

VISUAL AND AUDITORY LEARNING IN CHILDREN: A COMPARATIVE STUDY BETWEEN NORMAL NURSERY-SCHOOLCHILDREN AND RETARDED CHILDREN*

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How do mentally retarded children learn in comparison with normal children? After many years of study and observation I came to the conclusion that those children who had mastered the skills required for schooling were best able to manipulate their environment and were able to cope more adequately in society. The normal 4- and 5-year-old nursery-schoolchild had fewer temper tantrums and was less frustrated in situations at school. This more confident behaviour pattern is, it is believed, a result of greater awareness of the outside world and the ability of the young child to cope with numerous stimulations impinging upon him.

A first observation at 'The Hamlet', a school for retarded children in Johannesburg, was the utter lack of basic skills that these children displayed. They lacked colour and shape identification, and their visual perception was very inadequate. Their body schema was poor. All these handicaps, together with a general lack of communication and under-developed gross and fine motor coordination, reflect the inadequacies of these children.

It is therefore essential that a programme in a school for mentally defective children should emphasize the teaching of these skills in order to assist these children to function more efficiently in their environment. Their drawings on paper are a scribble of lines, with never a representational object or shape. Many are unable to reproduce a circle, square or triangle without specific training. The paintings are a mixture of colour and strokes, again without patterns or object representation.

Concerning shape and colour perception, Hebb¹ has written as follows:

'There is not a single instance given in which the congenitally blind after operation had trouble in learning colour names; but a great number in which the perception of identity in a simple figure was poor indeed . . .

'Investigators of vision following operations for congenital cataract are unanimous in reporting that the perception of a square, circle or triangle, or a sphere or cube is very poor. To see one of these as a whole object, with distinctive characteristics immediately evident, is not possible for a long period. The most intelligent and best motivated patient has to seek painstakingly even to distinguish a triangle from a circle. The newly seeing patient can frequently find a difference between 2 such figures shown together, just as the normal adult can readily detect differences between 2 of Thorndike's figures lacking *identifiability*, but the differences are not remembered. There is for weeks a practically zero capacity to learn names for such figures, even when tactual recognition is prompt and complete . . .

'Identifiability is not merely a perceptual difference of one figure from another when the two are side by side, but implies a rememberable difference—identifiability is clearly recognizable, and recognition is one form of association. Thus identity is a matter of degree, readiness of recognition and the extent to which generalization is selective.

'Unity may be innately determined, an immediate property of sensory dynamics, whereas identity is dependent on a prolonged experience. Because these two things have not been separated in the past, it has appeared that perceptual organization is innate. Some aspects of the organization are present, apparently, at the first experience, but others are not.'

MATERIAL AND METHODS

It was decided to compare 30 nursery-schoolchildren 3-5 years old, with a group of 30 mentally retarded children whose mental ages ranged from 3 to 5 years. The test covered colour identification and discrimination, visual and shape discrimination (letters) and auditory discrimination.

The children in the normal group were matched at random with the retarded group. The retarded group was further subdivided into 3 subgroups:

Group A. 1 year's exposure to a specific training programme.

Group B. 3-6 months' exposure to the special training programme.

Group C. No specific exposure to a special training programme.

The mentally retarded children in groups A and B were provided with a nursery-school situation where exercises for gross motor and fine motor coordination were introduced such as climbing, jumping, and running games. Pupils were given ample opportunity in body-image work with the aid of mirrors, outdoor equipment such as 'jungle gym', slide, water trough, sand pit and ball games.

Colour recognition and discrimination was introduced with the aid of concrete objects and through association methods. Children were asked to name the colour of their shoes, dresses, jerseys, skirts, etc. Blocks and toys were identified by colour: 'Pick up the red block, throw the blue ball, pick the yellow flower', etc. Simultaneously, shape identity and discrimination were emphasized in the lessons. Puzzles and coloured grading toys were used to introduce quantitative concepts. Discrimination cards and bingo and lotto games were used to teach the concepts of 'same' and 'different'. (Identity and recognition of differences in objects.)

Stories told to children were simple, emphasizing differences in sounds to assist in aural discrimination, and were usually based on realistic topics. Discussion with children and conversation between pupils were encouraged to stimulate verbalization and social communication.

Handwork activities were included in the daily programme—cutting, drawing and painting assisted the motor coordination but could also be used for colour and shape identification and discrimination. Although free and unguided drawing and painting were encouraged, guided work was used to reinforce a lesson in colour and shape discrimination. The teacher often suggested to the child that a green circle could be used for a tree top, a red triangle for a roof and a blue square for a house, etc.

