

A PSYCHOMETRIC STUDY OF DEMENTIA.*

By M. B. BRODY, M.D. Sheff., D.P.M.,

Senior Resident Physician, Runwell Hospital, Wickford, Essex.

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This paper reports an attempt to determine the nature of dementia by analysing the results of mental tests applied to groups of patients clinically estimated to be demented in varying degree.

Previous investigations.—The relevant literature concerns the results of mental tests in psychosis and in normal senility. These topics having been recently fully surveyed elsewhere (Brody, 1942a), they need occupy no space here.

I.

SUBJECTS AND TESTS.

Subjects.—The subjects, already described in a previous paper (Brody, 1942b), were 83 mental hospital patients divided into four groups. Those in group A were not demented, those in groups B, C and D "mildly," "moderately," and "severely" demented. Since no test significantly differentiated them, groups B and C were combined into a larger group (B + C) of mild and moderate dementia. Although these terms were used primarily to indicate gradation within the total group, later experience has shown that most of the patients would have been similarly classified by psychiatrists using these terms in their usual clinical sense. There were no cases of very severe or extreme dementia, since no patient was included who clinically displayed any deterioration of vocabulary functions. Great care was taken to select only patients who were fully co-operative and whose failures could be solely ascribed to dementia. Patients with invalidating disorders of the mood or of the stream of mental activity, or with invalidating physical disabilities, such as poor eyesight, poor hearing, or tremor, were rigorously excluded. The universally high scores on "naming objects," wherein such disorders would inevitably cause at least partial failure, proved the success of the case selection in these respects. The age group 50 to 69 was chosen because this is the period when dementia is commonest; and the patients in each group were equally balanced between the ages 50 to 59 and 60 to 69 (Table I). The sexes, too, were equally represented in each group (Table I). Table II lists the psychoses from which the patients had suffered before the supervention of dementia, and of which, in many cases, few signs remained. That they were not homogeneous did not impair the comparability of the groups which *were* homogeneous with regard to the quality under investigation. Psychologically and psychometrically, demented persons are very similar whatever the cause of the dementia.†

Although the number in each group was small, this disadvantage was thought to be compensated by the careful selection of patients as to age, sex, co-operation, and so that mental tests could be legitimately assumed to fulfil their intended purpose—matters which many previous investigators appear to have regarded insufficiently.

Dementia grouping.—The dementia ratings were made clinically before testing with the help of the medical officers and nurses in charge of the patients. They were based on informal interviews, and, especially, on observation of general conduct in the ward.

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† Hart and Spearman (1914), Barnes (1924), Babcock (1933b), Piotrowski (1937), Malamud and Palmer (1938), Hanfmann (1939), Wechsler (1939), etc. Indeed, Wells and Kelley (1920) postulated secondary changes in the brains of patients demented by the biogenic psychoses.

TABLE I.—*Age and Sex Distribution.*

	Group A.	Group B.	Group C.	Group D.	Group (B+C).
Number aged 50-59	10	10	10	10	20
Males	5	5	5	5	10
Females	5	5	5	5	10
Number aged 60-69	10	11	12	10	23
Males	5	5	6	5	11
Females	5	6	6	5	12
Whole group, aged 50-69 :					
Average age in years	59.4 ± 4.51	60.4 ± 5.33	60.2 ± 5.16	59.3 ± 5.54	60.3 ± 5.10
Number of males	10	10	11	10	21
Number of females	10	11	11	10	22

TABLE II.—*Distribution of Diagnosis.*

Diagnosis.	No. in Group A.	No. in Group B.	No. in Group C.	No. in Group D.	No. in Group (B+C).
Paraphrenia	9	5	5	1	10
Paranoia	1	Nil	Nil	Nil	Nil
Depression	3	2	"	1	2
Mania	Nil	1	"	1	1
Manic-depressive psychosis	2	6	2	2	8
Hypochondriasis	1	Nil	Nil	Nil	Nil
Syphilitic psychoses	1	1	2	6	3
Alcoholic psychoses	2	2	7	1	9
Arterio-sclerotic psychoses	1	3	2	4	5
Epileptic dementia	Nil	Nil	1	1	1
Senile dementia	"	"	3	1	3
Organic dementia (? cause)	"	1	Nil	1	1
Huntington's chorea	"	Nil	"	1	Nil
Totals	20	21	22	20	43

Tests.—The tests used were :

- (1) 1916 Terman Vocabulary test, in full, scored as Babcock (1930).
- (2) Form L of the 1937 Stanford-Binet test. This was re-scored by discounting credits for vocabulary and appropriately adjusting the remaining subtests in each year, thus providing a vocabulary-free score.
- (3) Babcock test in the original 30 item form (1930). The 20 items constituting the short form (1933a) were marked separately and the corresponding index calculated.
- (4) Alexander's Passalong test.
- (5) Kohs' Block test, original 17 item form.
- (6) Porteus mazes, scored up to a maximum of M.A. 16 years (Vernon, 1937).

The vocabulary test was used as it is claimed to measure the patient's initial intelligence level and is an essential part of the Babcock test. The Stanford-Binet was included because it has been so much used by previous workers. The Babcock test is the most important scale hitherto specially devised for measurement of dementia. Both these are mixed verbal and non-verbal tests, but predominantly verbal. The Passalong, Kohs' and Porteus tests are non-verbal. These particular tests were preferred not only because of their good standing, but also because they were used by Earl (1937, 1940) in an interesting study of morons. I thought it possible that demented might show similar characteristics.

All the tests were personally administered, and split into sessions not exceeding about an hour in duration.

II.

QUANTITATIVE RESULTS.

