The Development of Category Organization and Free Recall: Ethnic and Economic Group Comparisons

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ORASANU, JUDITH; LEE, CATHERINE; and SCRIBNER, SYLVIA. *The Development of Category Organization and Free Recall: Ethnic and Economic Group Comparisons.* CHILD DEVELOPMENT, 1979, **50,** 1100–1109. The present study investigated the extent to which category clustering in recall is dependent on preferred organization of the to-be-recalled items and whether preferred organization or recall performance are associated with ethnic or economic group membership. Functional and taxonomic organization were found to be equally effective bases for organizing recall; both were superior to idiosyncratic nonsystematic organization. While taxonomic organization was dominant in both grades, white children sorted taxonomically more often than black children, who preferred functional organization relatively more than white children. Economic status was not related to organization preference. No background group differences were found in amount recalled or clustering.

A developmental trend often found in free recall of categorizable word lists is that adults and older children organize their recall by categories to a greater extent than younger children (Bousfield 1953; Cole, Frankel, & Sharp 1971; Jablonski 1974). This form of recall organization has been called "category clustering." Degree of clustering has been used as an indicator of level of conceptual thinking ability because it involves transformation of input on the basis of conceptual principles (Jensen 1970). The present study is concerned with factors contributing to the development of clustering in children from various ethnic and socioeconomic backgrounds.

Developmental research has typically focused on the operations involved in clustering, that is, detection of category relations in the list, or rehearsal and retrieval strategies involving list structure (Kobasigawa 1977; Scribner & Cole 1972; Weist & Crawford 1977; Bjorklund, Note 1). However, developmental researchers have become increasingly sensitive to the fact that none of the above operations is possible unless the category structure of the list in some sense fits the category structure "in the head" of the subject. Unless this requirement is met, developmental differences in clustering may be attributed to differences in ability to perform the requisite operations when in fact the difference is due to stimulus factors. Procedures for circumventing this problem include designing lists which can be organized on alternative bases (e.g., acoustic, functional, or taxonomic; see Naron [1978] and Worden [1976]), constructing lists from category exemplars elicited from subjects (Nelson 1969), or establishing category equivalence by requiring subjects to sort unrelated items to a criterion of stability prior to recall (Lange & Jackson 1974; Mandler & Stephens 1967).

Similar caution must be exercised when comparing subcultural groups (Cole & Scribner 1977). Subcultural group differences have sometimes been found in level of clustering (Gerdes, Note 2; Glasman, Note 3). Jensen and Fredericksen (1973) found that black and white children differed in clustering and amount recalled from a categorizable list at the fourth-grade but not at the second-grade level. No black-white differences were found in recall of a random list at either grade level. These results were interpreted as equivalent rote memory abilities in both ethnic groups but a delay in development of conceptual skills needed for recall organization among black

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children. On the basis of this and related findings, Jensen has developed a theory that basic rote learning skills (Level I) are equally distributed in all population groups, but that the development of conceptual abilities such as those needed for clustering (Level II) are advanced in middle-class (usually white) groups (Jensen 1970).

An alternative explanation for Jensen and Frederiksen's (1973) finding is that the categorical structure of the list was not equally salient to the black (low-income) and white (middle-income) children in their sample. To assess this possibility, the present study used a sorting task to determine preferred organization of recall list items by children from three different background groups; those same items were presented a week later in a standard multitrial free recall task. Two issues were addressed by our procedure: (1) Do children from different subcultural backgrounds differ in their preferred organization of recall list items, as measured by sorting? (2) What is the relation between sorting preference and recall performance? Are sorting differences reflected in different levels or patterns of recall organization? Do children from different subcultural groups who share sorting preferences recall more like each other than like other children from their own subcultural groups who sort differently?

The present study compared black low-income, black middle-income, and white middle-income first- and fifth-grade children. We sought to separate out ethnic and economic factors that are usually confounded. To minimize the possibility that subcultural group differences, if any, were attributable to differences in the quality of schools attended by the various groups, all of the children were drawn from the same schools in an integrated neighborhood. (See Scribner & Cole [1976] for a thorough discussion of this point.)

