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ABSTRACT

THIS PAPER IS CONCERNED WITH THE QUESTION OF RELATIONSHIP AMONG PREFERRED PERCEPTUAL MODES, SELECTED INDEPENDENT VARIABLES WHICH CAUSE INDIVIDUAL DIFFERENCES, AND THE RESULTING EFFECTS ON CONCEPTUAL BEHAVIOR. SUBJECTS RANGED FROM FOUR AND ONE-HALF YEARS TO EIGHT AND ONE-HALF YEARS OF AGE. EACH CHILD CHOSEN BY THE PLAN WAS SCREENED FOR COLOR BLINDNESS AND TESTED FOR THE FOLLOWING INFORMATION: FORM, COLOR, AND SIZE PREFERRED PERCEPTUAL MODE, DRAWING SCORES, VOCABULARY SCORES, AND SEX CONCEPTS. THE SOCIOECONOMIC STATUS OF EACH SUBJECT WAS ALSO DETERMINED. DIFFERENCES FOUND IN THE STUDY WERE DUE TO AGE, SEX, AND NURSERY SCHOOL ATTENDERS. CONCLUSIONS DRAWN INCLUDE: (1) THE HIGHER THE I.Q. OF A CHILD, THE MORE LIKELY HE IS TO BE CONSISTENT IN HIS CHOICE OF PERCEPTUAL MODE; (2) PERCEIVING AND CONCEIVING BY COLOR ARE INDICATIVE OF IMMATURITY, LACK OF NURSERY SCHOOL EXPERIENCE, LOWER I.Q. AND POSSIBLY CREATIVITY; (3) FORM PERCEIVERS ARE BEST ABLE TO CONCEIVE BY FORM WHEREAS COLOR PERCEIVERS ARE BETTER ABLE TO CONCEIVE BY COLOR. (KJ)

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Logan, Utah

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U.S. DEPARTMENT OF
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SUMMARY

Color, form, and size cues within the environment exist in an interdependent relationship, but are not necessarily attributed with equal importance in the act of perception-cognition. Past research indicated that children have a preference for one mode of perception over others with regard to color, form, and size. It is the question of relationship among preferred perceptual modes, selected independent variables which cause individual differences, and the resulting effects on conceptual behavior which this paper examined. Individual differences by age, sex, prior schooling to kindergarten, socioeconomic status, IQ, and perceptual-motor skill were ascertained.

The study was confined to the population of Logan, Utah. The school survey was utilized as a means of stratifying the population by age, sex, and prior schooling to kindergarten, and a random sample was chosen from each stratified group. Each child chosen by the plan was screened for color blindness and then tested for the following information: form, color, and size preferred perceptual modes, Peabody Picture Vocabulary Test (IQ), form and color vocabulary scores, developmental drawing scores, concept utilization for form, color, size, and sex concepts, and clothing symbol knowledge for color, form, and size. Socioeconomic status was determined by the McGuire-White Scale questionnaire filled out by the parent during the interview. All of the information was collected within an hour at the home of each child.

The age range of children was from four and one-half years to eight and one-half years. The socioeconomic status of the families of the children fell in the following groups: Upper Class: 4.69%; Upper Middle: 49.22%; Lower Middle: 27.34%; Upper Lower: 17.19%; Lower Lower: 1.56%.

The data were analyzed by tests of analysis of variance utilizing socioeconomic status and IQ as covariates, and by correlation. Independent and dependent variables were diagrammed as follows:

Independent Variables

- Age
- Sex
- Nursery School Experience
- Socioeconomic Status

Dependent Variables

- Developmental Drawing Skill
- Form and Color Vocabulary Scores
- Peabody Picture Vocabulary Scores (IQ)

- Perceptual Mode

- Concept Utilization
- Knowledge of Selected Cultural Symbols

The most significant differences found among the subjects were due to age. As age increased, preference for form perception increased while color perception decreased; form and size concept utilization increased; and knowledge of age and sex symbols in clothing increased.

Differences in data were also attributed to the sex of the child. Girls were more likely to perceive by form; gave more correct responses on the sex-linked concept utilization tasks; and gave more correct responses on knowledge of clothing symbols associated with sex.

Attenders of nursery school chose size as a means of perceiving similarities more often than non-attenders. Non-attenders utilized color as a means of forming concepts more often than attenders.

Differences in socioeconomic status were found between boys and girls with girls having the higher status. Nursery school attenders possessed a higher socioeconomic rating than non-attenders. Children of higher socioeconomic status possessed a higher IQ than those of lower status. These relationships were all controlled by the use of status as a covariate for the tests of analysis of variance.

A measure of drawing skill for seven forms was obtained from each child. As skill increased, age and IQ increased; form as a preferred means of perception increased and color decreased; utilization of size and sex concepts increased; and knowledge of sex and age clothing symbols increased.

While a low percentage of the total sample made errors in color and form vocabulary, an increase in color and form vocabulary did occur with age.

As IQ scores increased, children were better able to utilize form, size, and sex concepts and had a greater knowledge of sex and age symbols of clothing. IQ scores also increased with high scores in form and color preferred perceptual modes, while low IQ scores were related to a greater number of size choices.

Perceptual mode, the core of the entire study, was considered as both an independent and dependent variable. Its relationships to independent variables have been stated above. With regard to dependent variables, form perceivers were found to have greater ability in utilizing form concepts and less ability in utilizing color concepts. Color perceivers had a greater ability in utilizing color concepts and less ability in utilizing form concepts. No relationships were found between size choices in preferred perceptual mode and the ability to use size in forming concepts.

The abilities to utilize concepts of color, form, size, and sex-linked items and knowledge of clothing symbols were related to the independent variables as has been stated with regard to each variable above.

The results supported the predicted relationships of independent to dependent variables. It was found that the effects of age as an independent variable were so strong that they may have caused relationships to appear among the dependent variables in regards to the correlation analysis although no significant interactions in tests of analysis of variance were found.

Definite patterns in regards to form, color, and size perception were found with age, sex, IQ, skill in drawing, and knowledge of vocabulary. The was in which children perceived seemed to relate to the concepts they were best able to utilize.

The following conclusions were drawn from the study.

1. The trend from color to form as a preferred perceptual mode is an expression of readiness with regard to reading as supported by sex and nursery school attendence differences.

2. Nursery school attendence affects awareness of a variety of ways to perceive and conceive similarities such as size.

3. The higher the IQ of a child, the more likely he is to be consistent in his choice of perceptual mode, whether it be color or form.

4. Form perceivers are best able to conceive by form whereas color perceivers are better able to conceive by color.

5. Perceiving and conceiving by color are indicative of immaturity, lack of nursery school experience, lower IQ, and possibly creativity.

6. In spite of preferences in perceptual mode and abilities in concept utilization, children's knowledge of clothing symbols utilizing color, form, and size increase with age and IQ.

It is recommended that similar studies be carried on with older age groups in order to determine when preference for form perception begins to decrease, and some children actually switch back to color as a preferred mode. Also, further research is recommended to study the field of creativity in relation to the older color perceivers.

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PART I

INTRODUCTORY SECTION

Introduction

With the exception of infancy, the visual field never appears as an undifferentiated pattern of light, shade, and color. The growing child, in learning to manipulate his environment, is faced with the problem of assigning a name to, or classifying, the many different examples of a particular class of phenomena. This process is a problem of induction, hypothesis-formation, learning, and concept attainment.

According to Bruner (1957), perception involves an act of categorization. In learning to perceive, a child is learning the relations that exist between the objects and events that he encounters, learning appropriate categories and category systems, learning to predict and to check what goes with what.

The work of Piaget has made psychologists aware of the lack of reliable empirical information available on children's perceptual behavior. This project will consider a type of perceptual-cognitive activity which has been studied intermittently for over fifty years: the tendencies of children to use form, color, or size to classify stimuli into conceptually similar groups. Early research was concerned with the development of instruments to identify color, form, and size perceivers. More recently, the study of perceptual behavior has been flavored with a concern for individual differences rather than statements about children in general. Along this vein, attempts have been made to relate modes of perception to age, sex, and IQ, as well as other variables.

What perceptual-conceptual behavior may we expect of children? Koffka (1935) suggests that different aspects of our visual world - size, shape, color, orientation, and localization - are constituted in a thoroughgoing mutual interdependence. However, Bruner (1957) postulates that the more adequate the category systems constructed for coding environmental events, the greater the predictive veridicality that results. We might conclude, then, that color, form, and size cues within the environment exist in an interdependent relationship, but are not necessarily attributed with equal importance in the act of perception-cognition.

Past research indicates that children have a preference for one mode of perception over others. Over 30 years ago, Brian and Goodenough (1929) found that the child under three years of age preferred form to color in organizing his world into groupings of "similar" stimuli. From three to six years of age, the child shifted to color over form as the preferred basis for categorization. After six, form once again became dominant over color.

The population of this research is also representative of children, ages four through eight. At the middle of this span, age six, a child is usually admitted to elementary school. The major task of the primary grades is concerned with instruction in reading and writing, although there are some differences between school systems. It has been recognized that a simple measure of chronological age is an inadequate indicator of the child's readiness to learn these skills, and measures of mental age and of other types of "readiness" have been used to supplement the simple chronological age measure.

An analysis of reading, and especially of writing, suggests that these skills involve both perceptual and motor components. They involve perceptual discriminations in identifying and differentiating the essential word and letter forms. Reading involves motor coordination in precise eye-movement patterns, while writing makes heavy demands upon the precise control of the writing hand. This motor control in writing, however, must be guided by accurate perception of the form to be copied. The effect of a preference to perceive by form has not, as yet, been ascertained. However, age patterns seem to indicate that this preference may be related. Form at the age of six is the most important cue in the school environment.

An understanding of the role of stimulus preference in the child's learning behavior can provide us with the means to discuss and study more effectively the use of color, form, and size in visual communication. If preference operates as an observing response to cues in a discrimination or concept utilization task, then the solution of the problem may be either facilitated or hampered, depending upon the congruence between the subject's preference and the relevant dimension of the problem.

It is the question of relationship among preferred perceptual modes, selected independent variables which cause individual differences, and the resulting effects on conceptual behavior which this paper will examine. Individual differences by age, sex, prior schooling to kindergarten, socioeconomic status, IQ, and perceptual-motor skill will be ascertained. The study is confined to the population of Logan, Utah. The school survey is utilized as a means of stratifying the population by age, sex, and prior schooling to kindergarten, and a random sample is chosen from each stratified group. It is, of course, possible that no significant relationships among the variables will be found. If such is the case, then other researchers should examine other variables, which are, or might be, associated with preferred perceptual mode.

Review of Literature

Pertinent to understanding the development of a child's ability in concept attainment is the effect of preference for one type of cue over another. This relationship may provide us with an understanding of those aspects of the visual world to which the child most readily responds and reacts at a given age. Such information may have important

implications for education, communication, and knowledge of perception and learning.

A summary of the available information related to perceptual mode will be discussed under the following four headings: (1) Determination of mode of perception and related variables; (2) Conditions responsible for transition from one mode of perception to another; (3) Effects of stimuli manipulation on perceptual type; and (4) Effects of mode of perception on other behavior.

Determination of Color, Form, and Size Perceivers and Related Variables

A large portion of the research to date has emphasized differentiation between color, form, and size perceivers and related variables including age, sex, intelligence, culture, and deafness. In order to identify the preferred cues of children, verbal response test measures using abstract forms have been devised. One method involves the setting up of an experimental situation in which subjects are required to choose between three alternatives in matching a series of objects (i.e., Suchman, 1966). Each situation offers equal opportunity for matching upon the basis of form, color, or size, but a choice has to be made. An example is shown in FIGURE 1.

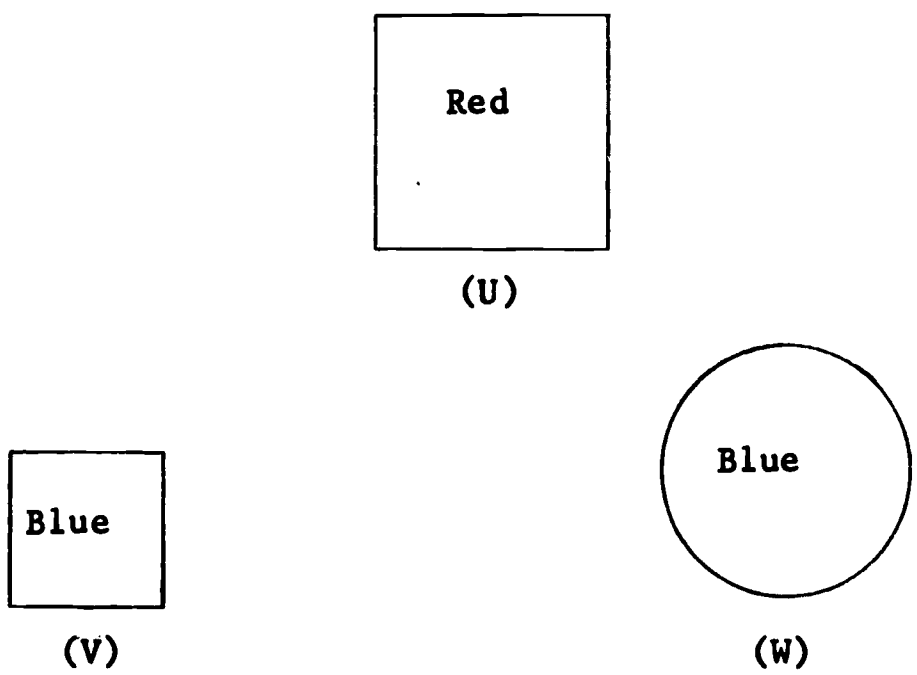

FIGURE 1. Test card of color-form-size preference where color, form, and size vary. Items (V) and (W) are the same color, (U) and (V) are the same shape, and (U) and (W) are the same size.

