

SPATIAL DISORIENTATION IN SENILE DEMENTIA
THE PSYCHOLOGICAL MECHANISMS DISTURBED AND SOME
SUGGESTED METHODS OF COMPENSATION

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INTRODUCTION

DISORIENTATION in a new place (e.g. a hospital ward) and inability to remember a route after having been shown and having walked it several times, is a well known feature of senile dementia. These disturbances are a frequent practical cause of difficulty, since such patients are not uncommonly physically fit and active and unless allowed to wander about during some of their waking hours become irritable and unhappy. Yet their supervision and care places a great strain on those responsible for their welfare. If left to themselves they have a tendency to fall downstairs or to wander on to roads which renders them a menace both to themselves and to others. Some insight into the causes of spatial disorientation in the elderly, and ways in which it might to some extent be compensated for, would therefore be of considerable practical assistance. It may not lead to a cure of the defects, any more than a study of the reasons for getting lost in a fog will help to relieve the meteorological conditions. What it may do, however, is to discover the equivalent to senile patients of "cats' eyes" to the motorist, and help to relieve labour and prevent accidents.

Loss of spatial orientation is not specific to senile dementia. It is almost always associated with some degree of cerebral disturbance (the organic confusional state), but is most clearly depicted and has been most fully studied in association with parietal lobe lesions (Critchley, 1953; Zangwill, 1951). In the latter cases, the insight and intelligence so frequently retained by the patients enables some idea to be gained of the mechanisms in the disability. Thus it appears that right-left discrimination is grossly at fault, and much of the difficulty is due to the patient being unable to take into consideration more than one small aspect of his perceptual environment at a time.

In the organic confusional state, spatial disorientation may be due in part to similar neurological deficits and perceptual restrictions (Paterson, 1943), but other cerebral areas and psychological factors are probably involved as well. On the psychological side, loss of memory and of critical judgment complicate the picture and emotional attachments appear to play an extremely important part (Paterson and Zangwill, 1944).

In the senile and pre-senile dementias, spatial disorientation never appears to have been singled out for special study. There seems to have been a tendency to write it off as due to general failure of intellect and memory and to consider that these terms afford an adequate explanation of the condition. But before loss of intelligence and memory can be regarded as adequate explanations for the symptoms of organic dementia, they themselves must be more clearly understood. To evoke one undefined word to explain another does not really clarify the situation, and our concepts of intelligence and memory are still far from being satisfactorily crystallized. Moreover a list of the defects noted

in different neurological or psychiatric disorders seldom leads to very positive results. Of far greater value on the practical side is a survey of the abilities retained and of the behaviour typically exhibited by the patients under consideration.

A preliminary survey of the situation, carried out by the present writer on some 20 patients aged 65 to 95 who were referred to the Oxford Geriatric Unit for reasons of mental disturbance or dementia indicated some lines of investigation which appeared promising. It was noted that despite the typical loss of memory so prominent in this condition, familiarity with an environment did, as has been noted by Bonhoeffer (1901), frequently lead to improved route finding. But it was also noticed that patients tended to take cues from many different sources, and that those individuals who were maintained in a lively atmosphere where there was entertainment and mental stimulation tended on the whole to present less difficulties than those who were kept in quieter surroundings (Cosin, 1954).

In the present paper a short account is given of some experiments planned to assess more reliably the value to senile subjects of (a) training in route-finding, (b) general mental stimulation in the perceptual field, together with a list of the cues to which the patients appeared to be most responsive.

Experimental Procedure. In order to have some standardized situation in which the behaviour of the patients could be compared, it was decided to test the patients on a paper maze, but preliminary trials soon indicated that none of these tests standardized on humans to date are very suitable for use with subjects suffering from senile dementia. They are either too faintly depicted to be seen by those with failing eye-sight, too difficult to trace for those with restricted movements, or involve too complex a set of instructions to be grasped adequately by those with failing intellects. It was therefore necessary to devise a new form of test in which allowances were made for the above disabilities. A set of situations based on the "detour problem" used in animal studies (Köhler, 1925; Liddell, 1937) and illustrated in Fig. 1 was found to be the most satisfactory and to yield the most interesting results.

The only maze to be given in a standardized manner throughout the experiments was D3. Performance on this was placed in one of the following categories:

- (1) Succeeded at first trial.
- (2) Succeeded within three trials.
- (3) Failed in three trials.