Two 20-item lists were used which differed in their hierarchical structure. One list contained five four-item taxonomic categories, while the other contained 10 high-associate pairs. A previous study using these lists (Orasanu, Scribner, & Lee, Note 4) showed that fifth graders primarily organized recall of the four-item category list into clusters of four items, whereas the pairs list was organized in clusters of two items. First graders organized both lists in two-item units. All subjects in the earlier study were upper-middle-class children.

Support for the hypothesis that ethnic or economic groups differ in operations needed for clustering would consist of similar sorting preferences by all background groups but differences in levels of clustering and recall, particularly on the categories list. Jensen's (1970) theory predicts greater recall differences between groups in the fifth grade than in the first grade. However, if background groups differ in their sorting preferences, no conclusion can be drawn about the source of any concomitant recall differences. An additional possibility is that background group differences in sorting preference would be accompanied by equal levels of recall and clustering or that group differences would diminish from first grade to fifth grade.

Method

Subjects

Two hundred and ten children attending public schools in a suburban New York village took part in the study: 102 first graders, and 108 fifth graders. Mean ages within each grade were 6 years 11 months and 10 years 9 months. Children were selected to reflect the socioeconomic and ethnic composition of the community. A gross indication of a family's economic status was participation in a school free-lunch program in which income level was the sole criterion for participation. Approximately two-thirds of the children in the school system were black, and about half of these received free lunch, while practically none of the white children were in the lunch program. Thus, within each grade there were three subject groups: black low income ($N_1 = 35$, $N_5 = 39$), black middle income ($N_1 = 31$, $N_5 = 32$), and white middle income ($N_1 = 36$, $N_5 = 37$). Approximately equal numbers of boys and girls were in each group.

Three women from the community (one black and two white) served as experimenters and were paid for their assistance. Each ran approximately equal numbers of black and white children from each grade in each list condition.

Materials

Stimulus materials consisted of two 20-word lists of common nouns, each list comprising 10 pairs of nouns that were high-frequency associates of each other and members of a common taxonomic category (e.g., *apple-orange, sun-moon*). Since available norms for children did not provide a large selection of

items, adult free-association norms (Deese 1965; Jenkins 1970; Keppel & Strand 1970) were used to construct the noun pairs. The majority of pairs were composed of words that were first or second associates of each other, and an effort was made to select pairs in which the association was bidirectional. Lists were distinguished by the relation among the noun pairs. In the categories list, pairs could be combined to form four-word taxonomic categories. Categories were clothes (hat, coat, shoe, sock), animals (dog, cat, lion, tiger), food (bread, butter, apple, orange), utensils (pot, pan, spoon, fork), and body parts (eye, ear, arm, leg). In the pairs list, pairs could not be grouped on the basis of taxonomic relations. Items were king, queen; table, chair; sun, moon; door, window; bat, ball; brush, comb; hammer, nail; square, triangle; car, truck; tree, plant.

List items were depicted in black-and-white line drawings on 3 × 3-inch cards with felt backing. A 20 × 24-inch felt board was used to display the pictures.

Procedure

Each child was assigned randomly to either the categories list or the pairs list and was seen individually in two sessions conducted approximately 1 week apart. The first session consisted of a sorting task and a single free recall trial; the second session consisted of a four-trial oral free recall task on the same list.

During the first session, the child was seated beside the tester at a desk on which the felt board was mounted. Items were displayed on the felt board one at a time in a 4 × 5 array according to a predetermined random order. Children were asked to name the pictures as they were shown, and they were supplied the standard name if it was not given. When all pictures were on the board, names of those pictures for which the child had not given the standard label were reelicited.

The child was then instructed to "look over the pictures on the board carefully and pick out two pictures that go together very well." If the child selected two members of a high-associate noun pair, he was asked to make a second selection. These instructions were continued until the child had paired all the pictures. If the child's first choice was not a high-associate pair, he was asked, "Is there some picture that goes better with [name] than [name]?" Whether or not the child retained the original choice or selected a new pair, pairing continued without further intervention until it was completed. The correction procedure was used only once.