Vocabulary.—Table IV shows the average vocabulary ages of the groups. With the vocabulary scored according to the mean vocabulary scores for adults at each

mental level (Terman, 1918), thus cancelling any possible post-adolescent increase in vocabulary, the group averages were 194.7 months for A, 180.8 months for (B + C), and 160.5 months for D; i.e. group A remained slightly above, group (B + C) about equal to, and group D rather more definitely below, normal average. The inter-group differences were statistically significant.

These results suggest first, that dementia affects patients in inverse proportion to their pre-psychotic mental level; second, that vocabulary deterioration occurs earlier in dementia than has hitherto been realized. The first applies in normal senility, and was indicated by Trapp and James (1937), Collins *et al.* (1938), and Shakow *et al.* (1941). The second, already noted in epilepsy (Capps 1939) and in arteriosclerotic and senile dementia (Shakow *et al.*, 1941) and supported by defects in the group D performance of the "opposites" and "pronunciations" items of the Babcock scale, helps to explain the low scores in group D. The test records provided better evidence of this factor than the quantitative results, for the group D patients, though rather leniently marked, often failed to define words which it was safe to assume they had originally known.

Mental-age level.—Table III shows the number in each group whose score on each test was below the equivalent of I.Q. 50. Few, even in group D, fell to the level of imbecility on any test, none on all. Moreover, the results on the vocabulary-free Stanford-Binet scale proved that an adequate, though low, score was not acquired through a large contribution in simple vocabulary. Hundreds and thousands of people leading normal lives free from suspicion of dementia or imbecility would not quantitatively surpass the group D performance. Clearly the social incompetence of demented patients cannot be accounted for in purely cognitive terms, such as reduction in intelligence, or in the products of intelligence, to below the minimum level at which social competence is possible—degeneration, so to speak, to the point of imbecility.

TABLE III.—Number in Each Group whose Score on Various Tests Fell Below M.A. 90 Months = I.Q. 50.

Test.	Group A. (N = 20.)	Group B. (N = 21.)	Group C. (N = 22.)	Group D. (N = 20.)
Vocabulary	0	0	0	0
Form L. St. B.	0	0	0	0
Vocabulary free St. B.	0	0	0	1
Passalong	1	0	0	2
Kohs	1	3	1	3
Porteus	0	0	4	5
1933 Babcock average	0	1	0	6
1930 " "	0	1	1	5

III.

PSYCHOMETRIC PATTERN.

Is there, then, a psychometric pattern typical of dementia and illuminating its nature?

Preservation of vocabulary.—Undoubtedly, vocabulary ability is comparatively well preserved in dementia. In all groups, few of the results on other tests approached the vocabulary level, and in group D none of them equalled it except in the simple test of co-operation and attention—Babcock Subtest 13, "naming objects" (Table IV). The discrepancy between score in vocabulary and on most other tests progressively increased with increasing dementia (thus confirming the observations on which Babcock's and similar tests are based). But this pattern is different only in degree, not kind, from that in normal senility and psychosis without dementia (Brody, 1942a). It merely indicates, in dementia, a decline in global cognitive capacity greater than in other conditions—a decline, however, already proved insufficient to be accepted as the entire psychopathology of dementia.

Stanford-Binet pattern.—The Stanford-Binet pattern in all groups were similar. Inter-group comparisons of the item by item successes and failures relative to

TABLE IV.—Mean Percentage Discrepancies with Standard Deviations.

