Studies in the development and breakdown of the use of names

I The relationship between nominal dysphasia and the acquisition of vocabulary in childhood

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The relationship between the breakdown of mental processes associated with organic cerebral pathology and the development of these mental processes in childhood has been discussed by psychologists and physiologists for many years. Whereas there is no doubt that the two often show parallels, the possibility that the order of breakdown is in any way dependent on that of acquisition has been debated.

In the sphere of memory, there is much evidence that as people enter the senium they begin to live more and more in the past (Ribot, 1885), even to the extent that generic images may revert to forms which must have been developed in early youth (Zangwill, 1950). Moreover, after concussion head injuries there is a consistent time relationship between the

events covered by retrograde amnesia and that at which the accident took place, the most recent memories being most liable to disruption (Russell and Nathan, 1946). Even in the sphere of memory, however, there are frequent exceptions to this rule (Russell and Nathan, 1946; Williams and Zangwill, 1952). Isolated memories may be retained for events which occurred during otherwise unremembered periods. In other fields of mental activity, the parallel between development and dissolution is very unclear. In general intelligence and in perceptual organization there are striking differences between the performances of children and those of adults with organic cerebral defects (Yates, 1956; Orme, 1957; Piercy, 1959).

Two problems seem therefore to present them-

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FIG. 1. *The objects used in testing recognition.*

selves in this field: 1, Why is it that there are parallels between acquisition and dissolution in some instances and not in others? 2, What are the chief factors involved in the retention of mental processes after cerebral disruption, and how are these related to the order of acquisition? A study of language breakdown may help to throw some light on this matter, since the use of words (especially in the naming of objects) is an act which appears to be fundamental to many intellectual and mental processes, and one which is notoriously liable to disruption in organic cerebral disturbances.

In this paper we will describe the findings from a simple test of naming and comprehension which was administered to 32 adult subjects suffering from speech disorders associated with organic cerebral pathology and to 120 children aged 2 to 11 years. The similarities and differences in the performances of the two groups and the light thrown on possible factors in breakdown are discussed.

PROCEDURE

A card bearing six pictures (Fig. 1) was used in the investigation. Subjects were interviewed individually and were asked to name the following objects as E pointed to them: 1 Watch, 2 comb, 3 basket, 4 hands (of watch), 5 teeth (of comb), 6 handle (of basket), 7 buckle (of watch-strap). The subjects were then asked to point to 1 needle, 2 chair, 3 umbrella, 4 eye (of needle), 5 arm (of chair), 6 spokes (of umbrella), as each name was spoken. There was no time limit set for any response. If a subject made an uncorrected error, or signified that he was unable to respond, prompting by 'cues' was begun in the order shown in Table I. Prompting was continued until a subject successfully accomplished the task or until all cues had been given before proceeding to the next task.

For each item, in the event of failure four cues were given. On the naming test, cue *a* is a description of the object's use, cue *b* arouses the word by association or by its use in a different context, cue *c* further arouses the word by giving its use in a different context or by a rhyme, and in cue *d* the word is spelt.

TABLE I
CUES USED IN NAMING AND COMPREHENSION TESTS

<i>Naming</i>	<i>Comprehension</i>
1 <i>What is this? (watch)</i> (a) We tell the time by it (b) It is a wrist (c) Not a scotch but a (d) It is a W-A-T-C-H	1 <i>Needle</i> (a) Thing you sew with (b) We sew with needle and cotton, point to the needle (c) It is long, thin, and pointed (d) Is it this one or this one?
2 <i>What is this? (comb)</i> (a) We do our hair with it (b) A brush and (c) Not a home but a (d) It is a C-O-M-B	2 <i>Chair</i> (a) The thing you sit in (b) It is an armchair, point to the armchair (c) It has four legs, and a high back (d) Is it this one or this one?
3 <i>What is this? (basket)</i> (a) We carry shopping in it (b) We put shopping in a shopping (c) Not a casket but a (d) It is a B-A-S-K-E-T	3 <i>Umbrella</i> (a) The thing you carry in case it rains (b) It can be used as a walking stick (c) It is pointed and has a handle (d) Is it this one or this one?
4 <i>These are the (hands)?</i> (a) The things that point to the time (b) Our feet and our (c) These are your ? and these ? (d) They are the H-A-N-D-S	4 <i>Eye</i> (a) Eye of the needle (b) Not the point but the eye (c) Part you thread the cotton through (d) Is it this or this?
5 <i>These are the (teeth)?</i> (a) The things that run through your hair (b) We bite with our (c) These are your ? and these ? (d) They are the T-E-E-T-H	5 <i>Handle</i> (a) Handle of the umbrella (b) Not cover but handle (c) Part you hold it by (d) Is it this or this?
6 <i>This is the (handle)?</i> (a) The thing you hold it by (b) You hold on to the (c) Not a mandle but a (d) It is a H-A-N-D-L-E	6 <i>Arm</i> (a) Arm of the chair (b) Not legs but the arm (c) Part you rest your elbow on (d) Is it this or this?
7 <i>This is the (buckle)?</i> (a) The thing that fastens (b) The strap and the (c) Not a chuckle but a (d) It is a B-U-C-K-L-E	7 <i>Spokes</i> (a) Spokes of the umbrella (b) Not cover but the spokes (c) The things that support the cover (d) Are they these or these?