The child's pairs were then returned to the felt board, with care taken to prevent taxonomically related pairs in the categories list from being placed in adjacent positions. The child was then given the following instructions: "Take two pictures and put them with another two pictures to make four pictures that go together very well." Categories-list children whose initial choice of a group of four was not based on a taxonomic relation were given a second opportunity in a manner similar to that described above for constructing pairs. This correction procedure was used only once. Finally, when the children had completed making five groups of two pairs each, they were asked to provide a name for each group. Grouping into fours and production of a verbal label were required of children presented the pairs list, even though no taxonomic structure or labels were built into the list. This was done to equate experience with the items from the two lists.

When sorting was completed, pictures were removed from the child's view, and the child was interviewed for 5 minutes. Following the interview, children were asked to recall the names of the pictures. The session ended with a second picture-naming and sorting task which will not be reported here.

The second session was introduced as a memory game. The child was not reminded of the sorting task nor of prior experience with the list. (No child commented on the previous task.) The first-sorted list was used as the stimulus material for a four-trial, oral presentation, free recall task that was administered under standard instructions and procedures. The order of list items was randomized with the constraint that two members of the same category could not occur in sequence. A different random order of the list was presented on each trial, presentation rate was approximately 2 seconds an item, and recall time was unlimited. Children's responses were recorded by hand and on audio tape.

Design and Analysis

The combination of grades, lists, and background groups resulted in a 2 × 2 × 3 between-subjects design. However, data were analyzed using multiple regression rather than a standard analysis of variance. The primary reason was that we wanted to use performance

on the sorting/labeling tasks as predictors of recall performance, along with grade and background variables. Multiple regression allowed us to accomplish the same goal as an analysis of covariance without requiring that the assumptions of analysis of covariance be met (Cohen & Cohen 1975). In addition, multiple regression allowed us to use all children available at each age level, resulting in background groups of slightly different sizes, which could not have been done with analysis of covariance.

Except for an overall comparison of amount recalled and level of clustering, the two lists were analyzed separately because of differences in the meanings of the sorting and labeling tasks for each.

Analysis of sorting and labeling performance was treated essentially as an analysis of variance: subcultural group membership, grade, and their interactions were used as predictors of performance on three sorting/labeling dependent measures (two on the pairs list). Subcultural group membership was coded on two dummy variables, ethnicity (black = 0, white = 1) and economic status (middle income = 0, low income = 1), as suggested by Cohen and Cohen (1975).[1] Interactions were tested by multiplying values on two variables and entering the product as a predictor after the main effects had been tested.

Recall and clustering were analyzed using a hierarchical plan (Cohen & Cohen 1975). Main effects of grade and subcultural group were first assessed. Then the three sorting/labeling scores (two for the pairs list) were added to the regression equation to see whether they would make an additional significant contribution. More important, this second stage indicated whether previously significant predictors (grade, subcultural group) remained significant once the new factors were entered. In essence, this plan told us whether all differences between grade and subcultural groups in recall performance were due to associated skills, such as sorting/labeling, or whether differences in recall skill existed beyond those attributable to associated factors.

Results

Results will be organized around the two issues described in the introduction, namely, (1) sorting preferences of each group, and (2) the relation between sorting preferences and recall. Within each section we will discuss performance on the categories and pairs lists separately.

Sorting Preferences

Categories list.—Three scores were obtained for each child's sorting and labeling performance: (1) the number of high-associate pairs produced (out of 10), (2) the number of taxonomic categories produced (out of five), and (3) the number of appropriate superordinate labels applied to each group of four items (out of five). Mean scores for each group are shown in table 1.

Economic status predicted the number of high-associate pairs produced in sorting, $F(1,103) = 6.23$, $p < .01$; mid-income children produced more pairs than low-income children. Ethnicity predicted the number of taxonomic categories sorted, $F(1,103) = 8.83$, $p < .01$; white children sorted taxonomically

TABLE 1

MEAN SORTING AND LABEL SCORES FOR EACH GRADE AND SUBCULTURAL GROUP

GRADE/SUBCULTURAL GROUP	CATEGORIES LIST				PAIRS LIST		
	N	Pairs (out of 10)	Categories (out of 5)	Labels (out of 10)	*N*	Pairs (out of 10)	Labels (out of 10)
First:							
Black low income	17	7.59	2.47	4.35	18	8.33	.17
Black middle income	14	8.20	2.27	5.20	17	9.06	1.06
White middle income	19	8.63	3.47	6.21	17	9.71	1.94
Fifth:							
Black low income	20	8.60	4.50	8.15	19	10.00	2.47
Black middle income	17	9.88	4.29	7.94	15	9.88	3.67
White middle income	19	10.00	5.00	9.42	18	9.89	4.72