Maze A was given to each subject before he was selected for the experiments to ensure that visual acuity was well enough preserved and that co-operation would be sufficiently forthcoming for him to be suitable for inclusion. The subjects were interviewed singly. Each one was first shown A and was asked to "Point to the spot, then to the cross, then to the black line". He was then told "Now I want you to put your finger on the spot and show me how you could get from the spot to the cross, keeping your finger on the paper the whole time and not going over the black lines". According to the nature of the mistake, if one was made, the pertinent part of the instructions was repeated. After each mistake, the subject was made to start again at the original spot. If subjects were unable to solve this test for themselves, they were shown the two alternative routes. Only if they failed to find one of the routes by themselves immediately after this demonstration were they excluded from further tests.

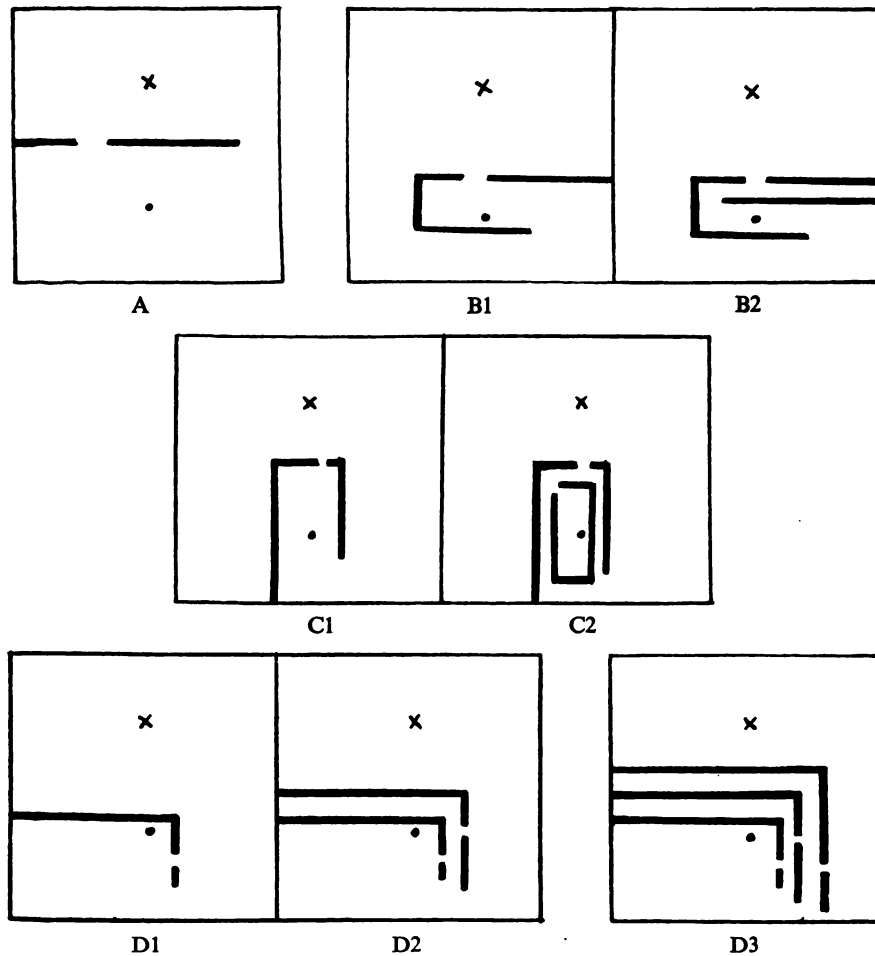


FIG. 1.—Mazes used with patients suffering from senile dementia. Subjects were instructed to place a finger on the spot and trace the route to the cross keeping the finger on the paper and not going over the black line.

Immediately after A, subjects were shown another maze, with the instructions: "Now here is another problem of the same sort. Start with your finger on the spot and show me how you can get up to the cross keeping your finger on the paper but not going over the black lines." Demonstrations by the examiner of routes other than A were not given except where mentioned.

Subjects. Sixty patients from the United Oxford Hospitals' Geriatric Unit at Cowley Road Hospital took part in these experiments. Although their ages ranged from 65 to 95, the majority were in the 80 to 90 age group. The patients studied had all been hospitalized primarily for reasons of mental impairment. Although many were suffering from senile atherosclerosis and others might have had minor cerebro-vascular accidents, none of them were critically ill or showed specific defects of speech, hearing or vision. All the patients were able to carry on a simple conversation, but they were unable to look after themselves. They were fully disorientated for both time and space and out of touch with all recent world events. Their scores on a simple 20 item question-

naire of orientation and memory (The Tooting Bec Questionnaire, Doust *et al.*, 1953) ranged from 3 to 6, the average for a group of people from a similar background in a Part III institution being 8·3.

