

STUDIES IN LEARNING IMPAIRMENT. I: SCHIZOPHRENIC
AND ORGANIC PATIENTS.

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ABILITY to learn and retain relatively unfamiliar materials has been shown to be impaired in many clinical syndromes, both organic and functional. The testing of this ability features in some form or other in several clinical tests of intelligence, such as the Wechsler Scale and the Binet, while it is more directly tested in the various memory scales. As is well known, efficiency of learning declines with age, and can be greatly reduced by organic brain damage. There is evidence also, which we shall briefly review, that it can be variably reduced in schizophrenia and in psychoneurosis.

With regard to impairment in schizophrenia, Gardner (1931) believed that schizophrenics show even *prepsychotically* an inferior learning ability when compared with a like number of manic-depressive patients. He found that schizophrenics, before the onset of the psychosis, do not go as high in grade status in school as the manic-depressives. In this study, however, the comparative school *attainment* of a schizophrenic group is evaluated in an unreliable way, and whether or not this finding should be more accurately confirmed, it has little more significance than to suggest a predisposition to impairment, which becomes more obvious in the later clinical setting.

A recent study by Huston and Shakow (1949) puts the problem on a sounder experimental basis. They used two learning tasks. The first consisted of pursuit-learning, and this required a progressive acquisition of skill in following a rotating target. The second was a similar motor skill test, in which a turntable revolved only when the patient kept a pointer on the target, so that the measure of learning achievement was given by the time taken for the turntable to revolve a fixed number of times. The writers found that, even with those schizophrenics rated as fully co-operative, there was a significant reduction in learning achievement when the group was compared with a normal control group. They found also that, with repeated retesting, some schizophrenics were able to reach perfect performance, and this led the writers to conclude that *capacity* to learn is unimpaired, and that it is a functional interference which so much reduces the schizophrenic performance below the normal. This impairment, they point out, makes the rehabilitation and re-education of the schizophrenic particularly difficult, but, conversely, it also suggests that adequate learning tasks may have some prognostic value.

As to learning efficiency in the psychoneurotic, several writers have drawn attention to distinctive qualities of failure which are of some interest. Trist (1941), using the Rey performance test, observed that the rotation of the

peg-boards upset the neurotics so that they tended to spoil their performance. Zangwill (1943, 1946), using three short tests (including the Rey) as an indicator of memory impairment, observed that patients with anxiety states or hysterical reactions seemed to give characteristic reactions on these tests. Neurotic performance was apt to be highly variable and inconsistent. On the Rey itself, he found learning to be not infrequently slow and showing occasionally stereotyped patterns of error, while some cases showed peculiarities of tempo and procedure. From the nature of the test, differences between the failure of neurotics and that of uncomplicated organic cases could only be observed qualitatively, but the writer concluded that Rey's test, with a procedure modified by Davis of Cambridge, could prove helpful in the differential diagnosis of organic and psychogenic disorders of memory. Davis himself (unpublished communication, 1950) used the test on psychoneurotics, and some of his cases he found to come very near success and then to make an extravagant number of mistakes again.

As to the actual tests used in the previous work, the Rey has undoubted value, but has been found unreliable in patients of high intelligence. Even though moves and time are recorded carefully, the value of the test depends primarily upon the qualitative grasp and experience of the individual examiner. Zangwill (1943) concludes regarding the use of his three short tests (repetition of digits, Babcock sentence repetition, and the Rey) that "the learning defect as displayed in these simple experimental settings appears sufficiently constant and uniform to justify further research and eventual standardization of appropriate tests."

In designing the present investigation, therefore, we have borne in mind both the value of the qualitative observations that good clinical tests can provide, and the need to make our estimate of learning efficiency more objective with regard to the obvious factors of age and intelligence level. Huston's and Shakow's study and Babcock's tests (1940) have demonstrated different methods of assessing the degree of learning impairment in schizophrenia, while Zangwill's tests have indicated that it should be possible to measure more objectively the kinds of failure in psychoneurotics. We can summarize the objects of our study as a whole as—(1) to set up suitable learning tasks which will provide an objective measure of progress in learning, as well as indicating in easily recordable form some of the distinctive features of schizophrenic and psychoneurotic failure, and (2) compare the performance of normal subjects on these tasks. In the present paper we shall give the results only for the schizophrenic and organic patients, as the preliminary results on the psychoneurotic group seemed to warrant separate treatment and a more extensive survey.