On the comprehension test, cue *a* describes the object's use, or in the case of 'parts' the whole object to which the part belongs, cue *b* repeats the word with increased information, cue *c* describes it in visual terms, and in cue *d* the subject is asked to choose between alternatives.

Cues were given randomly in an attempt to offer each type of cue in each position. If the correct response was not given after each type of cue had been offered a total failure was recorded. Naturally when a correct response was given, the other cues in the combination being used on that item were not given. Results of responses to the different types of cues are therefore in proportion to the number of times that type of cue has been offered. It will be appreciated that all combinations have not yet been given on every item.

SUBJECTS

The test was given to two groups of subjects composed as follows:—

GROUP 1: DYSPHASICS This group consisted of 32 subjects referred by the neurological services of the United Oxford Hospitals as showing clinical evidence of speech disorder in association with organic pathology. There was considerable variation in the ages (ranging from 24 to 67) and social backgrounds of the subjects, as also in the pathological condition and in the degree and nature of the impairment of language. Thus some subjects were unable to comprehend or utter any but the simplest verbal expressions while others showed only minimal degrees of disturbance in special situations. All subjects included in this survey did, however, show some degree of difficulty in the naming of what are generally referred to as 'common objects'.

GROUP 2: CHILDREN This group consisted of 120 children between the ages of 2 and 12 years, who were attending local infant and primary schools, and who were, in the opinions of their teachers, of average intelligence and ability for their ages.

RESULTS FOR THE NAMING TEST

DYSPHASICS The points of greatest interest arising out of this study are: The objects can be arranged in a clear 'order of difficulty' as may be seen from Table II where the proportion of correct responses given by the subjects in group 1 to each test item is shown, together with the total number of cues

TABLE II
RESPONSES TO THE NAMING TEST BY ADULT
DYSPHASIC PATIENTS

	Proportion Correct	Number of Cues Required
Comb	0.81	15
Watch	0.78	19
Basket	0.72	30
Handle	0.56	39
Hands	0.53	43
Teeth	0.28	58
Buckle	0.19	84

N = 32

FIG. 2. The relationship between the proportion of correct responses given to an object and the number of cues needed to elicit a correct response in dysphasic patients.

required to elicit the correct response. The harder the test item, the more cues were required to elicit the correct response. This point is illustrated in Figure 2. Cues *b*, *c*, and *d* were all of about equal usefulness, and were all more useful than cue *a* which consisted of describing the object by its use (Table III). In the case of cue *c*, which consisted of five rhyming and two contextual cues, nearly the same proportion of correct responses was elicited by each type of cue given (Tables III and IV).

TABLE III

Cues	Dysphasics	TOTAL PROPORTION OF CORRECT RESPONSES PER CUE				All Children 5-11 Years
		Children	5 Years	6 Years	7-8 Years	9-11 Years
<i>a</i>	0.15	0.01	0.00	0.00	0.00	0.01
<i>b</i>	0.33	0.08	0.21	0.04	0.3	0.15
<i>c</i>	0.33	0.3	0.5	0.7	0.5	0.50
<i>d</i>	0.35	0.05	0.00	0.3	0.5	0.21

TABLE IV

PROPORTION OF CORRECT RESPONSES
TO EACH RHYMING CUE

<i>Dysphasics</i>	0-22
<i>Children</i>	
5 years	0.15
6 years	0.15
7-8 years	0.50
9-11 years	0.30