[1] See Cohen and Cohen (1975) for a discussion of coding dummy variables, nonindependence of predictor variables, and tests of interactions between nominal and continuous variables.

more often than black children. Grade predicted scores on both measures, $F(1,103) = 11.47$, $p < .01$, and $F(1,103) = 46.05$, $p < .01$, respectively. All but three fifth graders produced all the high-associate pairs; all but nine fifth graders produced all the taxonomic groupings. Those nine fifth graders were black. Only 26 (out of 50) first graders formed all the high-associate pairs, and only 16 constructed groups of four on a taxonomic basis (11 white and five black first graders).

Four-item groupings which did not form taxonomic categories were examined to see if any other organizational schemes were evident. All nontaxonomic groupings by fifth graders were functional combinations. That is, items were combined on the basis of use, such as food with kitchen utensils (bread-butter/pot-pan) or clothing with body parts (arm-leg/shoe-sock). Functional groupings represented 55% of first-graders' nontaxonomic groupings, accounting for 30% of black first-graders' groupings overall, compared to 16% of white first-graders' groupings. The remaining combinations did not follow any consistent organizational principles and were considered idiosyncratic. Most were built of non-high-associate pairs.

While there was an overall grade difference in the number of superordinate labels produced, $F(1,104) = 35.33$, $p < .01$, this difference disappeared when label accuracy was proportionalized on the number of taxonomic categories actually sorted (first grade $\bar{X} = 84\%$; fifth grade $\bar{X} = 90\%$; $F < 1.0$). No differences were associated with subcultural group membership. Thus, all children knew the names of virtually all the categories they sorted taxonomically, rendering the categories and labels scores highly redundant ($r = .84$). On the other hand, children were able to generate no appropriate labels for groupings that were not taxonomic categories.

Pairs list.—Because there was no possibility for taxonomic organization of the pairs list, only two sorting and labeling scores were obtained for each child: (1) formation of high-associate pairs, and (2) generation of appropriate verbal labels for each group of four items. Scoring of pairs formation was the same as described for the categories list. Scoring of verbal labels, however, was based on "reasonableness," since no taxonomic superordinate was readily available. Two points were awarded for each label that clearly incorporated all four pictures (e.g., "nature" for the combination of sun-moon/plant-tree). One point was given for a label that pertained to only two pictures, such as "planets" in the preceding example. Appropriateness rather than scientific accuracy was the criterion. No points were awarded if the child simply listed the names of individual pictures. Thus, label scores ranged from 0 to 10 points (2 points for each of five groupings). Mean pairs and labeling scores for each group are shown in table 1.

Fifty out of 52 fifth graders formed all 10 high-associate pairs, but only 40 first graders (out of 52) did, resulting in a significant grade effect, $F(1,101) = 9.04$, $p < .01$. Again, economic status was related to production of high-associate pairs, $F(1,101) = 5.08$, $p < .05$, with mid-income children obtaining higher scores than low-income children.

Both background factors were related to label scores in addition to the effect of grade: ethnicity, $F(1,100) = 5.15$, $p < .05$; economic status, $F(1,100) = 5.89$, $p < .05$; grade, $F(1,100) = 54.07$, $p < .01$.

Recall

The second issue was the relation of sorting preferences to recall, both immediately following sorting (IR) and multitrial free recall (MTFR). Two aspects of recall were considered: amount recalled, and clustering. The hierarchical multiple regression analysis described earlier was applied to all four dependent variables for each list: IR–amount recalled, IR-clustering, MTFR–amount recalled, MTFR-clustering.

An overall comparison of amount recalled from the categories and pairs lists was made by entering list as a predictor in the equations predicting recall scores. No significant list effects were found in IR or MTFR. Results pertaining to the two lists will be presented separately hereafter. Summaries of significant predictors for the categories list recall are shown in table 2; those for the pairs list are shown in table 3.