LEARNING TASKS AND PROCEDURE.

The two learning tasks were :

(1) *Word-pair Learning.*

This consists of 10 sets of word-pairs which could be classed as "hard," in the sense used by Wechsler that the learning of them requires the forming

of a new and unfamiliar connection. The pairs of words are : (1) old—easy ; (2) thought—comfort ; (3) captain—train ; (4) care—sleep ; (5) monkey—bird ; (6) story—change ; (7) desert—table ; (8) general—small ; (9) time—money ; (10) storm—chance.

These 10 pairs are read out aloud slowly one by one in the same order, with a short pause between each pair. The subject is told to listen carefully to the pairs of words as they are read out, and to try and remember them so that when the *first* word only of each pair is given to him, he will be able to recall the word that went with it. The subject is told whether his answer is right or wrong, but no further help is given him. The list is then read out again up to a maximum of 10 repetitions, or until the subject has correctly recalled all 10 pairs in a particular series. If a subject makes a wrong answer but corrects himself quickly, this is counted as right. If he gets the word right *after* the examiner has told him wrong, that is counted as wrong.

(2) *Performance Task—Switch Learning.*

Apparatus.—This was contained in a box. In the centre of the top of the box stood a small 6-volt bulb. Also on top of the box were 3 double pole, double throw toggle switches. These were the subject's switches. At the other end of the box was another row of three similar switches. These were the experimenter's switches. The lay-out is shown in Fig. 1 below.

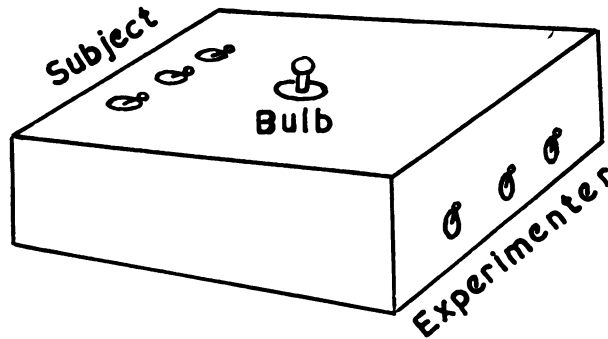


FIG. 1.—Diagram of switch-learning apparatus.

A battery inside the box was wired to the bulb through all the switches in such a way that the circuit was completed when, and only when, all the switches at one end were in the same position, up or down, as those at the other. Thus, in whatever position the experimenter set his switches, the subject had to put his switches in the same position to make the light come on. The movements made by the experimenter were partially concealed from the subject by the depth of the box, but, to prevent the subject from taking cues from these movements, the experimenter's switches were placed in a different order from those of the subject.

The spare connections of the subject's switches were wired through a separate battery, one to each coil of a Palmer 3-pen chronograph, in such a way that when the switch was in the "down" position the coil was activated,

and in the "up" position the circuit was broken. Thus, a record was made of all movements of the switches, and the time at which they occurred.

Procedure.—The subject had to learn 5 combinations of switches, chosen arbitrarily. The order of the 5 positions was the same in each trial, and he was allowed up to 10 trials to learn to switch all 5 on without any superfluous moves. He started always with all 3 switches up, and the minimum number of moves for a whole trial was 8. When a perfect score was made in a trial before the 10th, he was asked to go through them again to make sure he had learned them securely.

In the first trial the 5 positions had to be found by trial and error. The subject was seated at his end of the box, with the experimenter opposite. Instructions were given in these words :

" I want you to learn some combinations of switches. These are 3 ordinary switches, with just two positions—up and down (*demonstrating*)—and when all 3 are in a certain position this light will come on. When we start, I want you to move the switches until the light comes on, then remember the position for next time. I shall then alter the combination, and get you to find another one, and so on for 5 different combinations. The first time you will have to do it by trial and error ; then remember them so that you can switch them straight on next time. We shall go through them until you can switch all 5 on at once, with no extra moves. Remember it is not the order in which you switch them on that matters, but only their final position."

