Preference for Color and Form in Preschoolers as Related to Color and Form Differentiation

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MELKMAN, RACHEL; KORIAT, ASHER; and PARDO, KARIN. *Preference for Color and Form in Preschoolers as Related to Color and Form Differentiation.* CHILD DEVELOPMENT, 1976, 47, 1045–1050. The preference for color or form as bases for similarity judgments among preschoolers (ages 2–5) and its relationship to the differentiation of form and color concepts as indexed by discrimination, identification, and labeling were investigated. As hypothesized, an early stage of form preference was found, replicating Brian and Goodenough's results. This was followed by the often-reported color preference and subsequent shift to form preference. A second hypothesis—that the relative salience of a dimension develops in parallel to its relative degree of differentiation—was not supported. This was so despite the fact that, within age groups, individuals who displayed higher proficiency in one dimension than in the other also preferred that dimension over the other. Implications for existing explanations of developmental trends in preference were discussed.

The relative salience of color and form as bases for responding to stimuli has been studied in children as well as in adults. The results generally suggest that responsiveness to color represents a more primitive mode of functioning than responsiveness to form. Developmental studies have consistently reported a gradual increase in form salience with age (Brian & Goodenough 1929; Corah 1964; Kagan & Lemkin 1961; Suchman & Trabasso 1966a). Within age groups, subjects preferring form have been found to exhibit more adaptive or efficient modes of behavior than subjects preferring color (Brian & Goodenough 1929; Hill 1972; Suchman 1966).

There is evidence, however, that at a very young age form is more salient than color. Infant studies indicate that variations in stimulus pattern affect visual preference more strongly than either color or size (Fantz & Nevis 1967; Spears 1964). With preschoolers, Brian and Goodenough, using a matching technique, found a very early stage of form salience (around 2–2½ years) preceding the commonly obtained color salience and subsequent shift to form. This finding appears inconsistent with the prevalent assumption of the more advanced nature of form responsiveness and raises questions regarding some of the explanations of the developmental increase in form salience.

The first purpose of the present study was to attempt a replication of the finding regarding development of color-form preference in preschoolers which was made by Brian and Goodenough. No study since theirs has reported color-form preferences (on a matching task) in children below the age of 3, with the one exception of Suchman and Trabasso (1966a), whose data included a small sample of children aged 2-10 to 3-5.

The second purpose was to relate this development to the acquisition of form and color concepts. A number of studies suggest that the relative salience of a dimension is affected by, and may in turn affect, the amount of discriminative exposure to that dimension. On the one hand, differences in dimensional salience were found to predict discrimination accuracy and effectiveness of concept attainment (e.g., Gaines 1964; Odom & Mumbauer 1971; Smiley & Weir 1966; Suchman & Trabasso 1966b). On the other hand, differentiation training with a dimension was found to increase its relative salience (e.g., Caron 1969; Gaines 1970; Gusinow & Price 1972). Differences between groups in the preference for color and form have similarly been explained in terms of differences in reinforcement histories (Lee 1965; Suchman 1966). Lee proposed that the reinforcement of form discrimination in learning to read is responsible for the increased form salience in school-age children.

If the development of color-form salience in preschoolers is seen similarly to reflect variations in environmental contingencies, then the effects of these variations should be also detectable in the

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relative differentiation of color and form concepts: forms should be more accurately discriminated than colors at those developmental stages where form is found to be dominant, whereas the reverse pattern should obtain when color is dominant. Thus, if the nonmonotonic developmental trend reported by Brian and Goodenough is replicated, a parallel nonmonotonic development in the relative differentiation of form and color concepts may be expected. This may result, for example, if form differentiation undergoes its most rapid development earlier than color differentiation.

Three indices of differentiation were used in the present study. These were "discrimination" (the ability to match stimuli on the dimension), "labeling" (the ability to provide names for various values on the dimension), and "identification" (the ability to designate the appropriate value when given its name).

