is emphasized by a finding that African children showed no shift from color to form preference by adolescence" (Suchman, 1966, p. 157).

Other findings of that study (Suchman and Trabasso, 1966) which this writer found of interest were that children who rely most heavily on color to identify and match objects generalize their preferences to a range of hue intensities and do not behave in accord with the folk concept that children prefer only saturated hues. Children who rely on

form to identify and match objects likewise generalize their preference to symmetrical, as well as asymmetrical contours and do not evidence a preference for asymmetrical forms as suggested by Piaget and Inehlder (1948). A question with which these authors were concerned was what other role might stimulus preference play in the child's learning environment.

Birren (1961) along with Burnham, Hanes, and Bartleson (1963) and Beebe-Center (1932) have stated that as the child matures, a liking for yellow diminishes and red and blue become the favorite colors. With adulthood, the liking of hues of shorter wave lengths is most distinct.

Child, Hansen, and Hornbeck (1968) after evaluating the previous experiments on children's color preferences began to see the need for more valid research in this area. They did a color study by investigating with children the separate influence of hue, value, and chroma, which had previously been done with adults (Granger, 1955). Also, color preferences for the two sexes were analyzed separately. Over 1100 students in the public school system from the first through the twelfth grades were the subjects. Twenty different pairs of colors (made from Munsell papers) were presented to the subjects and they were asked which they liked the best. "In most pairs the two colors differed only on one dimension of color experience but in certain pairs the two colors differed simultaneously on two dimensions" (p. 237).

In contradiction with most previous studies done by other researchers which relate to child preferences, Child, Hansen, and

Hornbeck (1968) found that cooler colors were preferred at all ages from 6 - 18 as was also found true of adults in studies done in Britain and America. Hue preferences also varied quantitatively with age. Chroma of a higher saturation was preferred over a lower chroma in the 1-12 grades. The researchers mentioned above also found this true of adults. In the value study no general tendency could be stated. Granger (1955) argued "that color preferences do not differ appreciably between the sexes" (p. 238). This basic belief was refuted by Hansen, Child, and Hornbeck (1968). Their study, like other major studies, reported sex differences along with general similarities. There seemed to be a female preference for lighter colors. With increasing age, there was a decreasing preference for high saturation and increasing consistency of hue choices compared with consistency of saturation choices, and an increasing tendency to resolve conflicts in favor of hue rather than saturation.

Hess (1970) reported in his unpublished research that he had "found a strong and highly consistent correlation between eye color and modes of perception and personality. Blue eyes were associated with form dominance in perception and a scientific attitude, whereas brown eyes were associated with color dominance in perception and a nonscientific attitude" (p. 31).

Research on Color with Adult Subjects

Some researchers have tried to answer the question: Does one learn to perceive his environment through color or through form? Katz (1935) with the aid of Gelb made some interesting observations by studying a

patient who had suffered from the loss of ability to recall colors. This patient perceived the colors of visual objects (such as the color of paper) as film colors (spectral colors such as those seen through a prism) having the appearance of volume colors. The colors of all visual objects had lost their surface character. The patient was unable to localize the distance of an object as a normal person could. The color failed to lie flat on the surfaces of objects. Colors had a sponge-soft texture and the patient had to plunge his hand into the color to touch the object. As the patient recovered his surface color-perception, it was the bright colors which first recovered their surface character. These observations help point out how important the ability to see color is in perceiving one's environment.

Birren (1969a) reported that Deutsch noted "all persons are aware of sensations and psychic excitation which through the vegetative nervous system, boost all life functions, increase the appetite, stimulate circulation,..." (p. 19). In an experiment, he found that when the face and neck are illuminated with a red light from the side, the outstretched arm will deviate toward the light and away from the light if it is blue. This reaction was also noted when the eyes were sealed from the colored illumination. Birren (1969a) noted that findings in a similar experiment by Metzger showed nearly the same reaction. With the patient's arms outstretched before him horizontally, it was noted that when red light was thrown on the patient's eyes, his arms spread away from each other. Green light would cause them to approach each other in a series of jerky motions.

Birren (1969a) noted that Goldstein, who has worked a great deal with color, concluded, "The stronger deviation of the arms in red stimulation corresponds to the experience of being disrupted, thrown out, abnormally attracted to the outer world...excitation by red. The deviation to green illumination corresponds to the withdrawal from the outer world and retreat to his own quietness. The inner experiences represent the psychological aspect of the reactions of the organism. We are faced in the observable phenomena with the physical aspects" (p. 19).

Birren (1969a) reported that Deutsch pointed out that every action of light has in its influence physical as well as psychic components. Aaronson (1964) noted Birren's theory of the effects of color on mood: "Red, orange, yellow, green, and blue describe a sequence from excitation to inhibition. Purple, white, gray, and black are emotionally neutral" (p. 30). Aaronson (1964) attempted to test this theory by means of posthypnotic suggestion as follows:

> A male, age 22, unfamiliar with Birren's work, and capable of somnambulism under hypnosis, was hypnotized and instructed that everything he looked at would seem a given color. Even if another color, it would still seem tinged with the suggested color. Three placebo runs in which hypnosis was induced, but no posthypnotic suggestions given, were interspersed. After 5 hrs., S was asked how his day had seemed and the suggestion was removed.
>
> On all of the 15 days, prehypnotic reports of how he felt were similar. Posthypnotic reports of his feelings were as follows: Red: active, aggressive (not hostile), outgoing; orange: bright, happy; yellow: bright, happy, energetic, industrious; green: sick, bilious, dreary; blue: slow, calm, mildly depressing; white: normal, but slightly negative; black: heavy, sad, depressed, dreary, unhappy; purple: bad, depressed, persecuted, paranoid; placebo: normal. An instruction that all colors would seem intensified made him feel happy and alert, that color intensity would seem diminished made him feel slow and draggy (p. 30).

Smits (1969) hypothesized that an observer perceives the time interval spent before a red color stimulus as shorter than the same time interval spent watching a blue color stimulus. Previous literature has suggested that looking at saturated hues with a long wavelength (red, orange, yellow) and saturated hues with a short wavelength (blue and green) have different physiological, behavioral, and introspective effects. The warm colors cause greater activity and are advancing spacially and the cool colors are relaxing and receding into space. Because of this, Smits indicated that there should also be a difference in time expression under the influence of these colors. Her hypothesis was upheld as 72 subjects significantly judged that time spent before the red color stimulus was shorter than time spent before the blue color stimulus. Birren (1969a) also reported that Goldstein noted the above findings and added that time was underestimated under green lights. He found that these same effects held true for weights and lengths.

There is evidence that all the senses are so related that activation of one may have an effect upon another. Birren (1955) noted that Zietz reported that low pitched sounds tended to shift the appearance of color toward deeper hues (i.e. red to blue, orange to red) and high pitched tones tended to shift colors toward lighter hues (i.e. red to orange, orange to yellow). Birren (1955) reported that Kravkok reported that the sensibility of greenblue tends to increase when accompanied by sound, whereas the yellow-orange-red sensibility decreases. Birren (1955) also noted that Allen and Swartz confirmed Kravkov's work and

extended it to other intersensory influences. They found that certain tastes and odors caused changes in the sensibilities of certain colors.

Birren (1967) noted that Goldstein stated, "It is probably not a false statement if we say that a specific color stimulation is accompanied by a specific response pattern of the entire organism" (p. 31). When a woman with a cerebellar disease, who had a tendency to fall unexpectedly, wore a red dress such symptoms occurred more frequently. Goldstein observed that the tremor torticollis (involuntary twitches of the muscles) can at times be lessened in severity if the individuals are protected against red or yellow, by wearing glasses with green lenses.

Gerard (1958) has done the most recent work in the realm of light and color and their psycho-physiological influences on man. He investigated the color-affect of the entire organism, at the psychological level, using advanced and modern techniques as well as eliciting verbal descriptions. Gerard began his study by asking several questions: "Is the response to color differential? Do such hues as red and blue arouse different feelings and emotions? Do they induce correlated changes in autonomic functions, brain activity, and subjective feelings? Do the patterns of response correspond to the relative energy of the colored stimuli?" (Birren 1969a, p. 19). Red, blue, and white lights transmitted on a diffusing screen were used in the experiment. Verbal reports associated particular feelings with red, blue, and white illumination, in support of previous studies, but with the conscious associations, the experimenter recorded physiological activity during

exposure to each color condition and found reactions which involved much of the body.

> Systolic blood pressure, palmer skin conductance, respiration rate, and frequency of eye blinks were significantly lower during the blue than during red illumination. Intermediary levels were obtained under white light. Alpha waves from the visual cortex were present for a significantly greater percentage of time during red stimulation, indicating less cortical arousal during blue illumination (p. 2).

> Physiological measures in general are subject to risk when used as a basis for interpreting causes of behavior. Such measures are in reality correlations of one behavior pattern with another (the subjects' response to instructions). Yet, the physiological behavior recorded in Gerard's study has great significance because his results weaken the often presumed hypothesis that color-affect may be treated as a unitary stimulus of minor influence; i.e. an independent variable, which in the planning of experiments or physical spaces, contains affective properties of insignificant effect. Color, Gerard showed, stimulates much of the body processes, and different behavior patterns are observed from exposure to different colored lights. His data support in part the theory that as a person moves through his environment and experiences various colors, he reacts differentially to them (Kohn, 1967, p. 20).

> Subjective measures in Gerard's study showed the following: Different colors elicited different feelings and attitudes, as reported by subjects at the end of the experiment by means of rankings and ratings. Overall color effects were significant in 22 out of 30 analyses of variance by ranks. Based on sign tests, statistically significant differences included (1) greater overall well-being, greater relaxation and calm, more pleasant ideation, and less anxiety and hostility during blue than during other illustrations; (2) increased boredom during white illumination; (3) more tension, excitement, and arousal during red stimulation (p. 2).

Environmental Effects of Color

Birren (1969a) reported that Hebb carried out experiments to examine the effects of isolating a person for periods up to five days in a completely monotonous and unvarying environment. "In a small room they lay on a bed; they heard nothing but the monotonous buzz of machinery;

they had translucent goggles over their eyes so that they could see only a blur of light; and they wore long cuffs which came down over their hands to keep them from touching anything" (p. 28). Some subjects were able to endure this environment for 5 days but others could not endure it for more than two days. At first, the subjects slept a great deal but soon they became bored, restless, and could rest only in snatches. When their intelligence was tested after the isolation, it was found to have decreased. "They frequently suffered from visual and auditory hallucinations. When they emerged from their incarceration, their perceptions of their surroundings were impaired, i.e. straight edges such as those of walls and floors, looked curved" (Birren, 1969a, p. 28). Therefore, it seems that a constantly changing environment is necessary for maintaining normal consciousness, perception, and thought.

Armstrong (1967) in a paper given as a part of the program of the Research Council at the annual meeting of the American Health Association, pointed out that the environments in our school systems are not necessarily the best for individual needs when one considers the interrelationship between heredity and environment. According to the results suggested by a study carried out under the New York Education Department's Experimental Program, which involved the longitudinal review of the academic development of 1300 children in 10 schools, public schools are not a good environment for many children. Each child was classified by the quality of work done in the late elementary school and again in senior high school. According to the classification used, seventy percent of those who did well in elementary school on

achievement tests did well on achievement tests in high school, and only thirty-two percent of those who did well on teacher's grades in elementary school did well on teacher grades in high school. "What happens to these children who cease to do good work? They give every promise of doing well and then fail to develop as expected. Is this failure to develop in high school already established in some genetic factor, or preschool experience, or is it a product of the immediate school environment?" (p. 112).

Direct Observation Procedures

In the basic research of child behavior, direct observation is widely used. However, there are specific steps to be considered when designing and using a direct observational tool. First, one must define operationally as well as behaviorably what is being observed. Fu (1971) reported that Kerlinger suggested "all behaviors have to be assigned to categories or to units of behaviors and the size of the units have to be decided" (p. 12). Kerlinger (1964) noted that one can observe behavior in small units and yet often this tends to lower reliability because of confusion for the observer. The alternative may be a smaller number of behavior units to be observed, yet this can result in an increase in validity and a decrease in reliability because of the ambiguity of the wider scope. Thus the appropriate observation will focus on smaller segments of behavior to be observed and the observer will record only what he sees. There will be no value judgments made by the observer as to why the child did or did not do something.

Fu (1971) stated that the most widely used observational method is time sampling as it permits objectivity, systematization, quantification, and economy. Helmstadter (1970) also advocated the use of a time sampling procedure. "In general, best results are obtained when checklists or tally sheets listing the specific behaviors of concern are used. Thus, the task of the observer should be that of checking off a behavior which he sees or of making a tally each time it occurs" (Fu, 1971, p. 13). Wright, (1960) summarized the advantages of observational child studies:

> It limits with exactitude observed contents as well as temporal lengths of the behavioral stream. It permits systematic control by selection of phenomena to be observed and studied. It insures representativeness and reliability by recording large numbers of commensurable observations. It is economical of research time effect. Its coding schemes minimize equivocal judgements and prescribe definite ways to quantify whatever is observed. It goes far to achieve standardization of observer and analyst as measuring instruments (Fu, 1971, p. 16).

After a review of this literature, it appeared to this investigator that many direct observational procedures have been used for the purpose of training teachers to elicite the proper responses or relevant behavior from the student. Time sampling of classroom interaction analysis has therefore focused on the teacher. Cogan investigated the "relationships between teacher behavior and student behavior and asserts the need to search for the existing cause and effect relationships" (Kennedy et al., 1969, p. 4). Kennedy (1969) noted that Withall claimed that the teacher's verbal behavior is responsible for most of the emotional components of transactions occurring in a classroom.

Kennedy (1969) reported that in recent years, observational tools for analyzing the behavior of teachers in the classroom have been developed for research conducted by Withall (1967), Medley, and Mitzel (1958), Ryans (1960), Flanders (1960), Hughes (1959), Hough (1967), and others. "These researchers have developed systematic techniques for observing the verbal behavior of teachers which may provide more bases for analyzing teacher performance" (Kennedy, Haefele, and Ruff, 1969, p. 4).

Becker, Thomas, and Carnine (1969) in their study of operant conditioning for teachers to use in reducing behavior problems introduced a direct behavioral schedule. This schedule focused on the child's behavior, in the classroom, and secondly on the teacher's response to the child's behavior. The purpose was to train teachers to eliminate behavior problems by focusing their attention on relevant behavior and ignoring that which is irrelevant.

It appears that few studies other than that of Nelson (1971) which was previously discussed was found by this investigator to stress equally the importance of the social and academic behavior in the classroom. No study was found which observed a structured group time in a nursery school setting under the influence of wall color changes. However, Arnote (1969) observed nursery school children during free play by use of a time sampling schedule. The variable which she manipulated was space and her unit of measure was aggressive acts. She found that as the space decreased from 50 square feet per child to 20 square feet per child, the aggressive acts increased.

Summary

This review of literature cited studies relating to the various aspects of experimentation in color theory. It seems that many of the early studies were undertaken to measure color affect and color preference, yet colors had a complexity of affective significance and, consequently, much of the data conflicts. It was noted from these early studies that the only way to measure the influence of color on a human was through his behavior.

Color seems to be a very basic part of a child's learning to deal with his environment, yet there has been no specific agreement as to when the child first begins to develop a perception of and preference for color. The standard adage about "children and primitives" (Renner, 1964, p. 38) preferring red, orange, and yellow is beginning to be questioned by researchers who are finding that color perception is a very complex phenomena, consisting of hue, value, and chroma preferences.

Research with adults has shown that color responses can be measured by systolic blood pressure, palmer skin conductance, respiration rate, and frequency of eye blinks. Red, blue, and white lights seem to cause differential responses and behavior patterns.

In the basic research on child behavior, the most widely used observation method is time sampling. In this method, the observer takes small segments of behavior and records directly what he sees. It is a direct method and has been used a great deal to help train teachers in the classroom, as well as for observing the behavior of children.

CHAPTER III

METHOD

The main purpose of this study was to investigate the stimulus characteristic, wall color, as it influences classroom social behavior in a nursery school setting. A direct observation schedule and time card, sound-level meter, tape recorder, and teacher's comments were used to determine the possibility of an interrelationship between the behavior of the child and the color of the walls. Basic information about the subjects was secured by means of a color-blindness and color preference test administered by this investigator, Behavior Profile from eight nursery school teachers and mothers, and a questionnaire to parents for general identification of the background colors in the child's home. The development and use of these instruments will be discussed in this chapter.

Subjects

The subjects were twenty-three children enrolled in the three and four-year-old groups during the 1971 summer session in the Nursery School of the School of Home Economics at the University of North Carolina at Greensboro. The subjects were randomly divided according to age and sex into two groups. In Group I, or the base line group, there were eleven children, which included three three-year-old boys, two two-year-old girls, five four-year-old girls, and one four-year-old boy. Group II was composed of twelve children--two three-year-old

boys, two three-year-old girls, two four-year-old boys, and six four-year-old girls.

Instruments

Instruments used in collecting basic data about subjects included a questionnaire, Behavior Profile, color-blindness and color preference test. Instruments used during the experiment were the direct observation schedule and time card, sound-level meter, tape recorder, and teacher's comments. A discussion of the development and use of these instruments follows.