The experimenter then set the first combination. Each time the light was switched on, the experimenter first set the next combination on his own switches, then put the subject's switches in the "up" position, making an interval of as nearly as possible 5 seconds between the light going on and the switches being replaced.

RESULTS.

I. *Comparison of Normal and Schizophrenic Performance.*

(1) *Word-pair Learning.*

The schizophrenic group consists of 35 patients, mainly early acute cases, and does not include any designated as markedly paranoid in symptoms, nor does it include any patients who failed to co-operate on the tasks. The age range is from 17 to 41, with the majority of cases falling within the 20–30-year age-group. As some criterion of prepsychotic attainment, the raw score on the Wechsler adult intelligence scale vocabulary test has been used, and, for the group, this ranges from 16½ to 40, the majority falling within 20 and 30.

The normal group consists of 32 subjects, the distribution of age and vocabulary level corresponding very closely with that of the schizophrenic group, although the normals are slightly higher on vocabulary but also slightly older than the schizophrenics.

Results for the two groups are shown in Fig. 2 below, in which the average number of word-pairs correctly recalled on each of 10 trials is given.

As a group, the schizophrenics appear considerably worse than the normals on this task, and this is perhaps brought out more clearly in Fig. 3, where the

same results are given in the form of histograms which show the number of subjects in each group who reached a perfect score of all 10 word-pairs correctly recalled on each of the 10 trials.

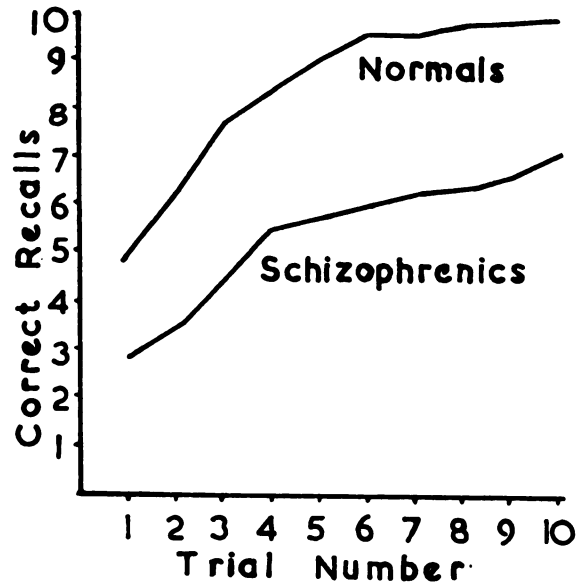


FIG. 2.—Graphs showing word-pair learning of normals and schizophrenics.

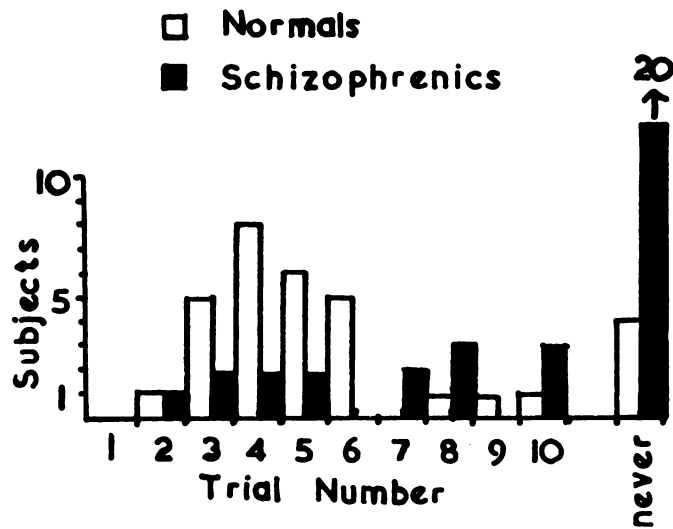


FIG. 3.—Histograms showing number of subjects in the two groups reaching perfect performance at each trial on the word-pair learning.

