INVESTIGATION OF AMNESIC DEFECTS BY PROGRESSIVE PROMPTING

BY

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There appears to be a growing tendency in the recent literature to ascribe the defects of memory seen in organic amnesic states to difficulties of activation (recall) rather than to those of registration or organization of impressions. This was foreshadowed by the clinical observations of such workers as Korsakoff (1889) and Bonhoeffer (1904), who remarked that amnesic patients might be able to find their way around the wards in which they lived, although they would deny, as soon as removed from these surroundings, that they had ever been inside a hospital ward. Although Gillespie (1937) argues from such observations that “the continuity of personal identity and mechanical memory are separate phenomena”, the evidence can also be interpreted in terms of inertia or inaccessibility of those memories which are not reinforced by perceptual stimuli.

Such an interpretation is supported by the observations of Grünthal (1923) who found that much past material for which a patient is ostensibly amnesic may be recovered if questions are put to him in such a way as partially to reinstate the forgotten situations. Experiments on learning conducted by Brodmann (1904) and Gregor (1909) with amnesic patients also demonstrated that the apparently forgotten leaves traces which may be seen in a saving on the number of repetitions required for re-learning. Schilder (1942) concludes from a consideration of this evidence that “a psychic experience once conceived does not completely disappear from the psychic field” but “becomes paler in the course of time... It can be evoked when the immediate situation demands it”.

More recent experimental confirmation of this hypothesis has been forthcoming from studies of amnesia following electric convulsion treatment (E.C.T.). Mayer-Gross (1943) and Zubin (1948) both report that recognition is significantly less severely affected by this treatment than recall, and Janis (1950) further found that past experiences which patients cannot recall when first asked about them may be recovered if the patients are allowed the opportunity to “work on” their memory.

Recent animal experiments carried out by Klüver and quoted by Lashley (1950) point in the same direction and have led the latter to define amnesia as “a lowered level of vigilance, a greater difficulty in activating the organized patterns of traces”.

One difficulty in assessing the clinical evidence in this field is the lack of systematic comparison between the availability of memory in normal and abnormal subjects. A study of the availability of memory in general, in relation to the total amount of material remembered, is necessary before organic amnesia can be considered solely in terms of inertia of mental functions. An experimental technique has been designed in a preliminary attempt to meet this need, and the result of its application in a small group of subjects is described in the present paper.

Method and Procedure

The experiment was conducted on patients between the ages of 17 and 60 in the United Oxford Hospitals. The term “amnesic state” refers to patients who appeared sufficiently alert and rational to carry on coherent conversations, but who claimed to have little recollection of their experiences after comparatively short intervals. Intensive testing usually revealed the presence at this time of serious defects in intellectual ability, but the memorizing defect remained relatively the most outspoken disturbance. The majority of patients presenting this condition were suffering from concussional head injuries, intracranial tumours, or tuberculous meningitis.

The test material consisted of (1) a sheet of paper on which were painted silhouettes of the following six animals: dog, rabbit, goose, elephant, cat, horse; (2) six booklets each consisting of a series of nine inkblot sketches graded from a shapeless blot in progressive approximations to a picture identical with one of the animals on the first sheet (Fig. 1). The subjects were presented with the sheet of pictures and asked to name and remember the animals on it. Two hours later they were asked to name as many of the animals as they could recall. For each animal that they failed to name they were then shown the first
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sketch of the appropriate booklet, with the following instructions:

"Let me give you some help. As I turn over these pages, each picture will become more and more like one of the animals you have forgotten. Tell me as soon as you see what animal these pictures are going to turn into, or as soon as you remember any of the animals you haven't yet mentioned."

The patient's responses to each picture were recorded. Every time a patient ventured an opinion as to the final outcome of the series, he was asked, "Do you remember seeing that on the sheet of paper before?" If he mentioned an animal already named, he was told, "But you remembered that already. This is going to be one you haven't told me about." Other incorrect suggestions were left uncorrected.

The number of pictures in a series which had to be shown to a subject before he remembered having seen the original was taken as the number of prompts given to him. It may be mentioned that none of the subjects possible for disability, age, and length of stay in hospital. One half was again tested for their recall after four days, and the other half after seven days. Unfortunately, only six of the amnesic patients were in the same mental state and available for retesting seven days after the original exposure.

The responses were scored according to the following points: (1) number of pictures recalled without prompting; (2) number of pictures recalled or recognized with the aid of prompting where necessary.

On those pictures not recalled alone, but recalled with the aid of some promptings, the following additional facts were noted: (3) number of promptings needed to secure correct "guess" of what animal the pictures would turn into; (4) number of promptings needed to secure recollection of its previous exposure.