Basic Data Collection

A questionnaire asking for information regarding color used in the child's home (wall colors, clothing, television, toys), and hue preferences of parents and of the child was given to the parents (Appendix B).

Seven student teachers, the lead teacher, and the mothers of the children were asked to fill out a Behavior Profile on each child (Appendix C). On the Behavior Profile, developed at the Merrill Palmer Institute, the following qualities were plotted on a continuum to describe the child's behavior: amount of activity, vigor of activity, sensitivity to stimulation, reactivity, alertness, characteristic mein, characteristic mood, stability of mood, and frustration tolerance. To arrive at a profile score, a numerical value was assigned to each adjective along the continuum and these values were tallied for each quality for each child. Scores for Group I and Group II were then

obtained by totaling these from each child's individual profile, so that the behavior of the groups could be compared.

Canaday (1971) related to the investigator a test for color blindness. This puzzle based on Ray's test for color blindness, was used individually by all subjects. The colors used were three close tints of pink, three close tints of green, and three close tints of blue. It consisted of 2" square color chips attached to a 15" x 18" cardboard base with a blank square alternating with the color chips and extra color squares for matching with those attached. The investigator showed each child how to put the puzzle together by matching the top three color chips on the board. When the child seemed to understand what was expected, he was given the remaining six color chips to place by himself. A child seeing color normally would have no trouble matching the two chips of the same color, while the color-blind child would have difficulty.

Before the experiment began, a hue preference test was given to each of the children using the wall colors in the experiment. Subjects were asked to choose a preference from six colors: dark blue, red, pink, light blue, red dots on pink background, and dark blue stripes on light blue background. The results were tabulated and reported as either red or blue preference, with their three variations.

Experimental Data Collection

The first step in developing a direct observation schedule for measuring behavior changes in nursery school children was to identify relevant, orienting, and disruptive behavior as it occurred in a

structured group time. Two weeks were spent in the Nursery School observing structured group sessions during which time one child's behavior was recorded each session. Twenty hours of such observations provided data from which groups of behavior categories were established. These were condensed and were found to coincide with Becker, Thomas, and Carnine's (1969, p. 8-9), Coding Categories for Children with Teachers, which was developed for use in behavior modification in the classroom (Appendix D). Some modifications were made in this observation tool during a discussion with the student teachers, the lead teachers, and the Director of the Nursery School. When a pre-test was conducted by two observers, other changes were made. The direct observschedule and time card was constructed to allow the observer to check a particular behavior at three second intervals. Each child was observed for a total of one minute, twenty seconds each session at three second intervals. Becker's symbols for each type of behavior were listed down the left side of the schedule, and time intervals were listed across the top. In this manner, twenty behaviors could be checked for a child during his observation period each day.

Direct observation by the investigator was made of the children as they participated in a structured group session of fifteen minutes each day for a total of fifteen days. The children of Group I were divided into three subgroups of four, four, and three, and the children of Group II were divided into three subgroups of four each. These subgroups were designated "A", "B", and "C". The fifteen minute period was divided into three five minute periods during which the children

assigned to a subgroup were observed. In order that the same children would not be observed during the same five-minute period each consecutive day a schedule for rotating subgroups was worked out as follows:

DAYS 1	2	3	4	5
A B C	B C A	C A B	A B C	B C A
6	7	8	9	10
C A B	A B C	B C A	C A B	A B C
11	12	13	14	15
B C A	C A B	A B C	B C A	C A B

A sound-level meter was used to measure the noise level in decibels of each structured group session. An observer directly behind the group of children recorded a decibel reading every thirty seconds during the fifteen minute session. The dial of the sound-level meter was set at seventy, which is optimum for recording normal classroom sounds (Dalby, 1971).

Every group session was taped on a small recorder to pick up the tone and verbal responses of the children. After the sessions were over, a tally of the vocal interruptions was made. Because most disruptive behavior of three and four-year-old children is in the form of a vocal interruption (Canaday, 1971), this instrument was used to add another dimension to behavioral records.

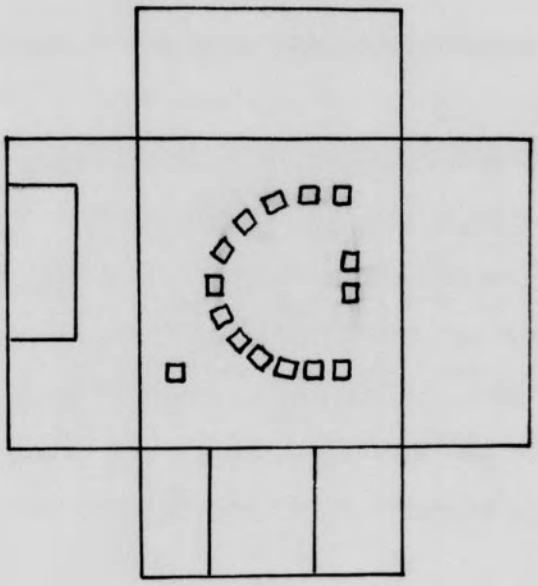
When the session with each group was completed, the teacher wrote her general comment on each child's behavior and noted her personal feelings about the color being tested. There were no specific instructions as to the type of comment for the teacher to record, which left

her free to make spontaneous remarks. Her comments about the subjects were separated into positive and negative statements, and a tally was kept.

Procedure

The Director of the Nursery School and the parents of all subjects granted permission for the experiment to be conducted, and the teachers cooperated and assisted. The experimental procedure was made as pleasant as possible and soon the children looked forward to group sessions.

The experimental wall structure was constructed by taping polyurethane panels 2' x 8' x 2" into five 6' high panels: 14' x 6', 12' x 6', 14' x 6', 3' x 6', 4' x 6'. These panels were taped and braced in four corners in a rectangular shape, leaving a 5' passageway in one side and a 3' x 7' window opening along the top of another side. The floor of this enclosure of 168 square feet was covered with two strips of white paper 6' x 14'. Natural and artificial lighting varied from 30 to 50 foot-candles according to the daylight conditions and specific wall color being tested. The subjects were seated in a semi-circle facing the teacher and the investigator, who recorded their behavior on the direct observation schedule and time cards. An observer with the sound-level meter sat behind the children. A diagram of the wall structure and seating arrangement of the children, teacher, and observers follows:



Scale- 1/8"= 1'

Fig. 1. Experimental Setting

The white polyurethane panels were used for the first three days of habituation for both groups and during the remainder of the experiment for Group II. For Group I, six rolls of painted paper were pinned to the wall structure for six days of the experiment and then repeated for six days more in the following order: dark blue, red, pink, light blue, red dots on pink background, and dark blue stripes on light blue background. Two rolls of paper 52' x 6' were painted with an oil based paint which matched a red and a dark blue selected from the Color Aid Pack and two rolls were painted with a water based paint which matched

the pink and light blue color numbers, 5.0, 5.OR 6/8 and 65.0, 5.0B 7/2, from the Munsell Book of Color. Red circular dots 1' in diameter were cut and pinned to the pink background and dark blue stripes 3" wide and 6' high were pinned to the light blue background at even intervals (Appendix A).

Basic data about the subjects were collected before the experiment began by means of a questionnaire, Behavior Profile, color blindness and color preference test which were discussed earlier.

Each day of the experiment both Group I and Group II were brought into the test situation for fifteen minutes. Group I was scheduled from 9:15 - 9:30 a.m. for the first six days and Group II from 9:40 - 9:55 a.m. For the last six days of the experiment, the time period was reversed for the two groups.

For the structured group session, the following stories were read, in the sequence listed, one a day for the first six days: Angus Lost by Marjorie Flack, Harry and the Lady Next Door by Gene Zion, Angus and the Ducks by Marjorie Flack, Curious George Rides a Bike by H. A. Rey, Harry by the Sea by Gene Zion, Curious George Takes a Job by H. A. Rey. During the last six days of the experiment, this order of the stories was repeated. The same finger play and songs followed each story for both groups with the same teacher conducting all sessions.

During the structured group sessions, this investigator observed and recorded by means of the direct observation schedule and time card the behavior of each child for one minute twenty seconds, at three second intervals according to the rotation described earlier. The

other observer recorded the decibel readings from the sound-level meter every thirty seconds, while a recorder taped each group's session. After each session had been completed, the teacher made comments on the behavior of the children and her personal feelings about wall color that day.

Analysis of Data

Group II behavior data served as a comparison for discussing behavior data of Group I. For the two days when walls were of identical color, raw data tallies were collapsed resulting in seven trials for each subject for the following types of behavior: relevant behavior, orienting response, disruptive behavior, and noise level. These scores for the base line and the experimental groups were analyzed by a two-factor mixed design repeated measures on one factor analysis of variance.

This two-factor mixed design is basically a combination of the completely randomized design and the treatments by subjects design. Not only does this design permit comparison of the differences of the overall performance of the subjects in the two experimental groups, but it also permits evaluation of the changes in performance shown by the subjects during the experimental session.

A simple analysis of variance was used to determine the difference between the number of vocal interruptions in Group I and Group II. The *t* test was used to determine the relationship between the behavior profiles of the experimental and the base line groups. Bruning and Kintz (1968) was used as a guide for the treatment of data.

CHAPTER IV

RESULTS AND DISCUSSION

The aim of this study was to explore the possibility of identifying measurable behavior changes in a nursery school child during a structured group session as a function of the classroom wall color. A review of literature on color research seemed to show a great deal of conflict among studies concerning the effect of color on human beings. Therefore, this study differed from previous studies in three ways: (1) Several studies have indicated that color arouses emotional reactions but no study has measured this reaction in behavioral terms. (2) Gerard's (1958) study measured the effects of hue in a room of colored light but no study has measured the influence of painted hues in a classroom situation. (3) Most studies appear to have been concerned with adult subjects who were aware of the fact that color was being tested yet no study has used nursery school children who were unaware that a test was being conducted or that color manipulation was the object of the test.

Data from previous research was used to develop the hypothesis that wall color will have no measurable effect upon relevant behavior, orienting response, disruptive acts, noise level, vocal interruptions, or teacher's comments in a nursery school structured group session.

Before the hypothesis could be tested, basic data concerning each subject's background of color experience and background of typical

behavior was needed. Information regarding color use at home (wall colors, clothing, television, toys) and hue preferences of parents and of the child were obtained by questionnaire. White walls occured most frequently, white being used in over three-fourths of the living rooms of children in the study, in one-half of the parent's bedrooms, in approximately one-third of the kitchens and children's bedroom, and in more than one-third of the nurseries. Browns (wood paneling) were used in approximately one-half of the family rooms, green in one-third of the bedrooms, and yellow in one-fourth of the kitchens. Reds and blues were seldom used as wall colors in the children's homes (Table 1).

Favorite colors reported were red and purple for the children, yellow for the mothers, and blue for the fathers. Blue was the most frequently stated color preference for children's clothing, and red the most frequently stated color preference for toys (Tables 2 and 3).

Two-thirds of the children were from homes having color televisions. Slightly over one-third of these children watched color programs for two hours daily, and one-fourth viewed such programs three hours daily (Table 4). All of the children in the study recognized color by name.

Table 4

Numbers of Children Who Spent Time Viewing Color T.V. vs. Black/White T.V.

		Less than 1 Hr.	1 Hr.	2 Hrs.	3 Hrs.	4 Hrs.	More than 4 Hrs.
Color T.V.							
	(No.)	3 of 16	3 of 16	6 of 16	4 of 16	-	-
	(%)	19%	19%	37%	25%	-	-
Black/White T.V.							
	(No.)	2 of 10	5 of 10	2 of 10	1 of 10	-	-
	(%)	20%	50%	20%	10%	-	-

NOTE: Two children watch both color and black/white T.V.

Table 1

COLORS USED IN THE CHILD'S HOME ENVIRONMENT
(Responses and Percents shown)

	Tints of:	Brown	Red	Orange	Yellow	Green	Blue	Purple	White	Other
LIVING ROOM	Responses	1 of 24	-	-	-	3 of 24	1 of 24	-	19 of 24	-
	Percent	4%	-	-	-	13%	4%	-	79%	-
KITCHEN	Responses	1 of 23	-	1 of 23	6 of 23	5 of 23	-	-	7 of 23	*3 of 23
	Percent	4%	-	4%	26%	22%	-	-	30%	13%
FAMILY ROOM	Responses	10 of 19	1 of 19	-	1 of 19	-	1 of 19	-	6 of 19	-
	Percent	53%	5%	-	5%	-	5%	-	32%	-
PARENT'S BDRM.	Responses	-	-	-	3 of 24	5 of 24	2 of 24	-	14 of 24	-
	Percent	-	-	-	13%	21%	8%	-	58%	-
CHILD'S BDRM.	Responses	-	3 of 24	-	4 of 24	8 of 24	1 of 24	-	8 of 24	-
	Percent	-	12%	-	17%	33%	4%	-	33%	-
NURSERY	Responses	1 of 24	3 of 24	-	4 of 24	4 of 24	2 of 24	-	10 of 24	-
	Percent	4%	12%	-	17%	17%	8%	-	42%	-

*There was one red/green, one yellow/white, and one red/blue/green reported.

Table 2

FAVORITE COLORS OF CHILD, MOTHER, AND FATHER
(Responses and their Percents Shown)

Tints of:		Brown	Red	Orange	Yellow	Green	Blue	Purple	White	None
CHILD	Responses	-	8 of 24	2 of 24	1 of 24	2 of 24	4 of 24	6 of 24	-	1 of 24
	Percent	-	33%	8%	4%	8%	17%	25%	-	4%
MOTHER	Responses	-	3 of 24	-	9 of 24	3 of 24	6 of 24	2 of 24	-	1 of 24
	Percent	-	12%	-	38%	12%	25%	8%	-	4%
FATHER	Responses	-	2 of 24	1 of 24	1 of 24	7 of 24	11 of 24	-	-	2 of 24
	Percent	-	8%	4%	4%	29%	46%	-	-	8%

Table 3

HUES OF FAVORITE CLOTHES AND TOYS OF THE CHILDREN
(Responses and Percent shown)

Tints of:	Brown	Red	Orange	Yellow	Green	Blue	Purple	White	Other
CLOTHES									
Responses	-	8 of 34	3 of 34	4 of 34	2 of 34	11 of 34	3 of 34	2 of 34	1 of 34
Percent	-	23%	9%	12%	6%	32%	9%	6%	3%
TOYS*									
Responses	-	6 of 15	-	1 of 15	-	4 of 15	2 of 15	1 of 15	1 of 15
Percent	-	40%	-	7%	-	27%	13%	7%	7%

*15 Responses Indicate Mixed Hues

Analysis of the behavior profile by the t test showed that there was no statistically significant difference between the behavior of Group I and Group II, yet examination of the two groups showed that the behavior of several children in Group I was rated on the extreme side of the chart (Table 5). When a child was extremely active, extremely frustrated, his score was above three. Therefore, one might speculate that in the actual performance of the two groups, Group I might have been slightly more suggestible than Group II.

All of the children were able to complete satisfactorily the color-blind test indicating that none were color-blind.

In the hue preference test, the children had their choice of two hues, red or blue. Three-fourths of the males chose blue and approximately three-fourths of the females chose red (Table 6).

Table 6

Hue Preference Test
(Responses and Their Percents Shown)

Hue		Category I Males (8)	Category II Females (15)
Blue	Responses	6 of 8	4 of 15
	Percent	75%	27%
Red	Responses	2 of 8	11 of 15
	Percent	25%	73%

The two hues were made up of three variations each--red, pink, and red dots on pink background; and dark blue, light blue, and dark blue stripes on light blue background. Over one-third of the male subjects preferred the dark blue while almost one-half of the female subjects preferred the red dots on pink background (Table 7).