It will be seen that, whereas only 12.5 per cent. of the normals fail to reach perfect recall on the 10th trial, 57.1 per cent. of the schizophrenics fail to achieve the maximum number. Within the group the schizophrenics show considerably more variation than the normals. Some of the best schizophrenic patients

are quite as good on the tests as the best of the normals, but whereas no normal scored less than 9 on the tenth trial, one schizophrenic scored 0, and 14 had scores of 6 or fewer. There is no doubt that most of the schizophrenics make some progress, but they often start lower and remain lower in their learning curve throughout the trials. Individually, also, the schizophrenics tend to be much less *consistent* in their learning progress than the normals, 27 of them (77 per cent.) having at least one relapse, i.e., scoring less on one trial than on the preceding trial, whereas only 8 normals (25 per cent.) ever dropped below their previous score. In some cases the schizophrenics seem to have difficulty in overcoming what appears to be an interference from their own associations to the stimulus words as they are given out by the experimenter. This may at least in part account for the much slower learning that is observed in a number of the patients. The quality of the impairment will be made clearer when we examine the individual variations within the group.

(2) *Switch Learning.*

The same 35 schizophrenic patients carried out this task as for the word-pairs. The normal group consists of 26 subjects, of comparable age and vocabulary distribution. Results for the two groups on this task are given in Fig. 4 below, in which the average number of moves required at each trial for the total of 5 switch combinations is shown.

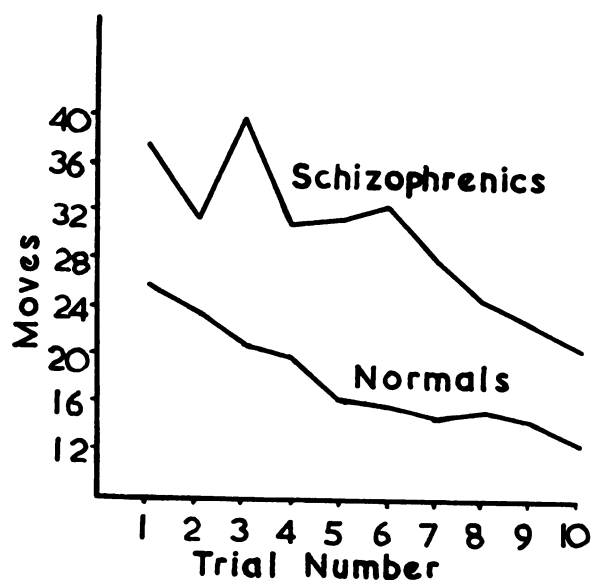


FIG. 4.—Graphs showing switch-learning performance of the normal and schizophrenic groups.

As with the word-pair task, the results are more clearly presented in the form of histograms in Fig. 5, showing the number of subjects in each group who reached a perfect score (i.e., completed the task in the minimum possible number of moves, which is 8) on each of the 10 trials.

Whereas 30.8 per cent. of the normal group never reach a minimum score, 62.9 per cent. of the schizophrenics fail to do so. Again, however, it is the much greater variation between subjects and within the performance of single subjects that most distinguishes the performance of the schizophrenics from that of the normals. For, although some of the normals show little improvement on the task, they also show no evidence of the considerable "spikes" in performance seen in the learning graphs of many of the schizophrenics. That is to say, some of the patients may appear to be making a steady progress towards optimum learning of the task. They may then, for example, meet with a failure on a combination which they thought they knew. Instead of adjusting to this situation, as the normals habitually do, by making a reason-

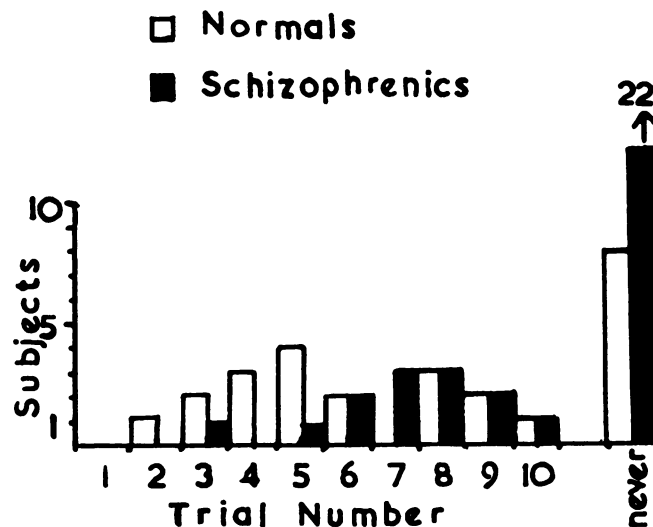


FIG. 5.—Histograms showing number of subjects in the two groups reaching perfect performance at each trial on the switch-learning task.

able trial and error to find the correct move-pattern again, they may resort to a mere repetition of the same error over and over again, so that their performance seems to break down as soon as they come upon a difficulty of this kind. Instead of facing it, they revert to purposeless movements. This accounts for the fact that the greatest number of moves ever made in one trial by a normal subject was 58, whereas many figures well above this are found in the schizophrenic records, including one trial totalling 208 moves, representing completely undirected movements of the switches.