Test.	A.	B + C.	D.	B.	C.
Vocab.-free Stanford-Binet	15.85 ± 12.68	24.98 ± 11.77	33.70 ± 10.65	25.67 ± 9.96	24.30 ± 13.50
Passalong	22.60 ± 19.13	29.32 ± 16.32	27.15 ± 19.08	26.00 ± 17.08	32.50 ± 14.20
Kohs	26.40 ± 15.39	34.40 ± 13.56	35.80 ± 13.35	37.70 ± 13.28	31.30 ± 13.29
Porteus	26.15 ± 13.12	32.00 ± 17.34	39.00 ± 15.00	27.87 ± 10.33	35.95 ± 18.05
Babcock (1930)	12.00 ± 11.02	22.14 ± 10.50	31.45 ± 12.31	22.24 ± 10.34	22.05 ± 11.13
Revised Babcock (1933)	16.30 ± 10.48	26.56 ± 10.67	37.30 ± 13.87	26.14 ± 9.82	26.95 ± 11.87
*1. Personal data	3.05 ± 14.8	8.23 ± 16.28	11.8 ± 19.93	10.24 ± 10.54	6.34 ± 16.52
2. Naming days	+2.1 ± 16.36	3.81 ± 21.56	0.75 ± 22.37	5.43 ± 26.11	+2.27 ± 17.25
*3. Gen. inf.	38.15 ± 20.57	47.51 ± 19.51	65.65 ± 17.55	44.24 ± 17.76	50.64 ± 21.38
4. Naming months	+4.4 ± 19.34	2.16 ± 22.28	5.00 ± 22.08	2.81 ± 25.22	1.55 ± 20.25
5. Old school knowledge	1.95 ± 20.53	7.26 ± 21.37	10.95 ± 14.61	7.95 ± 21.82	6.59 ± 21.85
6. Alphabet	4.00 ± 18.34	10.35 ± 21.99	25.15 ± 34.29	15.19 ± 25.72	5.73 ± 17.73
*7. 20 to 1	16.00 ± 21.98	24.88 ± 26.24	34.85 ± 23.53	31.48 ± 27.26	18.59 ± 24.80
*8. Imm. rep. parag.	21.60 ± 26.41	35.81 ± 21.86	46.55 ± 35.0	31.05 ± 18.57	40.59 ± 24.2
*9. Substitution	28.45 ± 19.37	46.93 ± 11.17	53.95 ± 15.95	46.62 ± 10.73	47.23 ± 12.06
*10. Digits forward	23.30 ± 23.22	34.47 ± 22.14	38.95 ± 24.14	38.86 ± 18.34	30.27 ± 25.40
11. Locating cities	30.60 ± 38.72	44.51 ± 37.74	65.30 ± 25.76	44.76 ± 33.15	44.27 ± 43.3
*12. Digs. revd.	23.05 ± 22.77	27.16 ± 18.44	32.80 ± 20.40	30.91 ± 11.78	23.59 ± 23.14
13. Naming objects	+30.55 ± 9.76	+30.30 ± 16.39	+30.85 ± 19.90	+29.52 ± 19.88	+31.05 ± 13.11
*14. Knox cube	22.35 ± 20.63	26.81 ± 19.86	37.46 ± 18.82	24.91 ± 19.29	28.18 ± 21.73
15a. Writes name (not avgd.)					
* b. Dictation	26.70 ± 15.77	34.79 ± 12.66	42.50 ± 17.35	35.95 ± 11.23	33.59 ± 14.53
c ₁ . Maze $\frac{1}{2}$ in. track	26.80 ± 29.72	33.42 ± 22.01	32.80 ± 23.49	34.38 ± 24.34	32.50 ± 20.62
c ₂ . Maze $\frac{1}{4}$ in. track	26.75 ± 27.91	37.07 ± 23.20	31.60 ± 26.48	34.19 ± 24.33	39.82 ± 22.86
c ₃ . Maze $\frac{1}{8}$ in. track	7.40 ± 27.25	21.91 ± 25.67	17.75 ± 35.02	19.10 ± 25.97	24.59 ± 26.28
c ₄ . Maze $\frac{1}{16}$ in. track	31.10 ± 32.88	54.28 ± 25.29	46.20 ± 37.23	49.05 ± 23.08	59.27 ± 27.35
*16. Parag. retention	30.50 ± 32.26	53.98 ± 31.32	65.15 ± 38.57	47.86 ± 25.07	60.00 ± 36.17
*17. Paired ass.	30.00 ± 38.57	57.40 ± 31.02	68.50 ± 32.50	51.76 ± 37.45	60.50 ± 33.50
*18. Pronunciation	+4.1 ± 14.23	+4.12 ± 15.83	8.60 ± 16.69	+1.38 ± 16.66	+6.73 ± 15.29
*19a. Date	+0.25 ± 23.38	0.49 ± 28.01	9.45 ± 41.90	+0.57 ± 26.68	1.50 ± 30.41
b. Days revd.	6.05 ± 24.04	14.93 ± 27.22	23.53 ± 24.34	11.05 ± 30.11	18.64 ± 24.95
c. Months revd.	13.50 ± 24.01	19.00 ± 25.57	30.30 ± 34.81	17.45 ± 24.17	20.46 ± 27.90
20. Picture recog.	0.25 ± 21.58	16.05 ± 23.80	28.00 ± 26.17	22.48 ± 21.20	9.91 ± 25.57
*21. Des. from mem.	12.45 ± 21.07	24.05 ± 20.26	42.30 ± 20.02	22.95 ± 16.49	25.09 ± 24.04
*22. Sentences	8.80 ± 14.43	17.35 ± 16.42	34.50 ± 13.91	17.76 ± 13.72	16.96 ± 19.30
*23. Word recog.	15.90 ± 28.41	16.28 ± 22.60	25.15 ± 20.81	17.33 ± 26.31	15.27 ± 19.59
*24. Opposites	+7.30 ± 17.71	+0.95 ± 20.05	28.20 ± 31.38	+2.67 ± 25.17	0.68 ± 14.64
Vocabulary (Babcock), M.A. (months)	207.0 ± 28.20	191.7 ± 27.30	167.9 ± 26.9	191.8 ± 24.80	191.6 ± 29.5

Babcock (1930) subtests. * || Included in 1933 form.

TABLE V.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is at Least M.A. 12 years, and who Fail Tests up to and Including Year XII on Form L of the Revised Stanford Binet Tests.