Table 5

AVERAGE SCORES FOR ITEMS IN THE BEHAVIOR PROFILE

Children - Group I

	1	2	3	4	5	6	7	8	9	10	11	12	Average
Activity (Amount)	3	3	3	3	3	3	2	3	4	4	3	2	3.0
Vigor of Activity	3	3	3	3	3	3	3	3	4	4	3	2	3.1
Sensitivity to Stimulation	4	3	3	4	3	3	2.5	3	4	4	3	2.5	3.3
Reactivity	3	2	3	4	3	3	3	3	4	3	3	3	3.1
Alertness	3	2	3	4	3	3	3	3	4	3	3	2.5	3.0
Characteristic Mien	3	2	3	4	3	3	3	3	4	4	3	2.5	3.1
Characteristic Mood	3	3	3	3.5	3	3	3	3	3.5	3	3	3	3.1
Stability of Mood	3	3	3	3.5	3	3	3	3	3.5	3	3	3	3.1
Frustration Tolerance	4	3	3	4	3	3	3	3	3.5	3	3	3	3.2
Total	29	24	27	33	27	27	25.5	27	34.5	31	27	23.5	28.0

Children - Group II

	1	2	3	4	5	6	7	8	9	10	11	12	Average
Activity (Amount)	3	3	2.5	3	2.5	4	3	2	3	3	3	3.5	3.0
Vigor of Activity	3	3	3	3	3	4	3	2.5	3	3	3	3.5	3.1
Sensitivity to Stimulation	3	3	3	3	3	3.5	3	2	3	3	3	3.5	3.0
Reactivity	3	3	3	3	3	3	3	2	3	3	3	3	2.9
Alertness	3	3	3	3	2.5	3	3	2	3	3	3	3	2.8
Characteristic Mien	2.5	3	3	3	3	3	3	2.5	3	3	3	3.5	3.0
Characteristic Mood	3	3	3	3	3	3	3	2.5	3	3	3	3	3.0
Stability of Mood	3	3	3	3	3	3	3	2.5	3	3	3	3.5	3.0
Frustration Tolerance	3	3	3	3	3	3	3	2.5	3	3	3	5.5	3.1
Total	26.5	27	26.5	27	26	29.5	27	20.5	27	27	27	30.5	26.9

Table 7

Hue Preference Test with Tints and Variations of Blue and Red Hues

Tints & Variations		Category I Males (8)	Category II Females (15)
Dots	Responses	2 of 8	7 of 15
	Percent	25%	47%
Stripes	Responses	1 of 8	-
	Percent	12%	-
Dk.Blue	Responses	3 of 8	2 of 15
	Percent	38%	13%
Lt. Blue	Responses	2 of 8	2 of 15
	Percent	25%	13%
Red	Responses	-	2 of 15
	Percent	-	13%
Pink	Responses	-	2 of 15
	Percent	-	13%

Observations about each child's behavior, totaling 3,300 for Group I and 3,600 for Group II, were made during the fifteen days of testing by means of the direct observation schedule and time card. The sound-level meter and tape recorder registered the noise level and vocal interruptions of both groups daily, to total 430 decibel readings and 1,339 vocal interruptions over the fifteen day test period. There was a total of 509 teacher comments about the behavior of the children. The behavior of Group I as compared with that of Group II showed a statistically significant difference with all instruments as tested with a two-factorial analysis of variance repeated measures on one factor, a simple analysis of variance and a t test.

Information on relevant behavior, orienting response, and disruptive behavior was obtained by direct observation. For each child a tally was kept of each of these behaviors. These data were treated by two-factorial mixed design, repeated measures on one factor analysis of variance.

For relevant behavior the results of the analysis of variance (Table 8) indicated a significant difference between the conditions of Group I and Group II ($F = 11.11$, $p < .05$).

Table 8

Analysis of Variance For Relevant Behavior

Source	df	MS	F
Total	160	-	-
Between Subjects	22	-	-
Conditions	1	492	11.11*
Error b	21	44.28	-
Within Subjects	138	-	-
Trials	6	94.5	5.26*
Trials x Conditions	6	14.66	.81
Error w	126	17.94	-

*p .05.

Subjects in the base line group paid more relevant attention to the teacher, stories, finger plays, and songs than did subjects in the experimental group. The difference between the two groups was due in

part to the composition of the groups themselves. As was pointed out by the Behavior Profiles, Group I included several subjects who were less mature and more suggestible than those subjects in Group II; however, this was not a statistically significant difference. Another influence on the behavior of Group I probably resulted from the fact that color was changed daily and the situation was never stable.

The analysis of variance for orienting responses (Table 9) indicated a significant difference between the conditions of the two groups ($F = 6.67$, $p < .05$).

Table 9

Analysis of Variance for Orienting Response

Source	df	MS	F
Total	160	-	-
Between Subjects	22	-	-
Conditions	1	20	6.67*
Error b	21	3	-
Within Subjects	138	-	-
Trials	6	1	.1
Trials x Conditions	6	12.6	2.06
Error w	126	6.1	-

*p .05

More subjects watched other subjects more often in Group I than in Group II. This may have been due in part to the suggestibility and

less mature character of Group I as shown in the Behavior Profile. In most instances it was the youngest subjects in Group I who watched others rather than paying relevant attention, since their interest span seemed much shorter than that of the older subjects in their group.

For disruptive acts the results of the analysis of variance (Table 10) showed a significant difference between the conditions of the two groups ($F = 7.61$, $p < .025$).

Table 10

Analysis of Variance for Disruptive Behavior

Source	df	MS	F
Total	160	-	-
Between Subjects	22	-	-
Conditions	1	100	7.61**
Error b	21	13.14	-
Within Subjects	135	-	-
Trials	6	6.16	1.86
Trials x Conditions	6	4.67	1.41
Error w	126	3.30	-

**p .025

Group I had a greater number of disruptions throughout the testing period than did Group II, which was always surrounded by white walls. This result could have been caused in part by differences in the behavior of the two groups. The disruptive acts were most obvious during

the first eight days of the experiment, indicating that the initial impact of a stimulus causes the greatest reaction. This investigator concluded that despite these intervening possibilities that color was a contributing factor in the number of disruptive acts in Group I.

The data collected with the sound-level meter was analyzed by the two-factorial mixed design analysis of variance also. Analysis indicated a significant difference in the noise level of the two groups according to the test conditions (Table 11).

Table 11

Analysis of Variance for Sound-Level Meter

Source	df	MS	F
Total	419	-	-
Between Subjects	59	-	-
Conditions	1	349	21.14****
Error b	58	16.51	-
Within Subjects	360	-	-
Trials	6	43.6	5.59*
Trials x Conditions	6	5.5	.71
Error w	348	7.79	-

* p .05
**** p .001

Group I, which was tested in colored surroundings, was noiser than Group II which was tested in white surroundings. Just as results of the direct observation schedule and time card indicated that Group I

had more disruptive acts and orienting responses and less relevant behavior, the sound-level meter recorded a higher noise level for this group. All of these differences substantiate and give weight to each other, and all seem to indicate a difference between the behavior of the two groups.

Data collected with the tape recorder, the number of vocal interruptions per group, were analyzed by a simple analysis of variance.

Table 12

Analysis of Variance for Vocal Interruptions
(Group I & Group II)

Source	df	MS	F
Between Subjects	1	7154	19.58***
Within Subjects	10	365.4	
Total	11		

***p .005

Results (Table 12) indicate a significant difference (F = 19.85, p .005) in the number of vocal interruptions between the experimental and the base line group with the experimental subjects making significantly more vocal interruptions. This finding is in agreement with Canaday's statement (1971, personal communication), that "for children ages three and four, most disruptive acts are vocal."

From the results previously discussed, there was a significant difference between the behavior of the two groups, but in order to say which variable specifically caused this difference, whether it was the

weather, the differences in the subjects within the two groups, or the color, another test of significance was needed. Therefore, the two-factorial mixed design repeated measures on one factor analysis of variance was appropriate for comparing the groups across trials (also referred to as color days). If a significant difference was found across the trials then it would indicate that color was significant in causing this behavior.

The results of the analysis across trials for relevant behavior (Table 8) indicated that there was a significant difference ($F = 5.26$, $p < .05$), in the amount of relevant behavior for Groups I and II according to the colors used for each day's testing. There was more relevant behavior for Group II than for Group I, indicating that the group surrounded by white was less distracted and was better able to devote its' attention to the structured group session than was the group surrounded by the colored walls.

For orienting responses there was no significant difference across the trials between the two groups (Table 9). This result indicated that color had very little to do with how often a child attended to another child in either group. A child's looking at the floor or walls was considered ignoring and not an orienting response; therefore, the wall color could have drawn the child's attention away from the structured group session and other subjects.

The results of analyzing disruptive behavior indicated that there was no significant difference across trials for either Group I or II (Table 10). This suggested that a single wall color or a hue group

could not be given the credit for causing the difference between the two groups in disruptive behavior.

When the sound-level meter readings were analyzed (Table 11) there was a significant difference ($F = 5.59$, $p < .05$) across the days, indicating that the color of the day had influenced the noise level of the groups. Because the sound-level meter and the tape recorder were instruments which could not be influenced by value judgments, a great deal of confidence was placed in these findings across trials.

In order to determine which color made the difference in the amount of relevant behavior, orienting responses, disruptive behavior, and noise, an interaction between the trials x conditions for each of these behaviors was performed by the two-factorial mixed design repeated measures of one factor analysis of variance. Throughout the results for the measures mentioned there were no significant differences found for trials x conditions. Although it is not possible to state which color caused the greatest difference in the behavior of the two groups the fact remains from the other two statistical inferences of conditions and trials that subjects tested in the white wall surroundings when compared with subjects tested within the colored wall surroundings did show a measurable difference in most behaviors. There was always a significant difference found between Groups I and II under the test conditions for the following instruments: direct observation schedule and time card, sound-level meter, and tape recorder. Under color changes there was a significant difference only for relevant behavior and sound-level meter readings.

From the analysis of the data the null hypothesis stating that wall color had no measurable effect on behavior was rejected.

In order to further diagram the behavioral differences which occurred between the two groups the mean scores for relevant behavior, orienting responses, disruptive behavior, noise level, and vocal interruptions were plotted. These plotted mean scores give strong indication that the various wall colors used in the experiment did have measurably different effects on the behavior of the subjects in a structured group session. Although these differences were not statistically significant, it is of interest to this study to note the differences that did occur color by color and group by group.

When the mean scores of Group I and Group II were plotted for relevant behavior (Fig. 2) there seemed to be a strong indication that the colors, dark blue, red, and pink caused Group I to pay less attention, while the light blue, dots, and stripes caused more attention. Relevant behavior occurred least on days that walls were pink and most on days that walls were light blue.

The plotted mean scores of orienting responses of Group I and Group II (Fig. 3) support the previous observation made from statistical data that orienting responses were not a measurable behavior in reference to color change. There were variations in the means of the two groups, but there was no pattern in either of them. The fluctuation in Group II was just as great as that in Group I; therefore, it seemed that orienting responses were not effected by color.

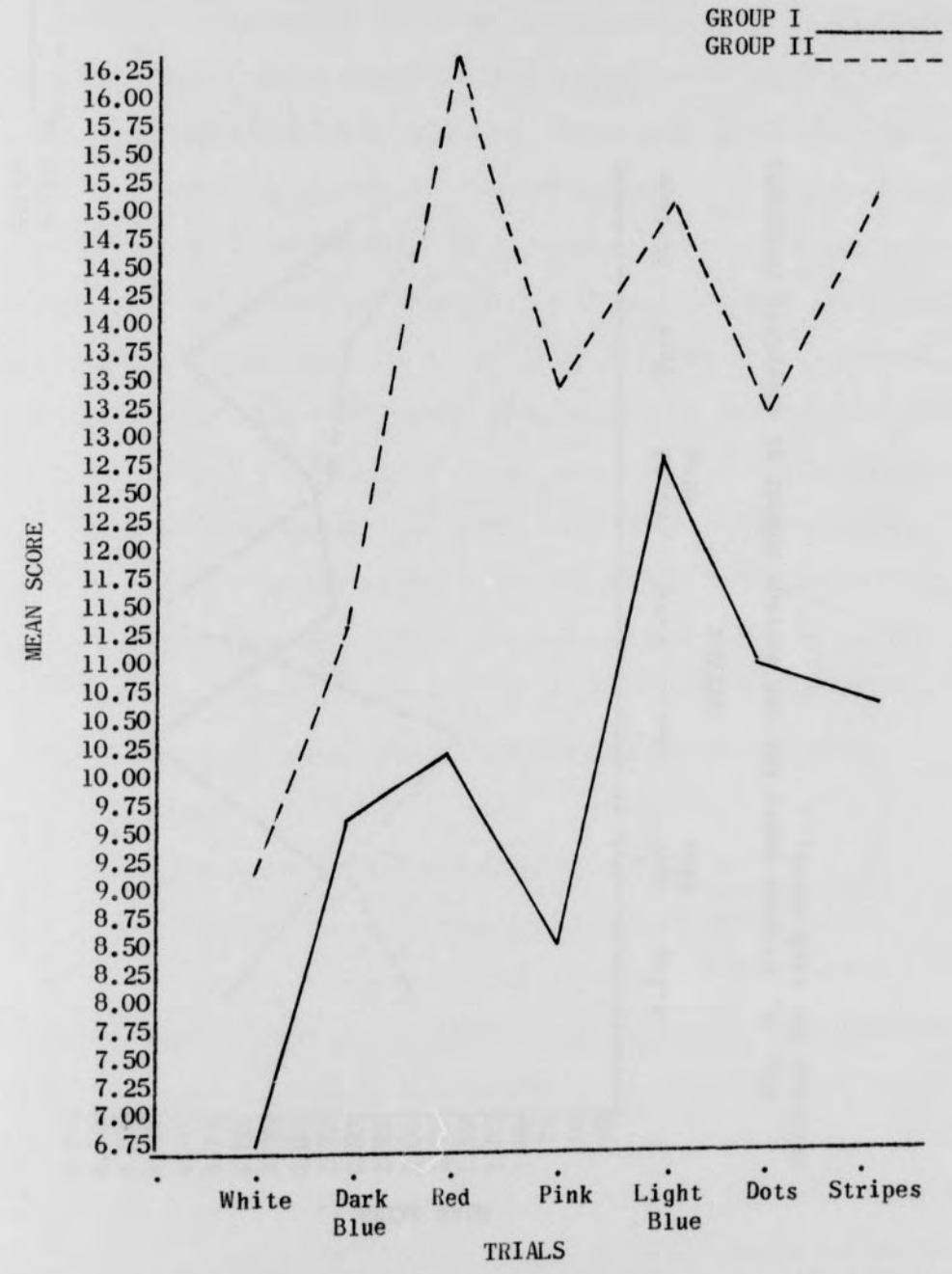


Fig. 2. Plotted means for the average number of relevant behaviors recorded for each color.

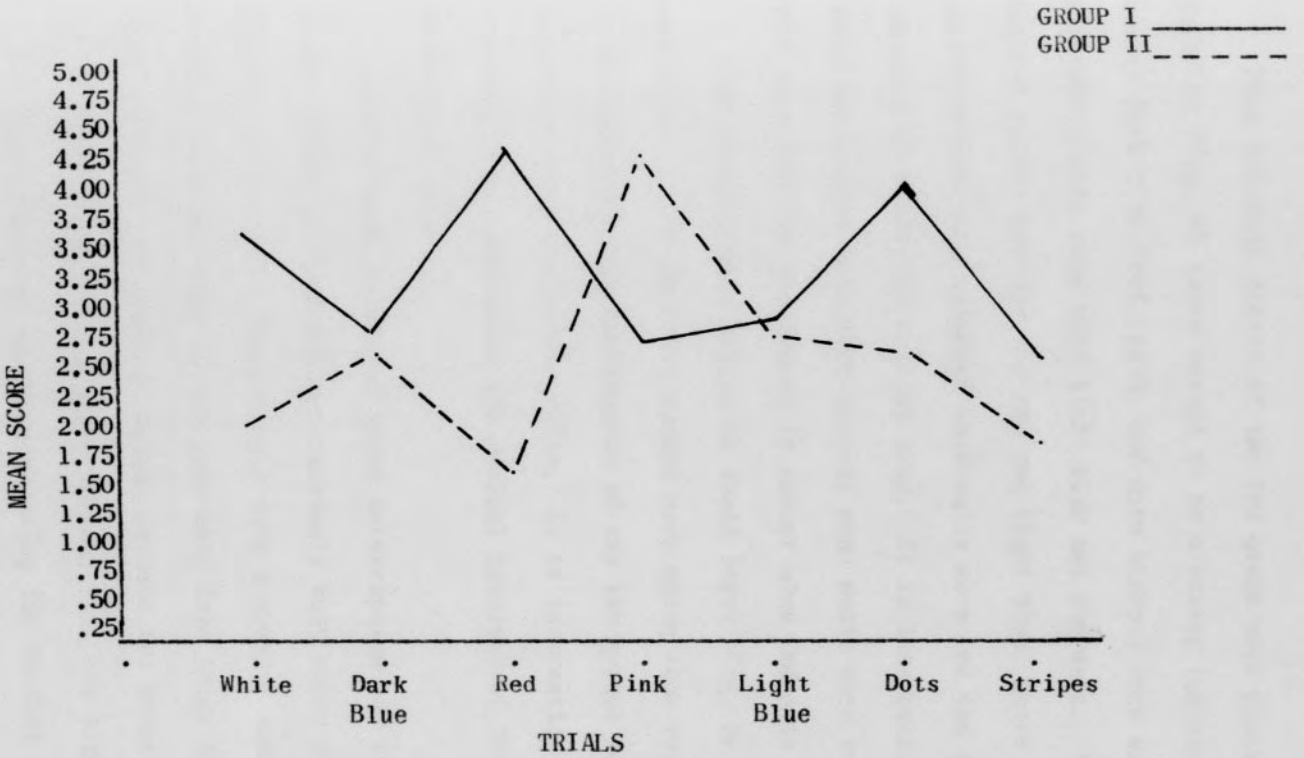


Fig. 3. Plotted means for the average number of orienting responses recorded for each color.

When the mean scores of the two grups were plotted for disruptive behavior (Fig. 4) there seemed to be a strong indication that the colors dark blue, red, pink, and blue stripes were associated with more disruptive acts than were light blue and the dots. The widest spread between colors was for the red and light blue, where the highest number of disruptive acts occurred when walls were red and the smallest number occurred when they were light blue. It is interesting to note that while disruptive acts were highest when walls were red, and disruptive acts were next to the fewest in number when red dots were on pink walls.