Amount recalled from the categories list by first and fifth graders in IR and MTFR is shown in the two top panels of figure 1; the corresponding data from the pairs list are shown in figure 2.

Categories list.—As expected, fifth graders recalled more than first graders in both IR and MTFR. Neither ethnicity nor economic status was related to amount recalled. However, children who formed few high-associate pairs in

sorting recalled less in both IR and MTFR than those who formed all the pairs. Whether groups of four were sorted on a taxonomic basis or not made no difference to amount recalled in IR or MTFR.

Pairs list.—Grade effects were found for both IR and MTFR. Again, there were no effects of ethnicity or economic status on amount recalled in either task. However, sorting and labeling performance was related to recall. Both accuracy in forming high-associate pairs and appropriateness of verbal labels were reflected in IR. Since only first graders evidenced variability in formation of pairs, there was a significant interaction between grade and pairs scores; MTFR was only related to label scores.

Overall, the pattern of predictor variables for the pairs list was similar to that for the categories list: neither background factor was related to amount recalled, but formation of high-associate pairs predicted amount recalled

TABLE 2

SIGNIFICANT PREDICTOR VARIABLES IN MULTIPLE REGRESSION ANALYSES CATEGORIES LIST

Dependent Variable	Predictor Variable	*F* Ratio ($df = 1,102$)
Amount recalled:		
Immediate recall.....	Grade	16.46**
	Pairs	6.45*
Multitrial free recall....	Grade	27.16**
	Pairs	6.94**
Cluster z score:		
Immediate recall.....	Grade	11.42**
	Pairs	6.75*
	Categories	10.64**
Multitrial free recall.....	Grade	18.38**

* $p < .05$.
** $p < .01$.

TABLE 3

SIGNIFICANT PREDICTOR VARIABLES IN MULTIPLE REGRESSION ANALYSES PAIRS LIST

Dependent Variable	Predictor Variable	*F* Ratio ($df = 1,98$)
Amount recalled:		
Immediate recall.....	Grade	6.93*
	Pairs	6.24*
	Labels	11.66**
	Grade × Pairs	5.34*
Multitrial free recall.....	Grade	18.23**
	Labels	7.25*
Cluster z score:		
Immediate recall.....	Grade	24.33**
	(Ethnicity)[a]	(4.67)*
	Pairs	4.76*
	Labels	10.52**
	Grade × Labels	4.14*
Multitrial free recall....	Grade	27.90**
	(Economic status)[a]	(6.09)*
	Labels	6.90**

[a] Variable originally contributed to the equation but dropped out when other variables were entered.
* $p < .05$.
** $p < .01$.

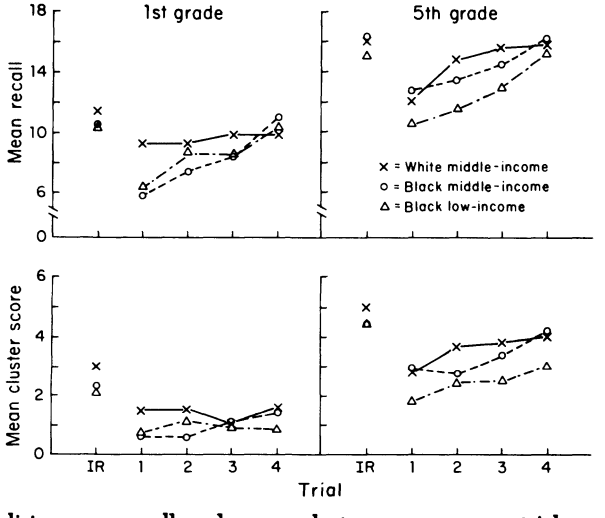

FIG. 1.—Categories list: mean recall and mean cluster scores across trials, grades, and subcultural groups.