These patients were divided into 6 groups of 10, the groups being matched as far as possible for age, physical state and mental preservation. The groups were tested under different conditions as follows:

<i>Group</i>	<i>Sequence of Testing</i>
1	Maze A followed immediately by D3.
2	Maze A. Subjects were then shown and asked to interpret ambiguous black and white pictures, and were then tested on D3.
3	Maze A. Subjects were then given Mazes B1 and 2, C1 and 2 and finally D3.
4	Maze A. Subjects were then shown Mazes D1 and 2 with either verbal assistance or demonstration if necessary. After 24 hours they were tested on D3.
5	Maze A, and following sequence as above, except that only $\frac{1}{2}$ hour elapsed between the training on D1 and 2 and the test on D3.
6	Maze A and sequence as above, but D3 given immediately after D1 and 2.

Results. The number of patients in each group who succeeded or failed on test D3 is shown in Table I, and the statistical significance of these differences

TABLE I
Showing the Distribution of Successes and Failures on Maze D3 in the Different Experimental Groups

Group	Conditions	Succeeded		Failed Within 3 Trials
		At 1st Trial	Within 3 Trials	
1	Immediately after A	1	2	7
2	After pictures	2	4	4
3	After Mazes B1 and 2, C1 and 2	3	3	4
4	24 hours after D1 and 2	4	1	5
5	$\frac{1}{2}$ hour after D1 and 2	6	2	2
6	Immediately after D 1 and 2	7	1	2

TABLE II
Showing the Value of χ^2 , for the Difference Between the Successes and Failures of the Experimental Groups

Groups	χ^2	P.
1 and 2	1·8	—
1 and 3	1·8	—
1 and 4	0·82	—
1 and 6	5·0	0·02
2 and 3	0·0	—
4 and 5	2·0	0·20
4 and 6	2·0	0·20

as calculated by the χ^2 technique is shown in Table II. It will be seen that many more subjects in groups 5 and 6 (i.e. those who received preliminary training on D1 and D2 within half an hour of the crucial test itself) succeeded in finding the route on D3 than was the case in the other groups, but the performance of group 4 indicates that similar training given 24 hours before the

crucial test has no significant effect. The performance of groups 2 and 3 suggest that mental stimulation on allied perceptual tests immediately before the crucial test improves performance, but with such small groups the differences are not large enough to be statistically significant.

From these results it seems justifiable to conclude that in subjects suffering from senile dementia, as in normal people, practice on a task allied to the one under consideration materially assists performance, but that the degree of assistance varies with (a) the psychological relationship, (b) the time elapsing between training and test.

Behaviour during Performance. Of just as much interest as the statistical results reported above, is an analysis of the behaviour shown by the subjects in the maze situation, and particularly the nature of the mistakes they made. The latter can be divided into several classes.

(1) A tendency to make directly for the goal, regardless of the instructions. The goal appeared to have such a strong attraction for them that, like some of the less intelligent animals in a detour situation, these patients were unable to detach themselves from it. Thus, if the gap in the black lines fell between the starting point and the goal (as in the B and C mazes) the subjects were usually able to find it without difficulty. It was only when the necessity arose to go away from the goal in order to find the gap that difficulty was experienced and the instruction "not to go over the black line" was seriously ignored.

In other cases, the attraction of the goal was seen in a tendency to turn towards it too quickly. A very common error was that illustrated in Fig. 2. Some subjects repeated this mistake again and again, even though realizing their error each time they arrived at "w".

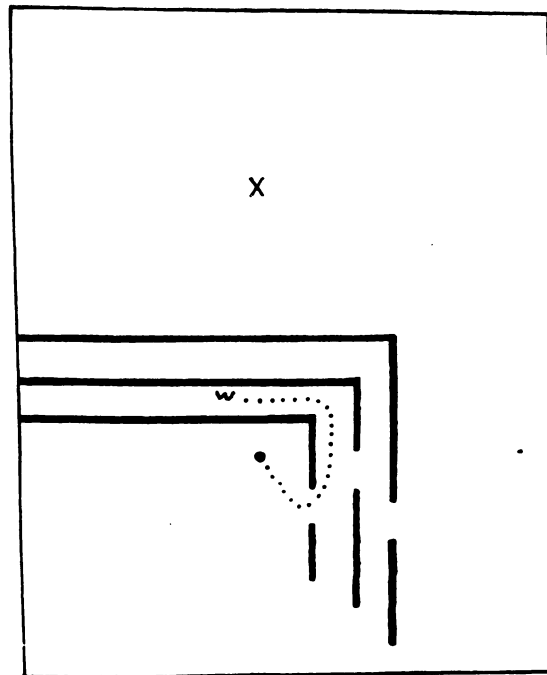


FIG. 2—Illustrating an error frequently made by subjects due to turning for the goal too soon.