The plotted mean scores of sound level (Fig. 5) indicated that the variations of red on walls caused more noise than variations of blue. It was apparent that habituation of the two groups occurred at different rates when walls were white. It is interesting to note that as the experiment continued, the decibel readings of the two groups became more alike.

Plotted mean scores of vocal interruption raw scores for both groups seemed to indicate very strongly that color does make a difference, and that on the red wall days a greater number of vocal interruptions occurred than on the blue wall days (Fig. 6). Dark red and light blue had the greatest spread between the means, suggesting that the red caused more vocal interruptions than the light blue.

A histograph was constructed using the decibel averages collapsed across the days (Fig. 7). There was an indication that color did make a difference in the noise level between the two groups, as Group I was always louder than Group II. On red wall days, higher decibel readings

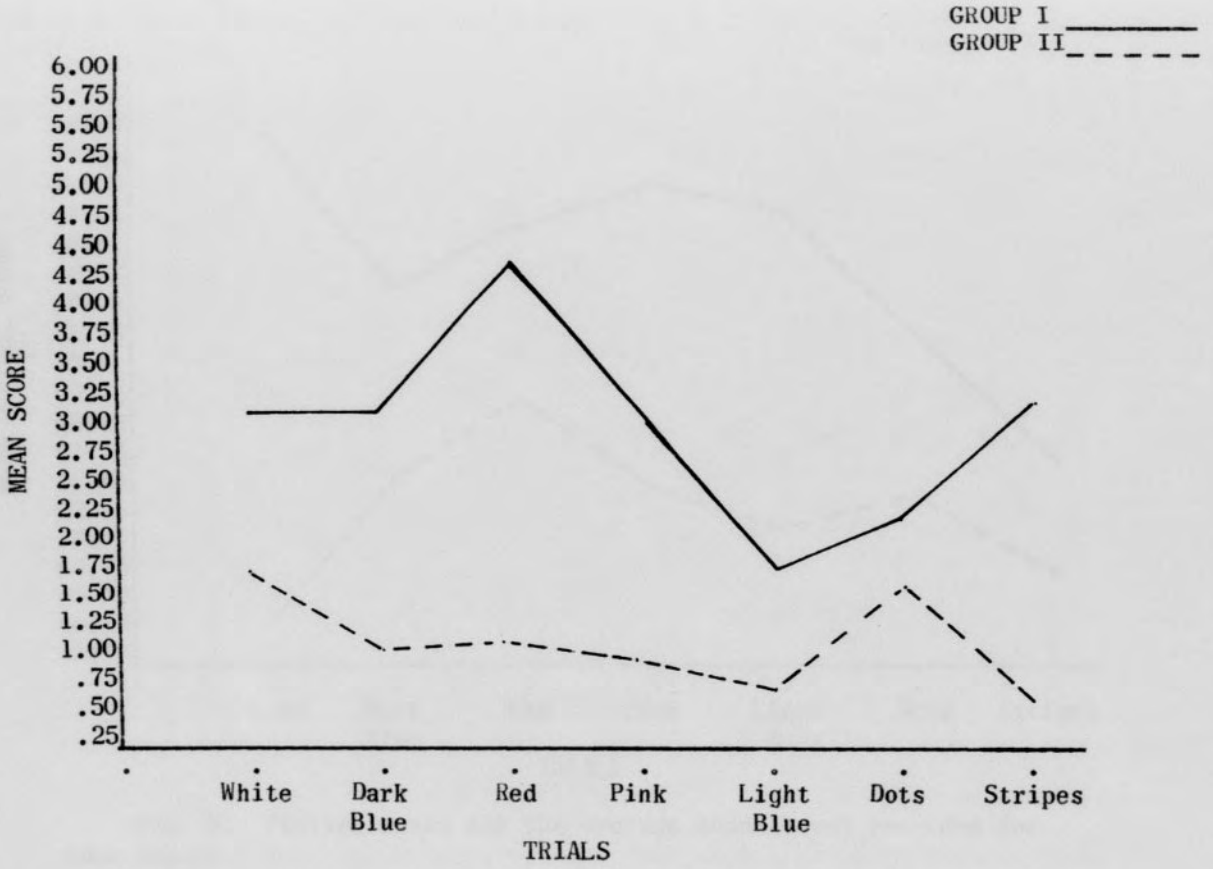


Fig. 4. Plotted means for the average number of disruptive behaviors recorded for each color.

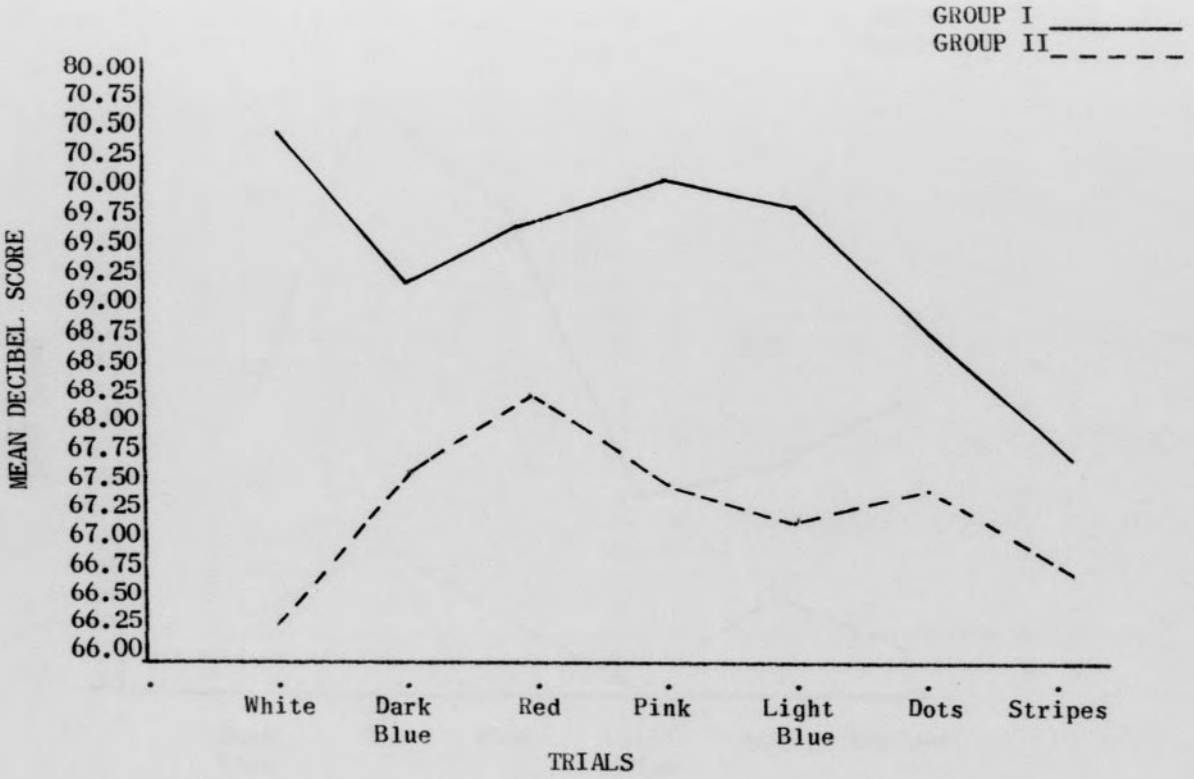


Fig. 5. Plotted means for the average sound level recorded for each color.

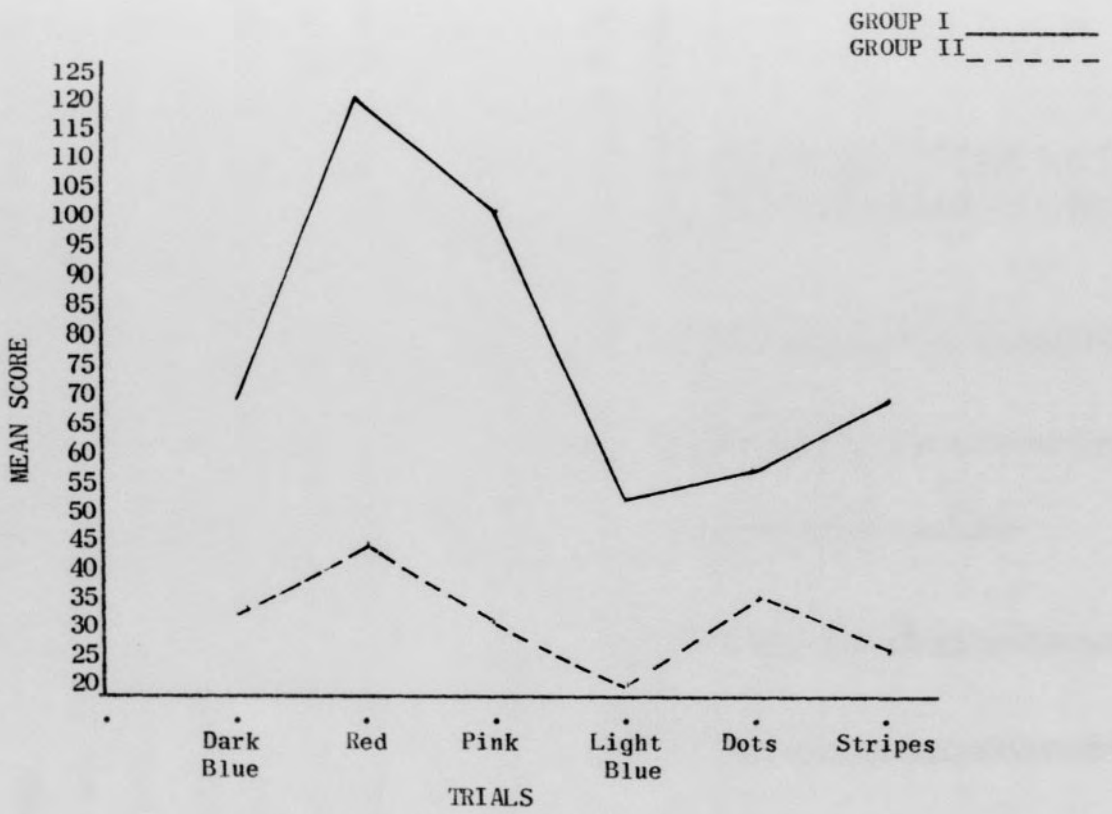


Fig. 6. Plotted means for the average number of vocal interruptions recorded for each color.

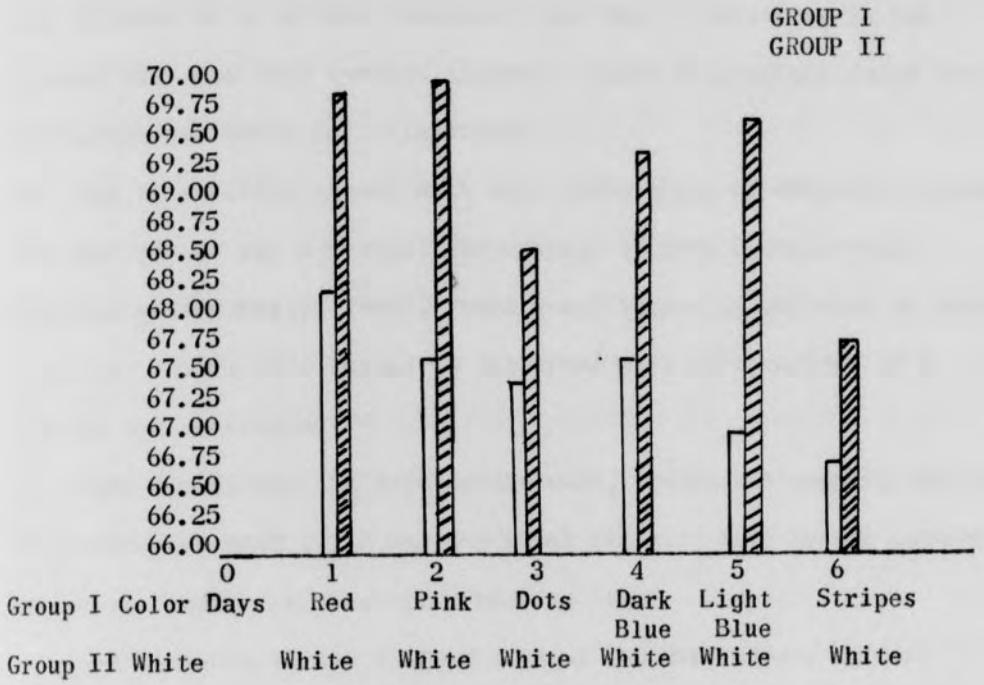


Fig. 7. Sound-level meter, histograph showing average for colors.

were produced than on the blue wall days. The two figured backgrounds seemed to relate in smaller decibel readings, and yet the red dots still were associated with a higher reading than the blue stripes.

To summarize, red and pink walls caused less relevant behavior, more disruptions, and more noise to occur than did light blue walls. The figured backgrounds of dots and stripes caused less disruption than did the intense colors of red, pink, and dark blue. This raises several questions:

1) Is it possible that a more complex patterned background is less disruptive than a saturated colored background? Researchers have found

that figures of a certain complexity are more interesting to the learner than the less complex figures. Could this effect carry over to the background walls in a classroom?

(2) Was this effect caused with this young group of subjects because they had not as yet developed the concept of form consciousness (Suchman and Trabasso, 1966)? What would happen if children in grade school or adults were tested in patterned wall surroundings in a similar test situation?

(3) What effect are the psychodelic wall, treatments suppergraphics, and wallpapers with large designs which recently have become popular, having on people who live surrounded by them?

For fourteen of the fifteen days of the experiment, decibel readings were plotted according to first or second exposure to a color treatment of Group I. On each of the two days of white wall treatment, which were principally days of habituation, there was a lot of noise throughout the structured session for both groups (Figs. 8 & 9). Group II, however, had less noise for a fairly long period of time, while the noise level fluctuated up and down for Group I through the second day. On the next day, dark blue was introduced to Group I; the noise level was higher than for Group II (Fig. 10). On the first red wall day, noise level was higher for Group I; there was a difference in the two groups, yet not extreme (Fig. 11). With the first pink wall treatment, Group I had a much higher decibel reading than did Group II (Fig. 12). When walls were light blue for Group I, the decibel readings for the two groups were much closer together than with any previous color, yet

noise in Group I was again greater (Fig. 13). On the first day of red dot treatment, the experimental group evidenced a slightly higher noise level (Fig. 14). A deviation in the noise pattern of the first seven days of the experiment occurred when striped walls were introduced (Fig. 15). On that day the white wall group was noisier.

To summarize the findings from the graphs for the first trials with each color, it seems that the greatest decibel reading differences came on the pink wall day with Group I being much noisier than Group II. On the light blue wall day, the noise level of the two groups was very close together. On the striped wall day, the noise level of Group I was not as great as that of Group II in the white wall surroundings.

When the dark blue color was tried for a second time, several interesting things occurred. The difference in noise between Group I and Group II increased, with Group I being much noisier than Group II (Fig. 16). Again, there was little difference in the two groups on the second day of red wall treatment (Fig. 17). On the second pink wall day there was a difference between the noise level of the groups, but not as much as there was on the first day of exposure to this color (Fig. 18). On the second exposure to light blue walls, Group I showed an extremely high noise level, much higher than that of Group II, which was just the opposite effect obtained from the exposure to it on the first trial (Fig. 19). On the second trial of the dots and stripes, there was again very little difference between the groups (Figs. 20 & 21).

To summarize, the decibel readings for both trials were very close when dots and stripes were used on the walls for Group I. The other decibel readings for both trials varied when red, pink, dark blue, and light blue were used on the walls.

From the tally that was kept on the teacher's positive and negative comments, it was observed that more positive as well as negative statements were made on the days when the red dots on pink background were on the walls. On the pink and red wall days, the number of negative comments was somewhat fewer than it had been on the dot wall days. On the dark blue and striped wall days, a fewer number of negative comments was elicited than had been on the dot pink and red wall days. The light blue wall day elicited the lowest number of negative comments and the highest number of positive comments. The figures are shown below in a table. These figures have been collapsed across identical days of each color for both Group I and Group II.

Table 13

Teacher Comments

	Positive	Negative
Dark Blue	57	26
Red	57	30
Pink	52	31
Light Blue	61	20
Dots	74	33
Stripes	46	22

It appeared that the wall colors affected the teacher in very much the same way as it did the children.