In a sewing or knitting period for the older girls, the teacher asked the pupil to name the colour of the wool she chose for her handwork.

As an additional aid, the training programme included exercises and work sheets as suggested by Frostig and Horne² and by Kephart.³

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The Test

The test took place in the principal's office. The child was seated at the same table as the tester and was questioned on the items. The entire testing time was never longer than 10 minutes and was usually over within 3 minutes. Colour identity and discrimination tests were taken from the grades testing text by Grassam,⁴ while visual discrimination was tested from the letters in the text reader by McKee and Harrison.⁵

A test sheet was devised as follows:

Name of child..... Birthdate..... Age at time of testing
.....years.....months.

| Colour and Shape Perception (Subtest 1): | Points |
|--|-----------------------|
| 1. Point to colour blue on page. | 1 |
| 2. Point to colour yellow on page. | 1 |
| 3. (Pointing to red square) What colour is it? | 1 |
| 4. What else is red? Touch it with your finger. | 1 |
| 5. Look along to the next picture. What colour is it? White. | 1 |
| 6. Point to the green square. | 1 |
| 7. Point to the green flag. | 1 |
| 8. What colour is the stick of the flag? (Tester points to the stick.) Black. | 1 |
| 9. Name the colours that you see on this page. (Tester points to the first 4 balls.) If the child cannot name them, the tester points to one colour at a time and asks the child to name each colour separately. | 4 (1 for each colour) |
| | 12 points |

(Primary colours are used: Red, blue, yellow, green.)

Auditory or Aural Discrimination (Subtest 2):

12 pairs of words—1 point for each.
Do these words sound the same? Answer yes or no.

1. Secure Secure
2. Delight Detour
3. Beguile Beguile
4. Forgotten Forever
5. Decided Decided
6. Belated Debated
7. Pack Back
8. Quack Quack
9. Track Sack
10. Goat Goat
11. Bought Thought
12. Bright Quite

Total: 12 points

The tester must first make sure that the child understands the concept of *same*, e.g.

What is your teacher's name? Mrs K.

What is my name? Mrs L.

Is that the same? Do you think Mrs K. and Mrs L. are the same words?

The testee is given further examples of same and different sounds, e.g.

What is your name? John.

What is your brother's name? Richard.

Do John and Richard sound the same? If testee says yes, the tester tries another example. Or the tester can start off by asking:

Do John and John sound the same? If the child says yes, the tester uses two different names and repeats the question.

Visual Discrimination (Subtest 3):

The child is presented with the following page of letters:
C C Q C The tester starts with capital letter C, pointing to it: 'Look at this letter and show me which other letters in this row are the same as this one C.'
J I J J The tester continues in a similar manner with the other capital letters.
P P P B
M M N M
V V W V
W W M W
e e o e e The same procedure is followed with the lower case letters.
g a g g g
l l l h l
d q d d d
o o o c o
f f t f f

Total: 12 points.

| Grand Total | Actual points | Possible points |
|-------------------------|---------------|-----------------|
| Colour perception | | 12 |
| Auditory discrimination | | 12 |
| Visual discrimination | | 12 |
| | | 36 |

RESULTS

The children were grouped according to mental age in the retarded group, and chronological age in the normal nursery-school group. All the retarded children were tested on the SA Individual Scale of Intelligence (Stanford-Binet test) which has been standardized for South African children. The mental age is derived from the results on the South African Individual Scale of Intelligence. Group A consisted of a random group of normal children and a retarded group of 10 children who had had 1 year's training in the special programme:

TABLE I. NORMAL GROUP A

| Age | Colour score | Aural score | Visual score | Total |
|------|--------------|-------------|--------------|-------|
| 5-2 | 12 | 12 | 11 | 35 |
| 5-9 | 12 | 12 | 12 | 36 |
| 5-7 | 12 | 12 | 12 | 36 |
| 5-1 | 12 | 8 | 10 | 30 |
| 4-11 | 12 | 10 | 5 | 27 |
| 4-9 | 11 | 8 | 8 | 27 |
| 4-11 | 12 | 12 | 12 | 36 |
| 4-5 | 12 | 6 | 10 | 28 |
| 4-6 | 12 | 3 | 11 | 26 |
| 4- | 12 | 0 | 0 | 12 |
| | 119 | 83 | 91 | 293 |