One other feature of some interest in this connection is the sharp rise, shown in the graph of Fig. 4, in the schizophrenic curve at the third trial. Whereas a slighter rise on trial 6 is artificial, in that it is due to the great number of moves made by one patient only, this rise on trial 3 perhaps does represent a distinctive trend of some importance, because 20 out of the 35 patients were, in fact, worse in their performance on the third trial than they were on the second. It seems to represent a quite common temperamental quality in these patients to react to early failure to recall the switch positions by unintelligent

trial and error. It will be seen that the actual trial and error scores (i.e., on trial 1) for the schizophrenic patients are considerably worse than the normal. As was to be expected, there is a much less systematic approach to the problem in the schizophrenics than in the normals. The value of t obtained from a comparison of the mean number of moves of the two groups on the first trial is 2.520, which gives a probability of less than .02.

II. *Individual Variations within the Schizophrenic Group.*

We shall now examine rather more closely the quality of the individual variation on the two tasks within the schizophrenic group. In some patients the impairment is extreme, progress is almost *nil*, the quality of performance showing perseverative trends and "easy" associations on word-pairs. Although apparently co-operating, such patients have great difficulty in directing their thinking to the task which the experimenter is asking them to carry out. In other patients there is no evidence of any tendencies of this kind. Whatever the preoccupations and affective disturbances may be, the illness does not seem to have encroached upon the individual to the extent of impairing him mentally.

Briefly, we shall pick out a few illustrations of the type of impairment that is found. First, although most of the chronic cases show a fairly marked impairment, this is not invariably so. Impairment on the learning tasks seems to be related not so much to chronicity of the illness as it is to degree of impairment shown by the patient's score on a set of abstraction tests described elsewhere by Hall (1951). Certain of the chronic cases do, however, show an extreme degree of impairment in relation to what would be expected from prepsychotic intelligence. They display sometimes a complete inability to understand why, for example, the two words making up the word-pair task are "unconnected." A similar perplexity has been observed in senile organic states, and is a common observation in such patients' failure on sorting tests. For this reason, and also because "easy" familiar associations continually intruded, some of these patients made little learning progress on this task. An example from one case will illustrate the kind of responses obtained, the stimulus word given by the experimenter being shown first, and followed by the patient's response to it: Desert—Water, I should say. Old—Opposite, do you mean? Young? Storm—Wind goes with storm, so to speak. Story—Story-teller, do you mean? Time—Time marches on. Can't say; haven't a watch on me.

Although in some cases these personal easy associations gradually fell out so that a second stage was reached in which the patient began to fill up the gap from the experimentally given associations, even though incorrectly at first, a few of the patients never overcame this tendency, their failure being quite as marked as that shown by some of the older organic patients we shall mention below. It is, it seems, very far from being a simple matter to analyse the responses of these patients even in such a relatively controlled situation.

Among the acute cases also there is considerable variation. At the one extreme, the nature of the patient's failure may be clearly due to excessive

anxiety about his performance as he fails to improve. On the other hand, one patient who showed extreme thought disorder, incoherence of speech and who was visually and auditorily hallucinated on admission, was able to learn all the word-pairs correctly after the third repetition.

Although there are several cases in this group who are markedly better on the word-pair task than the switches, it is usual for impairment to be shown on both the tasks. Probably the switches task brings out more clearly the discontinuities in performance, the oscillations that are a feature of many of the schizophrenic learning curves. Further, the badly impaired patients may easily fall into patterns or stereotyped systems of movement which represent a similar tendency to that shown on the word-pairs when they produce "easy" associations.