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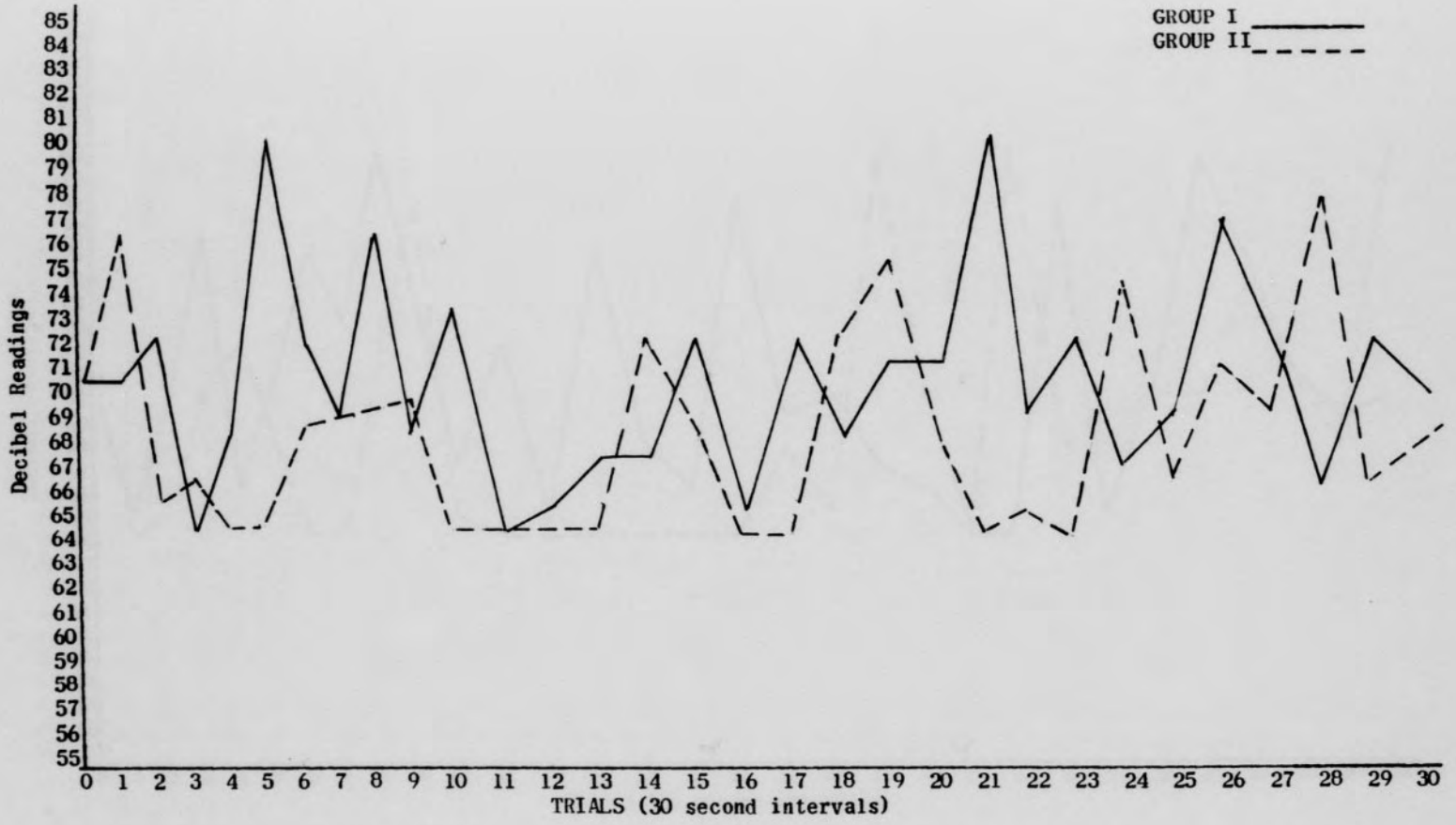

Fig. 8. Daily sound-level meter readings (1st day with white walls)

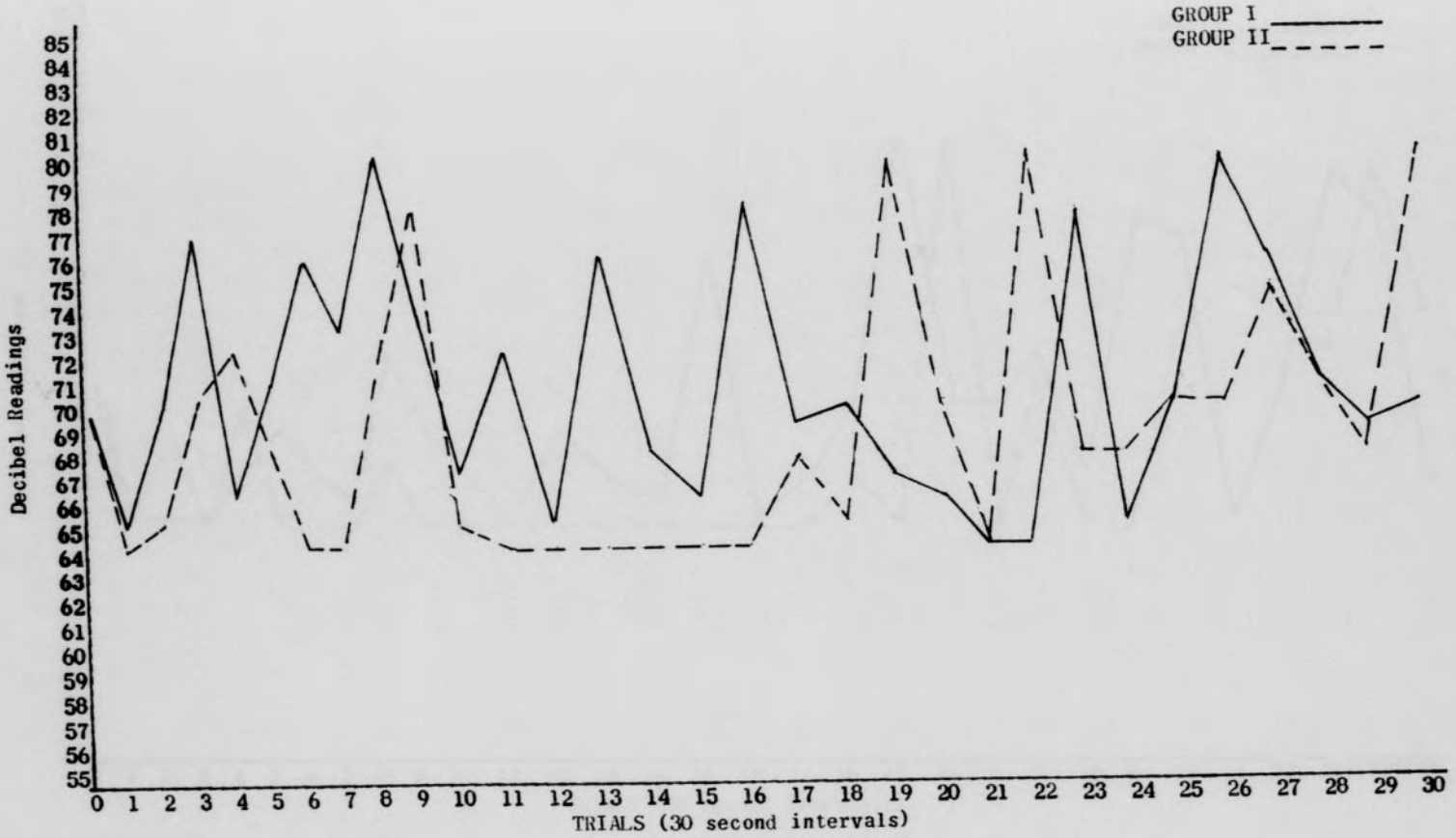

Fig. 9. Daily sound-level meter readings (2nd day with white walls)

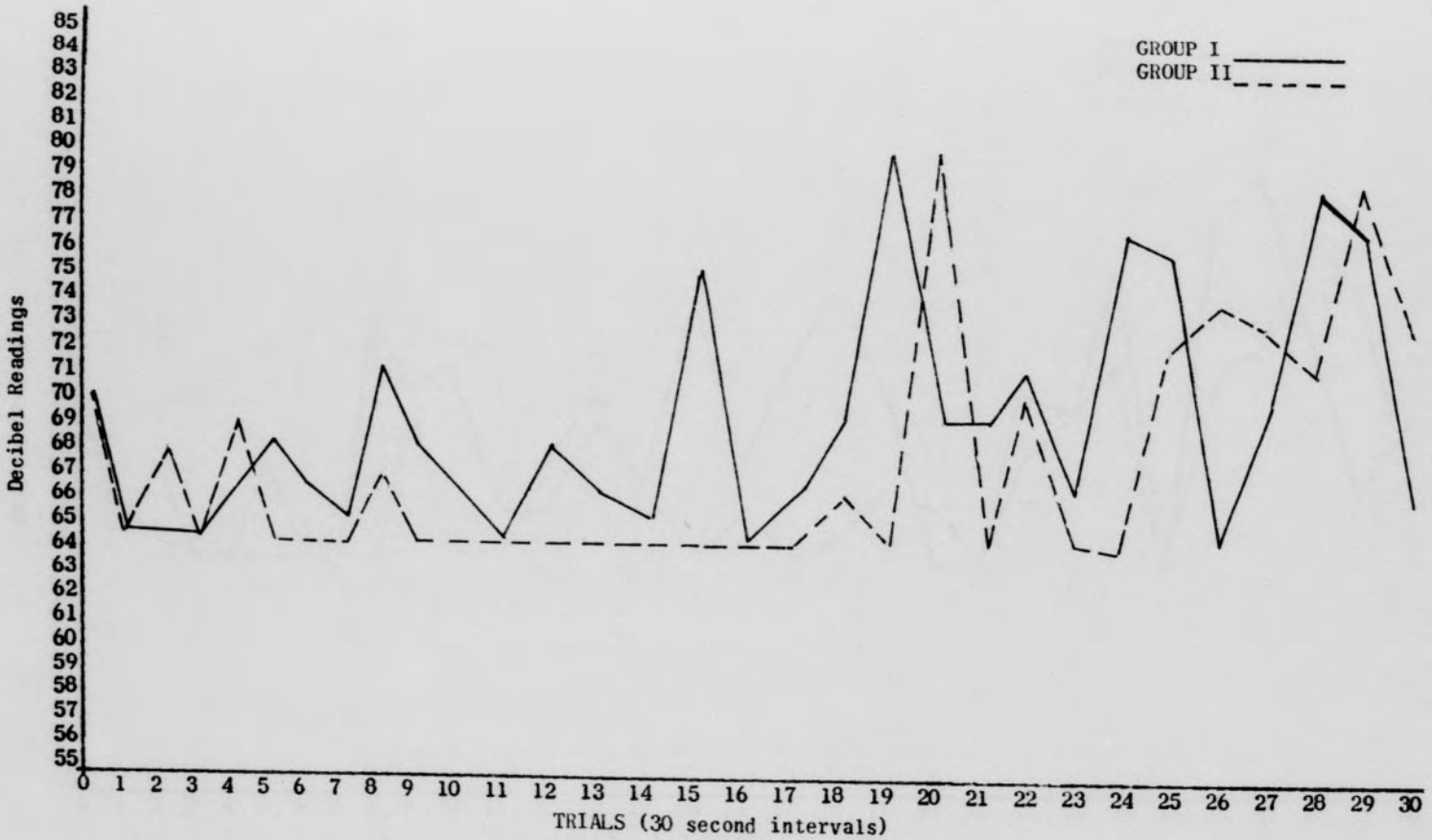

Fig. 10. Daily sound-level meter readings (1st day with dark blue walls)

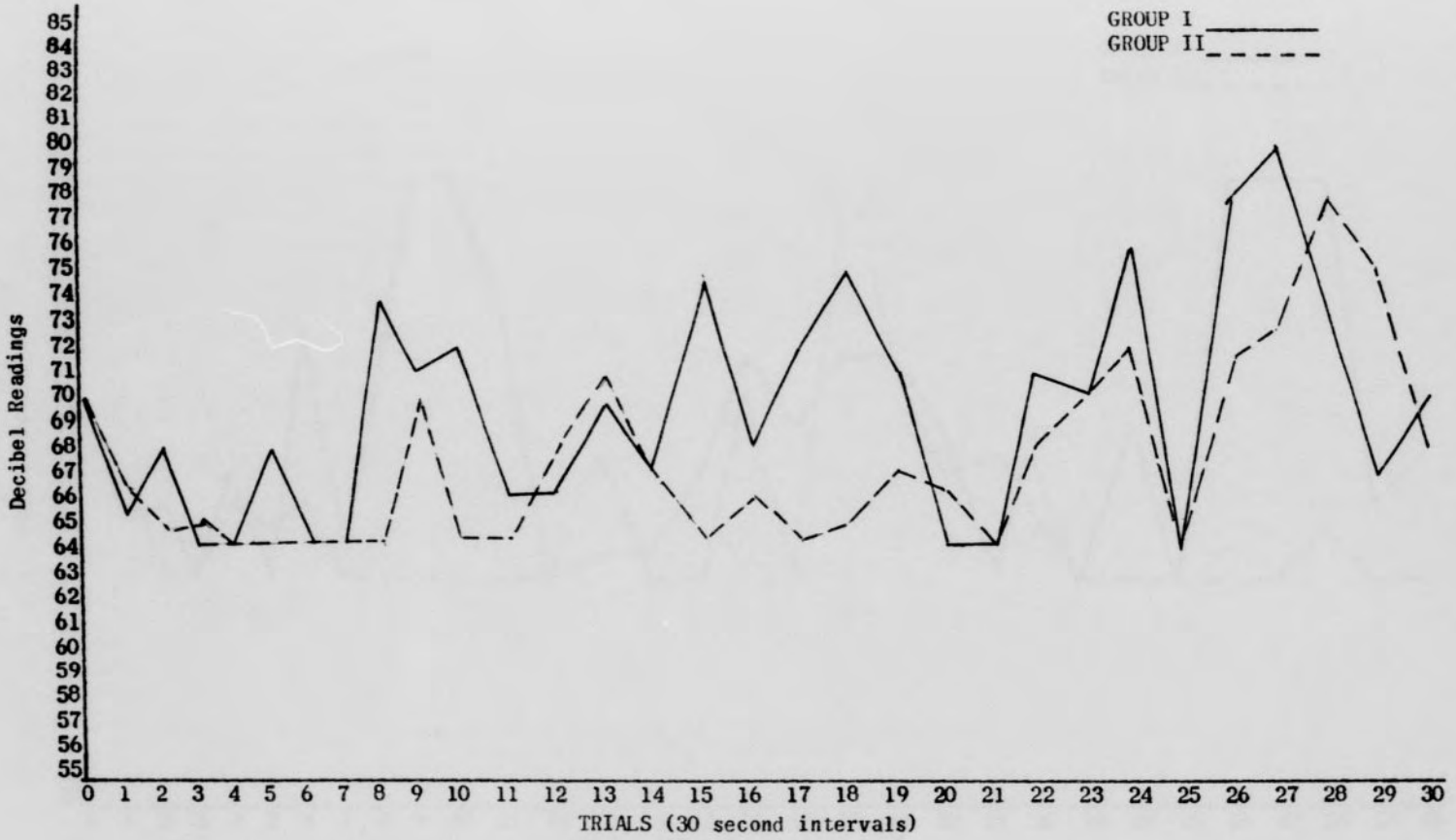

Fig. 11. Daily sound-level meter readings (1st day with red walls)

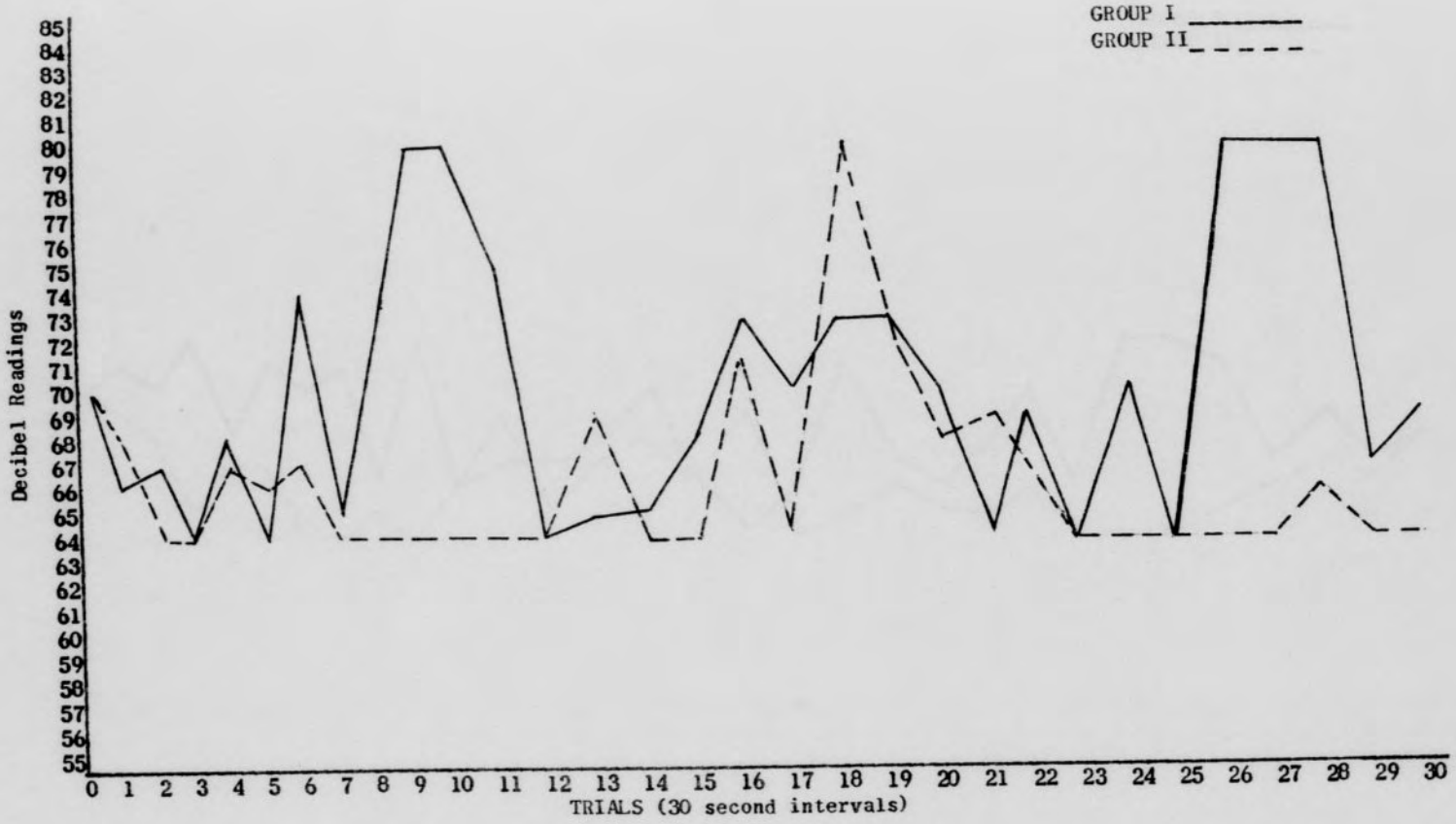

Fig. 12. Daily sound-level meter readings (1st day with pink walls)