TABLE II. RETARDED GROUP A

| Chronological age | Mental age | Colour score | Aural score | Visual score | Total |
|-------------------|------------|--------------|-------------|--------------|-------|
| 12-2 | 5-2 | 12 | 11 | 12 | 35 |
| 14-4 | 5-9 | 12 | 0 | 11 | 23 |
| 9-2 | 6-3 | 12 | 12 | 11 | 35 |
| 12-7 | 5-1 | 12 | 4 | 7 | 23 |
| 11-4 | 4-11 | 4 | 0 | 0 | 4 |
| 10-6 | 4-9 | 2 | 0 | 12 | 14 |
| 17-1 | 6-4 | 12 | 12 | 12 | 36 |
| 7-3 | 4-5 | 12 | 6 | 1 | 19 |
| 7-6 | 4-6 | 12 | 0 | 6 | 18 |
| 8-1 | 4- | 0 | 0 | 0 | 0 |
| | | 90 | 45 | 72 | 207 |

Group B consisted of 10 normal nursery-schoolchildren and 10 retarded children exposed to a special programme for 3-6 months.

TABLE III. NORMAL GROUP B

| Age | Colour score | Aural score | Visual score | Total |
|-----|--------------|-------------|--------------|-------|
| 5-1 | 12 | 12 | 10 | 34 |
| 5-1 | 12 | 11 | 11 | 34 |
| 5-1 | 12 | 12 | 11 | 35 |
| 4-5 | 12 | 12 | 11 | 35 |
| 4-4 | 11 | 1 | 3 | 15 |
| 4-3 | 12 | 0 | 3 | 15 |
| 4-3 | 12 | 0 | 3 | 15 |
| 4-1 | 12 | 0 | 0 | 12 |
| 4- | 12 | 0 | 2 | 14 |
| 3-7 | 12 | 0 | 1 | 13 |
| | 119 | 48 | 55 | 222 |

TABLE IV. RETARDED GROUP B

| Chronological age | Mental age | Colour score | Aural score | Visual score | Total |
|-------------------|------------|--------------|-------------|--------------|-------|
| 18- | 6-10 | 12 | 0 | 10 | 22 |
| 19-4 | 6- | 8 | 0 | 12 | 20 |
| 11-10 | 5-7 | 2 | 12 | 12 | 26 |
| 14- | 4-5 | 12 | 11 | 8 | 31 |
| 9-8 | 4-4 | 2 | 0 | 0 | 2 |
| 8-3 | 4-3 | 12 | 0 | 0 | 12 |
| 11-2 | 4-3 | 12 | 0 | 0 | 12 |
| 11-5 | 4-1 | 12 | 0 | 0 | 12 |
| 12-8 | 4- | 0 | 0 | 12 | 12 |
| 17-6 | 3-7 | 0 | 0 | 0 | 0 |
| | | 72 | 23 | 54 | 149 |

Group C consisted of 10 normal nursery-schoolchildren chosen at random and 10 retarded children who had no exposure to a special programme.

TABLE V. NORMAL GROUP C

| Age | Colour score | Aural score | Visual score | Total |
|-----|--------------|-------------|--------------|-------|
| 5-1 | 12 | 1 | 9 | 22 |
| 4-9 | 12 | 5 | 8 | 25 |
| 4-9 | 12 | 5 | 9 | 26 |
| 4-9 | 12 | 0 | 10 | 22 |
| 4-8 | 12 | 8 | 0 | 20 |
| 4-2 | 12 | 0 | 8 | 20 |
| 4- | 12 | 0 | 10 | 22 |
| 3-8 | 12 | 0 | 10 | 22 |
| 3-8 | 12 | 7 | 3 | 22 |
| 3-6 | 12 | 7 | 6 | 25 |
| | 120 | 33 | 73 | 226 |

TABLE VI. RETARDED GROUP C

| Chronological age | Mental age | Colour score | Aural score | Visual score | Total |
|-------------------|------------|--------------|-------------|--------------|-------|
| 16- | 5-1 | 12 | 0 | 6 | 18 |
| 17-3 | 4-9 | 8 | 0 | 0 | 8 |
| 13-10 | 4-9 | 12 | 0 | 0 | 12 |
| 10-10 | 4-9 | 12 | 0 | 0 | 12 |
| 15-2 | 4-8 | 6 | 0 | 0 | 6 |
| 11-2 | 4-2 | 0 | 0 | 0 | 0 |
| 13-3 | 4- | 12 | 0 | 0 | 12 |
| 9-10 | 3-8 | 0 | 0 | 0 | 0 |
| 11-10 | 3-8 | 0 | 0 | 0 | 0 |
| 10-6 | 3-6 | 0 | 0 | 0 | 0 |
| | | 62 | 0 | 6 | 68 |

The results are condensed in Table VII.