The outstanding feature of the results is the very great *intra-group* variation, even when allowing for the differences in intelligence level, educational and occupational background, and other relevant factors. We have, at one extreme, a degree and quality of failure in certain of the chronic schizophrenics which we shall see is comparable in many ways to that of some organic patients. At the other extreme there is no evidence whatever in a few cases of any impairment or oddity in performance. It is doubtful, further, whether it is feasible to discuss the group results in terms of "incapacity" or some kind of "functional" interference. Both may clearly be instrumental in different cases. On the one hand, the failure appears to be due mainly to emotional interference such as is not infrequently found in the psychoneurotics. The failure of other patients appears to be in no way connected with emotional disturbance, the patient being typically unconcerned at his poor performance.

III. *The Learning Performance of Organic Patients.*

As with the schizophrenic group, so with the organic we find great variation in the level of performance and method of approach to these learning tasks. In this preliminary survey we have intentionally made no attempt to restrict our investigations to any particular subdivision of patients, and we find that performance ranges all the way from the apparently unimpaired to a level where there is no learning whatever, but rather a mere repetition of identical error.

The results for 10 patients tested before and at various intervals after leucotomy are shown in Table I. For convenience of tabulation, the *average* number of word-pairs correctly recalled and the *average* number of switch moves made are given in their appropriate column.

Although the follow-up on these patients has not been completed, there are indications of a considerable variation within the group. Case 1 shows a marked drop on both tasks 8 days after operation, but then returns to pre-operative level when retested some weeks later. Case 2 shows little change of any significance even at the first post-operation retest. As was to be expected, on the 8-day testing, most of the patients were considerably slower than they had been previously in tackling the switch-combination task. Apparent organic features that occur here are perseveration on the word-pairs

TABLE I.—*Learning Scores for 10 Patients, (W) being the word-pair scores, (S) the switch scores, at the intervals stated.*

Case.	Clinical description.	Sex.	Age.	Vocab. score.	Pre-operation.	Post-operation.		
						(i) 8 days.	(ii) 5-7 wks.	(iii) 5-7 mths.
1 .	Paraphrenia	. M.	. 44	. 29½	W. 6.4 .	0.5	6.0	6.6
					S. 24.2 .	46.0	18.4	16.4
2 .	Paranoid state with depression	. M.	. 37	. 29	W. 8.0 .	9.3	8.8	9.6
					S. 15.6 .	14.8	22.2	18.2
3 .	Chronic anxiety	. F.	. 35	. 31	W. 9.1 .	0.7	9.0	..
					S. 19.0 .	38.0	25.6	..
4 .	Paraphrenia	. M.	. 37	. 28	W. 6.1 .	4.3	..	..
					S. 28.2 .	32.8	..	..
5 .	Paranoid schizophrenia	. M.	. 33	. 37	W. 7.9 .	9.7	..	..
					S. 11.0 .	13.6	..	..
6 .	Simple schizophrenia	. F.	. 25	. 37	W. 6.0 .	4.5	..	4.4
					S. 34.0 .	76.4	..	24.6
7 .	Ditto	. F.	. 38	. 13	W. 4.3 .	4.9	..	..
					S. 51.6 .	102.6	..	..
8 .	Chronic anxiety	. F.	. 35	. 20	W. .	3.4	1.7	..
					S. .	17.4	31.6	..
9 .	Chronic obsessional	. M.	. 28	. 30	W .	5.8	6.6	6.5
					S .	..	..	7.9
10 .	Paranoid state	. M.	. 55	. 20	W. .	1.1	2.0	..
					S. .	66.2	49.8	..

in, for example, bringing up the same response word for 5 or 6 successive stimulus words. Case 1, in particular, was consistently incapable of maintaining his progress on either task. On the word-pairs his learning was superficial, the connections between the two words of a pair never being assimilated to a meaningful level. In the same way, his approach to the switches task is completely unsystematic.

We are concerned here primarily with the apparent organic features in the learning of these patients at the 8-day post-operation stage rather than with the recovery of function that most of them eventually show. From Table I it will be seen that Cases 1, 3 and 4 show little change even as early as this first stage, while Cases 2 and 6 show a very marked impairment at first, followed by a return to pre-operation level when retested at the 5-7-week stage. Clearly no conclusion should be drawn from this incomplete data, but it seems that simple, controlled tasks of the kind used may be of value in assessing reasonably objectively one aspect of the return of mental function in leucotomy patients.