(2) A tendency to follow the black lines. For many patients the black lines themselves seemed to form an irresistible attraction. As soon as his finger touched a line, the patient would begin to move up and down along it, being apparently unable to detach himself from it and make off across an open space.

In view of this finding, some subjects were tried on a maze in which the route to be followed was similar to that in D3 but was shown by a black line on white paper (Fig. 3). The subjects, however, were no more successful at finding the correct route on this than on D3 itself, although it seemed to give them greater satisfaction and was a less traumatic experience to them.

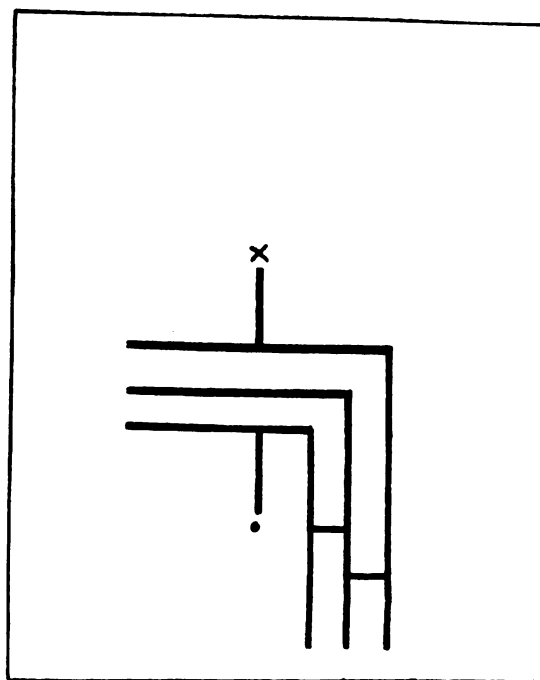


FIG. 3.—A Maze following the same principle as D3, but in which the subject had to run his finger along the black line instead of avoiding it.

(3) A tendency to make for gaps and blind alleys. If, while following down the side of the black line, the patients came to one of the gaps, they seldom passed it over. They nearly always went through the gap and explored the blind alley beyond.

(4) Forgetfulness of the goal. Many patients would start off in the right direction with apparent insight, but after a few seconds began moving their fingers through the gaps with painstaking care and then sat back as if their task was completed. Questioning revealed that they had nearly always lost track of the task set them.

(5) Inability to keep more than one command in mind at a time. This was indicated by the manner in which patients would frequently switch from one type of mistake to another, depending on the latest instructions they received. (E.g. The patient begins tracing patterns along the black lines. E.—“I want you to show me the way to the cross”. Patient moves finger straight over the black lines. E.—“But you must not go over the black lines”. Patient moves

along the black lines to the left and goes off the paper. E.—“But you must not take your finger off the paper”. Patient moves straight over the black line again. E.—“But you must not go over the black lines, you must go round them”. Patient starts tracing along the black lines again.)

DISCUSSION

It is always tempting, when reviewing and summing up a piece of work, to try to synthesize the findings into a single conclusion and to underline the proof or refutation of one or more hypotheses. Thus from the present piece of work it might be concluded that the performance of seniles on the maze test indicates two kinds of reason for failures; an *over* dependence on the environment on one hand (as shown by the over-riding attraction of the goal, the lines and the gaps), and an *under* dependence on it on the other (as seen in the tendency to lose sight of the goal, and in the inability to respond to more than one instruction at a time). Poverty of memory seems to be an important factor, since the effect of preliminary training wears off abnormally quickly, but that these patients do not completely lack some aspects of memory is indicated by the fact that response to training is seen in their case as it is in normal people.

It is possible, moreover, to regard each of these abnormalities as one part of a single comprehensive defect or “Grundstörung”, i.e. as individual symptoms of “restricted intellectual grasp” or “narrowing of the field of consciousness”. Thus, these subjects show the typical “concrete” attitude of Goldstein (1939), being able to concentrate on only one aspect of their perceptual environment at once.

