THE DIAGNOSTIC AND PREDICTIVE ACCURACY OF THE WECHSLER MEMORY SCALE IN PSYCHIATRIC PATIENTS OVER 65

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IN a previous study of the efficacy of a vitamin-preparation (Krawiecki, Couper and Walton, 1957), the Wechsler Memory Scale Form I (1945) was administered on four occasions to each senile psychotic patient in the trial. Although the experiment produced interesting therapeutic results the present paper is not concerned with these but rather with the diagnostic and predictive implications of the Memory Scale changes.

At the beginning of the experiment all the cases clinically manifested a memory defect, presumed to be associated with cerebral changes. At the end of the experiment some of the control group, treated with an inactive preparation, had shown very significant rises in their scores on the Memory Scale. Since some of these had been very large it suggested that these patients might not have been brain-damaged or were less so than those patients who had shown little or no change on successive re-testings. It further suggested that the size of these changes resulting from the administration of the Memory Scale on four occasions, might be of greater diagnostic value than the results from a single testing. The effects of long periods of hospitalization and consequent lack of mental stimulation might easily have produced an "apparent" memory disorder with a resulting diagnosis of dementia. If the patient was given the opportunity to learn through successive repetitions however, it might show that the memory disorder was reversible and the diagnosis of dementia less certain.

It was therefore considered necessary to follow up the original group of cases for a further period of two years to be more certain of the diagnoses and then to relate these to the memory scale changes. In this way the diagnostic and predictive accuracy of the Memory Scale with regard to the problem of senile dementia could be more accurately evaluated.

METHOD

A period of two years elapsed before the records of the 50 patients were again examined. The 1955 diagnosis was then compared with the changes in symptomatology to discover, for example, whether the patient had recovered and had been discharged, whether there had been an intensification of the previous organic picture, whether regrading to voluntary status had taken place because of improvement and whether the patient was considered to have suffered previously from an affective rather than organic condition. During the period covered by the examination of the case records no reference was made to the Memory Scale changes.

As one half of the patients had previously received Parentrovite and the

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other half a placebo, the two groups were examined separately to avoid a possible contamination in the results. Full information on the experimental group was obtained although data was available on only 23 of the control group.

Results

Tables I and II show the two diagnoses for each patient in 1955 and 1957, the first Wechsler Memory Quotient (1955), the changes between this and the fourth Memory Scale Assessment, and relevant follow-up comments.

The significance of the experimental and control group changes was then evaluated. The two groups were again treated separately.

Discussion

It is apparent from Tables I and II that the size of the Memory Scale changes bears a relationship to the final diagnosis (1957). Both sets of results suggest that the size of the changes between the first and final assessments was of greater predictive validity than the diagnosis in 1955. Detailed examination of these tables shows that of the eleven changes in diagnosis for the experimental group and the seven in the control group, larger increases between the 1st and 4th assessments were obtained by those patients subsequently diagnosed as affective or discharged from hospital as recovered, in contrast to those who made much smaller increases and who either had the diagnosis of organicity confirmed or whose diagnosis changed from an affective disorder to one of dementia.

A more precise statistical treatment of these changes is contained in Table III and IV. The organics and functionals (1957 diagnosis) in both the experimental and control groups were closely equated for age (Tables III (*d*), IV (*d*)). Although the mean M.Q.s of the organics and functionals (1955 diagnosis) in the experimental group showed a statistically significant difference, there was a considerable overlap between these groups. The level of confidence was only between the ·05 and ·02 levels (Table III (*a*)). Since, however, the majority of these patients had been hospitalized for many years, it was not inconceivable that some of the patients diagnosed as suffering from dementia were in fact suffering from a pseudo-dementia. It was decided therefore to compare the 1957 diagnosis with the 4th M.Q. results. The result shows a very high level of statistical significance (Tables III (*b*, *c*)). The significant reduction in the number of misclassifications can be seen by reference to Table VA. If the cut-off point was first established at M.Q. 91, then all the 1955 organics scored less than this, though 60 per cent. of the 1955 affective group did the same. In contrast, if the 4th M.Q. and the 1957 diagnosis were taken, the cut-off point could be lowered to a M.Q. of 81. This would correctly identify 14 of the 16 organics, with no misclassification in the affective group. Similar results to these were obtained in the control group. Using the 1955 diagnosis and the 1st M.Q. a statistically significant difference was found between the organic and functional groups, though again a number of misclassifications occurred (Tables IV (*a*), VB). When the 1957 diagnosis was used with the 4th M.Q. results, a higher level of statistical reliability was achieved. This could not be attributed to a difference in the ages of the two groups, as no significant difference in age was established between the groups (Table IV (*d*)). Table VB shows that if a cut-off point was made at M.Q. 86, all the organics scored less than this and nine of the twelve functionals obtained scores above this point.

