

CHAPTER VI

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METHOD

The present investigation was based on the design of Elkind's study to examine the conclusions of Elkind (1964) in the Indian situation.

Materials

The materials used in this investigation were (a) three dimensional, (b) two dimensional, (c) unidimensional. All materials were made of wood and they were in two sets. The smaller set was painted orange and the larger set was painted red. The materials were size graded. In the first set the smallest was a $\frac{3}{4}$ " cube and the largest was a $4\frac{1}{2}$ " cube. The smallest three dimensional block in the second set was a 1" cube and the largest was a 8" cube. In each series there were nine blocks. For the two dimensional materials, wooden slats were used. There were 9 slats in each series. All the slats were $1\frac{1}{2}$ " in width and $\frac{1}{8}$ " in thickness. The smallest slat was $1\frac{1}{2}$ " long. The size was increased by $\frac{1}{2}$ " such that the largest was $8\frac{1}{2}$ " long. For one dimensional material wooden sticks of $\frac{1}{8}$ " diameter were used. The smallest stick was 1" long and it was increased by $\frac{1}{8}$ " in length. The longest stick was 8". The second set of sticks commenced with $1\frac{1}{2}$ " and increased by $\frac{1}{8}$ ". The length of

the sticks was same as that of the slats and the two series were painted similarly.

Tests

Discrimination Tasks - For this test, the subject was presented with four problems with the blocks, four with the slats, and four with the sticks. I placed a set of nine blocks/slats/sticks, as the case may be, in disarray upon the table in front of the subject. I said: "Can you find me the smallest (block/slat/stick)? Show me the smallest" (Item 1). S: "Can you find the largest? Show me the largest" (Item 2). Now hiding the eyes of the subject, I disguised the smallest element such that it appeared larger. If it was a block, it was placed in front of other blocks. If it was a slat or stick, it was placed such that its upper edge protruded beyond that of the surrounding elements. Uncovering the eyes of S, I asks: "Find the smallest now! Show me the smallest" (Item 3). When the S responds, S was asked to hide his eyes again, and when the S did so, I camouflaged the largest element. If it was a block, it was hidden behind the other blocks, if it was a slat or stick, it was so placed that an element on one side of it protruded above it and an element on the other side protruded below it. The child was asked to see and the experimenter asked the question: "Show me the largest now, find the largest" (Item 4). The same procedure was followed with the other set of materials. For each correct response a credit of two points was given making the possible score of 8

with any one material. Thus, the maximum possible score for one set (small or large) having three types of materials was 24 points.

Serialization Tasks: A set of nine elements was placed in disarray on the table. Experimenter (E) asked, "Can you make a stairway with these? Now see how I make". Then the experimenter made a stairway. E disarranged the elements and said: "Now, make the stairway just as I did". If the child had any difficulty only 4 elements were given and he was asked to serialize (Item 1). Children who failed to serialize four elements were not tested further. If succeeded, the subject was given 7 elements to serialize (Item 2). Testing was discontinued if the child failed with 7 elements. If succeeded the child was given 9 elements to serialize (Item 3). Children who failed to serialize were not tested further. To test those children who initially, or eventually succeeded to serialize 9 elements, E removed 5 elements from the stairway and picked 5 elements at random from the second set. Then E said: "I have some more that also go in the stairway; can you put them where they belong?" (Item 4). If the subject did not get the idea, E demonstrated with one element and disturbed them afterwards. Each correct serialization item was given a score of 2 and if the child initially succeeded in serializing all the 9 elements he was given 6 points and 2 points for correctly doing item 4. The total score a subject could possibly make was 8 points with any one type of material. Subjects who succeeded eventually were given 1 point each for serializing four and seven elements.

(items 1 & 2), 2 points, for counting nine (Item 3) and 2 points for (Item 4). The possible score was 6 points for those children who have succeeded eventually, on any one material.

