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ABSTRACT

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DEVELOPMENT OF A TASK SEQUENCE IN VISUAL PERCEPTION: A VALIDATION STUDY

By

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Abstract: A model for sequencing tasks in the area of visual perception was developed. This paper reports an attempt to validate the structure of the model. The performance of 50 normal preschool children on a 47 item test was studied. The results obtained support the use of the model as a framework for developing visual perception tasks.

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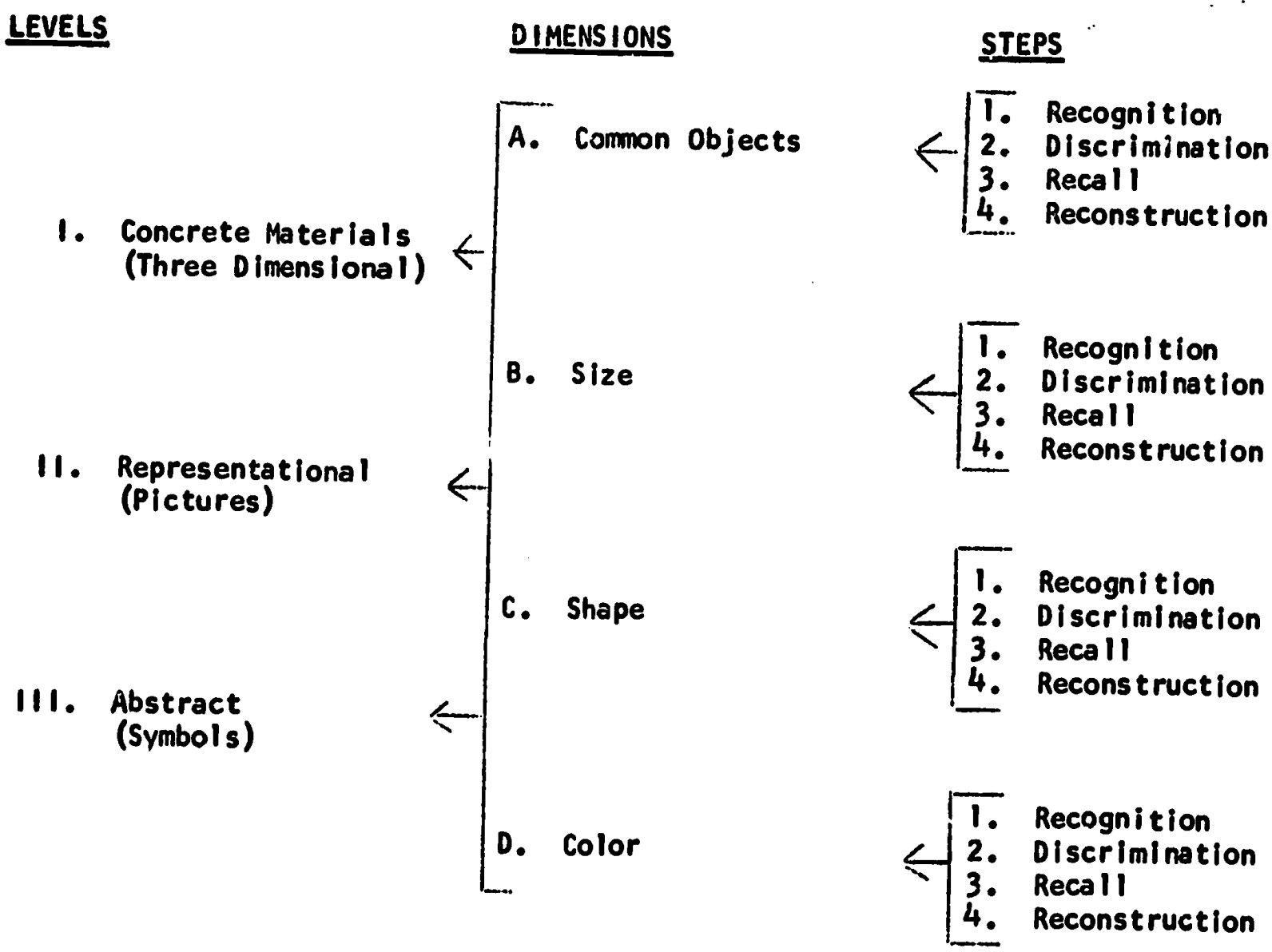
DEVELOPMENT OF A TASK SEQUENCE IN VISUAL PERCEPTION: A VALIDATION STUDY