A second type of experimental situation has also been utilized which compares two of the dimensions while the third dimension is held constant (Corah, 1966). In the example shown in FIGURE 2, the form dimension is held constant, since all the figures are square, and selection can be made only between color and size values.

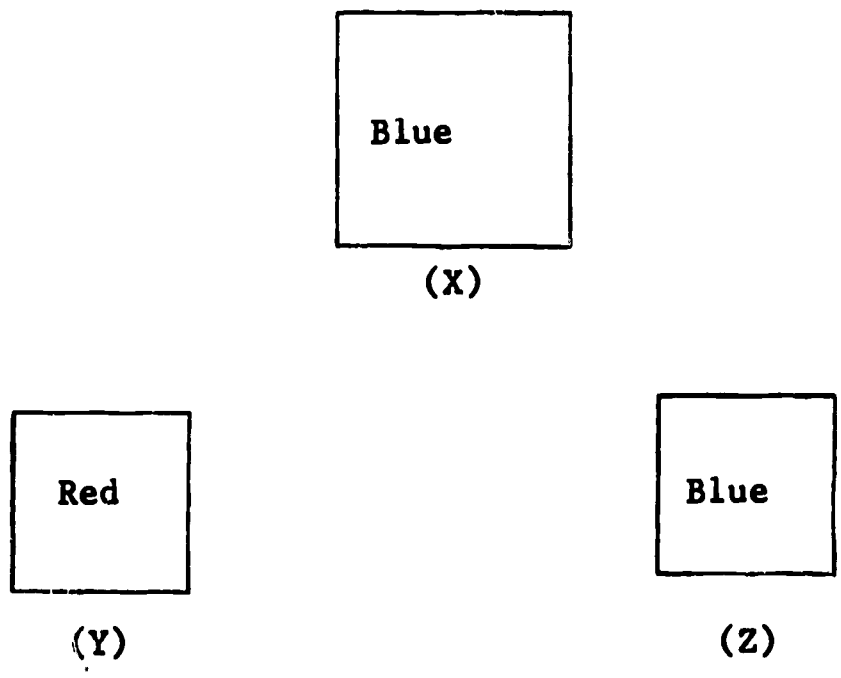

FIGURE 2. Test card where one dimension is excluded from selection. Items (X) and (Z) are the same color; (Y) and (Z) are the same size; no form choice is present.

Age. The preferred perceptual cues of children at a given age may be viewed as having biological, sociological, and psychological antecedents. Several theorists have sought to describe the classification of a society's members on the basis of age suggesting that age groups do, in fact, have separate cultures. Ralph Linton (1942) stated that in spite of the close relationship that age categories bear to physiological facts, they are by no means divorced from cultural facts. From the end of infancy, if not before, humans are subjected to special training designed to fit them for their roles as adults.

Supporting this line of thought was Talcott Parsons (1942) who pointed out the relationship between age and the social structure of the United States. Formal and/or informal age categorization seem to be a part of kinship structure, formal education, occupation, and community participation. Parsons also suggested that in most cases, age lines are not rigidly specific, but approximate; however, this does not necessarily lessen their structural significance.

Utilizing varied instruments to determine perceptual type, researchers indicate that age operates as a significant independent variable. Children of less than three years seem more often to choose on the basis of form, whereas those between three and six pick the pattern that has the same color. After six, form once again becomes dominant over color (Brian and Goodenough, 1929; Colby and Robertson, 1942; Corah, 1964). Size is rarely used as a basis for conceptual similarity (Kagan and Lemkin, 1961; Suchman, 1966).

While no one has sought to separate biological, sociological, and psychological antecedents for the observed differences in age, one might suggest that an interaction among these antecedents produces differences in the individuals. Such differences suggest the following questions: At what age do parents begin to stress the learning of colors and how does this relate to the age at which children seem most likely to match by color? In formal (or informal) education, when do children learn the alphabet and how to read and write; how does this relate to form perception?

Sex. A second relevant independent variable related to perceptual mode concerns the sex of the individual. Ralph Linton (1942) suggested that every society classifies and organizes its members in several different ways simultaneously. The importance of sex as a cultural classification differs depending upon the age of the individual. The minimum of seven groupings which Linton considered basic to all systems of age-sex classification suggests that there are times in the life cycle when sex differences are of little importance. The primary differentiations identified by Linton include infant, boy, girl, adult man, adult woman, old man, old woman. In terms of expectancies and varied cultural treatments, least differentiation is made between sexes during infancy.

Reaffirming this point of view, Talcott Parsons (1942) stated that in early childhood the sexes are not usually sharply differentiated; but in many kinship systems a relatively sharp segregation of children begins quite early. In the American culture, children of both sexes are in many fundamental respects treated alike, for example, in privileges and responsibilities. However, one may observe differences in dress and approved play interest. Behavior may also differ to the extent that the child begins to emulate the appropriate adult male or female model.

A number of researchers have sought to determine sexual differences in mode of perception. Honkavaara (1958) reported that in children, ages seven to eleven, more girls than boys classified stimuli on the basis of form. Kagan and Lemkin (1961) provided data which supported these results for children ages five years, eight months to eight years, six months. No significant differences were found for younger age groups. In other studies, sex differences have not been significant at any age (Brian and Goodenough, 1929; Corah, 1964).

Individual differences in perceptual mode seem to be in some way related to differences in sex. One might postulate a relationship between differential treatment of sexes and differences in preferred perceptual mode, particularly since the differences in treatment of sexes and differences in perceptual mode both increase with age.

Nursery School. Cultural systems of education may also influence mode of perception. The effect of nursery school experience, an optional part of children's education, has not been investigated in relation to preferred perceptual mode and the mean age at which

children become form perceivers. Worth noting is the fact that most of the researchers to date have utilized some form of school sample, i.e., nursery school, kindergarten, and grade school (Brian and Goodenough, 1929; Honkavaara, 1958; Kagan and Lemkin, 1961; Corah, 1964; Corah, Jones, and Miller, 1966; Corah, 1966; Suchman, 1966; Suchman and Trabasso, 1966; and Corah and Gross, 1967); whereas no researcher has sought to control for the experience of nursery school in the collecting of his data. Although nursery schools have widely varied programs throughout the country, some unique advantages include stimulation of the socialization process, and an enriched environment providing the child with many new experiences which are less likely to be a part of the non-nursery school attender.

Social Class. Social class or status is one of the most important variables in social research. The socioeconomic position of the person affects his chances for education, income, occupation, marriage, health, friends, and even life expectancy.

As early as the age of three months, an infant's reactions show increasing signs of being controlled by experience (Kagan, 1968). Attention is focused more and more in relation to the degree to which the elements of an event are a distortion or discrepancy from an established schema. In a comparison of lower-middle, middle-middle, and upper-middle classes, Kagan (1968) stated that the children from the lowest economic level display the smallest cardiac decelerations to all stimuli. One of the most dramatic differences between lower- and middle-class children of pre-school and school age involves language skills. Kagan postulated that the home environment of the upper-middle class child in a quiet suburban home provides for maximum distinctiveness of stimuli. On the other hand, the researcher described the lower-middle class small apartment as a "sea of homogeneous sound." (Kagan, 1968, p. 82) Communication of stimuli is minimally distinctive from background noise and, as such, is not likely to recruit the infant's attention.

Kagan's study implies that sustained involvement of any child is dependent on that child's previous acquisition of a set of hypotheses and reactions appropriate to the object. Distinctiveness of stimuli affect this acquisition.

Whether the family's socioeconomic status would affect perceptual mode of the mean age at which a child changes from color to form as a preferred means of perception is not known. A possible confounding of socioeconomic status with IQ and attendence of nursery school may exist, and therefore, some attempt should be made to explore the effects of this variable in relation to perceptual mode.

Intelligence. The intelligence of the child has been hypothesized as a cause of individual differences in perceptual mode. As a reflection of the capacity on the behavior of the individual, one needs to consider innate and effective capacity. The physiological component, or innate capacity, is that with which we are born. On the other hand,

effective capacity is that which we have to utilize at any given time. Social and psychological factors within the environment have been related to performance in effective capacity.

Several investigators have suggested that form matching is related to higher intelligence. As early as 1913, Katz (1913) attributed superior intellectual development to the few form-dominant subjects among the children in his study. Tobie (1926) also expressed the view that form matching increases with the development of intelligence. Engel (1935) divided his school children into groups of good, moderate, and poor "intelligence" and found the highest percentage of form responses in the first group. The highest percentage of color responses was obtained from the "poor" group. Lindberg (1938) found that giving initial color responses on his Ring Abstraction Test was associated with poor school achievement in children. However, he found no relationship between color-form sorting and school achievement.

Utilizing descriptive statistics, Honkavaara (1958) presented data suggesting that color matching is related to high intelligence. Corah, Jones, and Miller (1966) found a tendency for form responders to have higher IQs than color responders, although the difference did not reach the .05 level of significance. Conflicting results may have been a reflection of the lack of control of nursery school attendence and socioeconomic status as well as the difficulty in measuring IQ at a relatively young age.

Culture. Cultural background may influence the reactions of the subjects in the selection of form or color cues. A developmental sequence from color to form, although demonstrated for American (Brian and Goodenough, 1929; Suchman and Trabasso, 1966), French (Descoudres, 1914), and German children (Katz, 1913), does not hold true for all cultures. In a study based on three color versus form preference tests given to 120 children, ages three to fifteen, at the Koranic school in Zaria, Nigeria, West Africa, there was no developmental transition from color to form preference at any age level (Suchman, 1966).

Such results imply that the culture in which we live may in some way affect our preference for color or form cues. Keesing (1958, p. 427) defines culture as "the totality of learned, socially transmitted behavior." Just knowing that there are differences between cultures in terms of cue preference tells us nothing about why the West African child chooses color while the American and West European children choose form. The fact that not all children become form perceivers suggests that preferred mode of perception may be relative to the culture and not exclusively a product of physiological maturation.

Hearing. A variable of a physiological nature affecting cue preference is hearing. Perhaps this physiological limitation causes a comparable loss of cultural contact for the individual and thus should be controlled.

Given choices between stimuli in the color, form, and size dimensions, most elementary school children with normal hearing preferred

form, whereas most deaf elementary school children preferred color. The sample was matched for age, sex, and IQ (Suchman, 1966). Doehring, 1960, also found that older deaf children, ages eight to twelve, preferred color to form.

Analysis of the Conditions Responsible for the Transition from Color to Form Perceptual Type

Various researchers have sought to identify plausible theories to account for the differences in perceptual mode as related to age, sex, culture, and hearing. Motor development, decentration processes, language development, and the ability to categorize stimuli will be considered.

Motor Development. Studies of children's motor achievements and characteristics show that they are affected by experience, practice, and training. A review of the evidence by Werner (1948) suggests that the reactions of the youngest children are determined by motor behavior and thus by the "graspable" qualities of the objects. As yet no one has explored the relationship between motor behavior and perceptual modes. It is conceivable that a relationship may exist between perceptual mode and motor development in drawing simple geometric forms, but it remains to be demonstrated. Large samples over a period of time have made possible the development of reliable age norms for developmental drawings of simple geometrical forms (See FIGURE 3). A relationship between these norms and perceptual mode might better clarify age, sex, and even cultural differences.

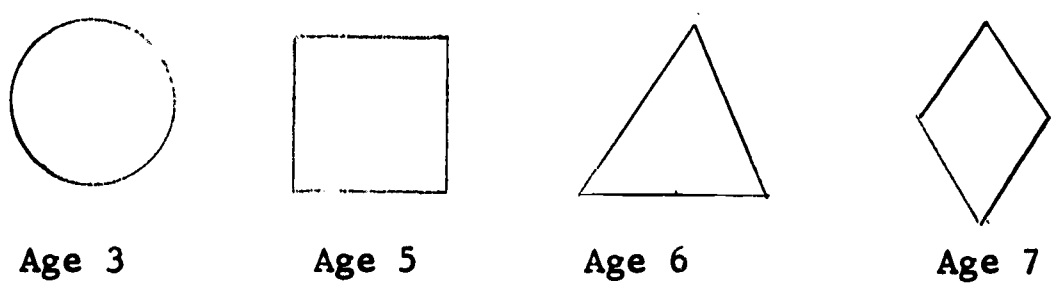

FIGURE 3. Drawing items and age norms from the Stanford-Binet Third Revision.