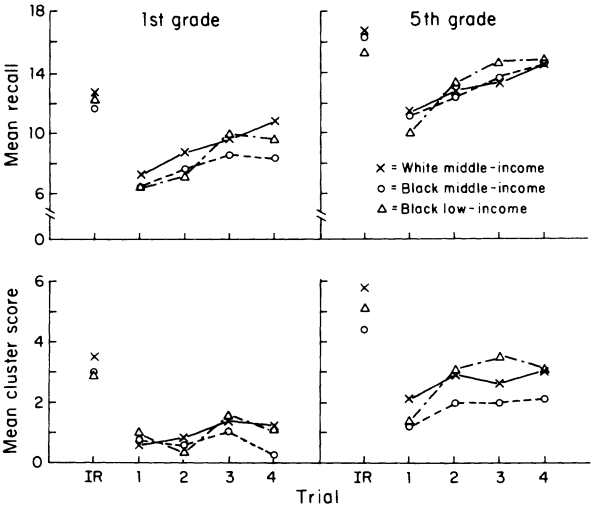

FIG. 2.—Pairs list: mean recall and mean cluster scores across trials, grades, and subcultural groups

(particularly among first graders). The only difference between lists was that label scores predicted amount recalled from the pairs list but not from the categories list.

Recall Organization

Categories list.—Organization was assessed using the cluster *z* score developed by Frankel and Cole (1971). Clusters were identified on the basis of groups of four items produced by each child in sorting. Thus, for children who sorted all categories taxonomically, clusters consisted of taxonomic categories, whereas for nontaxonomic sorters the nature of the clusters varied. To test the possibility that nontaxonomic sorters actually organized their recall on a taxonomic basis (rather than using their own groupings), we calculated two cluster scores for each child. One was based on taxonomic principles, the other on the child's own groupings. For 33 out of the 43 nontaxonomic sorters, *z* scores were equal or higher based on their own groupings, although not significantly so. The cluster *z* scores depicted in the bottom halves of figures 1 and 2 are based on the children's own groupings, as are all subsequent analyses.

Grade effects were found in both IR and MTFR.[2] Neither ethnicity nor economic status was related to amount of clustering. Clustering in IR was related to accuracy in forming both high-associate pairs and taxonomic categories, but this relation was not present in MTFR. That is, clustering in IR varied with the basis of fours: greater clustering was associated with taxonomic sorting. The effect was not present in MTFR, indicating that taxonomic and nontaxonomic organizations were equally effective bases for organizing retrieval. This finding raises the question of whether clusters of four items ever appeared in MTFR.

In fact, among fifth graders, clusters of four represented 21% of recall by children who sorted all categories taxonomically and 11% of recall by nontaxonomically sorting children, a nonsignificant difference. More important, among nontaxonomic sorters, recall organization and probability of recalling an item did not depend on whether the item had been sorted in a taxonomic or nontaxonomic (functional) group. Thus, with respect to clustering in MTFR, no advantage was associated with sorting items on a taxonomic basis.

Pairs list.—Clusters of four from the pairs list were defined by each child's groups of four items created in sorting, since there was no standard basis of organization built into the pairs list.

Again, grade was related to clustering in both IR and MTFR. Contrary to our expectations, we found significant relations between background and recall clustering of the pairs list: Ethnicity was related to clustering in IR;

[2] The obtained grade effect must be considered somewhat inflated since Murphy, Puff, & Campione (Note 5) found that the Frankel and Cole cluster *z* score is slightly correlated with amount recalled.

economic status was associated with clustering in MTFR. As shown in the bottom half of figure 2, in IR white children clustered more than black children in both grades. In MTFR, middle-income children (both black and white) clustered more than low-income (black) children. However, both background factors dropped out of the equations when sorting and labeling scores were added. Label scores were significantly related to both IR and MTFR clustering; formation of pairs and the grade × label-score interaction were related to clustering in IR. The effect of label scores was more pronounced in the fifth grade where greater variability occurred in label scores.

A comparison of predictor patterns for the two lists indicates that older children clustered more than younger children both immediately after sorting and in free recall. Clustering in IR was more strongly related to sorting and labeling scores than was MTFR clustering; this held for both lists. Subcultural group differences were not found for any recall measure of the categories list but were obtained for organization of the pairs list. However, pairs list differences were mediated by group differences in sorting and labeling.