Visual perception skills are necessary prerequisites to beginning reading. Within recent years there has been a significant increase in the development of instructional materials and programs designed to provide children with training in various visual perception skills. Although such materials are now in wide use, their maximum effectiveness has not been realized. No single instructional program or set of materials is adequate in scope and sequence for all learners. In addition the teacher has not been provided with a rationale for modification or development of materials when they are found to be inappropriate for a particular child's level of functioning (Ensminger, 1970). There is a need for a theoretical framework within which the teacher can make decisions concerning the selection and sequencing of materials and tasks. The following model for sequencing visual perception tasks is an attempt to provide such a framework. This paper reports a study made to determine the validity of the model.



The rationale for the development of the model was derived from a logical analysis of findings reported in the literature of developmental and experimental psychology. Research studies suggest that object discrimination precedes pattern discrimination, and that children first learn to discriminate among common or familiar objects, then to perceive differences in size, then in shape, and finally in color (Zeaman & House, 1963; Thompson, 1962).

Therefore the model was designed to provide learning tasks along four dimensions at each of three levels. The four dimensions are: 1) common objects (differing multidimensionally), 2) size, 3) shape, and 4) color. The three levels are: Concrete, Representational and Abstract.

Learning of any dimension at any level is assumed to involve four steps: recognition, discrimination, recall and reconstruction (University of Washington: Experimental Education Unit, 1966).

A sequence of tasks for learning visual perception skills was developed to match the model. Instructional materials appropriate to each task were selected or created. Each task was stated behaviorally. A sample of the tasks at the concrete level is presented below.

I. Concrete Level

A. Common Objects

1. Recognition: Given four familiar objects (such as of fruit), the child can name or identify three.
2. Discrimination: Given an assortment of objects (such as washers, nails, chips, pebbles) the child correctly matches all like objects.
3. Recall: Given four familiar objects (such as fork, balloon, straw, and bead) in an array, the child can name each object. He can recall and name each object when hidden one at a time.
4. Reconstruction: Given a simple wooden puzzle, the child can insert the puzzle pieces to form the whole. (Volkmor & Langstaff, 1971).

The assumption was made that the tasks at the Concrete and Representational levels involve skills which normal children have mastered before entering the first grade. Thus the validation study was conducted with normal preschool children. Only the Concrete and Representational levels were explored.

Objectives

The first objective of the study was to determine whether the sequence of visual perceptual tasks suggested by the theoretical model showed a developmental progression. Secondly, empirical evidence was sought for the assumption that the tasks at the Representational level were more difficult than those utilizing concrete materials. A third objective was to establish support for the rank ordering of the stimulus dimensions--from multidimensional through size, shape, and color. Finally, evidence was sought for the sequential difficulty of the steps in skill attainment.

Subjects

The subjects were 50 normal children attending a preschool program in a middle-class neighborhood in Whittier, California. Ten subjects (five boys and five girls) were sampled at each of five six-month age intervals; the youngest group ranged in age from 3.0 to 3.5, and the oldest group from 5.0 to 5.5 years.

Method

Based on the sequence of tasks for the Concrete and Representational levels, a 47 item test was constructed. Ten of the 47 items were timed. A standard set of test materials and instructions was prepared. Following a pilot investigation of the test items with an additional sample of ten preschool children, the test was revised. Each subject was then tested individually in two sessions. Total testing time for each subject averaged 40 minutes. After all the data were tabulated, a criterion level for passing each item was established. For the timed items the cutting point for passing was determined by averaging the performance times for the total sample.

Analysis of Data

For each of the five age levels, frequency counts were made of the number of subjects passing each item. These data were plotted graphically as percentage scores to determine developmental progression for each test item.

To determine the items which discriminated adequately across age groups, difference scores were calculated for each item. These scores were obtained by subtracting the score obtained by the youngest age group from that obtained by the oldest group. Only items which showed a four point or greater difference were classified as discriminating.