Decentration. Piaget's concepts of centration and decentration suggest a theoretical framework applicable to age differences. According to Piaget (1950), the young child's perception is centered, that is, he attends to a dominant characteristic of a configuration at the expense of other characteristics. Several studies have shown color to be the dominant characteristic of the figures in younger children. As the child develops, his perception and judgment become decentered and he attends to all of the characteristics of a

configuration. His response may be the result of all of the factors involved with the subsequent selection of the most relevant cue. With this ability, the child according to Piaget, moves into the period of concrete operations, and is no longer dominated by his perceptions.

The length of time older children take to complete the task of choosing their preferred mode may be indicative of the fact that they are aware of more than one factor. Lack of differences in intelligence in preschool groups would tend to support this idea since centration effects and intelligence should be uncorrelated (Pollack, 1964). While the theory seems to support age and possibly sex differences in preferred perceptual mode, it is unclear as to why there would be hearing differences and particularly cultural differences. Decentration should take place in all cultures; however, the use of geometric forms may be relatively meaningless in some cultures thus causing differences to occur.

Language Development. Language development may also affect the responses children make. Some authors indicate that the giving of a name to an object establishes its meaning and its relationships and resemblance to the background of experience. McGranahan (1936, p. 202) states that:

> The effect of language on perception appears to be to make those features of the objective world that are represented by linguistic forms stand out in greater articulation, to cause similarities to be seen in things similarly represented and in general to influence perception in the direction of the speech forms.

Evidence relating color-form-size perception and language development is, at present, indirect. However, since the verbal skills of young girls increase more rapidly than those of boys, it is possible that girls apply the language labels, square, triangle, circle, to the stimuli more often than boys. Thus, for girls, the stimuli are more likely to derive their meaning from the label attached to them rather than through the more direct physical quality of color. That deaf children prefer color to form may also be related to these children's slower development of language. Such a theoretical framework certainly supports age differences, as vocabulary and age increase together. Cultural differences might be explained by contact, if any, with the concepts of square, triangle, and circle.

Ability to Categorize Stimuli. In addition to motor development, decentration processes, and language development, a fourth explanation as to differences in preference relates to the development of children's capacities to categorize or channel complex stimuli input. Children do not categorize stimuli because an array of data is available for input; they must also be able to sort and store the data so that useful models or concepts can be retrieved for comparison and further refined for the differentiation of familiar and the classification of new

data. It is possible that the child becomes increasingly aware that form provides the most reliable means of classifying his environment, although he may utilize other cues of color and size when they are appropriate.

Effects of Manipulation of Form, Color, and Size Stimuli on Perceptual Type

Some investigators have attempted to explore the relationship between the stimulus characteristics of amount of color and complexity of form, and their effects on mode of perception. A high level of color response is associated with forms which are not meaningful (Descoudres, 1913; Tobie, 1926), with solid colors as opposed to outline-colored forms, and with greater complexity of the forms (Corah, 1966). Another study demonstrates that differences in hue have no significant effect on color matching, while differences in brightness produce the greatest number of color matches (Corah and Gross, 1967). Suchman (1966) found that despite value changes within the color dimension and complexity variation within the form dimension, the child does not shift his preference. She also found that color perceiving children generalized their preference to a range of hue intensities and did not behave in accord with the idea that children prefer only saturated hues. Suchman's study indicates that form children, likewise, maintain their preference for symmetrical as well as asymmetrical contours and do not evidence a preference for asymmetrical forms over symmetrical forms as suggested by Piaget and Inhelder (1956) (Suchman, 1966).

Such results suggest that some care should be taken in constructing a test for perceptual mode in order to make the three dimensions (form, color, and size) initially equal in their importance.

As yet, no one has sought to find out the effect on mode of perception when two stimuli are combined against one; for example, a size match supported by color against form. Would the form perceiving child continue in his preferred manner even when two types of stimuli are pitted against his choice? Or, would the combination of stimuli cause him to change his mode and make the more highly weighted choice. Such information would further clarify the strength of these stimuli in perceiving the environment.

Effects of Color, Form, or Size Perceptual Preference on Other Behavior

Thus far the review of literature has served to point out an "interesting phenomenon," that is, that children tend to prefer a certain type of cue on a given test. A number of independent variables seem to be related to this perceptual preference including age, sex, culture, hearing, and possibly socio-economic status and nursery school attendence. Several theoretical frameworks have been suggested to account for the facts, however, these have not been tested. Lastly, the manipulation of some dimensions in form and color seem to cause differences in the responses of the subjects. This total phenomenon,

while by itself has less practical significance than if a relationship to conceptual behavior could be determined.

The least explored area related to form-color-size perception is the effect of preference on other behavior. For example, one might ask what role stimulus preference plays in the child's learning environment. Since preference measurement within certain value ranges is reliable (Suchman, 1966), a knowledge of these preferences might be used to predict concept utilization in the areas of color, form, and size. Further, these preferences may affect knowledge of cultural symbols utilizing color, form, and size.

Lee (1965) found that the ease with which children, ages three years, six months to six years, five months utilized the conceptual dimensions of color, form, and size was not an increasing monotonic function of age. He found that color and size items elicited increased errors with age whereas errors in the form dimension decreased with age. While the six-year-old is capable of using concepts of color and size, perhaps the number of errors reflects a shift in the degree to which the child regards these dimensions as critical or adaptive in categorizing his environment. Age differences as observed in concept utilization and perceptual mode behavior seem to be similar; however, the relationship has not been tested.

Perception through color, form, and size is also involved in the way we see other people. The child is aware at a young age of sex differences and even age differences among the people in his environment. Kagan, Hoskin, and Watson (1961) investigated the child's conceptualization of male and female. They found that maleness was associated with "large, dark, and angular" whereas femaleness was associated with the opposites of these terms. The differences were significant at the .01 level or better for both boys and girls. As yet, no attempt has been made to relate age, nursery school experience, socioeconomic status, IQ, or perceptual mode with an explanation of these associations. Yet, perceptual mode may indeed affect the way in which we see other people, as well as our ability to categorize them.

Summary

The need for research to better understand the phenomenon of preferred perceptual mode at a given age has been pointed out. Several possible theoretical explanations are provided; however, more concrete relationships to theory should be established by direct testing. Specifically, the relationships of preferred perceptual mode to perceptual, motor, and verbal development theory have not been investigated. The fact that a child prefers one perceptual mode over another may also contribute toward explaining differences in conceptual behavior. Such information has implications for education, communication, and existing theoretical frameworks.

General Design

Based on the review of literature, we can now develop an interrelating network of independent and dependent variables to be tested, as well as suggesting others to be controlled. A statement of the problem and hypotheses to be tested will also be made. In FIGURE 4, the relationship of the selected variables is diagrammed. A justification and discussion of the design will follow.

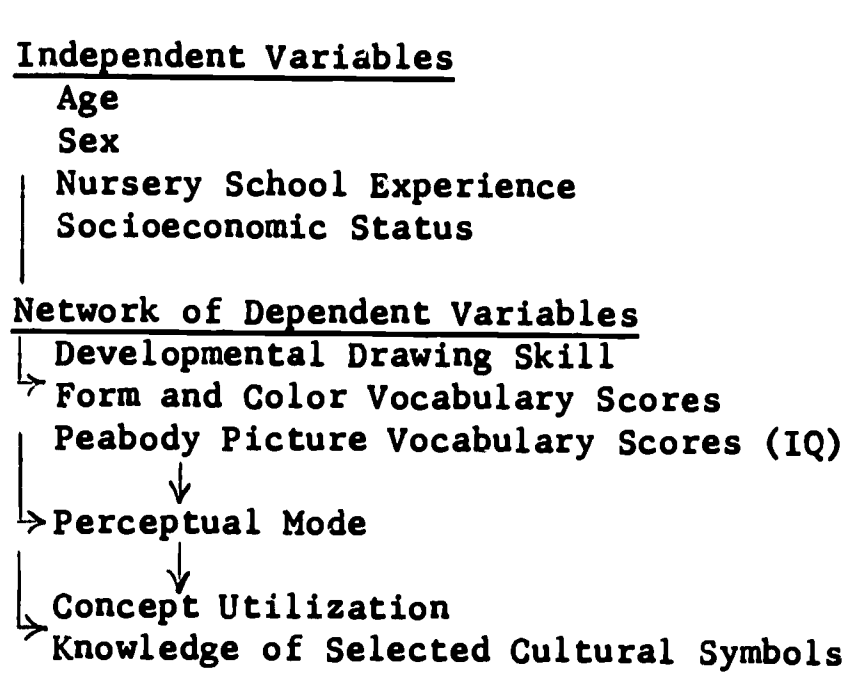

FIGURE 4. Independent and Dependent Variables.

The purpose of this project is to determine the relationships among preferred perceptual modes, selected independent variables which cause individual differences, and the resulting effects on conceptual behavior. The independent variables, age, sex, nursery school experience, and socioeconomic status were selected for several reasons. Previous reports imply that perceptual mode may vary with these variables, and as such, warrant replication. Secondly, these variables, to the degree that they also may be associated with concept utilization and knowledge of selected cultural symbols in color, form, and size, should be investigated.

A need pointed out in the review of literature is that the entire body of research could be better tied to a larger body of theory. The semi-independent variables of developmental drawing skill, vocabulary scores in color and form, and IQ as related to perceptual mode may serve this purpose.

The focal point of this research is the perceptual mode. Although many attempts have been made to determine its relationship to independent variables, perceptual mode has infrequently been used as an indicator of other behavior. Relating it to such dependent variables as concept utilization and knowledge of cultural symbols may provide information concerning the relationship between what is perceived and learning performance.

Although not a part of the diagram in FIGURE 4, several variables are necessary to control because they are known to relate to perceptual mode. These include the culture of which one is a member, hearing, color blindness, and equating of the color, form, and size cues.

Statement of Hypotheses

We hypothesize:

1. Utilizing IQ and SES for covariates, there are no significant main effects of nor interactions between age, sex, and nursery school experience for

   a. color, form, or size perceptual scores.
   b. concept utilization scores.
   c. knowledge of selected cultural symbols.

2. Utilizing SES for a covariate, there are no significant main effects of nor interactions between age, sex, and IQ for

   a. color, form, or size perceptual scores.
   b. concept utilization scores.
   c. knowledge of selected cultural symbols.

3. Utilizing SES for a covariate, there are no significant main effects of nor interactions between age, nursery school experience, and IQ for

   a. color, form, and size perceptual scores.
   b. concept utilization scores.
   c. knowledge of selected cultural symbols.

4. Utilizing SES for a covariate, there are no significant main effects of nor interactions between sex, nursery school experience, and IQ for

   a. color, form, and size perceptual scores.
   b. concept utilization scores.
   c. knowledge of selected cultural symbols.

5. No significant relationship for all possible correlations of the independent and dependent variables taken two at a time.

6. No significant differences between the initial color, form, and size perceptual scores and the scores obtained when stimuli are manipulated so that they are weighted two against one.

Methodology

This section includes a discussion of (1) selection of method, (2) development and choice of instruments, (3) the pilot study, (4) the sampling procedure, (5) description of the sample, (6) administration of instruments, and (7) the statistical analysis.

Selection of Method

In formulating the research procedure for this investigation, focus was placed on children between the ages of four and eight. Developmental factors such as comprehension of language, language facility, and sociability were considered in refining instruments for this age group. Availability of time and creating an atmosphere for willingness to take part played an important role in selecting the technique that would yield the best response. Data procurement devices used by researchers in similar studies were analyzed.

After careful study of these factors, a combination of interview and questionnaire to take place in the child's home was chosen. All of the data supplied by the child were collected by the interview method. This technique was advantageous because of its flexibility which provided the interviewer with the possibility of repeating or rephrasing questions to make sure that they were understood, or of asking further questions in order to clarify the meaning of a response. A questionnaire was completed by the parent in order to ascertain the birthdate of the child, his prior schooling to kindergarten, sex, and the socioeconomic status of the parents (See APPENDIX 1).

The child's home was chosen as the place for interviewing in order to obtain maximum cooperation from both the child and the parent. Children felt more at ease in familiar surroundings and thus were more willing to participate. By going to the home, lack of transportation and the need of a babysitter were ruled out as reasons for not participating.

Development and Choice of Instruments

Color Blindness. The Dvorine-Isochromatic Plates were used as a screening test for the ability to discriminate among colors. The test was selected because it is generally accepted as reliable and valid (Peters, 1955). The plates were divided into two sections: the first section consisting of 14 plates made up of eight different color combinations arranged in pairs of identical colors; and, the second section which contained seven plates featuring trails instead of digits, and similar color combinations to the first section.