We shall now examine briefly the findings obtained with a selection of the 30-40 organic patients tested. Results for 9 of these patients are shown in Table II. The tasks appear to be useful as an indication of the degree and quality of impairment, which obviously, having regard to the variety of factors involved, such as age, intelligence level, and clinical picture, shows a wide range of difference.

The first 3 cases, all of superior intelligence, were referred for psychological assessment prior to return to their normal occupations. All are of superior intelligence, and there was no evidence of impairment on abstraction tests or from scores on the Wechsler subtests. The learning tasks seem, however,

TABLE II.—*Learning Scores of a Sample of Organic Patients.*

Case.	Clinical description.	Sex.	Age.	Vocab. score.	Learning scores.	
1 .	Head injury : clinically some residual impairment 1 year after accident	M.	36	30	7.8	35.0
2 .	Tumour, left frontal region. Examined at (i) 4 weeks, (ii) 8 weeks, (iii) 3 months after surgical removal	M.	35	30	(1) 2.5 (2) 3.9 (3) 5.2	25.8 19.6 10.6
3 .	Right frontal lobectomy ; good recovery	M.	27	30½	7.9	17.9
4 .	Pre-senile dementia	M.	53	30	3.4	27.0
5 .	" "	M.	41	17	9.0	41.2
6 .	Organic paranoid illness of syphilitic origin	F.	53	26	8.5	28.4
7 .	Chronic alcoholic	M.	41	30	5.7	23.4
8 .	" "	M.	38	36½	6.8	10.2
9 .	" "	M.	47	22½	5.0	27.0

sufficiently difficult to detect some impairment in both the first two patients. Case 4 shows an almost complete failure on both tasks, his performance showing no improvement whatever, with many qualitative indications of profound organic dementia. He recalled 3 word-pairs correctly on the first trial, and 4 on the tenth trial. The associations he produced were often inferences or completions from familiar connections. For "General" his response was: "Well, could be private or lieutenant, if it was in the Army." He was also typically perseverative in his errors, tending to recall repeatedly his own previous answers. The same tendencies are found on the switch learning, for which he developed a routine system, which he carried out for all the 5 combinations. He seemed quite satisfied with his system, in spite of its failure to solve the problem set. The remaining cases show a more intermediate impairment, in that some learning does actually take place, even though it may be slow and uncertain.

For such a heterogeneous group no statistical comparison with the normal is feasible, and clearly it would not be possible to indicate the degree of impairment of an individual case until large-scale standardization at the various age and intelligence levels had been carried out. Nevertheless, even at this preliminary stage the tasks produce a type of information which seems a useful supplement to the standard tests, and give many indications as to quality of performance that are of value in a comprehensive assessment of a patient's present level of function.

DISCUSSION.

The two learning tasks that we have used in this study were designed to carry somewhat further the investigations that Zangwill and Davis had made on the nature of psychoneurotic and organic impairment of learning and memory. We have extended the research by studying particularly the performance of a schizophrenic group on these tasks, because it seemed to us that the recent investigation by Huston and Shakow, giving group comparisons, contributed little to our understanding of the *nature* of the learning deficit observed, while the tasks they used were confined to performance skills.

We believe that our own investigation has brought out certain points quite clearly on this problem. The first is that to investigate this, as for any aspect of mental impairment in "schizophrenia" as a whole, can only be a *preliminary* stage in a research which should then follow up the many smaller problems that emerge from study of the very wide variations within even a small group of patients like our own. We have found that some of the patients, particularly the chronic cases, show a degree and quality of impairment which is very similar to that shown by dementing organic patients and by some early post-leucotomy patients. Such patients make little, if any, progress; they may be so anchored to familiar, easy mental associations that such word-associations are more or less consistently reproduced throughout the word-pair learning task. On the switches they may formulate a system, to which they adhere throughout the task. This, the most extreme form of impairment, is shown almost exclusively by patients who are also severely impaired on the abstraction scale. There is much to suggest that the kind of perceptual patterning that these patients show on the sorting test, for instance, and the kind of perseverative systematic error on switches together with repetition of "easy" associations on word-pairs, are all aspects of the same basic phenomenon. The whole approach of the patient to tasks that are somewhat difficult is, by these deviations, at once greatly simplified, and apparently reasonably satisfactory to the patient as a method of solution.