TABLE VII. CONDENSED RESULTS

| | Colour | Aural | Visual | Total |
|------------------|--------|-------|--------|-------|
| <i>Normal:</i> | | | | |
| Group A | 119 | 85 | 91 | 293 |
| Group B | 119 | 48 | 55 | 222 |
| Group C | 120 | 33 | 73 | 226 |
| <i>Retarded:</i> | | | | |
| Group A | 90 | 45 | 72 | 207 |
| Group B | 72 | 23 | 54 | 149 |
| Group C | 62 | 0 | 6 | 68 |

DISCUSSION

The normal child learns through experience and play. A great part of his day is taken up in imaginative and realistic play which comprises incidental learning. The results of the tests show that the normal nursery-schoolchild aged 3-5 years has learnt a great deal by just attending nursery school and by using the equipment and facilities offered. He enlarges his vocabulary by listening to stories and by talking to teachers and children. He learns by doing, by playing and by his daily experiences. His maturation and development are assisted by the guidance of an interested and intelligent teacher. By being one step ahead, the teacher can stimulate, alert and introduce the normal child to a new world of experience and so enlarge his horizons.

All the skills which we take for granted in the normal child are lacking in the retarded. Here the teacher must be familiar with the normal in order to guide the retarded pupil through the slow but steady path which every child must walk. The retarded child does learn, but he learns very slowly and he requires constant reinforcement, support and reassurance. The programme must be the same for him as for the normal nursery-schoolchild, but it must be repeated in different forms, mediums and textures and on a concrete level which is within the child's grasp.

The above results show a similar growth pattern for all groups. Colour recognition and discrimination appear to be the first skill to be learnt. This is confirmed in the following quotation: 'Early Childhood—The Growth of Perception and Understanding: When children of different ages are shown, one at a time, a series of coloured geometrical forms—stars, circles, squares and the like, and are asked in each case to choose between matching the figure with another similar in form and size but different in colour, or with one of the same colour but differing in form, it has been found that children under 2½ years usually match on the basis of form. At about 2½-3 years, a swing towards colour appears. Thereafter an increasingly greater percentage of matching is made in terms of colour, ignoring differences in form, until a maximum preference for colour is reached at about 4½. Then the tide of interest turns. Form and not colour decides the issue in more and more choices until adult level is reached, at which time about 90% of matching is made in terms of form and only about 10% in terms of colour' (because colour has been firmly established and learned and therefore the individual discriminates colour and form).

In the nursery-school group, 28 out of 30 children scored full marks in the colour test. Two scored 11 points out of 12.

This was not the case with the 3 retarded groups. Group A scored the highest points, with only 3 unable to gain full marks. Group B had 5 out of 10 children who were unable to score the maximum number of points and 2 who were unable to score any points.

Group C scored considerably lower, with 4 children scoring full marks and 4 scoring no marks at all.

In the visual discrimination test, the results reflect a greater discrepancy between normal and retarded groups, and in these latter one sees that the trained group A scores considerably higher than the other 2 groups, namely group A 72, group B 54 and group C 6.

It may appear strange to the observer that group B in the normal group scores only 1 point higher than its counterpart in the retarded. However, it will be seen on closer analysis that this group comprises children with a lower mental age than group A, and that the chronological age of this group in the retarded ranges from 8 to 19 years, which means that some incidental learning has taken place over the years.

The aural discrimination test proved the most difficult for all groups tested.

The gap between normal and retarded widens still further in a test which is dependent on a knowledge of words and language and where communicative ability is a prerequisite to understanding differences in sounds.

The low scores of groups B and C indicate that aural discrimination comes with greater maturity and development, and only with specific stimulation by teachers and parents in the retarded group of children.

Further observation displays a need for specific training in all groups, normal as well as retarded. Teachers of all children must constantly verbalize their actions and

encourage children to use words for all their actions. Luria⁷ has described how a small child learnt to perform a difficult task if *reinforcing the action with speech*. The continuous verbalization in simple language organizes the child's concept of himself and his surroundings.

SUMMARY

The study reports an investigation into the learning patterns of children. The normal child learns at a very much faster rate than the retarded child, but the pattern followed by both is similar. The normal nursery-schoolchild absorbs more and interacts more rapidly with his environment. He requires stimulation from his teacher but it need be less direct and more subtle than for a slow learner or a retarded child. The backward and retarded child requires constant stimulation, reinforcement and verbalization of every action, deed and movement performed by him. It is reiterated and stressed that the retarded child's learning pattern follows the same curve as that of his brighter counterpart, and he does learn and show improvement and intellectual development if given a suitable environment for growth and maturation.

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