The initial diagnoses and the first M.Q. assessments were clearly not very reliable, though the results of the fourth assessment corresponded most closely with the final diagnosis. One of the most important distortions appeared to be the length of hospitalization with its resulting apathy. The importance of intensive stimulation, as presented, for example, by the successive re-testings, obviated this effect in the functionals to a considerable degree. For both the experimental and control groups there were large differences between the first and final M.Q.s for those subsequently considered to be suffering from an affective disturbance or who had been discharged as recovered. Those finally diagnosed as organics made much less progress on successive re-testings. The results from repeated re-testings, based on the principle of successive opportunities to learn, appeared of considerable predictive and diagnostic importance.

In spite of the predictive accuracy of the full scale however, it would be uneconomical to administer it several times when a diagnostic problem of possible senile dementia occurred. A shorter test involving the same principle of successive opportunities to learn appeared necessary. Further refinement could be achieved by analysing those sections of the test which were most impaired in those finally diagnosed as organic. Items which failed to discriminate could be omitted. Of particular relevance to this refinement is the experimental work of Ingham (1952). He suggested that memory could be divided into two sections based on general intelligence and a factor which he called "m" or retentivity: ". . . retained items . . . depend more upon 'm' than upon 'g', whilst both learning and immediate memory scales depend more upon 'g'."

The Memory Scale sub-tests were then examined. They were divided into those considered to be better measures of retentivity or "m", and those heavily dependent on present learning ability. Table VI shows the results from the different methods of analysis. The fourth Memory Scale assessment only was used. Those items referring to the patient's name, date of birth, and recitation of the alphabet were included under retentivity (R). Because the maximum retentivity score was only 5, the raw scores were multiplied by 14·6 to be comparable with the maximum learning score of 73. The learning score (L) comprised the patient's raw scores for meaningful passages, digits forward and back, visual memory and associate learning sub-tests.

Although there are patently large differences between the mean scores of the organics and functionals which need no finer statistical evaluation, detailed examination of the individual "Retentivity" and "Learning" items shows that only the "Learning" scores are of diagnostic value. In the experimental group, for example, the lowest retentivity score for the non-organics was 43·8. Seven of the sixteen brain-damaged subjects scored higher than or equal to this. In contrast the lowest learning score for the non-brain damaged was 22·0, whilst 13 of the brain-damaged group scored less than this. Similarly, in the non-brain damaged control group, ten patients scored over 40 in retentivity, whilst 3 of the eleven brain-damaged subjects scored more than this. In respect of the learning score, however, of the twelve non-brain damaged patients, eight scored more than thirty, whilst 10 of the 11 brain-damaged subjects scored less than this. The results appear to suggest that in psychiatric patients over 65, particularly those diagnosed as organic, present learning ability, as measured by the patient's ability to improve his performance on the final sub-tests over a period of four trials, is less than their ability to retain previously learned material. Since the functional patients also show this difference, though to a much less a degree, it is expected to be an exaggeration of the normal ageing process. Retentivity also seems affected in the organics, though much less than present learning ability.

TABLE I

Diagnostic and Memory Scale Changes for the Experimental Group Treated with Parentrovite

No.	Age (1955)	Years in Hospital (1955)	Diagnosis (1955)	1st M.Q. (1955)	Diagnosis (1957)	M.Q. Difference (4th–1st)	Follow-up Comments
1	77	1	Senile dementia	64	Affective Disorder	+23	Discharged, recovered.
2	77	9	Senile dementia	83	Senile dementia	−14	
3	78	42	Secondary dementia	50	Secondary dementia	+12·5	
4	87	30	Senile dementia	51	Senile dementia	+5	
5	74	2	Depressive with paranoid features	94	Senile depressive state	+28·5	Died, lung cancer.
6	73	1	Senile dementia	60	Senile dementia	+10	
7	75	2	Presbyophrenia	63	Presbyophrenia	+19·5	
8	75	33	Delusional insanity	62	Senile dementia	+2	
9	71	1	Senile dementia	69	Affective Disorder	+17	Discharged.
10	68	12	Korsakow psychosis	87	Korsakow psychosis	+7	Regraded voluntary.
11	67	32	Delusional insanity	61	Secondary dementia	+11	
12	65	3	Anxiety-depression	76	Anxiety-depression	+27	
13	69	30	Secondary dementia	62	Senile dementia	+1	
14	65	32	Delusional insanity Secondary dementia	59	Delusional insanity	+25·5	Regraded voluntary, works well, orientated.
15	67	1	Senile dementia	90	Affective Disorder	+25·5	Discharged after trial, made good recovery.
16	67	24	Senile dementia	53	Senile dementia	+11	Died, cardiovascular degeneration.
17	70	12	Delusional insanity	100	Delusional insanity	+14	
18	70	19	Melancholia	100	Secondary dementia	+10	
19	69	4	Senile dementia	48	Senile dementia	0	Died, peripheral failure, myocardiac disease.
20	66	32	Melancholia	58	Senile dementia	+3	
21	72	23	Senile dementia	59	Senile dementia	+3	
22	70	32	Mania	62	Secondary dementia	+11	
23	70	24	Delusional insanity with secondary dementia	49	Secondary dementia	+11	
24	65	6	Manic-depressive psychosis	99	Manic depressive	+9	
25	76	50	Dementia	48	Dementia	0	Died, cardiovascular degeneration.