Next, the percentage scores for each item were totalled by age to determine:

1. Overall age progression in terms of total test scores.

2. The difficulty of Representational level items as compared to Concrete level items.

3. The progressive difficulty of items involving the dimensions of common objects, size, shape, and color.

Since the preceding analysis revealed that most of the shape items at the Concrete level and the majority of the size items at the Representational level were too easy, a meaningful comparison of all the objects, size, shape and color items was impossible. Thus the best or most discriminating item for each dimension in both levels was selected for the analysis of dimension difficulty.

The order of difficulty of steps in skill attainment was determined by adding the total scores obtained by all subjects for: (a) recognition, (b) discrimination, (c) recall, and (d) reconstruction.

Results

The number of subjects passing each item is presented by age level in Table 1. Of the 47 items in the test, 28 met the four point difference criterion described above for discrimination between age levels. The discriminating items are identified in the Table.

TABLE 1.

Frequency Counts of Number of
Subjects Passing Each Test Item

Visual Perception Test Items		Age Groups				
		3.0-3.5	3.6-3.9	4.0-4.5	4.6-4.9	5.0-5.5
	Concrete Level					
	Common Objects					
1.	Recognition	9	10	10	10	10
* 2.	Discrimination	2	6	7	8	6
* 3.	Recall	5	7	10	8	10
* 4.	Reconstruction	3	6	9	10	10
5.	Reconstruction	2	2	1	4	5
	Size					
6.	Recognition	9	10	10	10	10
* 7.	Discrimination	3	7	10	9	9
8.	Recall	5	6	5	5	8
* 9.	Reconstruction	5	5	7	8	9
	Shape					
*10.	Recognition	5	6	9	10	10
11.	Discrimination	10	9	10	10	10
12.	Recall	8	9	10	8	10
13.	Reconstruction	10	10	10	10	10
	Color					
*14.	Recognition	6	8	9	10	10
*15.	Recognition	6	7	8	10	10
16.	Discrimination	7	10	10	9	10
*17.	Recall & Reconstruction	0	2	1	8	6
	Combination of Dimensions					
*18.	Shape & size varied, color constant	1	3	3	5	5
*19.	Shape & size varied, color constant	0	1	3	4	8
*20.	Shape & size varied, color constant	0	2	4	7	9
*21.	Shape & color varied, size constant	4	6	9	9	10
*22.	Shape & color varied, size constant	4	6	5	3	10
*23.	Size, shape & color varied	7	5	8	8	9
*24.	Size, shape & color varied	1	3	7	8	10
25.	Size, shape & color varied	1	1	2	2	4

* Items which discriminated across age levels.

	Representational Level					
	Common Objects					
*26.	Recognition	5	7	8	7	9
27.	Discrimination	8	10	10	10	10
*28.	Recall & Reconstruction	0	2	3	7	4
*29.	Reconstruction	4	1	2	6	8
	Size					
30.	Recognition	10	10	10	10	10
31.	Discrimination	9	9	9	10	10
32.	Recall	4	8	5	10	9
*33.	Reconstruction	4	5	8	7	9
	Shape					
34.	Recognition	6	5	6	10	9
*35.	Discrimination	4	5	5	8	9
36.	Recall	7	8	9	9	10
37.	Reconstruction	4	4	5	8	7
*38.	Reconstruction	0	1	3	7	7
	Color					
*39.	Recognition	5	7	9	9	10
*40.	Discrimination	3	8	9	10	10
*41.	Recall	5	7	9	9	10
*42.	Reconstruction	0	1	3	7	7
	Combination of Dimensions					
43.	Size, shape & color varied	6	9	8	8	8
44.	Size, shape & color varied	3	4	8	3	3
45.	Size, shape & color varied	7	7	7	10	9
*46.	Size, shape & color varied	3	6	7	10	9
*47.	Size, shape & color varied	2	6	7	9	10

* Items which discriminated across age levels.

The distribution by age of percentage of children passing the entire test is shown in Figure 2. The data show developmental progre sion in the visual perceptual abilities measured. The task became progressively easier with age increase.