But such conclusions and summaries do not really assist the understanding and management of the condition itself. Since little can be done to enlarge a restricted intellectual grasp, there is little to be gained from underlining its presence; and the naming of a deficit does not really lead to an understanding of it. As was suggested in the introduction, a study of the stimuli to which these subjects *do* respond and of the conditions influencing their behaviour has considerably greater promise.

From the observations reported here, it seems that the behaviour of patients in a route-finding situation is influenced not only by recent training in allied tasks, but also to some extent by perceptual stimulation of other types. This is in agreement with the findings of other workers, that “warming up” of mental activity assists the performance of actions rendered defective by organic cerebral injury. The most notable example is in the sphere of aphasia (Lashley, 1950), but a similar phenomenon has also been reported in the organic amnesic states (Williams, 1953). It is probably because of the “warming up” supplied by occupational and social therapy that patients suffering from intellectual impairment in old age respond so well to these types of treatment (Cosin, 1954; Donahue, 1950).

It is clear, however, that the route followed by a senile patient is influenced by several factors besides that mentioned above. Disregarding again the physical aspects of the condition, we find that on the psychological side it is influenced by the directness of the route itself (a route going straight to a goal is found more easily than one involving detours), by the amount of “support” afforded by the route (patients prefer moving along black lines to going across open spaces), and by the simplicity of the total setting. At the same time a patient is *not* assisted by the repetition of complicated instructions or by the clarity of the goal itself. If a set of instructions is too complex to be grasped at once, its

repetition only appears to be confusing, and if a goal is too clear and positive the patient finds difficulty in detaching himself from it.

From these considerations it is clear that the supervision of senile patients will not be eased by many of the cues or aids which assist the mentally healthy. A mass of sign posts throughout a hospital will not be any help to a person who does not know where he wants to go. The repetition of instructions (first right, second left, etc.) will not help a person who cannot take them in. On the other hand, the amount of individual supervision required by senile patients might be cut down by other methods such as (a) daily training along the route desired, (b) a convivial and stimulating (though not too varied) environment, (c) the building of houses or institutions which incorporate the cues to which senile patients do respond; i.e. buildings in which they can be left to wander without the danger of their losing their way.

Such buildings are not really impossible to envisage. A ward or house where the toilets (for which the patients are probably searching when they begin to wander) are placed in the most central and obvious position, instead of being discreetly hidden at the end of a passage, and are surrounded by a circular corridor off which all other rooms lead, should assist considerably. In whichever direction he wanders in such a building, the patient will automatically arrive where he wants or is wanted to be, and the amount of frustrating direction he requires will thereby be reduced.

The study of senile dementia, as of all cases wherein normal mental function is impaired, is of interest no less to the theorist than to the practitioner. If dementia is regarded as the loss of intelligence, then it must be concluded that factors which influence the patients studied here are also involved in the behaviour of normal people in similar situations. Thus, intelligence—or at least those aspects of it demonstrated in maze tests—involves (1) Ability to detach the self from the goal and from material “supports”, (2) Ability to keep many different aspects of a situation in mind at the same time, (3) Ability to perceive a cue but yet to refrain from responding to it till the appropriate moment, (4) Ability to profit from a past experience even when this took place a long time ago, (5) Ability to find a solution without being “warmed up”. Further study of these factors and conditions in normal people and in those suffering from localized lesions of the frontal and parietal cortex, together with the standardization of tests based on these dimensions might well be profitable.

SUMMARY

After clinical observation of some 20 patients suffering from senile dementia in whom spatial disorientation plus a desire to wander created a severe practical problem, some experiments were carried out to assess the factors and conditions influencing the routes chosen by subjects in this condition.

Sixty patients aged 65 to 95 admitted to hospital because of intellectual impairment were tested on a simple visual maze under different conditions. It was found that preliminary training up to half an hour before the test itself significantly assisted performance. Mental stimulation by allied tests had some beneficial effect on maze performance, but the groups were too small for this to be ascertained reliably.

It was noted that in their choice of routes the patients were influenced by (a) the direction and clarity of the goal, (b) the amount of mental “support” afforded by the route (e.g. the presence of a black line), (c) the complexity of the instructions and of the total setting.

It is suggested that these findings might have implications of interest to those caring for the senile dement, and to those interested in normal intellectual behaviour.

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