TABLE II

Diagnostic and Memory Scale Changes for the Control Group Treated with Placebo

No.	Age (1955)	Years in Hospital (1955)	Diagnosis (1955)	1st M.Q. (1955)	Diagnosis (1957)	M.Q. Difference (4th–1st)	Follow-up Comments
1	75	46	Mania	69	Mania	+32·5	
2	72	30	Primary dementia	89	Primary dementia	+11	De-certified, transferred to old men's home.
3	77	5	Senile dementia	62	Senile dementia	0	
4	65	4	Anxiety-depressive	87	Anxiety-depressive	+21	Died, bronchopneumonia.
5	66	5	Melancholia	57	Senile dementia	+9	Died, cardiovascular
6	65	21	Delusional insanity	70	Delusional insanity	+42	
7	65	28	Melancholia/dementia	64	Senile dementia	+17	
8	65	1	Dementia	56	Dementia	+17	
9	65	42	Melancholia, secondary dementia	55	Secondary dementia	+11	
10	79	4	Senile dementia	48	Senile dementia	+7	
11	79	1	Senile depression	69	Depression	+10·5	
12	79	30	Senile dementia	59	Senile dementia	+2	
13	77	6	Depressive state	60	Depressive state	+16	Discharged, recovered.
14	83	1	Melancholia	94	Melancholia	+30	
15	75	2	Senile dementia	56	Senile dementia	+8	
16	76	9	Senile dementia	67	Senile dementia	+17	Died, cardiovascular degeneration.
17	82	53	Senile dementia	66	Affective Disorder	+24	Well orientated, senile weakness.
18	78	50	Secondary dementia	59	Secondary dementia	+21	Died, cardiovascular disease.
19	72	3	Melancholia	79	Melancholia	+14	
20	72	11	Melancholia	66	Melancholia	+4	Died, cancer of prostate.
21	66	32	Delusional, secondary dementia	73	Delusional insanity	+39	Re-graded voluntary, orientation good.
22	73	43	Melancholia, secondary dementia	58	Secondary dementia	−1	
23	71	26	Delusional insanity with dementia	74	Delusional insanity	+29	Re-graded voluntary, bright, cheerful and correctly orientated.

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TABLE III

Mean Memory Quotients, Significant Differences, Ranges, t Test Results for the Experimental Group Treated with Parentrovite

	Mean 1st M.Q.	S.D.	Range	*t* Test
(*a*) 1955 Diagnosis:				
Organics	62·1	13·8	48 – 90	2·23, significant
Functionals ..	77·5	17·4	58 – 100	0·05–·02
	Mean 4th M.Q.	S.D.	Range	*t* Test
(*b*) 1957 Diagnosis:				
Organics	67·2	15·3	48 –110	5·16, significant
Functionals ..	100·3	14·4	82·5–122·5	<·01
	Mean M.Q. Change (4th–1st)	S.D.	Range	*t* Test
(*c*) 1957 Diagnosis:				
Organics	+5·2	6·55	−14 +12·5	5·7, significant
Functionals ..	+21·0	6·08	+9 – 28·5	<·01
	Mean Age	S.D.	Range	*t* Test
(*d*) 1957 Diagnosis:				
Organics	72·1	5·4	66 – 87	1·12, not significant
Functionals ..	69·8	4·4	65 – 77	

TABLE IV

Mean Memory Quotients, Significant Differences, Ranges, t Test Results for the Control Group Treated with Placebo

	Mean 1st M.Q.	S.D.	Range	*t* Test
(*a*) 1955 Diagnosis:				
Organics	61·3	7·1	48 – 74	2·82, significant ·02–·01
Functionals ..	74·0	11·96	57 – 94	
	Mean 4th M.Q.	S.D.	Range	*t* Test
(*b*) 1957 Diagnosis:				
Organics	68·0	9·5	55 – 84	5·28, significant <·01
Functionals ..	97·4	15·58	70 – 124	
	Mean M.Q. Change (4th–1st)	S.D.	Range	*t* Test
(*c*) 1957 Diagnosis:				
Organics	+9·8	7·2	−1 – +21	3·10, significant
Functionals ..	+22·7	11·5	+4 – +42	<·01
	Mean Age	S.D.	Range	*t* Test
(*d*) 1957 Diagnosis:				
Organics	72·5	5·75	65 – 79	·29, not significant
Functionals ..	73·2	5·2	65 – 83	

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TABLE VA

Placement of Organic and Functional Patients in Experimental Group

I—According to 1st Memory Quotient and 1955 diagnosis.
II—According to 4th Memory Quotient and 1957 diagnosis.