Test.	Group A. N = 20.	Group (B + C). N = 43.	Group D. N = 18.	Group B. N = 21.	Group C. N = 22.
Below IV-6	Nil	Nil	Nil	Nil	Nil
IV-6:					
1, 2, 3, 4, and 6	"	"	"	"	"
IV-6:					
5: Three commissions	"	"	(1) 6	"	"
V:					
1, 3, 4, 5, and 6	"	"	Nil	"	"
V:					
2. Paper folding triangle	"	"	(1) 6	"	"
VI:					
1, 3, 4, 5, and 6	"	"	Nil	"	"
VI:					
2. Copying bead chain from memory I	"	"	(2) 11	"	"
VII:					
1. Picture absurdities	"	(3) 7	(6) 33	(1) 5	(2) 10
2. Similarities—two things	"	Nil	(1) 6	Nil	Nil
3. Copying a diamond	"	"	Nil	"	"
4. Comprehension III	"	"	(1) 6	"	"
5. Opposite analogies I	"	(3) 7	(6) 33	"	(3) 14
6. Repeating 5 digits	"	(3) 7	(5) 28	(2) 10	(1) 5
VIII:					
1. Vocabulary (8 words)	"	Nil	Nil	Nil	Nil
2. Memory for stories: The Wet Fall	(4) 20	(21) 49	(13) 72	(12) 57	(9) 41
3. Verbal absurdities I	(2) 10	(8) 19	(13) 72	(2) 10	(6) 27
4. Similarities and differences	Nil	Nil	(4) 22	Nil	Nil
5. Comprehension IV	"	"	Nil	"	"
6. Memory for sentences III	"	(6) 14	(9) 50	(3) 14	(3) 14
IX:					
1. Paper cutting I	(3) 15	(14) 33	(11) 61	(6) 29	(8) 36
2. Verbal absurdities II (3 correct)	(5) 25	(17) 39	(14) 78	(7) 33	(10) 48
3. Memory for designs (1 point)	(9) 45	(27) 63	(18) 100	(16) 76	(11) 50
4. Rhymes—new form	(3) 15	(10) 23	(11) 61	(4) 19	(6) 27
5. Giving change	Nil	Nil	Nil	Nil	Nil
6. Repeating 4 digits reversed	(3) 15	(3) 7	(7) 39	(2) 10	(1) 5
X:					
1. Vocabulary (11 words)	Nil	Nil	Nil	Nil	Nil
2. Picture absurdities II	(10) 50	(27) 63	(15) 83	(12) 57	(15) 68
3. Reading and report	(9) 45	(31) 72	(17) 94	(16) 76	(15) 68
4. Finding reasons I	Nil	(1) 2	(11) 61	Nil	(1) 5
5. Word naming (28 words)	(5) 25	(24) 56	(14) 78	(11) 52	(13) 59
6. Repeating 6 digits	(4) 20	(14) 33	(10) 56	(8) 38	(6) 27
XI:					
1. Memory for designs (1½ points)	(14) 70	(40) 93	(18) 100	(20) 95	(20) 91
2. Verbal absurdities III	(3) 15	(16) 37	(13) 72	(7) 33	(9) 41
3. Abstract words I	Nil	Nil	(1) 6	Nil	Nil
4. Memory for sentences IV	(1) 5	(7) 17	(6) 33	(4) 19	(3) 14
5. Word naming (30 words)	(5) 25	(26) 60	(14) 78	(13) 62	(13) 59
6. Similarities—three things	(3) 15	(23) 53	(14) 78	(10) 48	(13) 59
XII:					
1. Vocabulary (14 words)	Nil	Nil	Nil	Nil	Nil
2. Verbal absurdities II (4 correct)	(7) 35	(26) 60	(15) 83	(13) 62	(13) 59
3. Response to pictures	(4) 20	(16) 37	(11) 61	(6) 29	(10) 46
4. Repeating 5 digits reversed	(8) 40	(18) 42	(13) 72	(9) 43	(9) 41
5. Abstract words II (2 correct)	Nil	Nil	(1) 6	Nil	Nil
6. Minkus completion (2 correct)	(6) 30	(27) 63	(15) 83	(13) 62	(14) 64

TABLE VI.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is at Least M.A. 13 Years, and who Fail XIII Year Tests on Form L of the Revised Stanford-Binet Tests.

Test.	Group A. N = 20.	Group (B + C). N = 41.	Group D. N = 16.	Group B. N = 20.	Group C. N = 21.
XIII :					
1. Plan of search	(4) 20	(19) 46	(10) 63	(9) 45	(10) 48
2. Memory for words	(4) 20	(16) 39	(8) 50	(8) 40	(8) 38
3. Paper cutting I	(9) 45	(31) 76	(13) 81	(17) 85	(14) 66
4. Problems of fact	(1) 5	(15) 37	(7) 44	(5) 25	(10) 48
5. Dissected sentences	(5) 25	(21) 53	(14) 88	(10) 50	(11) 52
6. Copying a bead chain from memory II	(8) 40	(29) 71	(15) 94	(14) 70	(15) 71

TABLE VII.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is at Least M.A. 14 Years and who Fail XIV Year Tests on Form L of the Revised Stanford-Binet Tests.

Test.	Group A. N = 19.	Group (B + C). N = 38.	Group D. N = 13.	Group B. N = 19.	Group C. N = 19.
XIV :					
1. Vocabulary (16 words)	Nil	Nil	Nil	Nil	Nil
2. Induction	(4) 21	(19) 50	(8) 62	(9) 47	(10) 53
3. Picture absurdities III	(5) 26	(28) 74	(12) 92	(14) 74	(14) 74
4. Ingenuity (1 correct)	(11) 58	(27) 67	(11) 85	(16) 84	(11) 58
5. Orientation—direction I	(7) 37	(27) 67	(12) 92	(15) 79	(12) 63
6. Abstract words II (3 correct)	Nil	(3) 8	(2) 15	(2) 11	(1) 5

TABLE VIII.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is at Least M.A. 15 years, and who Fail A.A. Tests on Form L of the Revised Stanford-Binet Tests.

Test.	Group A. N = 16.	Group (B + C). N = 31.	Group D. N = 9.	Group B. N = 17.	Group C. N = 14.
A.A. :					
1. Vocabulary (20 words)	Nil	Nil	Nil	Nil	Nil
2. Codes	(13) 81	(30) 97	(9) 100	(16) 94	(14) 100
3. Differences between abstract words	(5) 31	(19) 61	(7) 78	(12) 70	(7) 50
4. Arithmetical reasoning	(8) 50	(22) 71	(7) 78	(15) 88	(7) 50
5. Proverbs	(5) 31	(24) 77	(8) 89	(15) 88	(9) 64
6. Ingenuity (2 correct)	(11) 69	(28) 90	(9) 100	(17) 100	(11) 79
7. Memory for sentences V	(7) 44	(17) 55	(8) 89	(10) 58	(7) 50
8. Reconciliation of opposites (3 correct)	(8) 50	(25) 81	(7) 78	(16) 94	(9) 64

TABLE IX.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is Below M.A. 20 years, and who Pass S.A. III Tests on Form L of Revised Stanford-Binet Tests.