We can see how such an approach comes about by examining the nature of the mental processes required for good performance of these learning tasks. To learn the word-pairs, most normals make a more or less conscious effort at establishing some sort of meaningful connection between the two words that make up a pair. This is the reaction to many sorts of *unfamiliar* material that Bartlett (1932) observed and termed the "effort after meaning." It is the effort to establish the unfamiliar within a familiar frame of reference. If the patient avoids or is incapable of making this effort, he is unlikely to make any learning progress, while the reproduction of "familiar" associations is merely a completion, in the Gestalt sense, analogous to the perception and recall of a circle with a gap as a complete circle.

To learn the switch-combinations, most normals of reasonable intelligence seem to approach the task as a whole, and not merely as a set of isolated, unrelated problems. Hence we find that even their trial-and-error procedure at the first trial is likely to result in fewer moves than the impaired schizophrenic or organic will produce. There is an intelligent anticipation in the way in which the more high-grade normals link up the first position with the second, and so on, for the series. There is also in quite a number of cases a more or less conscious attempt to fix the positions in the mind by appropriate verbal formulation. All this is lacking in the impaired patient. He may follow some simple rule, which is selected more or less by chance, and apply it to all the 5 switch combinations, and will not or cannot deviate from his personal solution of the problem however much the instructions are repeated.

We have seen, however, that this extent and quality of impairment is not typical of the majority either of schizophrenics or of organic patients whom we have studied. The failure of some schizophrenics where it occurs is nearer

in kind to that which we have found some psychoneurotics show. Here there is a severe emotional interference which may make the learning curve fluctuate considerably up and down instead of progressing reasonably steadily. There may be temporary evidence of true learning, only for this to be disturbed again when, for instance, a switch combination is failed which the patient believed he knew. He then seems at once thrown back on random movement of the switches, instead of persevering with a renewed trial and error. There are many temperamental characteristics of this kind which are revealed clearly in the switch-learning task.

We should conclude, perhaps, not only by again emphasizing that many early acute schizophrenics show no evidence of learning impairment, but that there appear to be all degrees of impairment within this group, ranging from that due primarily to emotional disturbance, down to a more or less complete failure comparable in degree and quality to that shown in some cases of organic dementia. Merely because of this similarity in approach and in quality of failure we do not, of course, wish to imply that there need be any causal similarity.

SUMMARY.

1. In this study of learning impairment, two simple tasks, one consisting of 10 word-pairs, the other of switch-combinations, have been used with a maximum of 10 trials to assess some of the factors and qualities of impairment found in schizophrenic and organic patients.

2. Comparison of the performance of the schizophrenics as a group has been made with that of a normal group similar in age and vocabulary score distribution, and it is evident that the most distinctive feature of the former is the much greater intra-group variation. On further analysis, qualities of performance in the schizophrenic are assessed in relation to affective disturbance, reaction to failure, and genuine incapacity.

3. Results obtained in various organic patients are examined with a view to comparing the quality of learning failure in organic dementia with that of deteriorated schizophrenics. Certain similarities are observed between the quality of performance of some patients of each group.

We wish to thank in particular Dr. R. E. Hemphill, Medical Superintendent, for first suggesting this topic of research to us, as well as for his continued interest in its progress.

REFERENCES.

- BABCOCK, H., and LEVY, L., *The Measurement of Efficiency of Mental Functioning*. Chicago: Stoelting, 1940.
 BARTLETT, F. C., *Remembering*. Cambridge: University Press, 1932.
 DAVIS, D. R., personal communication, 1950.
 GARNNER, G. E., *Amer. J. Psychiat.*, 1931, **11**, 247-52.
 HALL, K. R. L., to appear in *Brit. J. Med. Psychol.*, 1951, **24**.
 HUSTON, P. E., and SHAKOW, D., *Amer. J. Psychiat.*, 1949, **105**, 881-8.
 TRIST, E. L., *Occup. Psychol.*, 1941, **15**, 120-8.
 ZANGWILL, O. L., *Proc. Roy. Soc. Med.*, 1943, **36**, 576-80.
Idem, *J. Ment. Sci.*, 1946, **92**, 19-34.