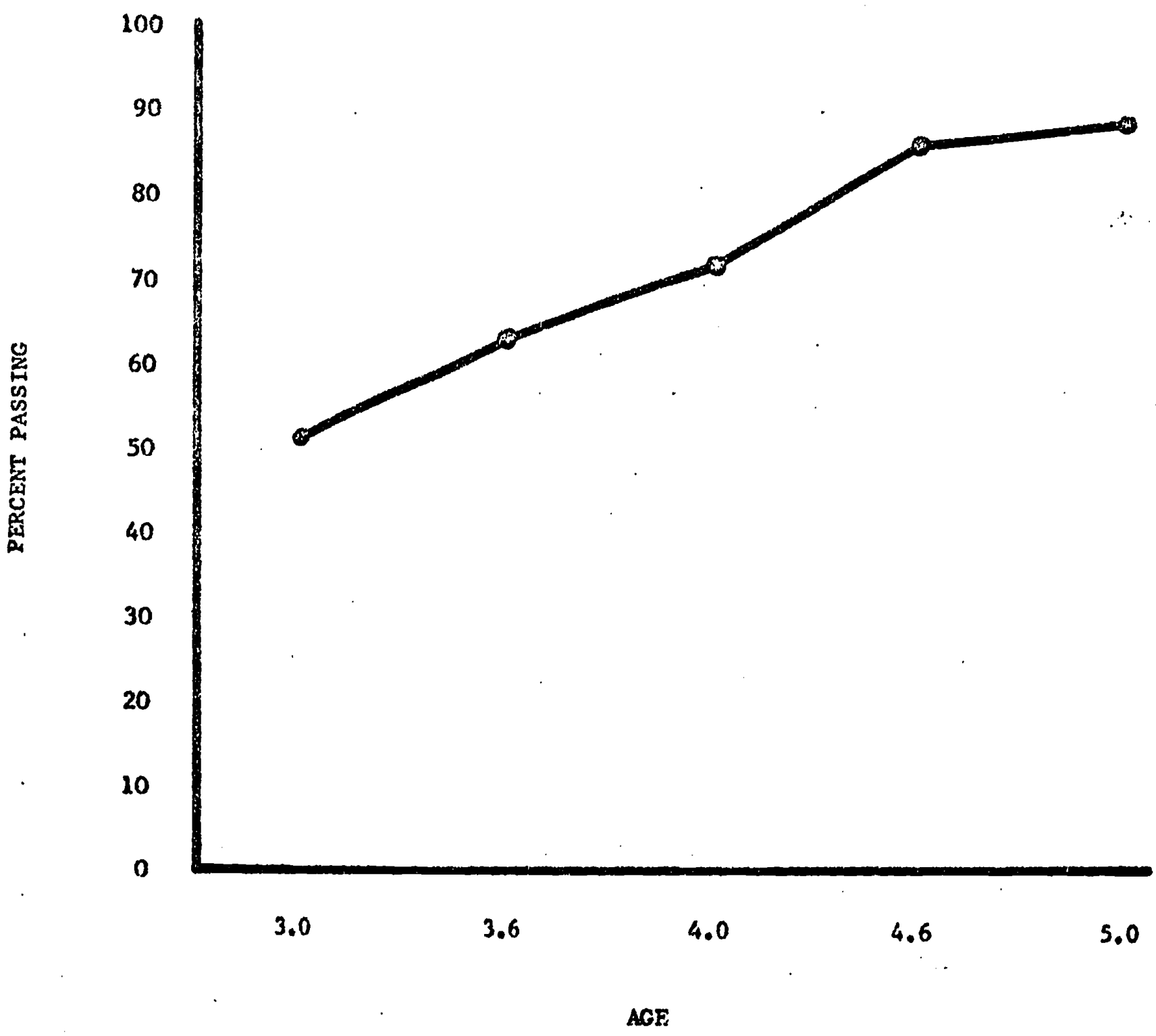


Figure 2. Distribution of subjects passing entire test.

Next, performance on the Concrete level tasks was compared with performance on the representational level tasks for each age group. The data presented in Figure 3 support the assumption that tasks at the Representational level are more difficult than tasks utilizing concrete materials. The difficulty between the two levels of tasks is most marked at the young age levels and becomes less significant as age increases.