	Memory Quotients																
	48–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	101–105	106–110	111–115	116–120	121–125	N
I:																	
Organics	4	2	3	2	1			1	2								15
Functionals ..			1	4			1			1	3						10
II:																	
Organics	2		2	6	2	2				1			1				16
Functionals ..								2	2			1	1	2		1	9

TABLE VB

Placement of Organic and Functional Patients in Control Group

I—According to 1st Memory Quotient and 1955 diagnosis.
II—According to 4th Memory Quotient and 1957 diagnosis.

	Memory Quotients																
	48–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	101–105	106–110	111–115	116–120	121–125	N
I:																	
Organics	1	1	5	2	2	2											13
Functionals ..			2		4		1		2	1							10
II:																	
Organics		1	1	3	2	1	1	2									11
Functionals ..					1		2		1	1	1	2	1	2		1	12

TABLE VI

Individual and Group Mean Learning (L) and Retentivity (R) Scores for the Experimental and Control Groups, using the 4th Assessment Results and the 1957 Diagnosis

Experimental Group				Control Group			
Functionals		Organics		Functionals		Organics	
R	L	R	L	R	L	R	L
73·0	26·0	73·0	15·0	29·2	48·0	0	0
73·0	57·5	29·2	9·5	58·4	17·5	14·6	25·0
73·0	22·5	14·6	12·0	73·0	22·0	29·2	32·5
43·8	22·0	58·4	18·0	73·0	46·5	14·6	28·0
73·0	34·0	73·0	15·5	73·0	28·0	14·6	23·5
43·8	27·5	73·0	27·0	58·4	31·0	29·2	10·0
58·4	50·5	58·4	18·0	29·2	17·5	14·6	17·0
58·4	43·5	43·8	14·0	43·8	41·5	58·4	21·0
58·4	45·0	14·6	18·0	58·4	36·5	58·4	23·5
———	———	73·0	47·0	73·0	36·5	58·4	5·0
554·8	328·5	0	0	58·4	35·0	0	0
		0	17·0	73·0	39·5	———	———
		29·2	16·0	———	———	292·0	185·5
		14·6	25·5	700·8	399·5		
		14·6	18·0				
		0	0				
		———	———				
		569·4	270·5				
Means:							
61·6	36·5	35·5	16·9	58·4	33·2	26·5	16·8

CONCLUSIONS

1. Although a single testing with the memory scale resulted in a high percentage of misclassification, repetition of the test apparently produced two different responses in the functional and organic patient. The functional patient improved his performance to a more significant degree than the organic and these differences were of considerable diagnostic and predictive importance.

2. Depression and the apathy induced by lengthy periods of hospitalization can result in an apparently poor memory, which, in psychiatric patients over 65, might easily result in a faulty diagnosis of dementia.

3. Examination of the "retentivity" and "learning" scores on the fourth assessment, for both the organic and functional patients, showed that a relatively inferior learning ability distinguished the organic from the functional patient.

4. In spite of the accuracy of the Memory Scale it is uneconomical to be forced to administer the scale on four occasions. The necessity of developing therefore a test of dementia which was short and which combined both the principle of successive re-testings and which depended for success on present learning ability was indicated.

SUMMARY

A two-year follow-up study of 50 senile psychotics was carried out to establish more reliably the diagnosis of each case and to compare possible changes in diagnosis with Wechsler Memory Scale scores and changes in these following four repetitions of the test. In this way the validity of the Memory Scale with regard to the diagnosis of senile dementia could be more accurately evaluated.

The results showed that the presence of depression, or the adverse effect of long periods of hospitalization often resulted in an apparent memory disorder reflected both in a spuriously low first Memory Scale performance and a false diagnosis of dementia. After the fourth administration of the Scale, the final score and the extent to which the patient had been able to improve his performance were compared with the final diagnosis and outcome. There was

a close relationship between significant improvement in test performance and a final diagnosis of a functional disorder, compared with the more limited improvement of the organic.

Additional analysis of the results on the Memory Scale sub-tests suggested that those patients subsequently diagnosed as brain-damaged showed most difficulty in learning new material, in contrast to those "functional" patients who showed this disability to a much less degree.

The results strongly suggested that a valid test of dementia should consist of a relatively pure measure of present learning ability, and that this could best be provided by successive repetitions of the test.

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