Perceptual Mode. An instrument was devised to measure the form, color, and size choices of children (See APPENDIX 2). The instrument consisted of three parts. In the first part, the child made a choice between color, form, and size variables taken two at a time (See FIGURE 2). In part 2, the child made one choice from three equally possible matches (See FIGURE 1). In Part 3, two stimuli were combined against one, and the child chose between the two possible matches as shown in FIGURE 5 below. In the actual presentation of the stimuli, the order was randomized so that no one part was apparent. The position of the alternatives within each stimulus presentation was randomized so that all alternatives received equal attention within the instrument.

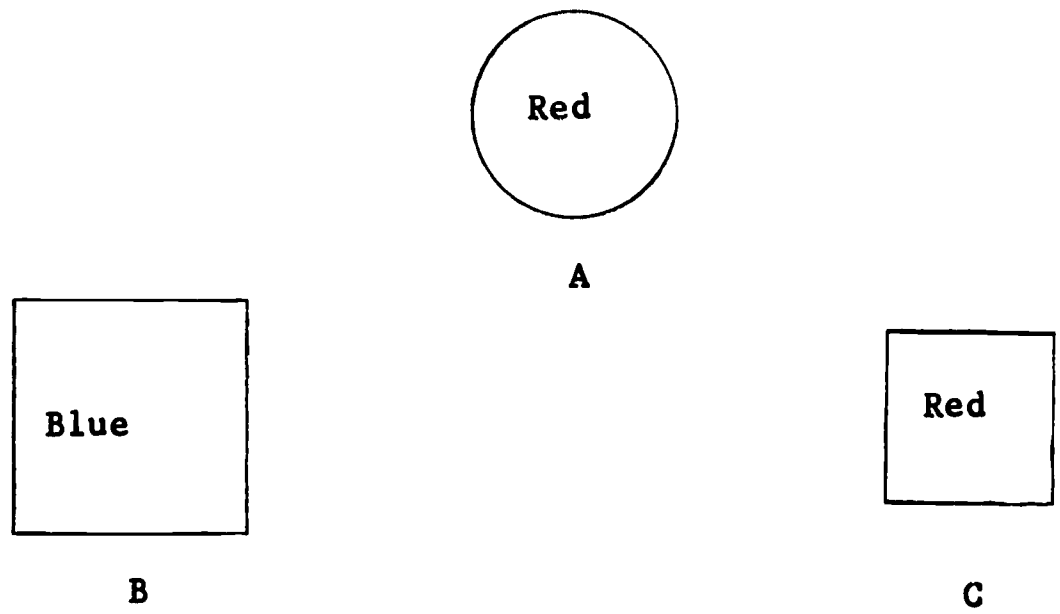

FIGURE 5. Test card where two dimensions are weighted against one. A and C are the same color and size; B and C are the same form.

Peabody Picture Vocabulary Test. The PPVT was administered to ascertain each child's verbal intelligence by measuring his hearing vocabulary. An untimed individual test suitable for children, ages 2.5 and up, the PPVT was administered in 15 minutes or less. No specialized preparation was required of the examiner beyond assuring herself of the proper pronunciation of all stimulus words. Content validity and item validity seemed well established (Piers in Buros, 1965). A test-retest coefficient of reliability after a period of one year was .88 (Moed, Wight, and James, 1963).

Standardized norms based entirely on 4,012 white children in and around Nashville, Tennessee are available, but considerable caution should be used in interpreting the norms in communities other than Nashville. Scores from our data were compared to other data collected within the study, and thus the norms were de-emphasized.

Form and Color Vocabulary Scores. The format of the color and form vocabulary test was similar to that of the Peabody Picture Vocabulary Test. The examiner read a word and the subject responded by pointing to the picture which best illustrated the word. The order of the test items was randomized and the position (left, right, and center) was controlled (See APPENDIX 3).

Developmental Drawing Test. In the developmental drawing test, the child was asked to copy seven simple geometric forms: circle, cross, square, triangle, horizontal diamond, vertical diamond, and divided rectangle (See APPENDIX 4). The forms and directions for the test were selected from the Purdue Perceptual Motor Survey (Roach and Kephart, 1966). Similar forms have been used in a number of tests such as the Bender-Gestalt and the Revised (1960) Stanford Binet. Normative data

concerning the age at which children were likely to be able to draw the forms were available (See FIGURE 3).

Concept Utilization Test. The purpose of this instrument was to explore the ability of the child to formulate concepts of color, form, size, and sex type. Each test item contained three stimuli, two of which possessed similar attributes on the same conceptual dimension. The three stimuli also varied on a second dimension which was irrelevant for solving the task. Each of the four concepts was represented by five different items. The order of presentation was randomized with the following restrictions: (1) all four concepts appeared in a "block" consisting of one representation of each of the four concepts; (2) the position of the correct response (i.e., the stimulus which differed from the others) was not in the same locus (left, right, or center) more than twice (See APPENDIX 5).

Clothing Symbol Test. The purpose of this instrument was to explore the ability of the child to identify color, form, and size stimuli utilized in clothing. The test consisted of paired items differing only in the color, form, or size dimension. The order of the items was randomized so that the pairs did not appear together (See APPENDIX 6).

Social Class. Social Class was determined by the McGuire-White Scale which utilizes three weighted indices in order to determine socioeconomic standing. These are occupation, weighted "5;" source of income, weighted "4;" and education, weighted "3." This information was determined by a questionnaire filled out by the parent at the time when the child was completing his interview. Scales for scoring the answers are presented in APPENDIX 7.

The Pilot Study

A pilot study was conducted in order to give the interviewer (1) experience with the instuments being used, (2) experience in communication with young children, (3) experience scoring the schedules, and (4) an estimate of reliability on the constructed tests.

Two groups of eight children each comprised the pilot study sample. The two groups were controlled for age, sex, and nursery school experience.

The instruments were given to the children and then repeated after a two week interval. No changes were made in the instruments themselves for the final sample. Reliability coefficients were determined for the non-standardized tests, and are reported in the following statements.

Perceptual Mode. Test-retest as well as internal reliability among the three parts were determined. After a two week interval, there were no differences between the first and second testing for overall mode of perception or mode of perception on any one part of the test. The

internal reliability for the entire sample between color, form, and size scores was determined by correlation, and is presented in TABLE 1. The instrument has content validity in that the elements of the test represent directly what is being measured.

TABLE 1. Correlations between the three parts of the Perceptual Mode Instrument

Perceptual Mode	Parts of Test		
	A & B*	A & C*	B & C*
Form	.82	.88	.81
Color	.87	.75	.92
Size	-.06	-.08	-.19

*Part A: The three stimuli, color, form, and size, are presented two at a time.
*Part B: The three stimuli, color, form, and size, are presented three at a time.
*Part C: The three stimuli, color, form, and size, are presented with one stimulus supporting the second stimulus and opposing the third choice.

Form and Color Vocabulary Scores. An attempt was made to determine test-retest and internal reliability during pretesting. None of the children in the pretest group made any errors on either the first or second testing. These results suggested that the instrument was not discriminatory for the two groups chosen in pretesting, and that few differences could be expected in the sample.

Developmental Drawing Test. The criteria for scoring outlined in APPENDIX 4 were used. Two judges scored the pretest copies independently and a reliability of .78 was determined. In the final sample, the interjudge reliability was r = .89. Differences were rescored until agreement was reached.

Concept Utilization Test. Test-retest reliability was determined during pretesting at r = .81. All of those pretested performed better on the second testing suggesting that some learning or remembering took place.

Clothing Symbol Test. Test-retest and internal reliability were determined during pretesting. The test-retest reliability was .84 and the internal reliabilities are presented in the following table:

TABLE 2. Internal correlations among individual questions for color, form, and size parts of the Clothing Symbol Test

Variable	Dimensions	r
Color	Light-Dark	.83
	Bright-Dull	.79
	Warm-Cool	.92
Form	Round-Point	.64
Size	Large-Small	.89

The Sampling Procedure

Cooperation was obtained from the Superintendent of City Schools for use of the school survey in obtaining the population and sample. The test population of children was drawn from Logan, a college town of 24,000, and matched by age into four groups, each containing equal numbers of each sex. The age groups were (1) four year olds (completed nursery school), (2) five year olds (completed kindergarten), (3) six year olds (completed first grade), and (4) seven year olds (completed second grade). Half of each age-sex group attended nursery school. The final sample unit, a total of 128 children, were chosen from the stratified plan utilizing a random method for each of the sixteen age-sex-nursery school groups.

The parents of the children were contacted by phone in order to explain the purpose of the project and to request permission to visit the child in his home. On hundred and thirty eight phone calls were made; 131 interviews were completed. Three children were color blind and were thus replaced by random procedure.

The researcher was unable to meet with seven children for the following reasons: (a) child visiting out of town (2); (b) child sick (2); (c) child mentally defficient (1); (d) parents unwilling to cooperate (2). The interviewing was completed within a month.

Description of the Sample

One hundred twenty eight non-color blind children comprised the final sample. Half of them were boys and half were girls. Half had attended nursery school and half had had no prior schooling to kindergarten.

Demonstrated by the McGuire-White Scale, the socioeconomic status of the families to which these children belonged may be described as follows (See TABLE 3).

TABLE 3. Index scores, social class predictions, number of families, and percent of sample for social class as predicted by the McGuire-White Scale

Index Score	Social Class Prediction	Number of Families	Percent of Sample
12	Upper Class	-	4.69
13-17		-	
18-22		6	
23-27		23	
28-32	Upper Middle	31	49.22
33-37		9	
38-41		5	
42-46	Lower Middle	12	27.34
47-51		18	
52-56		10	
57-61	Upper Lower	5	17.19
62-66		7	
67-71		2	
72-75	Lower Lower	-	1.56
76-84		-	

Administration of Instruments

All of the data were collected in one 1 hour sessions at the home of the child. The order of the instruments was not randomized in order to minimize a bias for one dimension on the Color-Form-Size Perception Test, possibly suggested from other instruments. It was also important that the order was such that it would hold the interest of the children for the entire hour.

The order of presentation was as follows:

(1) Color-Form-Size Perception Test	5 minutes
(2) Dvorine Pseudo-Isochromatic Plates	5 minutes
(3) Peabody Picture Vocabulary Test	15 minutes
(4) Color and Form Vocabulary	5 minutes
(5) Developmental Drawing Test	10 minutes
(6) Clothing Symbol Test	10 minutes
(7) Concept Utilization Test	10 minutes

Statistical Analysis

Hypothesis 1: Analysis of Variance (Age X Sex X Nursery School Experience) with IQ and Socioeconomic Status as Covariates.

Hypothesis 2: Analysis of Variance (Age X Sex X IQ) with Socioeconomic Status as Covariate.

Hypothesis 3: Analysis of Variance (Age X Nursery School Experience X IQ) with Socioeconomic Status as Covariate.

Hypothesis 4: Analysis of Variance (Sex X Nursery School Experience X IQ) with Socioeconomic Status as Covariate.

Hypothesis 5: Correlation Analysis.

Hypothesis 6: Correlation Analysis.

PART II

FINDINGS AND ANALYSIS

Findings

Data means were analyzed in several different ways. By analysis of variance tests, the variables of age, sex, nursery school attendence, and IQ were combined in all possible combinations taken three at a time in order to avoid four level interactions among the variables. The differences demonstrated by the analysis of variance tests were further explained by the results of a correlation analysis.

The Covariates

Socioeconomic status was used as a covariate through most of the statistical analysis of the study. An analysis of variance revealed significant differences for socioeconomic status in sex and nursery school experience. Girls had a higher status than boys which was not by design, and therefore should be controlled by the use of covariance. Children who had attended nursery school were of a higher socioeconomic status than those who had not. Children of higher socioeconomic status had a higher IQ than those of lower status.

IQ was also used as a covariate. No significant differences were found for age, sex, or nursery school attendence groups nor was there any significant interaction between these variables.

The Independent Variables and Perceptual Mode

Perceptual mode was defined as the preference for color, form, or size in perceiving similarities. The scores used for analysis were the total number of responses each subject made for each dimension of perceptual mode: color, form, and size. The details for scoring are provided in APPENDIX 2. A scores of 44 was possible for any one dimension. TABLE 4 presents the average number of times each perceptual mode was chosen be each age group, differences between the means as tested by the Analysis of Variance tests, and the correlation between age and perceptual mode.

The Analysis of Variance and Correlation Analysis demonstrated that as age increased, children chose form significantly more often and color significantly less often as a means of perceiving similarities. Size was least chosen by all age groups. The data suggest that transition from color to form takes place during first grade. By the time children had completed second grade, form was chosen most frequently as a means of similarity.