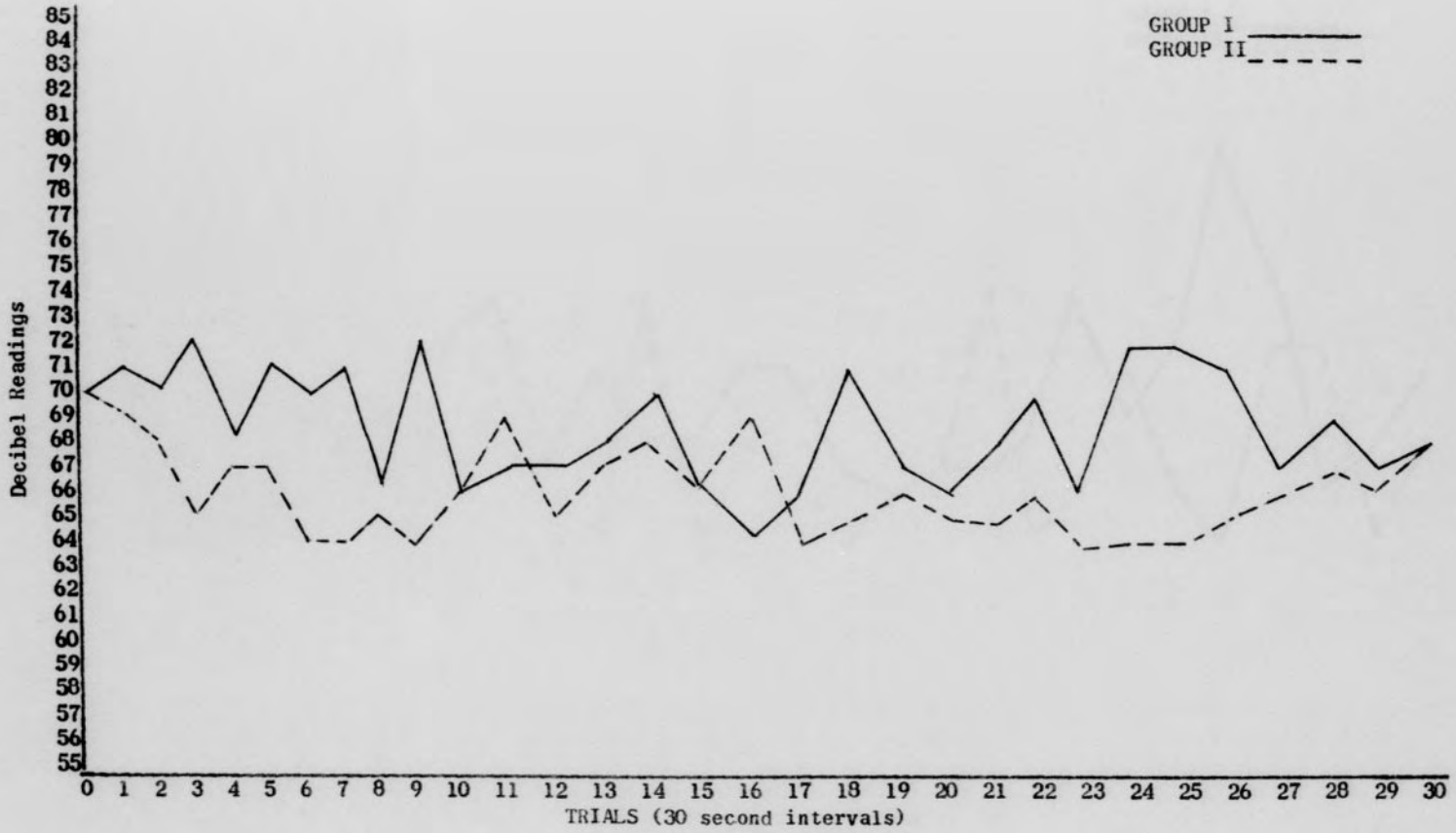

Fig. 13. Daily sound-level meter readings (1st day with light blue walls)

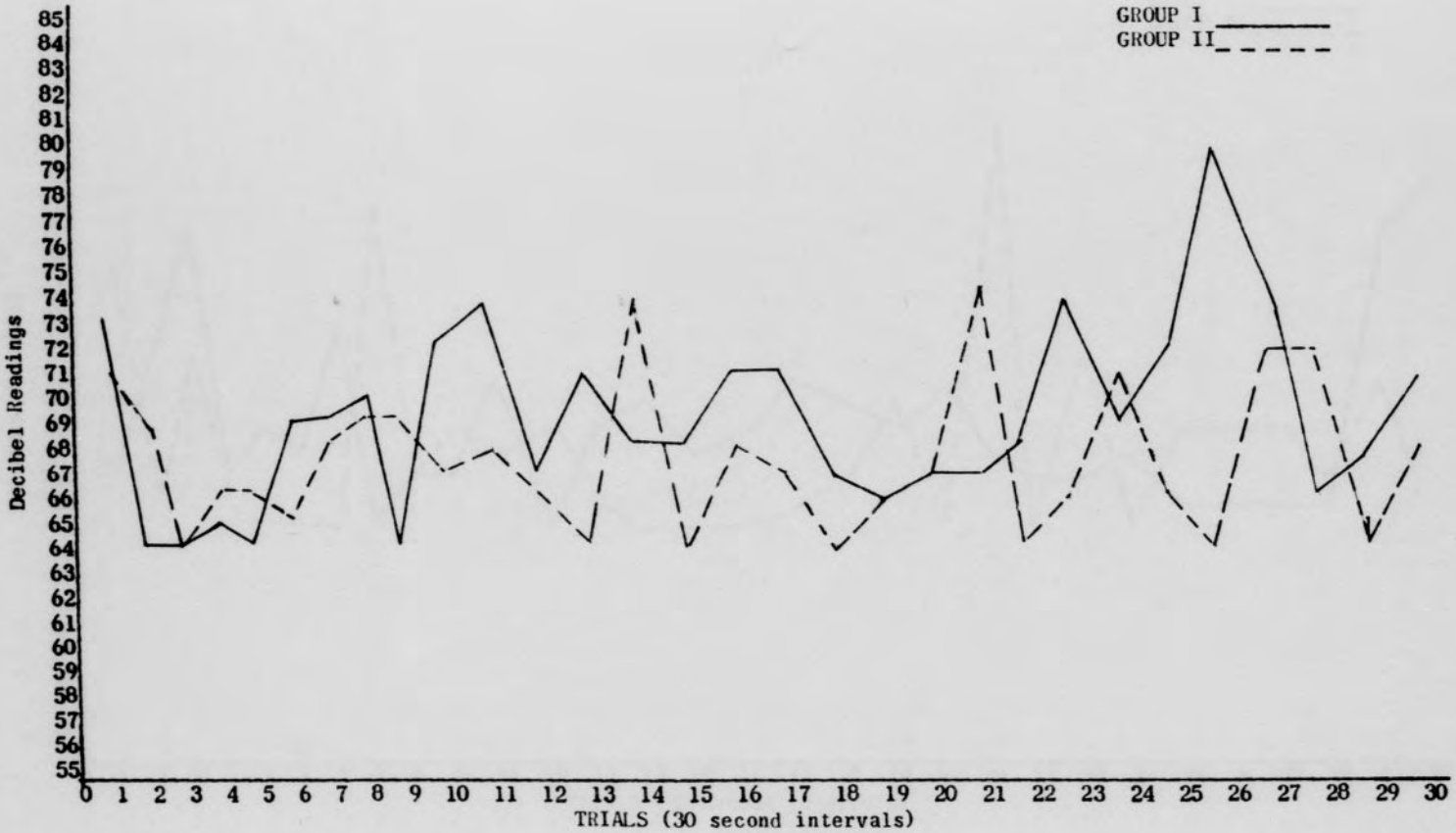

Fig. 14. Daily sound-level meter readings (1st day with dot walls)

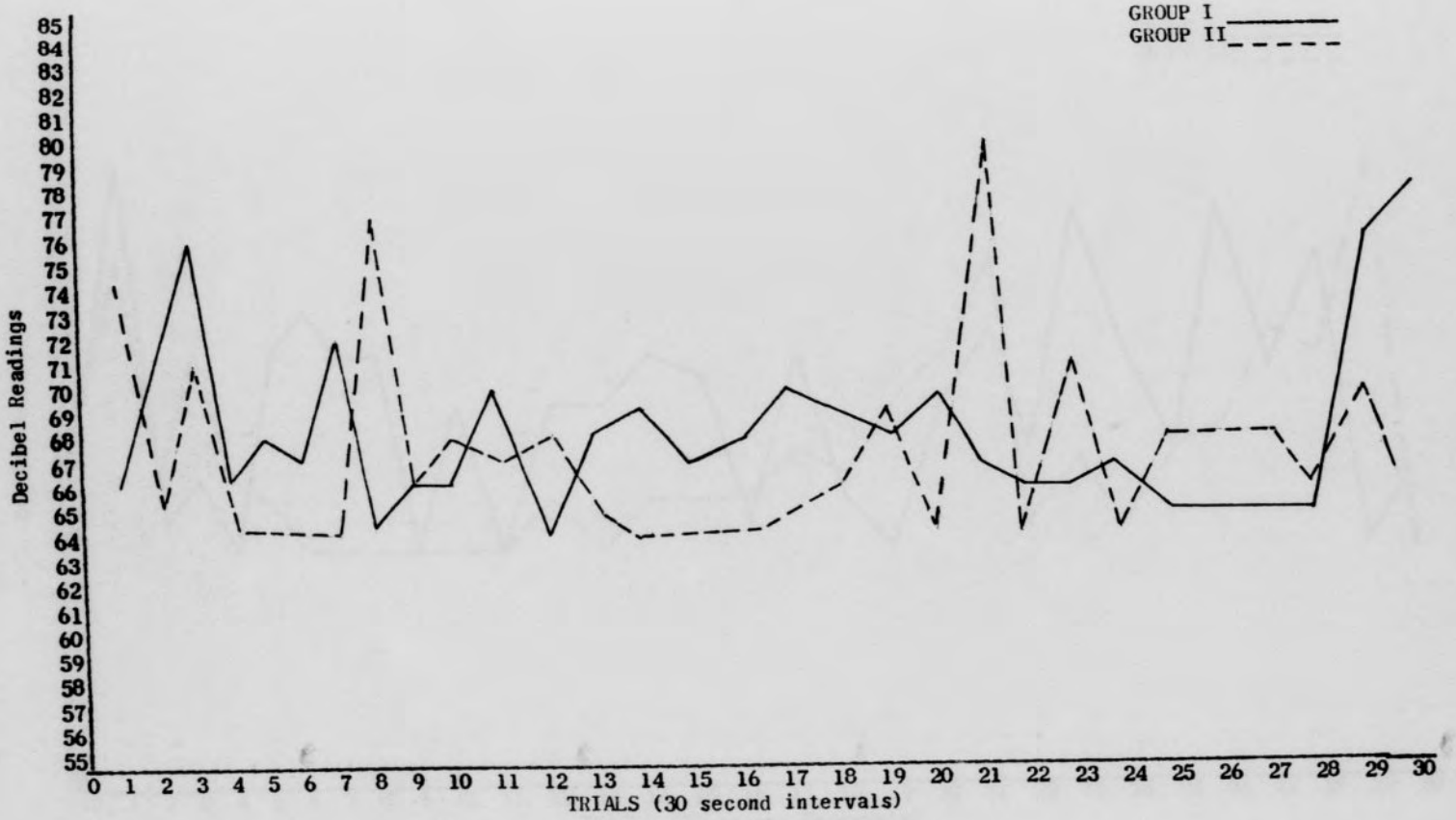

Fig. 15. Daily sound-level meter readings (1st day with striped walls)

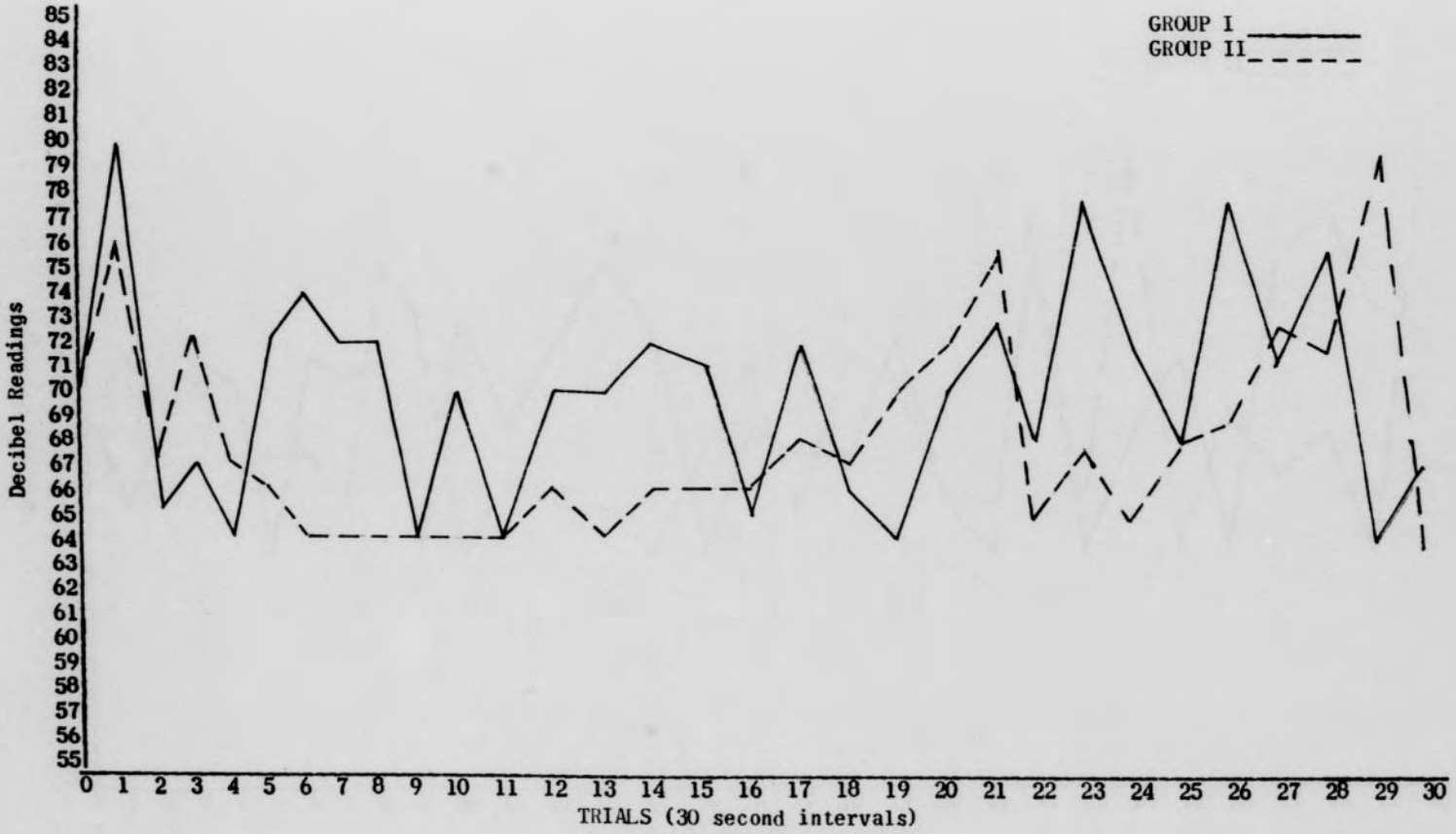

Fig. 16. Daily sound-level meter readings (2nd day with dark blue walls)