Test.	Group A. N = 15.	Group (B + C). N = 39.	Group D. N = 20.	Group B. N = 19.	Group C. N = 20.
S.A. III :					
1. Vocabulary (30 words)	(5) 33	(10) 26	(1) 5	(3) 16	(7) 35
2. Orientation—direction II	(2) 13	(3) 8	Nil	Nil	(3) 15
3. Opposite analogies II	(1) 7	(2) 5	(1) 5	„	(2) 10
4. Paper cutting II	Nil	Nil	Nil	Nil	Nil
5. Reasoning	(1) 7	(1) 3	„	„	(1) 5
6. Repeating of digits	(2) 13	(2) 5	„	„	Nil

vocabulary (Tables V to XI) suggested that certain items possess special significance as follows:

<i>Item.</i>	<i>Significance.</i>
Below year VII	Failure uncommon, but always indicative of serious dementia if vocabulary is within normal range.
Similarities and differences (Year VIII)	
Memory for designs (Year IX)	Failure below vocabulary age almost always present in serious dementia, but not necessarily proof thereof, since many normal persons also fail here. Success strongly argues against the presence of serious dementia.
Reading and report (Year X)	
Copying bead chain (Year XIII)	
Picture absurdities (Year XIV)	
Orientation (Year XIV)	
Codes (A.A.)	
Ingenuity (A.A.)	Failure below vocabulary age present in at least 50 per cent. of seriously demented patients, and usually indicative of serious dementia.
Essential similarities (S.A.I)	
Enclosed boxes (S.A.I)	
Verbal absurdities (Year VIII)	
Memory for stories (Year VIII)	
Memory for sentences (Year VIII)	
Paper cutting (Year IX)	
Rhymes (Year IX)	
Dissected sentences (Year XIII)	
Finding reasons (Year X)	

TABLE X.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is Below M.A. 18 years, who Pass S.A. II Tests of Form L of Revised Stanford-Binet Tests.

Test.	Group A. N = 10.	Group (B + C). N = 31.	Group D. N = 19.	Group B. N = 16.	Group C. N = 15.
S.A. II :					
1. Vocabulary (26 words)	(4) 40	(9) 29	(2) 11	(5) 31	(4) 27
2. Finding reasons II	Nil	(3) 10	Nil	(1) 6	(2) 13
3. Repeating 8 digits	(2) 20	(4) 13	(1) 5	(3) 19	(1) 7
4. Proverbs II	(1) 10	(1) 3	Nil	(1) 6	Nil
5. Reconciliation of opposites (5 correct)	Nil	Nil	(1) 5	Nil	"
6. Repeating thought of passage	"	"	Nil	"	"

TABLE XI.—Number (bracketed) and Percentage of Patients in Each Group whose Vocabulary Level is Below M.A. 16 years and who Pass S.A. I Tests of Form L of Revised Stanford-Binet Tests.

Test.	Group A. N = 6.	Group (B + C). N = 19.	Group D. N = 16.	Group B. N = 9.	Group C. N = 10.
S.A. I :					
1. Vocabulary (23 words)	(2)	(6) 32	(6) 38	(3) 33	(3) 30
2. Enclosed box problems	(3)	(4) 21	(1) 6	(2) 22	(2) 20
3. Minkus completion (3 correct)	Nil	Nil	Nil	Nil	Nil
4. Repeating 6 digits reversed	(1)	(2) 11	(1) 6	"	(2) 20
5. Sentence building	Nil	Nil	Nil	"	Nil
6. Essential similarities	(3)	(5) 26	"	(4) 44	(1) 10

Attempts, however, to categorize these items failed. No distinctive types of mental test differentiated the two groups. This appeared, too, in the Babcock scale.

Babcock pattern.—Table IV* shows similarity in the patterns in all groups. The curves are roughly parallel, although the distance between them varies. In all groups, performance was quite good on rote repetitions and items of practical and familiar information; less good on memory tests, especially retention, and in motor control; worst on tests requiring new learning—the ability to profit from experience—and on items of information not directly connected with practical life.

Verbal—non-verbal pattern.—Earl (1937, 1940) and others have reported that maladjusted morons achieve lower scores on non-verbal than on verbal tests, whereas socially adjusted morons score about equally, or rather higher, on the non-verbal tests. In normal persons between 50 and 69 and in non-demented psychotics, verbal ability exceeds non-verbal ability. Hence, a very large verbal superiority was expected in dementia.

The results (Table IV) confounded expectations. Relative to vocabulary, verbal superiority was less in group A than in group (B + C), while in group D the Stanford-Binet scale was performed worse than the Passalong and Kohs' tests and little better than the Porteus mazes. These results imply in dementia a levelling down of abilities with loss of the psychometric pattern characteristic of both normal senility and psychosis without dementia. Also they show a distinction between dementia and morosity with social inadequacy.

Absence of a specific pattern in dementia.—The only positive conclusion suggested by study of the psychometric pattern in the present patients is that while, in dementia, vocabulary ability is comparatively well preserved, other abilities severely decline, levelling down in a fashion which obscures the common pattern in simple psychosis and normal senility. Otherwise there is no trace of a specific pattern of abilities in dementia.

IV.

QUALITATIVE ASPECTS.

It was the qualitative aspects of mental test performance which were found most clearly to reveal the nature of dementia. There were striking qualitative differences between groups A and D, group (B + C) occupying an intermediate position. Here must be immediately stressed that the group differences were not absolute. Non-demented subjects, even very superior persons, sometimes exhibit the qualities of behaviour which characterize the dement. It is the frequency and intensity of these qualities and especially their appearance on tests low in the scale that should be easy for the subject as judged by his vocabulary, that is particularly suggestive of dementia. No rule of thumb can be applied in the qualitative evaluation of a test performance. Much depends on the experience and psychological insight of the examiner.