Perceptual mode scores were also analyzed for differences by sex. The average number of times each perceptual mode was chosen by boys and

TABLE 4. Mean number of times color, form, and size perceptual modes were chosen by each age group

Mode of Perception	Nursery School	Kinder-garten	First Grade	Second Grade	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Form	16.56	24.44	27.25	31.69	5.41**	6.95**	4.73**	5.67**	—	.34***
Color	36.44	27.44	24.25	19.63	6.46**	6.41**	5.09**	6.18**	—	-.37***
Size	4.97	4.88	4.88	4.94	.03	.10	.41	.15	—	-.01

**Significant at .01 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ for covariates.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5]F ratio for Analysis of Variance when Age was not included.

[6]Correlation Analysis.

girls, differences between the means as demonstrated by the tests of Analysis of Variance, and the correlation between sex and perceptual mode are presented in TABLE 5.

Girls chose form significantly more often than boys; although boys selected color more frequently, differences between the sexes were not significant at the .05 level. Since no interaction was observed between age and sex, one can not assume that the transition from color to form takes place in girls earlier than boys.

Attendence and non-attendence of nursery school were analyzed in relation to scores in perceptual mode. That size as a means of perception was selected more often by nursery school attenders was significant for some of the tests of Analysis of Variance, but not for the correlation analysis (See TABLE 6).

Perceptual mode was also analyzed for differences in IQ. The IQ scores were categorized into low, medium, and high groups. No differences in IQ were observed in relation to form, color, or size choices (See TABLE 7).

The Independent Variables and Concept Utilization

The total number of correct responses in each category (color, form, size, and sex-associated items) were the scores used in analyzing the child's ability for concept utilization. A perfect score for each area was five points. TABLE 8 gives the average number of correct responses for each category by age, the F ratios from the tests of Analysis of Variance, and the correlation scores.

The data suggest that the child's abilities to conceive by form increase significantly with age. Conceiving by color decreases with age from kindergarten to second grade although not significantly. The ability to conceive through size increases until the completion of first grade, and then significantly decreases. Similarities of sex-assoicated items were not significantly different for the four age groups.

Overall, children who were of nursery school age performed best for color concepts whereas kindergarten, first, and second graders were best able to conceive by form.

Concept utilization scores were also analyzed for differences between boys and girls (See TABLE 9).

Girls consistently performed better (gave more correct responses) on all the concept utilization variables although differences between sexes were significant only for the ability to utilize sex-associated concepts. The rank order of ability to utilize concepts of form, color, size, and sex is the same for both sexes. In descending order, both boys and girls conceive best by form, then color, size, and sex.

TABLE 5. Mean number of times color, form, and size perceptual modes were chosen by each sex group

Mode of Perception	Boys	Girls	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Form	21.97	28.00	4.87*	5.26*	3.98	—	5.34*	.19*
Color	29.44	24.44	3.20	3.69	2.63	—	3.77	.15
Size	4.92	4.94	.003	.05	.12	—	.02	-.01

*Significant at .05 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ for covariates.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance when Sex was not included.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as a covariate.

[6]Correlation Analysis.

TABLE 6. Mean number of times color, form, and size perceptual modes were chosen by nursery school attenders and non-attenders

Mode of Perception	Attenders	Non-attenders	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Form	24.63	25.34	.07	.53	—	.12	.23	.02
Color	25.66	28.22	.84	1.13	—	.95	1.02	-.08
Size	5.19	4.64	3.74	3.15	—	4.32*	4.76*	.17

*Significant at the .05 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ as covariates.

[3]F ratio for Analysis of Variance when Nursery School Attendence was not included.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as covariate.

[6]Correlation analysis.

TABLE 7. Mean number of times color, form, and size were chosen by low, medium, and high IQ groups

Mode of Perception	Low IQ	Medium IQ	High IQ	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Form	25.67	22.84	26.48	—	—	.26	.09	.70	.02
Color	27.35	28.74	24.67	—	—	.32	.07	.84	-.07
Size	4.67	4.93	5.14	—	—	1.20	.90	.44	.12

[1] F ratio for Analysis of Variance when IQ was not included.

[2] F ratio for Analysis of Variance when IQ was not included.

[3] F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4] F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as a covariate.

[5] F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as a covariate.

[6] Correlation Analysis.

TABLE 8. Mean number of times color, form, size, and sex-associated items were paired correctly for each age group

Concept Task	Nursery School	Kinder-garten	First Grade	Second Grade	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Color	4.44	4.56	4.51	4.28	.57	.62	.38	.42	—	-.08
Form	3.94	4.66	4.71	4.97	6.08**	6.33**	5.58**	4.52**	—	.33***
Size	2.72	3.69	4.06	3.50	8.20**	7.53**	6.46**	6.48**	—	.25**
Sex	2.91	2.38	3.16	3.16	2.06	2.06	1.98	1.71	—	.11

**Significant at the .01 level.
***Significant at the .001 level.

[1] F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2] F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ for covariates.

[3] F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4] F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5] F ratio for Analysis of Variance when Age was not included.

[6] Correlation Analysis.

TABLE 9. Mean number of times color, form, size, and sex-associated items were paired correctly by each sex

Concept Task	Boys	Girls	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Color	4.32	4.47	.38	.22	.03	—	.04	-.05
Form	4.52	4.63	.37	.02	.30	—	.40	-.05
Size	3.36	3.63	1.80	1.40	2.96	—	1.80	-.11
Sex	2.41	3.39	14.74**	14.08**	6.31*	—	18.79**	-.32***

**Significant at the .01 level.
***Significant at the .001 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ as covariates.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance when Sex was not included.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience and IQ with Social Class as a covariate.

[6]Correlation Analysis.

Attendence and non-attendence of nursery school for all ages and both sexes were also analyzed in relation to concept utilization (See TABLE 10). Non-attenders gave significantly more correct color concepts than children who had attended nursery school. Nursery school attenders performed better than non-attenders on form, size, and sex concepts although the differences were not significant.

Concept utilization scores were also analyzed in relation to IQ. With the exception of color concepts, the ability to complete the concept task correctly increased with the level of IQ, that is, the higher the IQ, the more correct matches were observed (See TABLE 11).

The Independent Variables and Clothing Symbols

Color, form, and size variables are utilized in making judgments about clothing, associated with the age and sex of an individual. Each child decided on the basis of color, form, or size as to whether a clothing item was suitable for a male or a female, and on a second set of items, whether a young or old person would use it. The scores reflect the mean number of correct responses by age, sex, nursery school experience, and IQ.

Data presented in TABLE 12 show the relationship between the number of correct responses for clothing symbols and the age of the child. As age increased, children's performance as measured by correct responses increased significantly for both symbol dimensions -sex and age- of the clothing symbol instrument. At all ages children performed better on the sex symbols than on the age symbols.

The clothing symbol data were also analyzed in terms of the sex of the sample. Girls gave more correct responses than boys on both dimensions of the test, although differences are significant only for the symbols of sex. Both boys and girls performed better on the sex symbols than on symbols of age expressed by clothing (See TABLE 13).

The effects of nursery school attendence for all ages and both sexes are presented in TABLE 14. Attendence of nursery school seemed to have no significant effects on knowledge of age and sex symbols of clothing. Those children who had attended nursery school performed slightly better on both age and sex dimensions than those who had not. Both attenders and non-attenders performed better on the sex symbols than age symbols.

Data presented in TABLE 15 show the relationship between IQ and the mean number of times age and sex clothing symbols were correct. For both dimensions -age and sex- more correct responses were observed as IQ increased.

Developmental Drawing

In order to measure drawing ability, the children were asked to copy seven forms. Each drawing was worth four points, and the score

TABLE 10. Mean number of times color, form, size, and sex-associated items were paired correctly by nursery school attenders and non-attenders

Concept Task	Attendence	Non-attendence	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Color	4.23	4.61	6.05*	6.93*	—	7.87*	6.44*	-.22*
Form	4.58	4.56	.008	.06	—	.02	.02	.01
Size	3.50	3.48	.006	.02	—	.003	.0005	.01
Sex	2.95	2.84	.18	.26	—	.05	.09	.04

*Significance at the .05 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ as covariates.

[3]F ratio for Analysis of Variance when Nursery School Attendence was not included.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as covariate.

[6]Correlation Analysis.

TABLE 11. Mean number of times color, form, size, and sex-linked items were paired correctly by low, medium, and high IQ groups

Concept Task	Low IQ	Medium IQ	High IQ	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Color	4.42	4.58	4.26	—	—	.96	1.31	1.07	-.07
Form	4.28	4.58	4.86	—	—	2.06	1.47	2.44	.22*
Size	3.19	3.53	3.76	—	—	2.20	1.10	2.30	.19*
Sex	2.44	3.09	3.17	—	—	6.31*	2.44	5.61*	.19*

*Significant at the .05 level.

[1]F ratio for Analysis of Variance when IQ was not included.

[2]F ratio for Analysis of Variance when IQ was not included.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as a covariate.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as a covariate.

[6]Correlation Analysis.

TABLE 12. Mean number of times age and sex clothing symbols were correct by each age group

Symbol	Nursery School	Kinder-garten	First Grade	Second Grade	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Sex	10.44	11.25	12.38	12.97	12.70**	12.36**	10.29**	8.09**	—	.45***
Age	8.88	10.13	10.41	11.59	6.59**	6.85**	4.16*	4.24*	—	.36***

*Significant at the .05 level.
**Significant at the .01 level.
***Significant at the .001 level.

[1] F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2] F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ for covariates.

[3] F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4] F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5] F ratio for Analysis of Variance when Age was not included.

[6] Correlation Analysis.

TABLE 13. Mean number of times age and sex clothing symbols were correct by each sex

Symbol	Boys	Girls	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Sex	11.16	12.36	14.33**	10.64**	14.28**	—	10.81**	-.28**
Age	10.02	10.48	1.16	.42	2.20	—	1.42	-.09

**Significant at the .01 level.

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ as covariates.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance when Sex was not included.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience and IQ with Social Class as a covariate.

[6]Correlation Analysis.

TABLE 14. Mean number of times age and sex clothing symbols were correct for nursery school attenders and non-attenders

Symbol	Attendence	Non-attendence	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Sex	11.88	11.64	.54	.06	—	.00002	.28	.05
Age	10.45	10.05	.87	.43	—	.55	.47	.08

[1]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with no covariates.

[2]F ratio for Analysis of Variance of Age, Sex, and Nursery School Experience with Social Class and IQ as covariates.

[3]F ratio for Analysis of Variance when Nursery School Attendence was not included.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as covariate.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as covariate.

[6]Correlation Analysis.

TABLE 15. Mean number of times age and sex clothing symbols were correct for low, medium, and high IQ groups

Symbol	Low IQ	Medium IQ	High IQ	F[1]	F[2]	F[3]	F[4]	F[5]	r[6]
Sex	11.07	11.91	12.31	—	—	4.50*	1.98	3.76	.24*
Age	9.33	10.56	10.88	—	—	2.42	1.83	3.30	.24*

*Significant at the .05 level.

[1]F ratio for Analysis of Variance when IQ was not included.

[2]F ratio for Analysis of Variance when IQ was not included.

[3]F ratio for Analysis of Variance of Age, Sex, and IQ with Social Class as a covariate.

[4]F ratio for Analysis of Variance of Age, Nursery School Experience, and IQ with Social Class as a covariate.

[5]F ratio for Analysis of Variance of Sex, Nursery School Experience, and IQ with Social Class as a covariate.

[6]Correlation Analysis.

used was the sum total each child earned for the seven drawings (See APPENDIX 4 for scoring details).

The relationship of developmental drawing scores to other variables was analyzed by means of correlation. A significant relationship between skill in drawing and age and IQ was revealed (See TABLE 16).

TABLE 16. Correlations between developmental drawing scores and the independent variables

Correlation Index for developmental drawing	Age	Sex	Nursery School	Social Class	IQ
Index	.61***	-.17	.17	-.01	.27**

**Significance at the .01 level.
***Significance at the .001 level.

As age increased, ability to draw the forms increased significantly. The higher the IQ, the significantly better the ability to draw the forms. That girls were able to draw the forms better than boys, and that nursery school attenders were better than non-attenders was also observed, although these trends were not significant at the .05 level of significance. No relationship between social class and ability to draw the forms was found.

Developmental drawings scores were also analyzed in relation to perceptual mode as may be seen in TABLE 17. As the tendency to perceive

TABLE 17. Correlations between perceptual mode and developmental drawing

Correlation Index for developmental drawing	Form	Color	Size
Index	.32***	-.23*	-.08

*Significance at the .05 level.
***Significance at the .001 level.

by form increased, the ability to draw the forms increased. Choices of color as a preferred means of perceiving decreased as ability to draw increased. It was not known to what extent the relationship of age to both these variables affected these results. Size choices seemed to have no relationship to level of development in drawing.

TABLE 18 shows the relationship of developmental drawing to age and sex clothing symbols.