Enumeration Tasks: Nine elements were arranged into a stairway. I asked the subject to count the number of stairs (Item 1). Then the experimenter pointing to the first stair asked the child. "How many stairs does the dolly have to climb to get on this stair?" When the child grasped the idea, I pointed to the second, third ninth stair in succession, asking how many stairs the dolly had to climb to reach the stair concerned (Item 2). I pointed to the 4th stair and asked: "How many stairs must the dolly climb to reach this stair?" When the child answered, I pointed to 7th stair and repeated the question (Item 3). Next I mixed all the elements and said: "If the stairway was together like it was before, how many stairs would the dolly have to climb to reach this stair (4th) and this one (7th), (Item 4). For each correct response to the item 2 was given 2 points each. If the S failed to respond to item 3 with 7 elements and item 4 with 7 elements but could do with 4 elements only in either case only 1 point instead of 2 for each item was given. The possible score was 6 points with any one type of material.

Experimental Design

The study involves 5 independent variables, viz., sex, age, schooling, tests (operations), and materials. The design

employed was schooling (2) X tests (3) X materials (3) X age (4) levels.

The design of the study was a factorial design. The factorial design was employed for the reason that it has a number of advantages. All the number of observations are taken into account though each treatment group may consist of only a few observations (20). Further, in the factorial experiment we have information about the main effects as well as the interaction effects. If the interaction effects are found to be non-significant we would have evidence that the main factors operate independently. When the interaction effects are found significant the nature of interaction could be investigated into.

The total number of subjects employed in the study were 676 comprising equal number of boys and girls. Analysis was made independently for boys and girls. The subjects were randomly assigned to the experimental conditions of testing.

The analysis of the data was made separately for boys and girls. For each group the design was schooling/No schooling (2) X Tests (3) X Materials (3) and X Age (4) levels.

At each age level there were 144 subjects divided into 2 equal groups of boys and girls. The boys and the girls were further divided into equal groups of school going and non-school going children. Three operations or tests namely, discrimination (D), seriation (S) and numeration (N) were studied. Subjects were presented with the operations in one of the six possible

orders. The operations were tested using 3 different types of materials which could be presented in 6 possible orders. There were thus $6 \times 6 = 36$ conditions of presentation combining the tests and materials. Each sub-group had 36 subjects as per the experimental design. One subject was tested under one of the 36 experimental conditions. Subjects were assigned to the above testing conditions at random.

In the investigation two sets of materials differing in size and colour were employed. The subjects were tested employing one set of materials, the smaller set painted orange, in the first instance. After the concerned subject was tested in 3 sessions using the small - sized materials the subject was administered the same tests in the same order using the large-sized materials painted red.

All subjects were tested individually and as far as possible under similar conditions. Each testing session lasted about 40 minutes. A few subjects required longer periods. Subjects were tested using strictly the same procedure. All instructions were given in the mother tongue of the children. Enormous care was taken to establish rapport with the subject before the tests were administered. Subjects were also given sweets for this purpose.

Every subject was taken charge from his or her home and

brought for testing. After the subject was familiarized with the test situation and its surrounds, the subject was given the following:

A numerosity Test (Not Counting): Subjects were presented with 5 problems in a serial order. Subjects were presented with two heaps of 3, 5, 7, 9 and 11 chips in that order and asked to judge which heap had more and which less. Irrespective of whether a subject passed a test or not he/she was given 3 consecutive tests.

The subjects were given number conservation tasks at the commencement of the first testing session. Number conservation was tested employing buttons and wooden sticks. Subjects were given five problems each containing 4, 6, 8, 10 and 12 items in that order. The subjects were next given the three tests (discrimination, seriation and numeration) in accordance with the order of presentation randomly assigned to him/her. Between any two testing sessions there was an interval of 7 days.

After the testing in three sessions was gone through, the subject was tested using the other set of larger-sized red-painted materials after an interval of a week. The same order as employed previously was followed for testing in the second series.

After the second set of three sessions, the subject was administered a mental ability test (Draw-a-man Test). The

numerosity and conservation tests were not repeated.

Following the procedure as above $144 \times 4 = 576$ subjects were tested in the investigation. However, to overcome any loss of subjects during the course of investigation oversampling to the extent of 25 percent in the case of school going and 80 percent in the case of non-school going subjects was resorted to. From the available data thus collected, data for 576 subjects alone in accordance with the experimental design of the investigation were analysed discarding the other data.

Discarding of data would obviously effect the sample. To overcome this difficulty extra data over what was required as per the experimental design was discarded randomly such that the essential nature of the sample was not adversely affected.