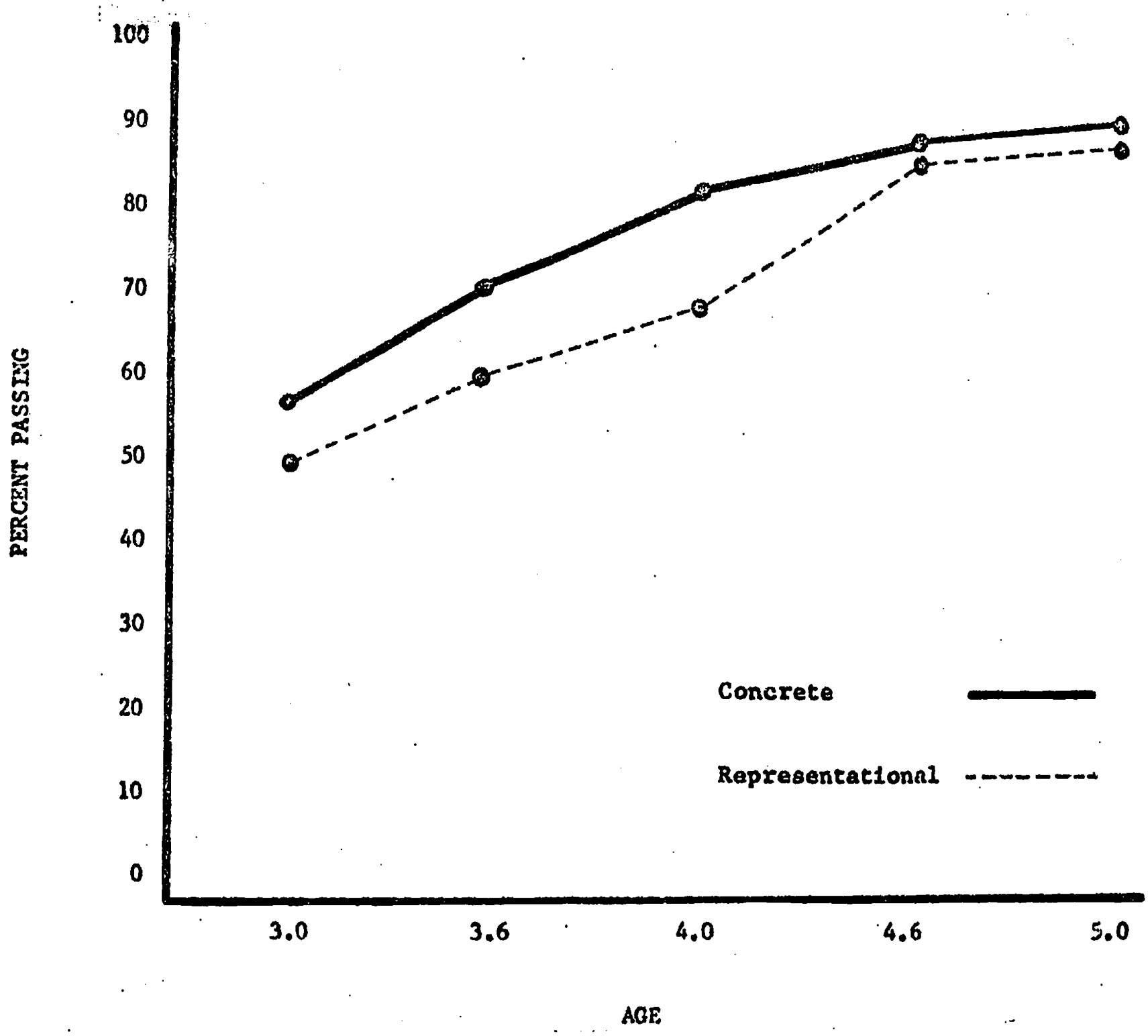


Figure 3. Comparison of Concrete and Representational Level tasks.

Support was found for the order of dimension difficulty hypothesized (Figure 4). Perception of common objects was the easiest; perception of color differences was the most difficult.