TABLE 18. Correlations between developmental drawing scores and age and sex clothing symbols

Correlation Index for Developmental Drawing	Sex	Age
Index	.50***	.34***

***Significance at the .001 level.

Scores for both age and sex symbols of clothing increased as the ability to draw the forms increased. Again, the relationship may be a function of the age of the children, as scores for both symbol knowledge and drawing increase with age.

The relationship between developmental drawing scores and ability to utilize concepts of color, form, size, and sex is presented in TABLE 19. The number of correct responses for form, size, and sex-associated concepts increased as skill in drawing increased. Little correlation between correct responses for color concepts and level of drawing was observed.

TABLE 19. Correlations between developmental drawing scores and concept utilization

Correlation Index for Developmental Drawing	Color	Form	Size	Sex
Index	-.06	.32***	.20*	.19*

*Significance at the .05 level.
***Significance at the .001 level.

Peabody Picture Vocabulary Scores

The Peabody Picture Vocabulary scores, a verbal measure of IQ, were analyzed in relation to perceptual mode by correlation analysis (See TABLE 20).

TABLE 20. Correlations between actual IQ scores and form, color, and size perceptual mode scores for three parts of test and total

Correlations of Dimension to IQ	Perceptual Mode			
	Part I	Part II	Part III	Total
Form	.34***	-.05	.47***	.23*
Color	.19*	.50***	.65***	.07
Size	-.01	-.05	-.26	-.20

*Significant at the .05 level.
***Significant at the .001 level.

The correlations indicated that as IQ increased, both form and color choices for preferred perceptual mode increased. Stated another way, children who sometimes chose form and sometimes color, had a lower IQ than those who were consistent in their preferred dimension. Size choices decreased as IQ increased.

Color and Form Vocabulary

The scores used for statistical analysis were the total number of correct responses for color vocabulary and form vocabulary. Analysis was somewhat complicated by the fact that few mistakes were made by the entire sample. Three percent of the sample made color errors and thirteen percent made form errors. A perfect score for form vocabulary was six and for color vocabulary, ten. The correlation of color and form vocabulary and the independent variables is presented in TABLE 21.

As age increased, the color and form vocabulary also significantly increased. No differences between sexes were observed. Although differences were not significant, children who had attended nursery school performed better than those who had not. Knowledge of both form and color vocabulary increased as level of social class increased, although this relationship was not significant at the .05 level. A significant negative correlation existed between knowledge of vocabulary and IQ scores.

TABLE 21. Correlations between independent variables and color and form vocabulary

Vocabulary	Age	Sex	Nursery School	Social Class	IQ
Color	.20*	-.02	.17	-.13	-.80***
Form	.33***	.00	.18	-.17	-.36***

*Significant at the .05 level.
***Significant at the .001 level.

A correlation analysis was also run for knowledge of color and form vocabulary and perceptual mode. Although the correlations were not significant at the .05 level, the relationship between perceptual mode and knowledge of form and color vocabulary is shown in TABLE 22 and may be described as follows. Form perceivers made more color vocabulary errors and color perceivers made more form vocabulary errors.

TABLE 22. Correlations between knowledge of color and form vocabulary and perceptual mode scores

Vocabulary	Perceptual Mode Scores	
	Form	Color
Color	-.18	-.08
Form	.05	-.18

Perceptual Mode

Correlations between perceptual mode scores and concept utilization scores and clothing symbol scores are reported in TABLE 23. A positive correlation was found between form perception scores and knowledge of age and sex clothing symbols. As color perception scores increased, knowledge of age and sex clothing symbols decreased. No correlation trends were found for the choice of size.

Knowledge of color concepts correlated positively for color per-

ceivers and negatively for form perceivers. Form concept knowledge correlated positively with form perception and negatively with color perception. No correlations were found for form, color, and size perception choices and knowledge of size and sex concepts (See TABLE 23).

TABLE 23. Correlations for perceptual mode scores, symbol knowledge, and concept utilization scores

Symbols or Concepts	Form	Color	Size
Sex Symbols	.30**	-.29**	-.02
Age Symbols	.16	-.18	.13
Color Concepts	-.32***	.33***	-.01
Form Concepts	.25**	-.23*	.001
Size Concepts	-.02	.0004	.001
Sex Concepts	.08	-.02	.01

*Significant at the .05 level.
**Significant at the .01 level.
***Significant at the .001 level.

Clothing Symbolization Test

Form aspects of age and sex symbols of clothing. The analysis of variance (See TABLES 12-15) suggested that the entire sample was more aware of sex differences than age differences in regards to knowledge of symbols. The correlation analysis which follows also reflects this difference in awareness. In TABLE 24, correlations between knowledge of the form dimension of symbols in clothing and the independent variables of age, sex, nursery school attendence, social class, developmental drawing scores, IQ, and perceptual mode for form are shown.

As age increased, knowledge of form aspects of clothing increased. Girls were more aware of this dimension than boys. Children with higher developmental drawing scores gave more correct responses to this dimension than those with lower scores in drawing. No correlation was found between knowledge of form symbols and attendence of nursery school, social class level, IQ, or total score for form perceivers.

TABLE 24. Correlations of form symbols for sex and age with the independent variables

Clothing Symbol	Age	Sex	Nursery School	Social Class	Developmental Drawing	IQ	Perceptual Mode for Form
Sex	.34***	-.31**	.09	-.15	.46***	.07	.09
Age	.11	-.02	.03	-.07	.11	-.07	.11

**Significant at the .01 level.
***Significant at the .001 level.

Color aspects of age and sex symbols of clothing. The color aspects for symbolization were divided into three areas: a warm-cool dimension, a dark-light dimension, and a bright-dull dimension. Correlations for each dimension are presented in TABLES 25-27.

In TABLE 25, the warm-cool dimension of color and its correlations to the independent variables may be found.

TABLE 25. Correlations between warm-cool color symbols and the independent variables

Symbol	Age	Sex	Nursery School	Social Class	Developmental Drawing	IQ	Perceptual Mode for Color
Sex	.26**	-.08	-.06	.16	.18	-.01	-.06
Age	.20*	.11	.06	-.02	.25**	.16	-.12

*Significant at the .05 level.
**Significant at the .01 level.

As age increased, knowledge of the warm-cool aspect of color associated symbols of clothing increased. Children with higher developmental drawing scores gave more correct responses on this aspect of the clothing symbol test. No correlations were found for sex, nursery school

attendence, social class level, IQ, or total color perceptual mode scores.

In TABLE 26, the dark-light dimensions of color and their correlations to the independent variables are presented.

TABLE 26. Correlations between dark-light color symbols and the independent variables

Symbol	Age	Sex	Nursery School	Social Class	Developmental Drawing	IQ	Perceptual Mode for Color
Sex	.40***	-.18	.10	-.14	.32***	-.02	-.16
Age	.18	-.08	20*	.14	.19*	-.002	-.29**

*Significant at the .05 level.
**Significant at the .01 level.
***Significant at the .001 level.

As age increased, knowledge of the dark-light color dimension of clothing symbols increased. Children with higher scores on the developmental drawing test gave more correct answers on this aspect of symbol knowledge. Form perceivers performed better on this dimension than color perceivers. Sex, nursery school, social class, and IQ differences were not significant.

The dull-bright dimension of color as related to the independent variables is presented in TABLE 27.

TABLE 27. Correlations between dull-bright color symbols and the independent variables

Symbol	Age	Sex	Nursery School	Social Class	Developmental Drawing	IQ	Perceptual Mode for Color
Sex	.20*	-.17	.04	-.06	.24**	.01	-.10
Age	.33***	-.12	-.04	-.21*	.31**	.11	-.13

*Significant at the .05 level.
**Significant at the .01 level.
***Significant at the .001 level.

Knowledge of the dull-bright symbol dimension increased with age. Children of higher social class performed better on the age symbol dimension than children of lower social class. The higher the developmental drawing ability, the higher the knowledge of this symbol dimension. No correlations were found between the dull-bright symbol dimension and sex, nursery school attendence, IQ, or preferred perceptual mode scores for color.

Size aspects of age and sex symbols of clothing. The correlations between size aspects of age and sex symbols of clothing and the independent variables are presented in TABLE 28.

As age increased, knowledge of the size symbol dimension increased. The higher the level of social class, the greater the knowledge of size symbols. As skill in drawing increased, knowledge of size symbols in clothing increased. No significant correlations between size symbol knowledge and sex, nursery school attendence, IQ, or perceptual mode scores for size were found.

TABLE 28. Correlations between size clothing symbols and the independent variables

Symbol	Age	Sex	Nursery School	Social Class	Developmental Drawing	IQ	Perceptual Mode for Size
Sex	.11	-.10	-.01	-.24*	.25**	.03	.10
Age	.28**	.03	.00	-.10	.19*	.06	.16

Analysis

The analysis of the findings will be based on the independent and dependent variable relationships that were predicted in FIGURE 4, page 12.

Age

The most significant differences found among the subjects were due to age. As age increased, skill in drawing increased (.001 level of significance); form vocabulary increased (.001 level of significance); form perception increased (.001 level of significance); color perception decreased (.001 level of significance); form concept utilization increased (.01 level of significance); size concept utilization increased (.01 level of significance) but only up to first grade and then decreased; and knowledge of age and sex symbols of clothing increased (.001 level of significance).

No differences among age groups were noted for choice of size as a perceptual mode, or color and sex linked concept utilization tasks.

Expected age differences noted in the review of literature would have led us to expect many of these relationships, but perhaps several findings need further explanation. These include the drop in size concept utilization that occurred when comparing the oldest and second oldest age groups; the lack of choice of size as a perceptual mode, and lack of differences among age groups for knowledge of color and sex-linked concepts.

Until the completion of first grade, children's ability to utilize size in forming concepts increased. A drop in this ability occurred in the oldest age group. A review of the answers of these children who were mostly form perceivers indicate that, although a size concept was obvious, they chose some aspect of form. It would seem that conceiving and perceiving by form becomes so strong that it obliterates the other possibilities.

The lack of choice of size as a mode of perception may have been caused by one of two things. First, given the choice of color, form, or size, a child may feel that color or form is more important than size as a basis of seeing similarities. Such a finding would be in accordance with the results and interpretations of other researchers. A second possibility is that the size differences in the size dimension of the instrument were not great enough and therefore not deemed important by the children.

Previous literature suggested that utilization of color concepts decreased with age. Although our results support this trend, the differences were not significant at the .05 level. Perhaps a wider age range would have provided greater differences. It is interesting to note that the age trend in color perception and color concept utilization is similar; both decrease with age for the limits of this sample.

Sex

Differences in data also were attributed to the sex of the child. Girls were more likely to perceive by form (.05 level of significance); gave more correct responses on the sex-linked concept utilization tasks (.001 level of significance); and gave more correct responses on knowledge of clothing symbols associated with sex (.01 level of significance).

Sex differences in perceptual mode were in accordance with earlier research findings as reported in the review of literature. The findings also demonstrated that boys were more likely to perceive by color although this was not significant at the .05 level.

That girls were more aware of sex differences in clothing and more capable of matching sex-linked concepts correctly is perhaps indicative of the fact that girls usually have their mother at home.

Thus they have a greater chance to emulate their mother than boys have of their father.

Nursery School

The following differences were found concerning nursery school. Attenders of nursery school were more likely to choose size as a means of perceiving similarities (.05 level of significance); utilized color as a means of forming concepts less often (.05 level of significance).

These findings suggest that children who have attended nursery school were more aware of different ways of perceiving and more size choices and fewer color choices were made. The rate of change from color to form appeared to occur more rapidly in nursery school attenders than non-attenders; but rather than just form they seemed aware of other possibilities such as size. Form, however, was still the overwhelming common choice.

The decreasing tendency to utilize color concepts occurred more rapidly in nursery school attenders. This finding tends to support the idea that attenders rule out color earlier as they become more aware of other ways of conceiving similarities.

Socioeconomic Status

Socioeconomic status was used as a covariate in order to run the analysis of variance tests. A preliminary statistical analysis revealed differences in status between boys and girls, nursery school attenders and non-attenders. These significant differences were not by design, and therefore the covariate formed a useful control. Status as a covariate only accounted for a significant amount of variability part of the time; however, it is utilized for all the reported results.

Drawing Skill

A measure of drawing skill for seven forms was obtained from each child. As skill increased, age increased (.001 level of significance); IQ increased (.01 level of significance); form as a preferred means of perception increased (.001 level of significance); color as a means of perception decreased (.02 level of significance); knowledge of age and sex clothing symbols increased (.001 level of significance); utilization of size and sex concepts increased (.05 level of significance).

The increase in IQ with an increase in skill was expected since drawing of forms is one measure of IQ on the Revised Stanford Binet. All of the other relationships reported above may well be due to strong age trends. The variables of drawing skill, perceptual mode, knowledge of symbols, and concept utilization are all similarly dependent on age which may cause correlations to appear among these dependent variables.