Results

The distribution of the control and amnesic subjects according to the number of pictures (1)

<table>
<thead>
<tr>
<th>No. of Pictures Recalled per Subject</th>
<th>Control</th>
<th>Amnesic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recalled without Prompting</td>
<td>Recalled with Prompting where Necessary</td>
</tr>
<tr>
<td></td>
<td>2 hours</td>
<td>4 days</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>2</td>
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<tr>
<td>5</td>
<td>7</td>
<td>6</td>
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<td>4</td>
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<td>1</td>
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<tr>
<td>0</td>
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<td>—</td>
</tr>
<tr>
<td>Average</td>
<td>4-95</td>
<td>4-9</td>
</tr>
<tr>
<td>Proportion of pictures recalled</td>
<td>0-825</td>
<td>0-816</td>
</tr>
</tbody>
</table>

Fig. 1.—Samples of material, showing the first, third, sixth, and ninth pictures in two of the booklets. The ninth picture is identical with the one seen previously.
recognized after an increased time interval, but the decline is quicker and greater in the amnesic group than in the control group. The ratio of the material recalled without prompting to the material recalled with prompting is greater in the amnesic group after both time intervals, and increases in both groups with the lapse of time.

For the pictures not recalled alone, but recalled or recognized with the aid of prompting, the distribution of the subjects according to the average number of promptings needed per person to secure the naming of the pictures and those needed to secure recollection are shown in Tables II and III and in Fig. 2 columns 6–10. It will be seen that the amnesic group does not require many more promptings in order to name the pictures than the control group, but it does require considerably more promptings in order to recollect having seen the pictures before. For both naming and recollection of the pictures an increasing number of promptings is needed with the lapse of time in both groups of subjects.

There was some variation between the number of promptings needed for the naming and recollection of the different pictures, but the difference between the amnesic and control groups was consistent for all pictures.

**Interpretation and Conclusions**

Organic memory defects have been ascribed by many recent writers to the inaccessibility of memories rather than to their absence. The experiments reported here suggest, however, that the availability of particular memories is relative to the total amount of material remembered, and may be retarded in certain conditions in both amnesic and normal subjects. Thus, although the gain obtained through prompting is relatively greater after a given time interval in the amnesic than in the control subjects, there is also among the former relatively more material for which the subjects remain totally amnesic. This suggests that amnesia cannot be wholly accounted for by inaccessibility as measured by recognition, although recognition and recall appear to represent different degrees of availability. It is not denied, however, that further evidence of the after-effect of a previous experience might be gained through different techniques, such as barbiturate hypnosis (Russell and Nathan, 1946), or the measurement of behaviour changes (Williams, 1950).

There remains the question, To what is the lack of availability due? Is it due in the situation described here to the difficulty found in responding to promptings, a defect of perception rather than of memory?
Is it due to the difference of "mental set" present at the re-test, or is it due to fading of memories with the lapse of time?

The findings cannot be explained entirely in terms of perceptual defects, because, as seen from Table II, the amnesic groups were able to name the pictures nearly as well as the control subjects. Nor can the results be interpreted in terms of "set to remember" or to the presence of discharged and undischarged tension systems (Zeigarnik, 1927), for, although at the delayed test the subjects had already been once asked for their recall and might thereafter have put the matter out of their minds, this condition applies to the 10 control subjects retested after four days as well as to those retested after seven days, between which groups significant differences were still found. The passage of time, however, seems to be accompanied by a decreased availability of memories in the control group which is seen in two aspects: in the decreasing ratio of material recalled without prompting to that recalled with, and in the number of promptings needed per picture to secure recall. In the amnesic subjects the lapse of time is accompanied by similar changes, but the speed of change is quicker than it is in the control group. In some respects (see Tables II and III) the memories of an amnesic subject after two hours are in the same state of availability as are those of a normal person after four to seven days.

These results suggest that the chief difference between the memories of normal and amnesic subjects does not lie in the availability of memories per se, but in the susceptibility of memories to the effects of time. I have reached a similar conclusion from a different type of experiment on different subjects (Williams, 1952). Although this has probably been recognized by the majority of clinicians (Schilder, 1942) it is considered worth emphasizing again as it does not appear to have received previous experimental verification, and the duration of memory traces does not up till now feature as a dimension measured by any of the standardized memory tests.

### Summary

A technique has been devised to study the accessibility of memories in relation to the total amount of material remembered.
When material cannot be recalled progressive promptings are applied until the original situation is reconstructed.

An experiment using this technique with 20 control and 31 amnesic subjects at different time intervals demonstrates that the memory of amnesic subjects is less accessible (relative to the amount spontaneously recalled) than is the case in normal individuals, but that inaccessibility alone cannot account for all the material forgotten by amnesic patients.

Accessibility decreases with the lapse of time, but does so more quickly in amnesic than in normal subjects. After two hours the amnesic subjects show much the same condition as the control group after four to seven days.

It is concluded that inaccessibility of memories is not in itself the prime difference between amnesic and normal subjects, but that a more important difference is the speed with which this accessibility diminishes.

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