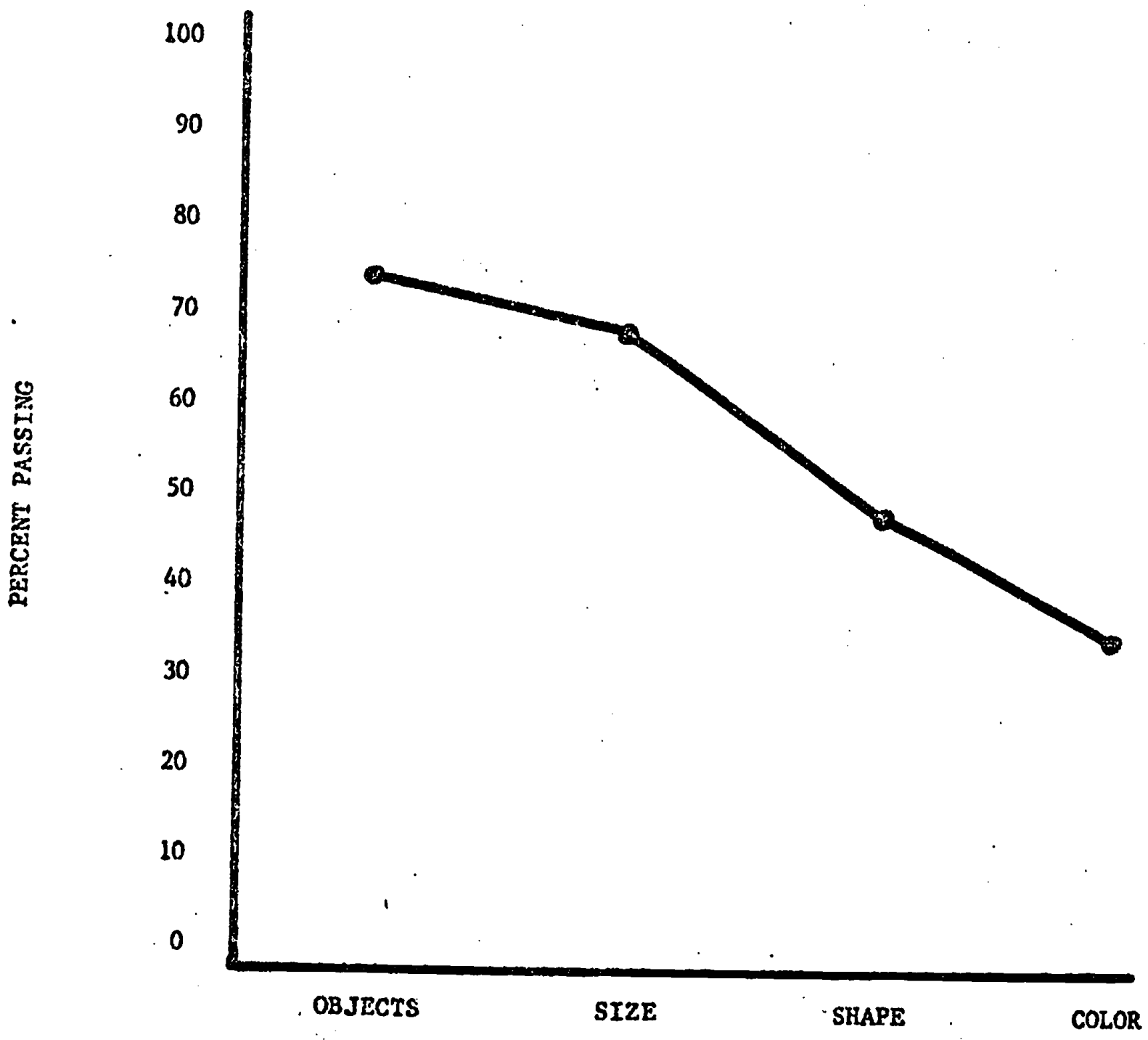


Figure 4. Comparison of dimension difficulty.

The data presented in Figure 5 support the assumption that the first step in skill attainment is recognition, then discrimination, recall and finally reconstruction.