Method

Procedure.—Subjects were invited individually to "play a game" with the experimenter, were escorted to a room adjacent to the nursery school, and seated beside the experimenter. Discrimination was assessed first, followed by dimensional salience, with labeling and identification administered last.

Discrimination procedures.—Half the subjects in each age group received the color discrimination first, and the remaining half received the form discrimination first. Each of the discrimination tasks consisted of two practice and eight test stimuli. The stimuli were 6 × 12-inch cardboards onto which an evenly spaced row of four shapes (1½ inches in diameter) was glued. For color discrimination, circles colored red, yellow, green, and blue were used. For form discrimination, a circle, a square, a triangle, and a star, all colored orange, were used. The four shapes were arranged according to a randomly chosen set of different orders. For each of the discrimination tasks there was a corresponding set of flat wooden blocks (½ inch in thickness) identical to the stimulus shapes in size, form, and color.

The experimenter placed in front of the subject the cards containing the discrimination stimuli with the first practice card in view. He picked one of the blocks, saying "Where does it go?" and then placed it on top of the appropriate stimulus. The child was then encouraged to do the same. The experimenter then exposed the second practice card, handed the child another block, and said "Now you show me where this one goes." Assistance was given where necessary. The eight test trials followed immediately with no further assistance or reinforcement given. The position of the "correct" shape on the cards varied randomly from trial to trial except that it was never the same on successive trials. The second discrimination task followed the first and was administered in the same fashion.

Dimensional salience procedure.—Again, the task consisted of two practice and eight test cards. Each card (a 6 × 8-inch cardboard) portrayed one stimulus (the standard) pasted in the middle of the upper half, and two stimuli (comparison stimuli) pasted below, equidistant from the standard. The stimuli consisted of randomly chosen pairings of the color and form values used in the discrimination tasks. Each color and form appeared approximately equally often. On the practice cards, one of the comparison stimuli was identical to the standard whereas the other differed from it in both color and form. The position of the identical stimulus was to the right of the standard in the first practice trial and to its left on the second. On the test cards, one comparison stimulus was identical to the standard in form but not in color, and the other was identical to it in color but not in form. The comparison stimuli matching the standard on each dimension appeared in both positions equally often, with the two positions appearing in random order except that neither occurred more than twice in succession.

The experimenter placed the cards in front of the child with the first practice card in view. Pointing to the standard, he said "Show me another one like this." On the practice trials where one of the choices was correct, the child was assisted and corrected if necessary. The test trials followed immediately after the practice trials according to the same procedure but with no assistance or reinforcement. The preference task was readministered 1–3 weeks after the original presentation.

Labeling and identification procedure.—Two 6 × 12-inch cardboards were used. On one were glued 3 × 6-inch strips of the colors red, yellow, green, and blue, in that order. On the other were drawn a black outline of a circle, a square, a triangle, and a star, in that order and of the same size as the previously used shapes. Half the children in each age group were presented with colors first, the other half with forms first. Upon presentation of the cardboard, the child was asked to label each color (or form) by "what is this?" If the child was unable to supply all the names, identification was assessed by having the child point to each color (or form) named by the experimenter in turn.

Subjects.—Subjects were Israeli upper-

middle-class children, 55 boys and 54 girls in the following age groups: 2-0 to 2-5 years (N = 12); 2-6 to 2-11 years (N = 20); 3-0 to 3-5 years (N = 22); 3-6 to 3-11 years (N = 20); 4-0 to 4-5 years (N = 22); and 4-6 to 4-11 years (N = 13). Each of the first four groups contained an equal number of boys and girls; the last group contained seven boys and six girls. Twenty-seven additional subjects were eliminated for failure on the practice trials of the salience tasks or for four or more successive right- or left-hand choices on this task.