0.25

CHILDREN The proportion of correct responses made to each test item by the children between 5 and 11 years, together with the number of cues necessary to elicit each response, is shown in Table V. The following are the points of greatest interest. There is a close parallel between the proportion of correct responses to each test item given by dysphasic patients and the age at which correct responses were given by 80% of the children tested (Table VI and Fig. 3). Using Spearman's coefficient of ranked correlation, $P = 0.9$, $T = 4.5$ (T is significant at 0.05 level when greater than 2.365). Within each age group there is a close parallel between the order of difficulty shown by dysphasic patients and by children (Table VI and Fig. 4). Taking the children as a whole there is a close correlation between the difficulty of each item and the number of cues necessary to elicit each response, as was seen to be the case in the dysphasic patients (Fig. 5). Analysis of the effectiveness of the different cues showed that these varied according to age (Table III). The spelling cue (*d*), was of little use until the age of 7 or 8. Any parallel between the response to cues of children and dysphasic patients is not established before the age of 9 years.

It will be remembered that cue *c* consisted of both contextual and rhyming cues. In children the proportion of correct responses elicited by the rhyming cues alone is shown to rise significantly between the ages of 7 and 8, after which it decreases (Table IV). The overall response to rhyme for children from 5 to 11 years is not significantly different from the response of adult dysphasics.

TABLE VI

PROPORTION OF CORRECT RESPONSES TO NAMING
TEST BY DYSPHASIC ADULTS AND CHILDREN

	<i>Dysphasics</i>	<i>Age 5</i>	<i>Age of Acquisition (years)</i>
Comb	0.81	1.0	2
Watch	0.78	0.89	5
Basket	0.72	0.97	4
Handle	0.56	0.72	6
Hands	0.53	0.12	8
Teeth	0.28	0.04	11
Buckle	0.19	0.04	11

ERRORS OF NAMING The errors on the naming test made by all subjects were recorded verbatim. In Table VII are listed those errors made to the teeth of the comb. It will be seen that there is a great similarity between the errors made by dysphasic patients and those made by children, because even where the words used are not identical, all errors fall into a common semantic or perceptual pool. This was a consistent finding in all errors.

TABLE VII

NUMBER OF TIMES EACH ERROR WAS MADE BY
DYSPHASIC ADULTS AND CHILDREN ON
NAMING TEETH OF COMB

<i>Error</i>	<i>Children</i>	<i>Dysphasics</i>
No response	46	6
'combs'	9	9
Description	12	—
'lines'	5	—
'sticks'	3	—
'spikes'	5	—
'bristles'	5	—
'pins'	2	—
'points'	2	—
'bars'	—	1
'hands'	2	—
'prongs'	—	1
'teeths'	1	1

RESULTS IN THE COMPREHENSION TEST

DYSPHASICS The test items arranged themselves into an order of difficulty though the test as a whole

TABLE V

RESPONSES TO THE NAMING TEST BY CHILDREN AGED 5 TO 11 YEARS

	<i>5 Years</i>		<i>6 Years</i>		<i>7-8 Years</i>		<i>9-10 Years</i>		<i>11-12 Years</i>	
	<i>Proportion Correct</i>	<i>Cues Required</i>	<i>Proportion Correct</i>	<i>Cues Required</i>	<i>Proportion Correct</i>	<i>Cues Required</i>	<i>Proportion Correct</i>	<i>Cues Required</i>	<i>Proportion Correct</i>	<i>Cues Required</i>
Comb	1.0	—	1.0	—	1.0	—	1.0	—	1.0	—
Watch	0.89	13	1.0	—	1.0	—	1.0	—	1.0	—
Basket	0.97	4	1.0	—	1.0	—	1.0	—	1.0	—
Handle	0.72	22	0.82	7	0.88	5	1.0	—	1.0	—
Hands	0.12	71	0.48	32	0.88	10	0.96	1	1.0	—
Teeth	0.04	64	0.04	52	0.39	37	0.24	35	0.83	2
Buckle	0.04	86	0.08	77	0.28	20	0.20	57	0.83	4

FIG. 3. The relationship between the proportion of correct responses given to an object by dysphasic patients and the age at which the name is learnt in childhood.

FIG. 4. The relationship between the proportion of correct responses given to an object by dysphasic patients and by 5-year-old children.

produced many fewer errors than did the naming test (Table VIII and Table II). Results of response to cues are therefore not given since the number of cues offered on the test has not been sufficient to yield useful information.