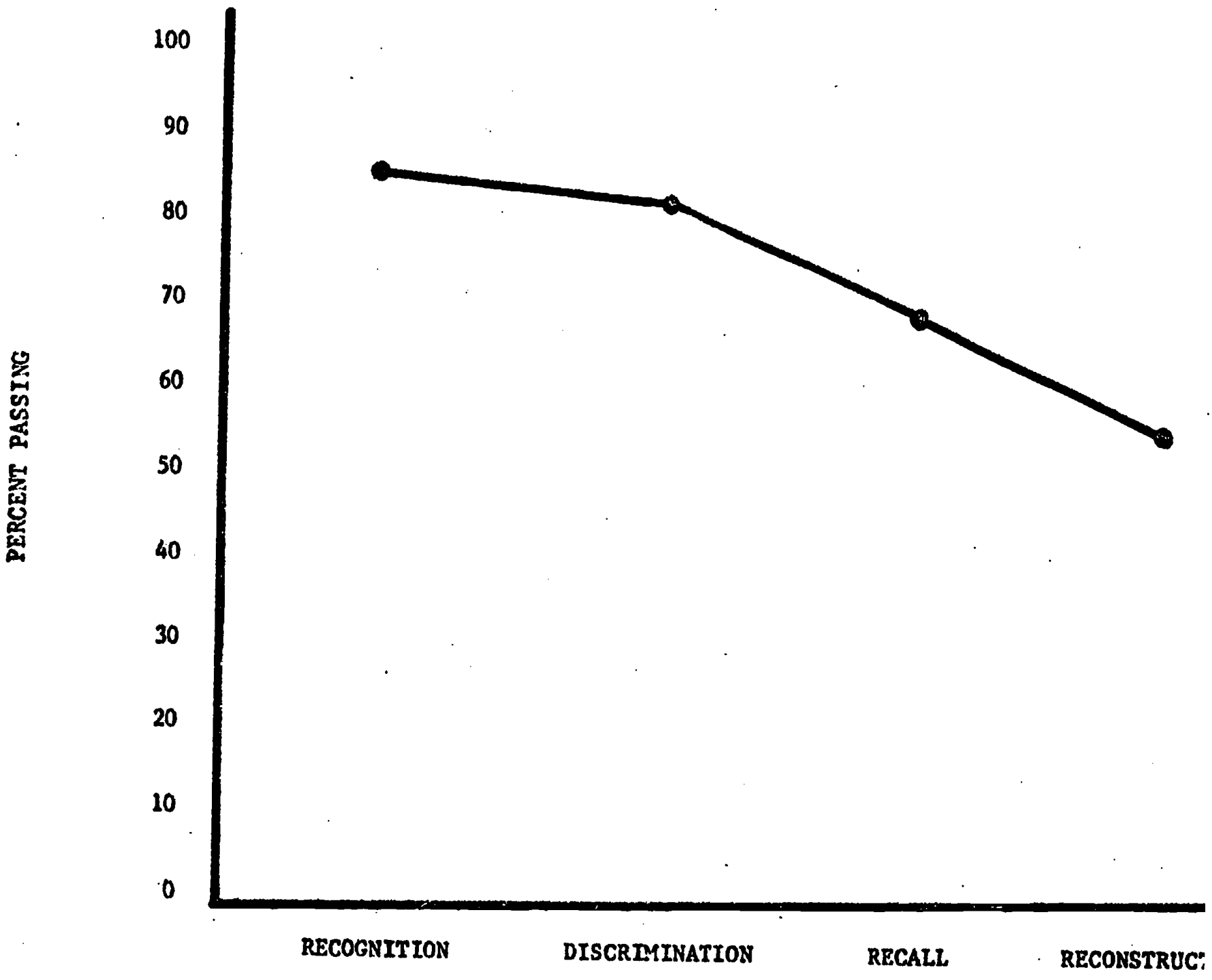


Figure 5. Comparison of learning step difficulty.

Discussion

The data generally support the rationale used in sequencing the visual perception tasks. Three factors seem to account for the fact that stronger evidence was not obtained. The first is the small size of the sample. The second is the occasional inconsistency of tasks between levels and within dimensions. This problem occurred because of the lack of instructional materials which met the exact specifications of the task sequence. Finally, some of the items designed for the test proved to be too easy for the children in the sample.

Based on the data from the validation study, the following conclusions may be drawn regarding the design of tasks to fit the suggested model for sequencing visual perception training materials:

1. When presenting tasks to the child, minimize verbal instructions where possible. The pilot investigation with the test items indicated that the children tended to perform tasks more efficiently when fewer verbal directions were given.

2. Tasks involving a combination of dimensions should be emphasized at the end of each level of training. The data show that such tasks provided the most discriminating items.

3. Training tasks in discrimination and recall should be designed to permit the child a choice among at least four and not more than seven stimuli. When less than four discriminanda were presented to the child, the task did not discriminate between ages and was too easy for the majority of the subjects.

A further study is planned to compare the performance of selected groups of exceptional children with the performance of the normal group reported in this paper.

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