Vocabulary.—In a previous paper (1941) I described eight varieties of behaviour conspicuously exhibited by demented subjects on the vocabulary test. These are:

- (1) Slow and incomplete comprehension of the task. Dements have to be given many examples, whereas the normal person requires only one or two. They tend merely to read out the word believing that to be sufficient. They easily lose their place in the list.
- (2) Emotionalism—especially minor degrees of lability and facility. They are easily flattered, often ask for guidance and re-assurance, and show poor reaction to difficulty.
- (3) Excuses and escape behaviour.
- (4) "Concrete" approach, revealed by an unduly high proportion of definitions by exemplification rather than generalization.
- (5) Guessing.

* Table IV was based on the average "percentage discrepancy" scores. Each patient's percentage discrepancy on each test was calculated by expressing the difference between his actual score (S) on that test and the vocabulary norm (N) as a percentage of the norm $\left(\frac{N-S}{N} \times 100\right)$. Means and S.Ds. were then calculated in the usual way. The size of the S.Ds. may appear to invalidate the means. But, it should be noted, the S.Ds. would have been exactly the same had the mean "percentage scores" $(S/N \times 100)$ been used, and the reliability of these would, in most cases, have been obvious.

- (6) Perseveration.
- (7) Mispronunciation.
- (8) Defective self-criticism and lack of insight.

The qualitative aspects of the vocabulary test in the present groups confirmed these observations. As will be seen, many of these varieties of behaviour were also exhibited on other tests.

Stanford-Binet: Items involving vocabulary.—“Definitions of abstract words” are essentially vocabulary items presenting no qualitative differences from the vocabulary test as a whole. “Differences between abstract words,” however, is not a simple vocabulary item. Though usually able to refer each word to a “concrete” setting, demented patients failed to perceive the abstract relationship, thus suggesting evidence of impaired “abstract behaviour.” A frequent response to part b was some variation of the sentence “Poverty makes you miserable,” which implies recognition of a distinction between “poverty” and “misery,” refers each word to a correct setting, yet misses the point. Responses to “reconciliation of opposites” exemplified the same principle. The commonest form of failure was “They’re not alike, they’re just the opposite”—a generalization, it is true, but a very superficial one, based on the literary connection of the words as words without reference to their meaning. Typical examples were: “Some are heavy and some are light, but they are something”; “You may have a tall and short person with the same expression”; “Heavy and light, they both tread on air”—meaning animate things may be either heavy or light; “Sick and well can both think.” Here the words are simply given a “concrete” setting and a third “concrete” aspect of the setting mentioned. Both the above tests excellently displayed the seriously demented patients’ lack of insight and defective self-criticism, revealed by their complacent satisfaction with obviously inadequate replies.

“Opposite analogies” unfortunately appears in the scale at levels which obscure its value. Common reasons for failure were, at the upper level, unfamiliarity with the words required for the solution, and at the lower level, incomplete comprehension of the task.

“Word naming” is the new equivalent of “free association for three minutes,” a test consistently reported to be difficult for both normal adults and psychotics. Seriously demented patients exhibited very slow comprehension of the task despite its simplicity. When finally they understood it, they were often reluctant to attempt it because, they said, it is so childish and silly. In truth, they had not grasped and entered into the test “set,” had not realized that they were asked to perform certain tasks, not for any value they might possess, but simply as tests. Emotionalism, excuses, and escape behaviour were conspicuous. Started on the test they generally seized on one of the examples, mentioned perhaps two or three similar words, then lapsed into silence. Inability to use a word as a key to a category and so to unlock a store of words, and inability, on exhausting one store, to find a fresh key word and a fresh store, were typical of the group D subjects’ impaired “abstract behaviour.” Perseveration, too, was common and conspicuous. Once the patient had exhausted his initial store he could not usually continue except by perseverating his previous words, unless the tester provided him with a new example. Urging produced no effect except possibly to increase the patient’s emotionalism and escape behaviour. The narrowness of mental horizon and dearth of ideation described by Cameron (1938a and b, 1939a and b) in senile dementia were much in evidence.*

Incomplete comprehension of the task was the usual cause of failure on “rhymes.” Common errors were to give rhymes which were not in the required categories, or a word in the required category that did not rhyme.

Three tests requiring the correct usage of words are “Minkus completion,” “dissected sentences” and “sentence building.” Slow comprehension of the task was often apparent on “Minkus completion.” Terman and Merrill (1937) believe that success here depends on perceiving relational elements in the complex whole, so that, again, the failure of demented subjects may be explained by their impaired “abstract behaviour,” although the errors on this test are difficult to classify. The most notable difference between the groups was in the degree of self-criticism.

* Blockage and retardation, common causes of failure on this test in many psychotic patients, were not seen as, it will be recalled, the selected patients were free from such disorders.

The non-demented group A patients usually preferred to admit defeat than to offer an unsatisfactory solution, whereas the group D patients complacently and uncritically submitted the first idea that occurred to them. This defective self-criticism closely paralleled that seen in the vocabulary test.

In "*dissected sentences*," also, failure was the result of inability to perceive relational elements in the complex whole. A vague general idea was conceived, and the necessity for correctly using the given material ignored, or the material altered. The commonest errors were: (a) *For* we started for the country at an early hour; (b) My teacher asked me to correct my paper; (c) His good dog defends bravely his master; or, His good master bravely defends a good dog. This test excellently revealed the seriously demented patients' recurrent requests for reassurance and guidance.*

"*Sentence building*" in the present revision is hardly comparable with the old test of "using three words in a sentence." It was so difficult for all groups that it had little discriminative value.