Results

Dimensional salience.—The number of trials on which form was preferred over color was determined for each child for each administration of the salience task (PREF-1 and PREF-2) and for their sum (PREF-T). The means of PREF-1, PREF-2, and PREF-T, expressed in terms of percentage of form choices, are shown in figure 1 for each age group. (Preliminary analyses revealed no effect for sex, for the sex × group interaction, or for the order in which the discrimination tasks were administered.) As can be seen, the strongest form preference is manifested by the youngest and oldest children, and the highest color preference by children aged 3 to 3-5. Thus, the curvilinear relationship reported by Brian and Goodenough (1929) appears to be replicated by the present data.

The average dimensional preference of the intermediate age groups clearly deviates from the 50% point at which neither form nor color is dominant. In comparison to these groups, the younger children's behavior could have resulted either from stronger form preference than the middle groups or simply from inconsistency in choice. In order to evaluate these alternatives, two manifestations of intrasubject consistency, interitem and intersession reliabilities, were examined. Interitem reliabilities were estimated by Cronbach's α coefficient (Cronbach 1951), and intersession reliabilities by the PREF-1–PREF-2 correlation coefficients. Table 1 presents these indices of reliability for each group and for the total population. It can be seen that the degree of consistency of preference does not increase with age: children display a remarkable consistency in dimensional preference as early as age 2 years. Only among the oldest group do the reliabilities appear somewhat deviant, combining high interitem consistency

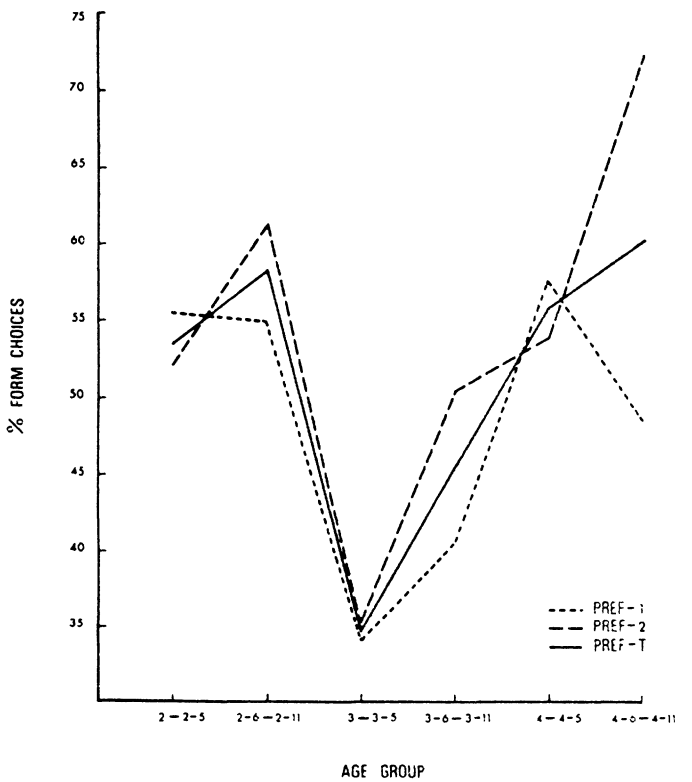

FIG. 1.—Percentage of form choices as a function of age groups

TABLE 1

INTERITEM AND INTERSESSION RELIABILITIES FOR AGE GROUPS AND FOR THE TOTAL SAMPLE

	AGE GROUPS						
	2-0 to 2-5	2-6 to 2-11	3-0 to 3-5	3-6 to 3-11	4-0 to 4-5	4-6 to 4-11	ALL
Cronbach's α							
PREF-1	.94	.93	.96	.96	.97	.96	.96
PREF-2	.91	.96	.98	.94	.93	.94	.96
PREF-T	.96	.97	.98	.97	.97	.96	.98
PREF-1–PREF-2 correlation	.87	.78	.94	.90	.98	.65	.86

with relatively lower intersession consistency. In this group there was a tendency, although not significant, for subjects to display higher PREF-1 scores when the immediately preceding task was form discrimination than when it was color discrimination. The results on the whole indicate that the near-midpoint performance of the youngest groups reflects consistent choices rather than random behavior.