Color and Form Vocabulary

One of the most difficult variables to analyze is the vocabulary

for form and color. The difficulty is caused by the low number of errors made by the entire sample. As age increased, knowledge of color vocabulary (.05 level of significance) and form vocabulary (.001 level of significance) increased; and IQ increased as form and color vocabulary decreased (.001 level of significance).

An increase in vocabulary with increases in age was an expected result. An analysis of IQ differences, however, can be based on only a very small sample of children making errors and a large sample of children who gave all correct answers. The low range of errors made by only one segment (young age group) of the total sample probably caused accidental relationships among the variables, and thus the differences in IQ.

Peabody Picture Vocabulary Test Scores

IQ scores as measured by the Peabody Picture Vocabulary Test were obtained from each child. The higher the IQ score, the greater the ability to utilize concepts of form, size, and sex (.05 level of significance); and the greater the knowledge of sex and age symbols utilized in clothing (.05 level of significance). Such findings are in accordance with those of other researchers as reported in the review of literature.

IQ scores also increased with high scores in form and color preferred perceptual modes (.001 level of significance); and low scores in size as a preferred perceptual mode (.05 level of significance).

The child with a higher IQ seemed to choose a preferred mode and stick with it. The child with a lower IQ chose form one time and color the next. When two variables were combined against one, the subject with the lower IQ chose size against form and color. One might conclude that children of higher IQ are quicker to make up their minds and stick to their decision even at a relatively young age. They also tended more toward the color and form dimensions of perception which seemed to be stronger in the test itself.

Perceptual Mode (Color Versus Form Versus Size Perceivers)

Preferred perceptual mode was the core of the entire study. Earlier research suggested that form and color perceivers would differ with regards to age, sex, and IQ. The effects of nursery school and socioeconomic status were also to be explored. It was predicted that perceptual mode might also affect concept utilization and knowledge of age and sex clothing symbols.

As age increased, form as a preferred means of perception increased (.001 level of significance) and color perception decreased (.001 level of significance). Girls tended to perceive more by form than boys (.05 level of significance). Nursery school attenders chose size more often as a means of similarity than non-attenders (.05 level of significance). Form perceivers had greater skill in drawing (.001 level of significance) and color perceivers less skill in drawing (.02 level

of significance). Children with a higher IQ tended to choose all of the color or all of the form choices on the perceptual mode test, whereas lower IQ children were less decisive (.001 level of significance). Size was least chosen as a means of similarity by children with a high IQ (.05 level of significance).

All of the above findings have been discussed and analyzed under previous variables. Let us now consider perceptual mode as an independent variable in relationship to concept utilization and knowledge of sex and age symbols used in clothing.

Form perceivers were found to have a greater ability in utilizing form concepts (.01 level of significance) and less ability in utilizing color concepts (.001 level of significance). Color perceivers had a greater ability in utilizing color concepts (.001 level of significance), and less ability in using form concepts (.02 level of significance). No relationships were found between size choices in preferred perceptual mode and the ability to use size in forming concepts.

The nature of the perceptual mode and concept utilization tests was similar in that they contained similar dimensions of form, color, and size. Also in both tests the child was asked to decide (what was the same."

An explanation of the results might thus be as follows. First, perception and concept utilization may both be a function of age as their trends for age are similar in direction. Second, the similarity in the two tests may account for similarities in results, although the geometric picture forms utilized in perceptual mode may not have been as realistic as the toys used in the concept utilization tasks. A third possibility is that preferred perceptual mode acts as a screening device and thus children are able to utilize concepts in their preferred mode best.

The relationship between preferred perceptual mode and the ability to pick out color, form, and size symbols associated with age and sex as expressed through clothing was somewhat disappointing. No differences among form, color, or size perceivers were found in ability to see form symbols, warm-cool color symbols, dull-bright color symbols, or large-small size symbols to occur. Form perceivers were more able to see the light-dark color symbols than color perceivers (.01 level of significance).

The lack of relationship between these variables may have been caused by the age trends. It would seem that age of the subject would need to be controlled because knowledge of the symbols increased with age. Since color perceivers were younger and form perceivers older, the relationship of symbol knowledge to perceptual mode was obscured or even became the opposite of what was expected. Further analysis could be accomplished by controlling for mode of perception or age.

Concept Utilization

An analysis of ability to utilize concepts of color, form, size, and sex-linked items follows.

Color. No age, sex, or IQ differences were observed in ability to utilize color concepts. Children who had not attended nursery school were more likely to make a correct match (.05 level of significance). Color perceivers gave more correct answers (.001 level of significance), and form perceivers fewer correct answers (.001 level of significance). The results suggest that utilization of color concepts is best accomplished by the youngest and least experienced of children within the age range of the study.

Form. As age increased, children were more likely to utilize concepts of form (.001 level of significance). No sex or nursery school attendence differences were found. The higher the IQ the more able the children were in completing this task correctly (.05 level of significance). As ability to draw forms increased, the ability to utilize form concepts increased (.001 level of significance). Children who perceived by form as a preferred mode gave more correct responses (.01 level of significance) whereas color perceivers gave fewer correct responses (.05 level of significance).

We might conclude that utilization of form concepts is closely related to age trends as are the other variables with which it is associated.

Size. Ability to utilize concepts of size increased up to the completion of first grade, then decreased (.01 level of significance). No differences were found for sex or attendence of nursery school. As IQ increased the ability to utilize size concepts increased (.05 level of significance). Children with greater ability to draw gave more correct responses for this dimension of concept utilization than those with lesser ability (.05 level of significance). No differences in perceptual mode were found for the ability to utilize concepts of size.

A discrepancy in results may appear in the reader's mind with regard to the fact that size was rarely chosen as a perceptual mode, yet, children were able to utilize concepts of size similarities. This discrepancy might be explained by the difference between the two tests. In the perceptual mode test, the child was given a choice of the way he wanted to perceive; his preference was usually form or color. In the concept utilization test, only one right answer for the size dimension existed. The older and more intelligent child saw this and was more likely to respond correctly.

Sex. Abilities to utilize sex-linked concepts were greater for girls than boys (.001 level of significance). No differences in age or nursery school attendence were observed. The higher the IQ, the greater the number of correct responses on this dimension (.05 level of

significance). As skill in drawing increased, knowledge of sex-linked concepts increased.

Throughout the entire collection of data, form, color, and size ideas had been stressed. In this situation the child could not draw on any of these variables, and this may have been confusing. Children with a higher IQ as manifested by both the Peabody Picture Vocabulary scores and skill in drawing forms were more capable of success in this task. Girls were more aware of differences or felt that differences between these sex-linked objects were more important at an earlier age than boys.

Age and Sex Symbols in Clothing

The data were scored for the color, form, and size symbolism used by different ages and sexes in clothing. In addition a total score was analyzed in relation to other variables.

As age increased, knowledge of clothing differences by sex and age increased (.001 level of significance). Girls had a greater knowledge than boys (.01 level of significance). No differences in knowledge were observed between attenders and non-attenders of nursery school. The higher the IQ the greater the knowledge (.05 level of significance). Children with greater skill in drawing had a greater knowledge of symbols (.001 level of significance).

Thus we can state that knowledge increased with age, that girls have acquired more knowledge than boys, and that a higher IQ aided in the attainment of this knowledge. The relationship between developmental drawing scores and knowledge of symbols is probably the result of the strong age trend.

Form symbols. Knowledge of form symbols followed the trends of knowlege of symbols in general. No significant differences were found for any variable for age symbols. For sex symbols (differences in form for boys and girls) age, sex, and developmental drawing scores were related as discussed above. No correlation was found between form perception and knowledge of form symbols although the direction of correlation was positive.

Color symbols. The trends of knowledge of symbols in general were observed for color. Knowledge of the warm-cool, light-dark, and dull-bright aspects of clothing all increased with age and skill in developmental drawing scores. Girls gave more correct answers than boys. The relationship between color perceptual mode and knowledge of these symbols was not significant; however, the strong age trend in perception probably disguises any existing relationship.

Size symbols. The overall trends in knowledge of symbols were observed for knowledge of the size dimension in clothing symbols. Choice of size as a match for perceptual mode and knowledge of size symbols were correlated positively, however, the relationship was not significant.

PART III

CONCLUSIONS AND RECOMMENDATIONS

The dominant developmental trend observed in this study was the change from color to form as a preferred mode of perception. As age increased, the children of the sample increasingly chose form as a means of perceiving similarities. The relationship of this age change to reading training is worth further study in the sense that the cross-over from color to form occurs as seen in FIGURE 6.

	Kindergarten	First grade
Color	27	24
Form	24	27

FIGURE 6. Crossover from color to form perception by grade

This trend occurs at the time reading training begins with an increase in form preference and decrease of color preference occurring in subsequent grades. Is this change from color to form a result of teaching, or, is it a matter of readiness? Several findings from this study support the readiness concept. First, the shift from color to form occurs sooner for girls than boys supporting the usual sex difference expectations for readiness. Secondly, the finding of a lack of differences between nursery school attenders and non-attenders for this trend implies that growth is more critical.

One wonders about the child who does not make the change from color to form. What is his reading performance compared to that of a form perceiver? When comparing the performance of form and color perceivers, it was observed that form perceivers were less able or willing to utilize the concepts other than form whereas color perceivers were able to utilize the concepts of size and form as well as color. Could it be that the older color perceiver is more creative? The study of perceptual mode should be carried on for better understanding of older color perceivers with regard to reading performance and creativity.

The choice of form and color were so strong for the age range in this study that size was rarely chosen. It was found that nursery school attenders were more likely to choose size as a means of perceiving

similarity than non-attenders. This trend is not seen as related to maturation, but as a result of exposure to many different experiences in observation possible in the nursery school.

The traditional position that IQ is related to growth in form perception must be qualified. The reason is that results here show that higher IQ is more related to choice consistency whether it be form or color. It was also found that children with a higher IQ were less likely to choose size than children of lower IQ.

The color and form trends for the age group of this study are not necessarily true for other age groups. One is not likely to remain a form perceiver for the rest of his life. At some later age than studied for this project, some people again become color perceivers. This observation was made in pretesting the color-form-size perceptual mode test on college students. The study of perceptual mode should be carried on with older age groups for better understanding of its relationship to independent and dependent variables.

A similar trend to that of perceptual mode was observed for form, color, and size concept utilization. The youngest children were best able to utilize concepts of color; the older children were best able to utilize concepts of form. The older the child the better he was able to utilize form, whereas color concept utilization decreased with age. Girls performed better on all types of concept utilization although sex differences were not significant. Differences for nursery school attendence were noted only for color concept utilization in which non-attenders gave more correct answers than attenders. The higher the IQ, the greater the number of correct responses for form and size concept utilization.

The principles of maturation apply best in interpreting and using these results. Girls seem to have matured earlier than boys. One begins to think of a color response as indicative of immaturity, lack of experience, and associated with a lower IQ, or possibly as the creative response.

The research also undertook to explore the relationship of independent variables and perceptual mode to knowledge of form, color, and size clothing symbols. It was observed that knowledge of all three types of symbols -form, color, and size- increased with age, and that girls were more aware of these symbols than boys. No differences were observed for attendence of nursery school. As IQ increased, knowledge of these symbols increased. The results here suggest that in spite of preferred perceptual mode and concept utilization trends moving from color to form, the knowledge which children reflect actually increased with age and IQ. That girls have a greater knowledge of clothing symbols than boys is probably most indicative of their interests.

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APPENDIX 1. Questionnaire

Child's Background

Interview Number _____

Date of birth of child: _____
Sex: Male Female

Did the child attend nursery school? Yes No For how long? _____

How many children do you have in each of the following groupings?

_____(1) Pre-school

_____(2) Kindergarten through Grade 6

_____(3) 7th grade and above

Indicate how far you and your husband went in school.

(a) through 7th grade
(b) finished 8th grade
(c) finished 9th grade
(d) finished 10th or 11th grade
(e) graduated from high school
(f) 1 to 3 years of college
(g) college graduate
(h) graduate school after college

Father (give letter which applies from above list) _____

Mother (give letter which applies from above list) _____

Explain what your husband does at work _____

_____

If you work for pay outside your home, explain the kind of work you do. _____

The main source of family income is:

a) wages, hourly wages, piece work (weekly pay check)

b) salary paid on a monthly basis

c) profits and fees from a business or profession

d) social security or unemplyment insurance

e) if other, explain _____

APPENDIX 2. Color-Form-Size Perception Test

The test consists of three parts measuring color-form-size perception in different ways. In the actual presentation of the 19 stimuli, the order will be randomized so that no one part is apparent. The position of the alternatives within each stimulus presentation will be randomized so that all alternatives will have received equal attention within the instrument.

Three practice cards will be presented to make sure that the subject understands the instructions. No color, form, or size dimension is reinforced in the practice cards.

DIRECTIONS: Which two are the same?

PC 1. One small red square and two large blue circles.
PC 2. One large green circle and two small red squares.
PC 3. One small blue circle and two large green squares.

PART 1. The three stimuli, color, form, and size, are presented two at a time.