Stanford-Binet: Tests of memory.—*Memory for digits*, forward and reversed, for sentences, for designs and for a paragraph† will be more fully considered under the items of the Babcock scale, where they appear in extended forms. Here it may be noted that they were among the best tests in the scale for exhibiting, in seriously demented patients, slow comprehension of the task, emotionalism, excuses and escape behaviour, guessing, and, on "designs from memory," impairment of "abstract behaviour."

"*Memory for stories*" was a useful test. Even when a non-demented person failed, he generally remembered three or four of the items, the name of the story and that the children lived on a farm being most easily forgotten. Demented patients failed nearly all the questions, Dick's name and that he was covered with mud often being the only items recalled. Further, the group D patients introduced errors and inaccuracies not seen in the responses of the group A patients. The pony, for example, was often said to have been presented by an uncle or granny, or to have been bought. They very seldom remembered that the pony became frightened and ran away. There is possibly some significance in their ability to recall the highly pictorial Dick-covered-with-mud item, and their inability, in contrast to the non-demented patients, to recall the more abstract causal factor.

"*Repeating the thought of a passage*" seemed to be less a test of memory than of comprehension of difficult ideas. It had little discriminative value. Nor had "*memory for words*," the value of which might, however, have been increased by using only the five abstract words.

"*Copying a bead chain from memory*" was nearly always failed by the severely demented subjects. Failure could not be ascribed solely to diminished memory functions. As in "designs from memory," success depends largely on apprehending the material in a fashion predisposing to easy recall. This necessitates perceiving the relational elements in the material which have to be grouped, systematized—"categorized." Even when non-demented patients failed this test, their behaviour was nearly always "categorical" as displayed by their obvious attempts to build some kind of symmetrical pattern. The demented subjects, on the other hand, merely strung the beads haphazardly until they had built a chain which they judged to be about as long as the original. Once more, the group D patients conspicuously lacked insight and self-criticism. Their complacent satisfaction with very poor solutions, their expectation of re-assurance and guidance and the ease with which they were flattered were obvious.

Stanford-Binet: Picture tests.—With the "*picture absurdities*," as on many tests, group D patients failed to perceive the relational elements in the complex whole, and seemed to be tied down, as it were, to the concrete details. Thus, often, they simply described what they saw, sometimes mentioning the absurdity (especially the saw upside down, and the rain) without attaching significance to

* An undoubted factor, however, is that the content of sentence (b), and, to a less extent, of sentence (a), is unsuitable for adults.

† The slight difference between the Babcock and Form L versions of this test in that, in Form L, the subject himself reads the paragraph and receives no warning that his memory of it will be tested, appears to be unimportant. No subject failed to read the paragraph perfectly. Those who complained that they were not asked to remember what they read were the very ones who failed conspicuously when asked to remember.

it. At year XIV 'demented patients' preference for guessing rather than confessing ignorance was prominent. Many superficial details, for example, the man's foot, or the gun, were described, with an eye to the examiner's reaction, as "looking a bit queer."

In "response to pictures," the boy was often not recognized as a telegraph boy, despite the G.P.O. on his cap. He was often thought to be ringing a bell. His knickerbockers and leggings are frankly misleading. These faults in the picture diminish the usefulness of the test, since in order to be sure that the subject has recognized what the drawings are supposed to represent, the examiner is sometimes obliged to ask questions broadly hinting at the correct solution. It is also necessary to score the test leniently. Sceptical adults are less likely than children to believe that the boy will be as much concerned about the delivery of his telegram as getting a lift. On the other hand, the test sometimes produced a response highly typical of dementia in its combination of superficial plausibility and essential inaptness; for example, that the boy has been knocked down by the car and is waving to show that he is uninjured.

Stanford-Binet: Tests involving "social comprehension."—"Verbal absurdities" at the VIII year level was one of the most sensitive items in the scale. Failure was mainly the result of incomplete comprehension of the task, and, as before, imperception of relational elements. The group D patients often appeared to take the statements as reports of true incidents or facts, and either described as foolish some actions of the persons concerned, or adduced circumstances that might superficially account for what happened. In the latter case, recognition of the incongruities in the data may seem to have been implied in the attempted reconciliations. But this was not always so. The patients merely translated the data into a real-life practical situation, and the underlying abstraction escaped them. Once more, the capacity for "abstract behaviour" was found to be impaired. This interpretation reveals the fundamental similarity of replies, such as (in answer to VIII, 3, a), "It's silly to tie himself up. What did he want to do that for?"; or (VIII, 3, b), "I'd give a man a shilling to watch the car until I got help"; or VIII, 3, d), "Perhaps he was going downhill" or "He'd have to put on more steam." Further examples were (IX, 2, c), "It was lighting his cigar that started the fire"; also, "There wasn't a fire. It was his cigar. When he put his cigar out, there was no fire"; (IX, 2, d) "Columbus didn't die in Spain. He went to America"; (IX, 2, c) "The water wouldn't be warm enough"; (XI, 2, b) "Someone might have fallen from a platform—that wouldn't be a railway accident"; and, for XI, 2, c—an amusing response given more than once—"The people in the last carriage would be left behind in the station instead of being taken where they want to go." All these replies display the characteristic combination of superficial plausibility and essential inaptness. They contrast with answers to absurdities where the material more closely approximates a real-life situation quite familiar to the patients. Such are the absurdities about trousers (IX, 2, a), which was very rarely failed, about the poste restante (IX, 2, b), and in VIII, 3, c, and XI, 2, a, both of which depend essentially on the perfectly familiar idea that death ends all feeling and behaviour. The severely demented patients succeeded quite well in these items.