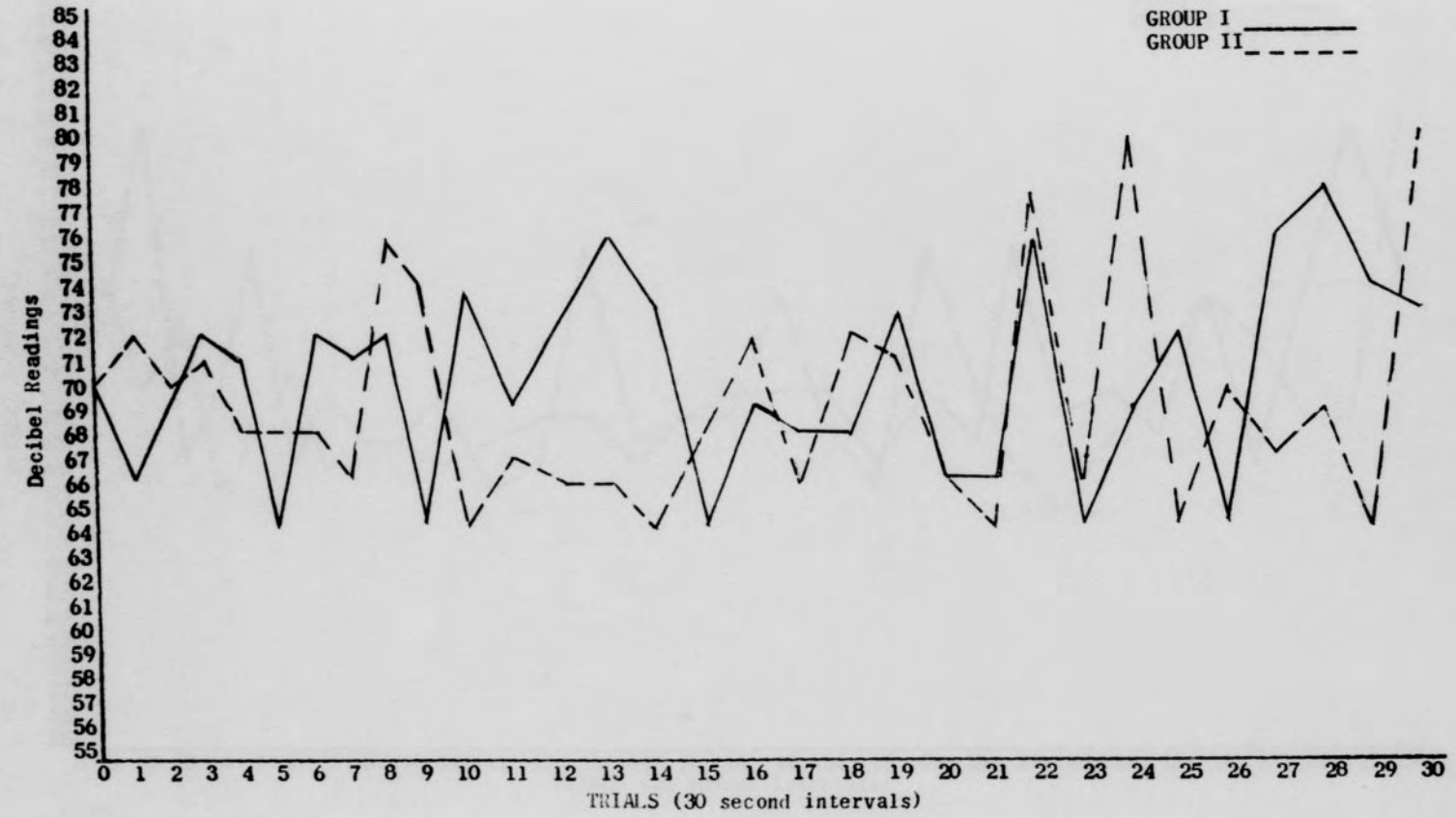

Fig. 17. Daily sound-level meter readings (2nd day with red walls)

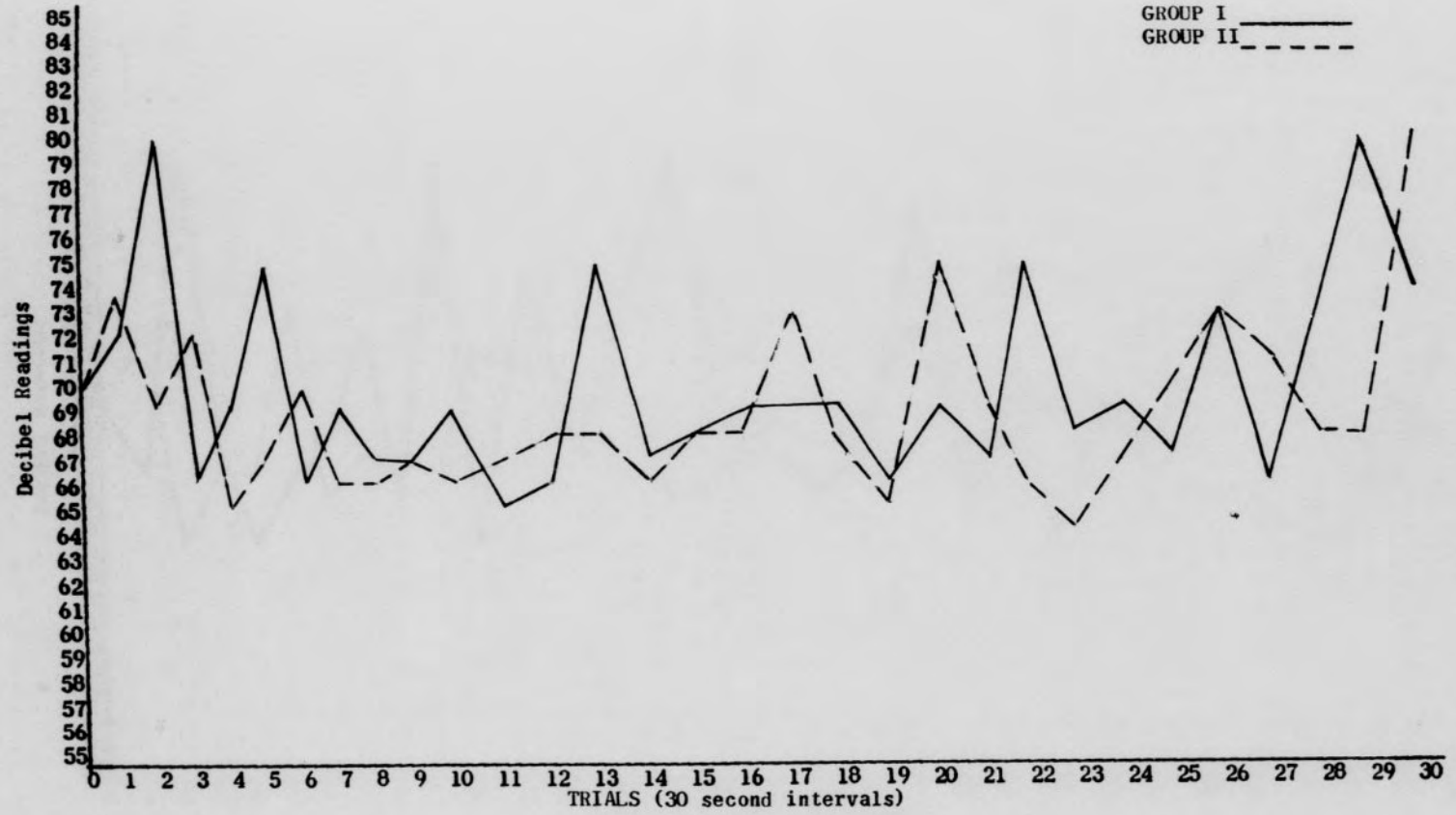

Fig. 18. Daily sound-level meter readings (2nd day with pink walls)

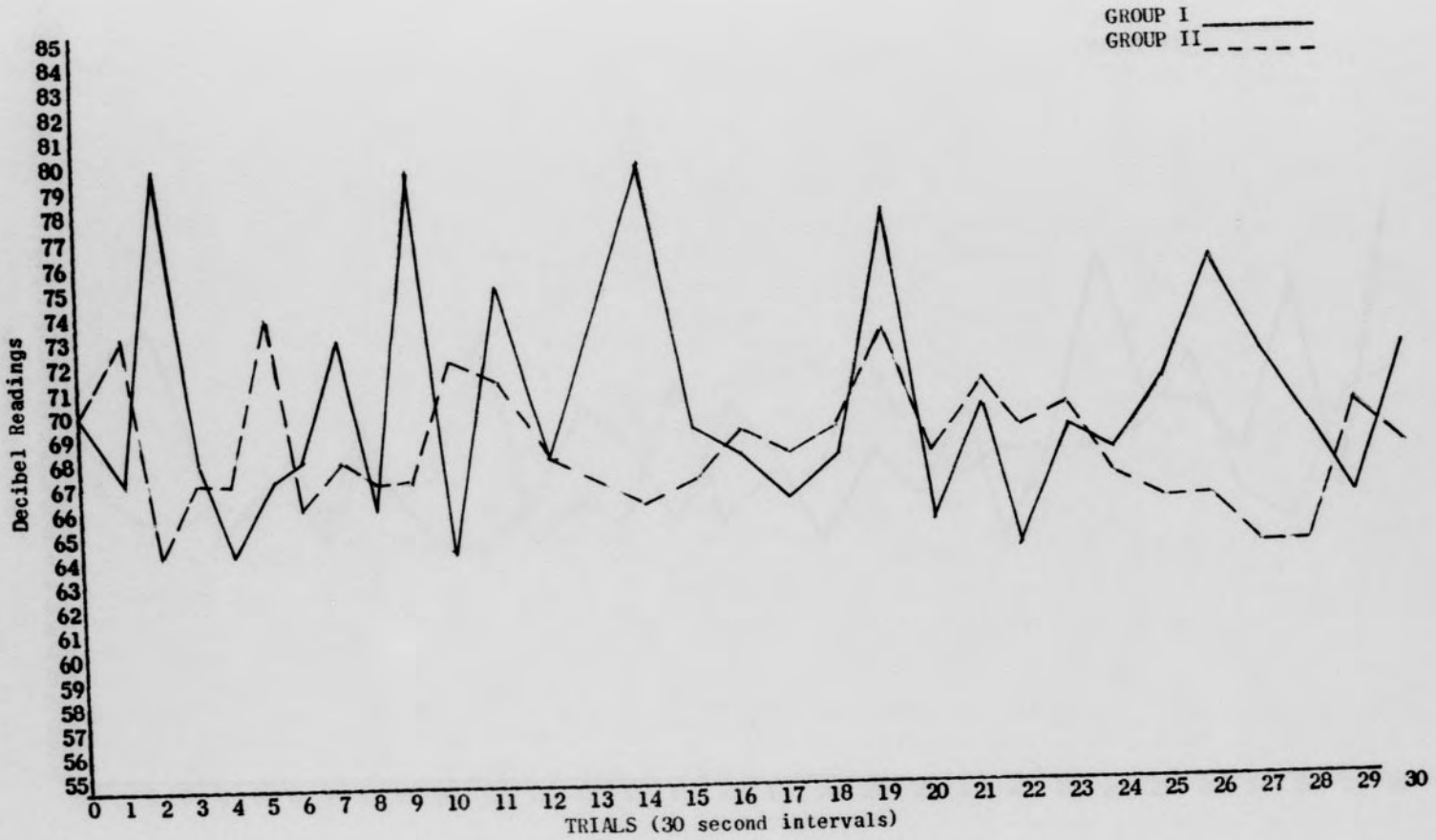

Fig. 19. Daily sound-level meter readings (2nd day with light blue walls)

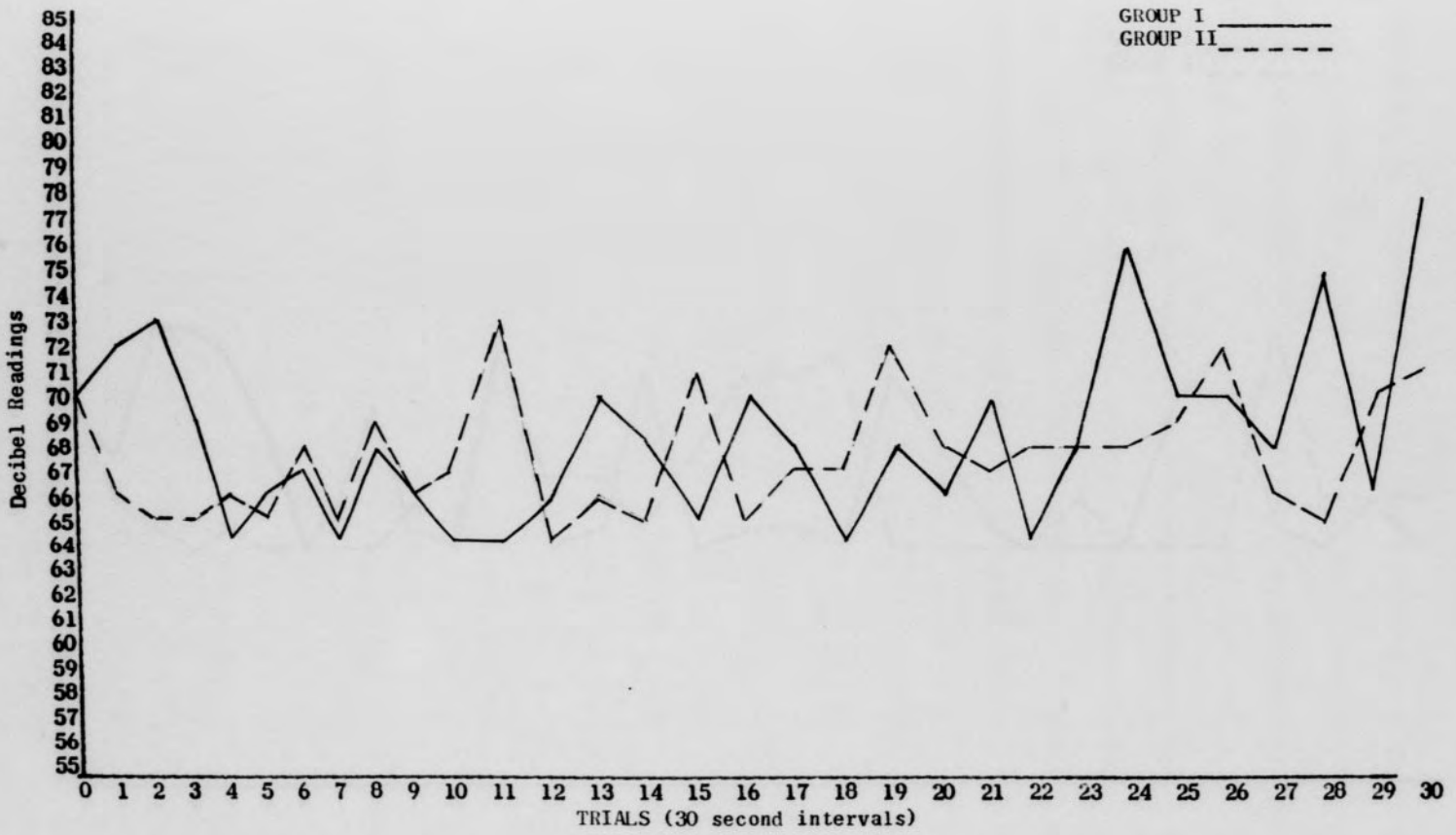

Fig. 20. Daily sound-level meter readings (2nd day with dot walls)