The distribution of dimensional preference scores was clearly bimodal for each of the age groups. A nonparametric test was therefore used to evaluate the significance of the age trend in preference. Subjects were classified as color dominant if they had 14 or more color choices, or form dominant if they had 14 or more form choices (out of 16). Otherwise they were classified as nondominant. According to this classification, 41 of the subjects were color dominant, 40 were form dominant, and 28 were nondominant. The frequency of color dominant, form dominant, and nondominant subjects in each of the age groups 2-0 to 2-11, 3-0 to 3-11, and 4-0 to 4-11 varied significantly, $\chi^2(4) = 9.58$, $p < .05$.

Differentiation and salience.—The relationship between differentiation and salience was evaluated using a between-group analysis first and a between-individual analysis second. In the first analysis the percentages of correct responses on color and form discrimination, labeling, and identification tasks were determined for each child. The means of these scores are presented in figure 2 for each age group. As can be seen, the data are distributed relatively monotonically, with color and form discrimination practically complete by 3½ years of age, and identification attained by 4½ years of age.

Figure 2 indicates that the development of color differentiation slightly precedes that of form differentiation. Apart from this trend, however, the abilities to discriminate, identify, and label form concepts seem to manifest developmental functions essentially parallel to those obtained for the respective color abilities. These results suggest that the relative salience of a dimension is developmentally independent of its relative differentiation.

The second analysis concerned the relationship within age groups between the individual's differentiation scores and his preference. Preliminary analyses indicated that preference yielded the same pattern of relationships to discrimination, identification, and labeling. Since, however, each of these measures alone allowed for variation among individuals within a limited age range only—discrimination among the youngest subjects and labeling among the oldest—the relationship between differentiation and preference is best conveyed in terms of composite differentiation scores. Subjects were classified as "form complete" if they achieved perfect scores on the form discrimination, identification, and labeling tasks; otherwise they were classified as "form incomplete." They were similarly classified as "color complete" or "color incomplete" on the basis of the color tasks. Table 2 presents mean form preference scores for subjects exhibiting complete differentiation of color only, of form only, of both, or of neither. Because of the small number of subjects in each category, the data were pooled to create three age levels.

Several conclusions are suggested by the data of table 2. First, the curvilinear function relating form salience to age appears to obtain for all subgroups. The initial decline in form preference is clearly noticeable even in subjects who achieved perfect scores on all color and form ability tasks. Second, given the overall age trend in preference, individuals who exhibited a higher proficiency in one dimension than the other tended to prefer that dimension as a basis for similarity judgments. Thus, form preference was strongest for form-complete–color-incomplete subjects and color preference was strongest for color-complete–form-incomplete subjects. The remaining two