FIG. 5. The association between the proportion of correct responses and the number of cues needed to elicit them in children.

CHILDREN The proportion of correct responses made to the items in each age group is shown in Table VIII. No comparison can be made with the dysphasics because the items are altogether too easy to show clear differentiations. In Table IX, however, it can be seen that items can be identified by name at an earlier age than they can actually be named. The same item is therefore probably easier as a comprehension task than as a naming task.

DISCUSSION

The following points are those which seem to be of the greatest interest. There is a constant order of difficulty among the seven items on the naming test for dysphasic patients and children. It could be

TABLE VIII

COMPREHENSION (PROPORTION CORRECT PER ITEM)

	Dysphasics	5 Years	6 Years	7-8 Years	9-10 Years	11 Years
Chair	1.0	1.0	1.0	1.0	1.0	1.0
Umbrella	0.98	1.0	1.0	1.0	1.0	1.0
Needle	0.91	1.0	1.0	1.0	1.0	1.0
Eye	0.88	0.45	0.66	0.84	1.0	1.0
Arm	0.72	0.92	0.96	1.0	1.0	1.0
Spokes	0.69	0.88	0.87	1.0	1.0	1.0

TABLE IX

	Comprehension at Age 9-10	Naming at Age 10
Eye	1.0	0.52
Arm	1.0	1.0
Spokes	1.0	0.08

predicted that if a subject could not name the watch he would not be able to name either the teeth or the buckle but that if he could name the teeth he would be able to name all the whole objects. This order of difficulty shows a close relationship with the age of acquisition in children; the names first learnt in childhood are those last lost in dysphasia. Dysphasics and children tend to make the same errors in naming. In both children and in dysphasic adults it is often possible to evoke a name which appears to be unavailable by the presentation of cues. In both groups there is a parallel between the number of cues required to evoke a correct name and the difficulty of the task, but the type of cue most effective varies with age in children although it remains fairly constant in dysphasic adults. Before the age of 7, children hardly respond to spelling cues at all. Between the ages of 7 and 8 they respond most frequently to rhyming cues. From the age of 9 onwards the most effective cue, as in the case of adult dysphasics, is one which arouses the word itself even though this may be in a different context.

The similarities between the performances of children and dysphasic adults are so close that it almost seems possible to speak of a 'naming age' in nominal dysphasia; and indeed verbal tests based on the standards of performance found in children might well prove of value in comparing degrees of language breakdown in the various different spheres of expression, comprehension, reading, and writing.

Care must be taken, however, not to confuse similarity of production with identity of performance. The fact that difficulties seen in nominal dysphasia so closely parallel those in childhood does not prove that the mental processes involved in naming are identical in the two conditions. For example, the type of cue most effective in producing a response is not identical before the age of 9 years. In this situation children appear to show a tendency, which has been noted elsewhere (Riess, 1946; Luria and Vinogradova, 1959), to generalize words by means of their sounds rather than by their semantic associations.

At the same time, the connexion between naming in dysphasia and early acquisition in childhood requires some explanation. There seem to be two possible mechanisms.

FREQUENCY OF REHEARSAL The earlier the age at which a skill is acquired, the more opportunity it has to be practised, and the more a skill is practised the more resistant it is to disruption.

PHYSIOLOGICAL STABILIZATION The physiological processes which occur spontaneously within neuronal circuits may, if uninterrupted, consolidate the activities with which those circuits have been concerned, as has been demonstrated in the spinal cord (Eccles, 1953). It might be supposed that if such processes also occur in the neuronal mechanisms underlying speech the longer such spontaneous processes are allowed to continue the more stable will be the activities resulting from them. It would, however, be against the principles of science to accept this latter explanation if a more simple one could account for the observations noted. Indeed, which, if either, of the above postulated mechanisms is most effective will only be decided when more is known about the processes involved in naming and the conditions by which it is affected.

SUMMARY

Thirty-two adults suffering from nominal dysphasia of different degrees of severity and 120 children aged 2 to 12 years were asked to name three common objects and four of their parts. Naming these seven items showed a highly consistent order of difficulty in both groups of subjects. There was also a close parallel between the degree of difficulty presented by a name and the age at which it was acquired.

Prompting by 'cues' was given for all items which could not be named. In both children and dysphasic adults, the number of cues needed to elicit a correct response increased with the difficulty of the item but the type of cue most effective was not the same in both groups below the age of 9 years.

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