Stimulus	Alternative	Scoring
1	F vs C	2 pts for F or C
2	F vs C	
3	F vs C	
4	C vs S	2 pts for C or S
5	C vs S	
6	C vs S	
7	F vs S	2 pts for F or S
8	F vs S	
9	F vs S	

PART 2. The three stimuli, color, form, and size are presented three at a time.

10	F vs C vs S	4 pts for F or C or S
11	F vs C vs S	
12	F vs C vs S	
13	F vs C vs S	

PART 3. The three stimuli, color, form, and size, are presented with one stimulus supporting the second stimulus and opposing the third choice.

14	C & F vs S	2 pts for C&F or 4 for S
15	C & F vs S	
16	C & S vs F	2 pts for C&S or 4 for F
17	C & S vs F	
18	F & S vs C	2 pts for F&S or 4 for C
19	F & S vs C	

APPENDIX 3. Color and Form Vocabulary Test

The presentation of the eight stimuli in this test will be randomized. The position of the alternatives within each stimulus presentation will be randomized so that all alternatives will have received equal attention within the instrument.

DIRECTIONS: Point to the picture which is ___(stimulus word)___

Stimulus Word	A	B	C
red	red	yellow	green
yellow	blue	orange	yellow
orange	orange	green	red
green	blue	green	orange
blue	yellow	red	blue
square	circle	square	triangle
triangle	triangle	circle	square
circle	square	triangle	circle

APPENDIX 4. Developmental Drawing Test

The child is first asked to "draw that, as close as you can." A four by five white card is placed on a wire stand so that the form is easily visable to the child. The seven cards are presented in turn at the child's own rate. The child is permitted to use as many pieces of paper as he finds necessary.

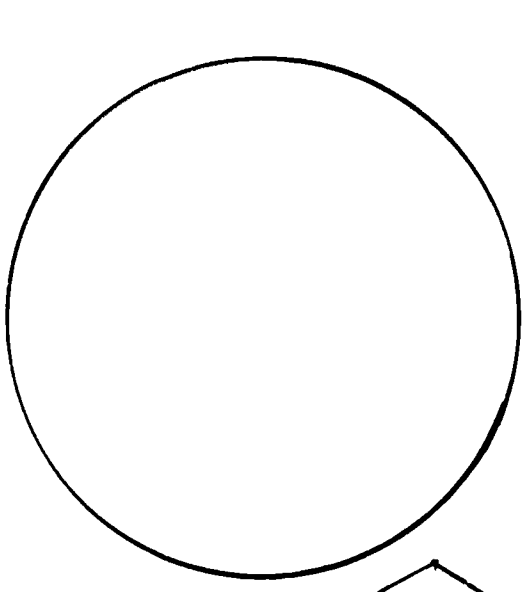
The criteria for scoring the copies are based on the features of the drawings which Bender described as representing preciseness; namely, the presence of all components, essential form, orientation, and size relationships. Each drawing can receive four points, one for each of the following:

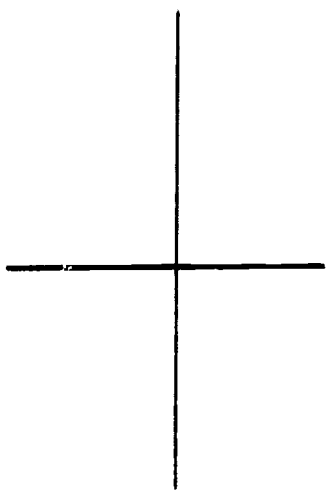
1. Inclusion of all components or depiction, for example, correct number of lines to form an object.

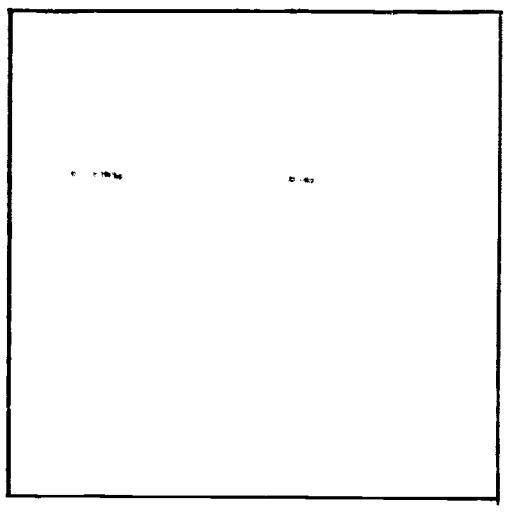
2. Representation of essential form: the form is recognized for what it should be.

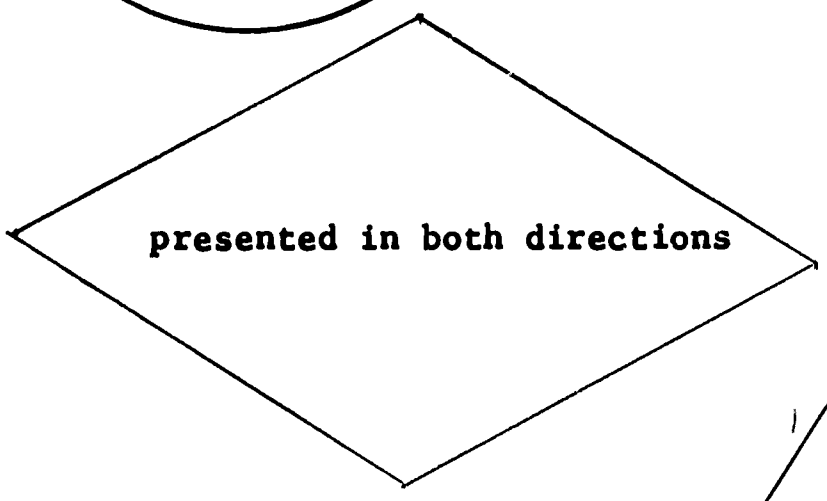
3. Correct orientation: the object is well oriented in the horizontal, vertical, and oblique planes.

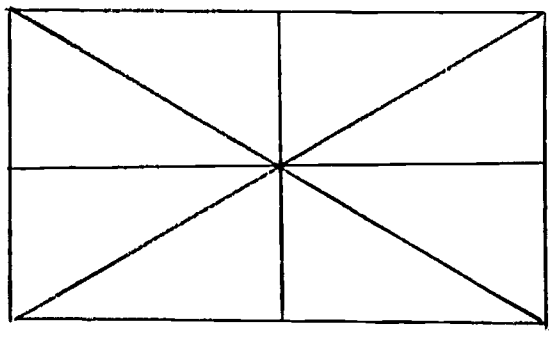
4. Size: the drawing is one that is almost identical with the stimulus in size.

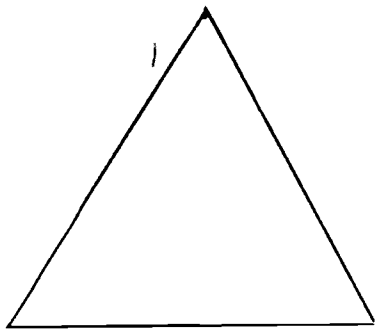












APPENDIX 5. Concept Utilization Test

The stimuli in this test are familiar objects such as automobiles, dolls, planes, blocks, tools, and clothing. Each test item will contain three stimuli, two of which possess similar attributes on the critical concept for that item, with a third stimulus possessing a different attribute along the same conceptual dimension. The three stimuli will also vary on a second dimension irrelevant to the task. Each of the four concepts will be represented by five different items such as the examples given below.

DIRECTIONS: Look at these things on the table. There are two of these that are the same (or alike or matching). Can you tell me which two? (S response) Now tell me which one does not belong. (S response) Can you tell me why?

Two practice trials on unrelated variables will be given in order to make sure the child understands what he is expected to do.

SAMPLE QUESTIONS:

Concepts		Stimuli		
Color	a)	1 large blue car	1 medium blue car	1 small green car
	b)	1 medium green car	2 medium green cars	3 medium red cars
Size	a)	2 large blocks	2 large blocks	2 small blocks
	b)	1 small red plane	1 small green plane	1 large yellow plane
Form	a)	1 block	2 blocks	3 blocks
	b)	1 large block	1 medium block	1 small block
Sex type	a)	a man's top hat	an axe	a lipstick
	b)	a clothes iron	a women's bracelet	a smoking pipe

APPENDIX 6. Clothing Symbol Test

The stimuli in this instrument were pairs of familiar articles of clothing. Each pair was alike except in color or form or size. The child performed two Q-sorts, one on the basis of age identity and a second sort for sex identity. Fifteen pairs were designed for each set. The order of the item within the sort was randomized so that the pairs did not appear together. Test-retest and internal reliability were determined during pretesting.

DIRECTIONS: In front of the child are placed two pictures: a girl and a boy (Sort 2: young and old persons). The researcher points to the pictures of the boy and girl and says, "See these people?" Then a set of clothing pictures is placed in front of the child and the researcher says, "These are pictures of clothing. Put the picture next to the person whom you think would wear it."

APPENDIX 7. Index of Social Status (McGuire White Scale)

In order to derive a score for social status, the following weightings were used.

Occupation . . . . Rate 1 to 7 on OC scale ... Weight —— x5

Source of Income . Rate 1 to 7 on SI scale ... Weight —— x4

Education . . . . Rate 1 to 7 on ED scale ... Weight —— x3

1. SOURCE OF INCOME (SI)

1. Inherited savings and investments; "old money" reputed to provide basic income.

2. Earned wealth; "new money" has provided "transferable" investment income.

3. Profits, fees, royalties, includes executives who receive a "share of profit."

4. Salary, commissions, regular income aid on monthly or yearly basis.

5. Wages on hourly basis; piece-work; weekly checks as distinguished from monthly.

6. Income from "odd jobs" or private relief; "sharecropping" or seasonal work.

7. Public relief or charity; non-respectable incomes (reputation).

2. EDUCATIONAL ATTAINMENT (ED)

1. Completed appropriate graduate work for a recognized profession at highest level; graduate of a generally recognized, high status, four year college.

2. Graduate from a four year college, university or professional school with a recognized bachelor's degree, including four year teacher colleges.

3. Attended college or university for two or more years; junior college graduate; teacher education from a normal school; R.N. from a nursing school.

4. Graduate from high school or completed equivalent secondary education, includes various kinds of "post-high" business education or trade school study.

5. Attended high school, completed grade nine, but did not graduate from high school; for persons born prior to 1900, grade 8 completed.

6. Completed grade eight but did not attend beyond grade eight; for persons born prior to 1900, grades four to seven would be equivalent.

7. Left elementary or junior high school before completing grade eight; for persons born prior to 1900, no education or attendence to grade three.

3. OCCUPATIONAL LEVEL (OC)

Rate	Professionals	Proprietors	Businessmen
1.	Lawyer, judge, physician, engineer, professor, school supt. et al with postbaccalaureate study.	Large businesses valued at $100,000 or more dependent on community.	Top executives, President, et al of corporations, banks, public utilities.
2.	Nurses, teachers, librarians and others with 4 yr. college degree.	Business valued at $50,000 to $100,000.	Ass't., office and dept. manager or supervisors; some mfg. agents.
3.	Professionals without 4 yr. college degree (usually have a diploma)	Business or equity valued from $10,000 to $50,000.	Managers of small branches or buyers and salesmen of known mchdse.
4.		Business or equity valued from $5,000 to to $10,000.	Stenographer, bookkeeper; ticket agent, sales people in dept. stores, et al.
5.		Business or equity valued from $2,000 to $5,000.	Dime store clerks, grocery clerks, beauty oper., telephone oper., et al.
6.		Business or equity valued at less than $2,000.	
7.	Reputed lawbreakers		

OCCUPATIONAL LEVEL (OC), cont.

Rate	White Collar	Blue Collar	Service	Farm People
1.	CPA; editor of newspaper, magazine; executive secy. of status organization			Gentleman farmer or land owners who do not supervise directly their own property.
2.	Accountant; insurance, real estate, stock salesmen; editorial writers			Land operators who supervise properties & have an active urban life.
3.	Bank clerks, auto salesmen, postal clerks, RR or Tel. agent or supervisor.	Small contractor who works or supervises his jobs.		Farm owners with "hired help." Operators of leased land who supervises.
4.		Foreman; master carpenter, electrician, et al; RR engineer	Police capt. tailor, RR condr., watchmkr.	Small landowner; operators of rented property hiring "hands"
5.		Apprentice to skilled trades repairmen; med. skilled worker	Policemen, Barbers; LVN's brakemen	Tenants on good farms; foreman; owners of farm who "hire out"
6	Semi-skilled factory and production workers; assistants to skilled trade; warehousemen, watchmen.		Taxi and trk. drivers; waiters, gas sta atn. aides.	Sharecroppers; established farm laborers; sus'ce farmers.
7.	Heavy labor; odd-job men; mine or mill hands, unskilled workers		Domestic hlp. busboy, scrubwomen janitor	Migrant workers squatters & nesters