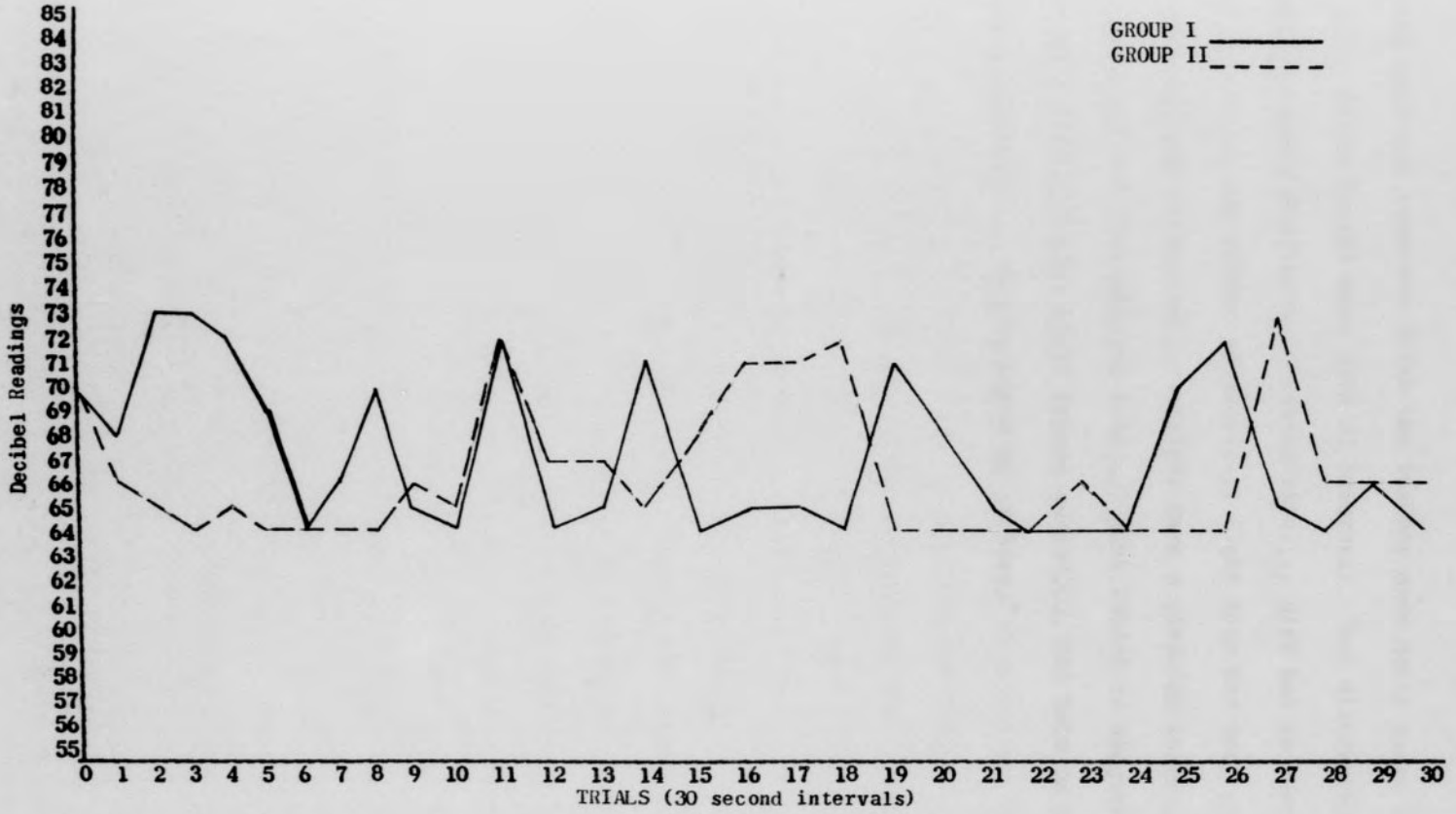

Fig. 21. Daily sound-level meter readings (2nd day with striped walls)

The personal comments which the teacher made daily about the colored walls being tested were also of interest: "red distracted my attention--seemed difficult to concentrate..., pink had no special effect on me--it was rather pleasant..., light blue was very pleasing ..., dots did not bother me..., stripes were a pleasing color..., red was disturbing and hot--extreme heat..., pink tended to suggest heat; color was pleasing (light blue) seemed cooler..., red dots on pink are hot and disturbing..., not bothered by stripes."

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

For centuries planners, architects, interior designers, and product designers have manipulated the abstract environmental variables of their trade--shape, form, space, and color--with little understanding, if any, of the effects these variables have had on those for whom they designed. Because human behavior is known to be influenced by these variables, it is imperative that designers begin to develop techniques to identify and measure these behavior changes. Therefore, this study of wall color is timely and justified.

This study was undertaken to investigate the stimulus characteristic of wall colors in a nursery school setting utilizing a structured group session and to find out if a subject's relevant behavior, orienting response, disruptive behavior, noise level, and vocal interruptions were influenced by changes in wall color. Subjects were twenty-three children enrolled in the 1971 summer session for three and four-year-olds at the University of North Carolina at Greensboro, School of Home Economics Nursery School. The subjects were randomly assigned to either Group I or Group II, one group serving as the baseline with white wall color surroundings and the other as the experimental group with colored wall surroundings.

Each group's behavior was observed and recorded daily by means of a direct observation schedule and time card, sound-level meter and tape

recorder in a fifteen minute structured group session for fifteen days. The subjects were brought into the test room, used exclusively for this purpose during the experiment, and seated in a semi-circle around the teacher and observer. The wall structure surrounding the enclosed space allowed for flexibility in changing the colors as it was made of 2" thick polyurethane panels to which painted paper could be pinned. As many variables as possible were controlled so that wall color was the only difference in the test situation of Groups I and II, day by day. Analysis of the data was made by a two-factorial mixed design repeated measures on one factor, and a simple analysis of variance and a t test between means.

Conclusions

The conclusions were: the null hypothesis that wall color will have no effect upon relevant behavior, orienting response, disruptive behavior, vocal interruptions, or noise level in a structured group session in the nursery school was rejected. An analysis of variance was performed on the data collected from the direct observation schedule and time card, sound-level meter and tape recorder and in each test there was a significant difference between the behavior of Group I and Group II. The baseline group was less noisy and less disruptive, and paid better attention than did the experimental group. The analysis performed on the sound-level meter readings and relevant behavior indicated a significant difference between the behavior of Group I and Group II, which occurred when certain colors were on the walls. This difference disclosed that color did make a difference in the noise

level of the groups and in the amount of relevant behavior in the groups. There was not a significant difference in the behavior of the two groups for the amount of orienting responses or disruptive behaviors when the wall colors were changed. When the interaction analysis for trials x conditions was performed on the data, there was no significant difference between the behavior of the groups, indicating that it was not possible to tell which of the seven colored walls made the difference.

Recommendations for Further Study

The investigator recommends that more emphasis be placed on the study of the environmental-stimulus color and it's effects on the behavior of human beings. Because this study indicated a significant difference between groups placed in varying color surroundings, it seems that more research should be done to substantiate and further define these findings.

There are many ways in which this study could be improved.

1. The experiment needs to be conducted over a longer period of time because human beings are able to adapt to almost any situation over a period of time. Therefore, color effects need to be measured over a long period as well as over a short period.

2. The observations should be made with the use of video tape to allow for more thorough and impartial observation. As noted in the findings, the teacher was affected by the wall colors in her positive and negative comments; therefore, the person observing could also have been affected. To avoid this, an impartial instrument should be used.

3. A greater number of observations need to be made on each subject. This problem, too, could be solved with video tape since it could be played back a number of times.

4. A larger number of subjects need to be tested under a larger variety of color conditions.

5. This study should be repeated using patterned walls in neutral tones. The results which were noted in this study concerning patterned wall colors were most unexpected. Patterned walls and saturated walls may hold different meanings for children of various ages. The more complicated patterned background may be more interesting and may elicite better classroom social behavior than saturated colors.

6. The sample size needs to be increased across a wide age range with an equal number of males and females to ascertain any sex differences.

7. Various activities should be observed other than a structured group session to find out if such behavior would be affected in a like manner.

8. Sophisticated and technical equipment for measuring and recording the activity level of the children in the testing room needs to be used if this experiment is to be repeated.

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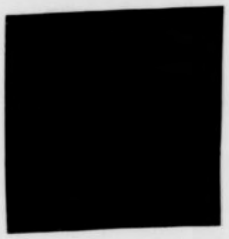
APPENDIX A

Colored Walls



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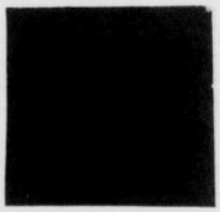

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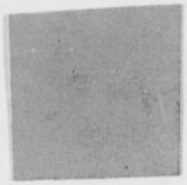

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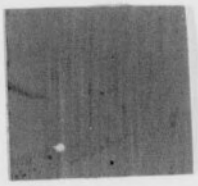

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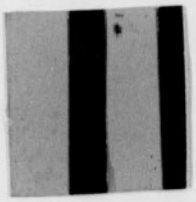
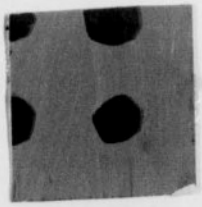
6/8





APPENDIX B

Questionnaire

Parents Name_____

PARENTS QUESTIONNAIRE

Directions: For questions asking for the wall color in a specific room, or rooms, please use the color chart provided and indicate by number the color which most nearly matches the wall color in your home. Place this number in the space provided. For the other questions indicate the appropriate letter which answers the question by a check.

1. What are the predominant colors in which the walls in your home are painted or papered? (a) Living room____(b) Kitchen____(c) Family room____(d) Parent's bedroom____(e) This child's bedroom____.
2. What was the predominant color of the walls in this child's bedroom when he was an infant?_____.
3. What is the favorite color of this child? (a) red____(b) Yellow____ (c) orange____(d) blue____(e) green____(f) purple____(g) white____ (h) black____.
4. What is the favorite color of the mother? (a) red____ (b)yellow____ (c) orange____(d) blue____(e) green____(f) purple____(g) white____ (h) black____.
5. What is the favorite color of the father? (a) red____(b) yellow____ (c) Orange____(d) blue____(e) green____(f) purple____(g) white____ (h) black____.
6. Does this child recognize colors by name? (a) yes____(b) no____ Check the colors this child recognizes by name. (a) red____(b) yellow____(c) orange____ (d) blue____(e) green____(f) purple____ (g) white____(h) black____.
7. Does this child prefer clothes of certain colors? Check the appropriate letter, or letters: (a)red____(b) yellow____(c) orange____ (d) blue____(e) green____(f) purple____(g) white____(h) black____.
8. Does this child prefer a certain toy? (a) yes____(b) no____. If so, what color is this toy? (a) red____(b) yellow____(c) orange____ (d) blue____(e) green____(f) purple____(g) white____(h) black.
9. Do you have a color T.V.? (a) yes____(b) no____. Approximately how many hours per day does this child watch color T.V.? (a) 1____ (b) 2____(c) 3____(d) 4____(e) more____(f) less____.
10. Approximately how many hours per day does this child watch black/white T.V.?_____.
11. Does this child have brothers and sisters? (a) yes____(b) no____.
12. List your children in chronological order giving name, sex, and birth dates (year and month)._____
_____
_____
13. Does this child share his room with a brother or sister? (a) yes____ (b) no____. If yes, is brother or sister younger or older? (a) younger____(b) older____.

APPENDIX C

Behavior Profile

BEHAVIOR PROFILE
MERRILL PALMER INSTITUTE

Name of Child_____Date of birth_____Date_____

Let each horizontal line below represent the various degrees or strengths of the particular behavior tendency indicated at the left of the line. In each instance, the optimal or most desirable position on the rating continuum would be somewhere near the middle, the two ends of the line representing the less favorable extremes.

Place a dot on each line at a point which, in your judgment, indicates the child's position on that particular scale. Make a "profile" by drawing lines connecting the dots.

	1	2	3	4	5
Activity (Amount)	Hypoactive		Active		Hyperactive
Vigor of Activity	Leathargic		Moderate		Impetuous
Sensitivity to Stimulation	Impervious		Moderately Sensitive		Hair Trigger
Reactivity	Sluggish in Reaction		Responsive		Violent
Alertness	Sleepy as if Preoccupied		Attentive Outwardly Oriented		Tensely Alert
Characteristic Mien	Serious Grave		Pleasant		Impish
Characteristic Mood or Reaction Toward World	Indifferent		Comfortable Contented		Angry Hostile

BEHAVIOR PROFILE
Page 2

	1	2	3	4	5
Stability of Mood	Invariable		Moderately Stable		Extremely Cycloid
	1	2	3	4	5
Frustration Tolerance	Imperturbale		Moderately Disturbed		Frustration extremely disrupting

DEFINITION OF TERMS USED ON BEHAVIOR PROFILE
(Martin 1966)

Activity

*[1]Active----------Characterized by spontaneity, vigor, and much movement (English and English, 1958, 9).

Hypoactive----------Below or lacking in working, acting, and functioning (English and English, 1958, 245, 9).

Hyperactive----------Excess in movement and spontaneity (English and English, 1958, 244, 9).

Vigor of Activity

* Moderate----------Limited in the degree of activity (Neilson, 1958, 1577).

Lethargic----------Drowsiness, inactive, and apathetic (English and English, 1958, 293).

Impetuous----------Hastily energetic and rushing with force (Neilson, 1958, 1249).

Sensitivity to Stimulation

* Moderately sensitive---------Being moved in a limited manner to emotional situations (English and English, 1958, 492).

Impervious----------Blase, heedless manner. The child hears what we say but it does not seem to be taken in (Blant, 1950, 48-49).

Hair Trigger----------Easily moved (Neilson, 1958, 1125) by emotional situations (English ans English, 1958, 492).

Reactivity

* Responsive----------Ready to respond to any stimulus (English and English, 1958, 463).

Sluggish in reaction---------Slow to respond and not easily aroused (Neilson, 1958, 2370) to outside stimulus (English and English, 1958, 440).

[1]Asterisk denotes desirable position on the behavior tendency continuum.

Violent----------Intensity in feeling, behavior, or language (Neilson, 1958, 2828, 2846).

Alertness

* Attentive outwardly oriented-Intent in acquainting oneself with the situation existing on the outside (Neilson, 1958, 178, 1720, 1736).

Sleepy as if preoccupied-----Reduced responsiveness to external stimuli (English and English, 1958, 506) as a result of being lost in thought or absorbed (Lewis, 1961, 372).

Tensely alert----------Extreme susceptibility (Neilson, 1958, 2602) to ideas when presented and to environmental changes (English and English, 1958, 22).

Characteristic Mien

* Pleasant----------Cheerful, good-humored, agreeable, and likeable (Lewis, 1961, 364).

Serious, grave----------Solemn in disposition, appearance, or manner (Neilson, 1958, 2285).

Impish----------Inclined to cause annoyance to others (Neilson, 1958, 536).

Characteristic Mood or Reaction Toward World

* Comfortable, contented-------Peaceful (Lewis, 1961, 98), helpful (Neilson, 1958, 536), and satisfied with that which one has (English and English, 1958, 117).

Indifferent----------Apathetic, showing no interest or concern (Neilson, 1958, 1266).

Angry, hostile----------Unfriendly, and showing antagonistic and enraged resentment (Neilson, 1958, 205, 103).

Stability of Mood

* Moderately stable----------A reasonable (Lewis, 1961, 317) degree of durability and steadiness in purpose (Neilson, 1958, 2449).

Invariable----------Unchangeable, inflexible, unvarying (Lewis, 1961, 271).

Extremely cycloid----------Showing excessively (Neilson, 1958, 903) marked swings of moods (English and English, 1958, 136).

Frustration Tolerance

* Moderately disturbed---------A reasonable degree of uneasiness, apprehensiveness or anxiety (Lewis, 1961, 317, 156, 38).

Imperturbable----------Incapable of being disturbed or upset (Neilson, 1958, 1249, 744).

Frustration extremely disrupting----------Excessive (Neilson, 1958, 903) interference with goal directed activity (English and English, 1958, 217) by the breaking down of organization or breaking apart (Neilson, 1958, 753).

APPENDIX D

Direct Observation Schedule And Time Card

Coding Categories for Children with Teachers A, B, and C
(Becker, Thomas, Carnine, 1969)

Symbols		
A. Behaviors Incompatible with Learning:		General Categories
X	Gross motor behaviors	Getting out of seat; standing up; running, hopping, skipping, jumping, walking around, rocking in chair; movement without noise; moving chair to neighbor. Crawling, stretched out on floor.
N	Disruptive noise with objects	Tapping feet. Be conservative, only rate if you can hear noise with eyes closed. Shuffling feet, tapping fingers, talking, twisting hair.
A	Disturbing others directly and aggression	Hitting; kicking; shoving; pinching; slapping; attempting to strike; biting; pulling hair.
O	Orienting responses	Turning head or head and body to look at another person, showing objects to another child, attending to another child, correcting another child. Must be of 4 seconds duration to be rated. Not rated unless seated.
V	Blurting out, Commenting and vocal noise	Answering teacher without raising hand or without being called on; making comments or calling out remarks when no question has been asked; calling teacher's name to get her attention; crying, screaming; singing, whistling, laughing loudly. Must be undirected to another particular child, but may be directed to teacher.

T	Talking	Carrying on conversations with other children when it is not permitted. Must be directed to a particular child or children.
//	Other	Ignoring teacher's questions or command; doing something different from that directed to do. To be rated only when other ratings are not appropriate. Child leaving group.

B. Special Categories

	Improper Position	Not sitting with body and head oriented toward the front and feet on the floor, e.g. sitting on feet; standing at desk rather than sitting; sitting with body sideways but head facing front. Do not rate if chair is sideways but head and body both oriented toward the front with feet on the floor. Leaning on teacher.
S	Sucking	Sucking fingers, lips, object, shirttail, hair.
B	Bossing	Aggressive vocal behavior! Reading story out loud to self or other children (do not rate! in this case); acting as teacher to other children.
I	Ignoring	Sitting and looking at the wall or remaining in main nursery school.

C. Relevant Behavior

RB	Relevant Behavior	Time on task, e.g. answers to questions, listening, raises hand. Must include whole 20 seconds except for orienting responses of less than 4 seconds duration.

M E A S U R E C A R D
(3 seconds to record)

Name_____ Color of room_____

Date_____ Number in group_____

Recorder_____ Weather_____

Time_____ Group: Experimental Control

Table I