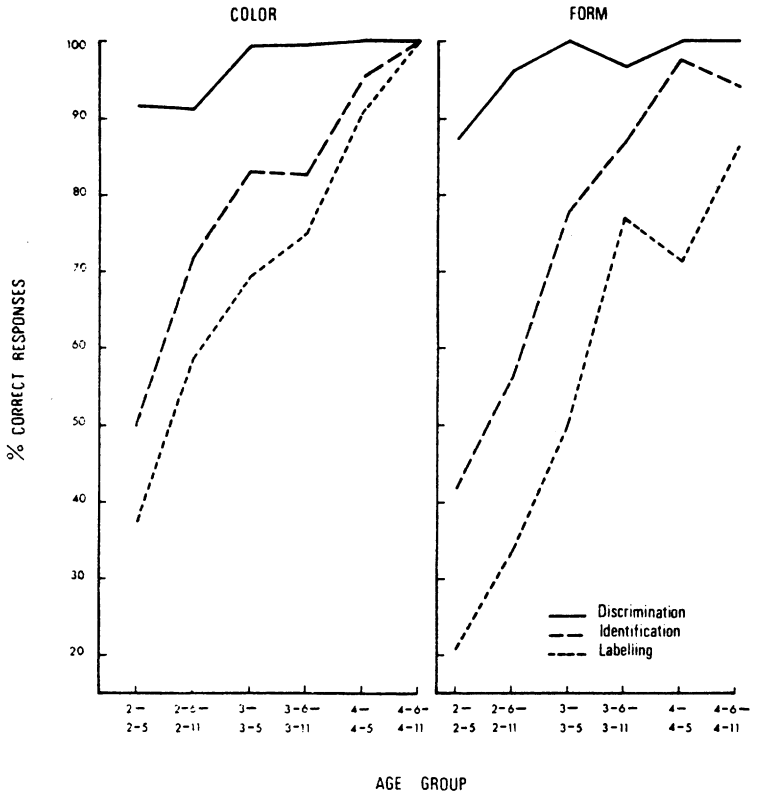

FIG. 2.—Mean percentage of correct responses on color and form discrimination, identification, and labeling as a function of age group.

groups obtained intermediate and comparable preference scores.

Discussion

The results of the present study replicated Brian and Goodenough's finding of an early stage of form salience declining up to the age of 3–3½ years and increasing thereafter. As in Suchman and Trabasso's (1966a) study, subjects in each age group displayed highly consistent preference patterns. This consistency indicates that the early peak in form preference is not due to inconsistent choices at these ages. Within age groups individual differences in color-form preference were correlated with the ability to differentiate color and form concepts: subjects who exhibited better differentiation of one dimension than the other tended also to prefer that dimension over the other. A similar relationship was also reported by others (e.g., Suchman & Trabasso 1966b). Developmentally, however, salience and differentiation appeared independent of each other. Thus, although salience revealed a nonmonotonic devel-

TABLE 2

MEAN PERCENTAGE OF FORM CHOICES ON THE DIMENSIONAL SALIENCE TASK BY CHILDREN (*N* in Parentheses) WITH DIFFERENT PATTERNS OF FORM AND COLOR ABILITIES

ABILITY PATTERN		AGE GROUP			
Form	Color	2-0 to 2-11	3-0 to 3-11	4-0 to 4-11	ALL
Incomplete	Incomplete	56(23)	44(14)	48(6)	51(43)
Incomplete	Complete	38(6)	23(11)	49(12)	37(29)
Complete	Incomplete	100(2)	81(2)	—(0)	91(4)
Complete	Complete	100(1)	43(15)	67(17)	57(33)

opmental trend, no indication was found for systematic changes in the relative differentiation of color and form concepts with age. These results may appear inconsistent with an explanation of the nonmonotonic development of color-form preference as reflecting changes in environmental reinforcement contingencies with age, since such changes would have been expected to be manifested in the differentiation measures as well. The results on the whole may be taken to suggest that, within the age range studied, salience and differentiation show ontogenetic developments independent of each other, with environmental contingencies possibly affecting deviations from age norms.

The results of the present study pose a problem for most accounts of developmental changes in color-form preference. None of the explanations offered for the often-reported increase of form preference with age (Corah 1964; Kagan & Lemkin 1961; Lee 1965) appears able, by extrapolation, to account for the initial peak and subsequent decline of form preference. This is so because all available explanations assume form salience to represent a more mature response, either because it presupposes the development of certain capacities or because it constitutes a more adequate response in terms of environmental contingencies.

The main issue appears to be whether both the initial decline in color preference and the subsequent rise in form preference reflect the same underlying process. One approach which may shed some light on this issue is a comparison of the cognitive and emotional correlates of form preference in young preschoolers and in older children. A second approach is the longitudinal study of color and form preference between ages 2 and 5.

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