Discussion

This experiment was designed to determine whether previously found differences between subcultural groups in categorized free recall could be located in organizational preferences revealed in a sorting task rather than in cognitive operations involved in clustering. The present study found that children from different ethnic and economic backgrounds differed in the extent to which they preferred taxonomic organization of a categorizable list. White children sorted taxonomically more often than black children, who sorted on a functional basis relatively more often than white children. Children from low-income families sorted on bases that were not recognizable to the experimenter more often than children from middle-income families. These differences were most obvious in the first grade; by fifth grade all but a handful of children sorted taxonomically. Those who did not sorted functionally.

Despite subcultural differences in organizational preferences, no corresponding differences in recall were obtained. While recall organization reflected sorting organization, no advantage was associated with taxonomic organization: functional and taxonomic organization were equally effective bases for clustering. Clearly, black and white children did not differ in their ability to perform the operations involved in recall clustering.

Only those children who failed to form the high-associate pairs in sorting clustered and recalled less than other children. This result held for both lists. It indicates that idiosyncratic sorting organization is not as efficient a base for recall organization as taxonomic or functional sorting organization, despite some reports to the contrary. However, studies in which subjective or idiosyncratic organization have been found to be adequate have used a repeated sort-recall procedure or required subjects to sort to a criterion of stability prior to recall (e.g., Worden 1976). The purpose of the present sorting procedure was not to establish equivalence but to assess organizational preference. Under these conditions, children who did not have a clear preference for functional or taxonomic organization clustered and recalled less. Idiosyncratic organization appeared to be less stable than the other forms of organization. It should be noted that four-item groupings of pairs list items can also be considered idiosyncratic. Whenever these groupings and their labels could be recognized by the experimenter as meaningful units, however, they served as well to organize recall as functional or taxonomic groupings in the categories list. The extent to which the sorting and labeling procedure itself potentiated use of those groupings in recall cannot be determined from the present procedure. It would be necessary to assess organizational preferences following free recall to answer this question (see Melkman & Deutsch 1977).

Results from the present study raise the question of the developmental status of functional versus taxonomic preferences. Since adults and older children usually prefer taxonomic organization, it is tempting to conclude that taxonomic organization is more developmentally advanced. Adult preference is not universal, however, but appears to be associated with Western-type schooling (Cole, Gay, Glick, & Sharp 1971; Greenfield, Reich, & Olver et al. 1966; Scribner 1974). In one of the few studies in which age was not confounded with years of schooling, Scribner (1974) found that 10–14-year-old Liberian children who had been to school sorted taxonomically, whereas their uneducated age-mates sorted on a functional or mixed basis. We can only speculate that the pre-school experiences

of black and white children in our sample differed in ways relevant to the task. Investigation into the nature of those experiences is only beginning (Bradley, Caldwell, & Elardo 1977; Kellaghan 1977).

The present findings are important in light of Jensen's (1970) theory of ethnic/economic group differences in intellectual abilities. Results from the present study suggest that, in cases where white children have been found to cluster and recall more than black children (e.g., Jensen & Frederiksen 1973), the list may not have presented the opportunity for black children to apply their preferred organization, which may have been functional. Perhaps more important than finding group differences in sorting preferences was finding that these differences diminished with age rather than increasing, as Jensen predicted. We attribute this result to the fact that all children in the present study attended the same schools. When black and white children who attend different schools are compared, as in Jensen and Frederiksen (1973), differences in the schools rather than differences in the children may account for any differences in task performance.

An additional prediction from Jensen's theory which was not confirmed was the list × subcultural group interaction. Greater group differences on the categories list than on the pairs list would be predicted by his theory on the assumption that less conceptual organization would be possible on the pairs list. Instead, we obtained no group difference on the categories list and some group differences in clustering on the pairs list. Multiple regression analysis revealed that the pairs list effect was not an intrinsic effect of group membership but was mediated by ability to establish organization and produce an integrating verbal label in sorting.

The present study illustrates problems of drawing conclusions about intellectual differences between subcultural groups on the basis of data from a restricted number of experimental tasks. The skill in question may depend on collateral skills which have not been identified, or on a certain knowledge base with respect to the materials. These possibilities need to be tested by varying experimental tasks to provide a number of different situations in which subjects can display the targeted skill. Findings from the present study indicate that conclusions about cultural group differences in intellectual abilities are premature until alternate explanations have been tested.

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