A short step brings "*comprehensions*" under review. If the above psychopathology is correct, the group D subjects should have had little difficulty in these tests where translation of the data into concrete situations and description of the appropriate behaviour is all that is needed. The observed results were in accord.

Like "*comprehensions*," "*problems of fact*" should, theoretically, be relatively easy for demented patients, and the results were again in accord. It was easier for the group D patients than any other test in its own and the preceding year except vocabulary items. The unfortunate frequency in the scale of material concerned with violence, accidents and death may be conveniently noted here.*

Continuing the argument, "*proverbs*" should have been difficult for the group D patients, for they demand a high degree of abstraction and capacity to free oneself from literal concrete interpretation of the material. The results fully substantiated the hypothesis. It was precisely his failure to escape from literal interpretation of the material that distinguished the dement from the non-dement.

* See also Wells and Kelley (1920) and Krugman (1939).

Replies such as (A.A., 5, a) "He won't go near the fire again because he got burnt," and (A.A., 5, b) "You've got to crack it before you can eat it" were repeatedly given by the demented subjects. Repetition of "What does the proverb mean?", or questions, not strictly allowed, such as "What does the proverb teach us?", merely evoked similar responses in different words. The easiest proverb was "A bird in the hand is worth two in the bush," probably because, being so commonly used in every-day life, the dements could produce the generalization ready made from real-life experience without having to deduce it.

"*Finding reasons*" at year X, which should have been easy according to the present thesis, was unexpectedly the most sensitive single item in the scale. The explanation is that the dements gave only one reason instead of two. This reason—usually (a) that noise prevents children from learning, and (b) that a car is more convenient or more comfortable than a bicycle—contained within it all subsidiary reasons, but the dements failed to analyse it because they failed to comprehend the full task and to enter into the test "set." When asked why noise prevents children from learning and why a car is more convenient than a bicycle, a string of reasons was readily given. Unfortunately, such prompting is not allowed. The test thus proved valuable as an indicator of comprehension of tasks and insight into test set. It must, of course, be admitted that the first item is unsuitable for adults. Yet if it were altered to pertain to a setting more familiar to adults, it might lose its specific value, for it could then probably be easily solved after the fashion of "comprehensions." The fact that part b was failed far less often than part a supports this view.

"*Finding reasons*" at S.A. II was too difficult for all groups to be very valuable.

Stanford-Binet: Similarities.—Failure on "*similarities and differences*" at year VIII was uncommon even in group D patients, and where it occurred was the result of incomplete comprehension of the task. Were not prompting allowed on the first two items, failure would have been commoner. The highly "concrete" objects were easily compared and contrasted at a sensory level without the necessity for abstraction. "Ocean and river" constituted the most difficult pair.

Comparison at a sensory "concrete" level cannot possibly succeed at year XI. Here the objects have to be "thought about," approached in an "abstract" fashion. As expected, the group D patients conspicuously failed. Their "concrete approach" was exemplified by the frequency of replies such as "They're not alike—a cow's an animal, a sparrow's a bird, and a snake's a snake"; "Well, a rose is a tree too, but a potato isn't"; "You can cut with a knife and you can cut with a piece of wire, but you can't cut with a penny"; "You can read a book and a newspaper, and a teacher reads books." Complacent satisfaction with inadequate replies, lack of insight and self-criticism, expectation of reassurance and guidance and emotional facility were prominent on this test.

"*Essential similarities*" at S.A.I. seemed to be somewhat easier than its position indicates. Qualitatively, the responses resembled those at year XI.

Stanford-Binet: Tests involving arithmetic.—Arithmetic enters into "*giving change*," but in such a simple fashion, and, moreover, in relation to such familiar matters that the test was rarely failed by group D patients (and even, as I have observed, by patients far more seriously demented). As Terman and Merrill remarked (1937), the test is not so much one of arithmetical ability as of ability to comprehend the problem.

"*Arithmetical reasoning*" at the A.A. level was an unsatisfactory test, unpopular even with non-demented subjects. In the dements, emotionalism, excuses and escape behaviour and guessing rather than confession of failure were prominent. The first item evoked the responses most characteristic of dementia; for example, "A long time"; "About a year, I expect"; "How do you know he'll save that every week?" The time limit was not a major handicap. Double time allowance rarely enabled those unsuccessful within the minute to reach the correct solution.

"*Arithmetical reasoning*" at the S.A. III level was too difficult to be of much differentiative value. Group D patients exhibited typical guessing.

Arithmetic enters, too, into the "*ingenuity*" problems, though, of course, the actual computations present no difficulty. Group D patients were poor in comprehending the task, as was proved by remarks such as "Must he bring it in both cans?" Their "concrete approach," the limitation of their thinking to real-life

practical matters, and their lack of insight into the test situation were well exemplified. Nearly always they treated the problem as they would in real life. "He'd have to guess"; "He'd half fill the seven-pint can." A reminder that the boy started by *filling* the seven-pint can merely produced replies that "He'd pour half away." Another commonly suggested method was that the four-pint can should be only partially filled. Again a reminder about the seven-pint can was no hint. "He wouldn't need to do that"! When reminded that the boy is not to guess, a common reply was, "He'd make a mark on the can." On this test, too, if the problems were not solved in the allotted time, they could not usually be solved at all.

The part played by arithmetic in the "*induction*" test is unimportant, though occasionally patients indicated that the right answer was twice sixteen without at first being able to calculate it. Only rarely was the rule spontaneously stated. The group D failures were mainly in comprehending the task of giving the rule, though they also usually failed to calculate the correct number of holes.

Arithmetic is also involved, though insignificantly, in the "*enclosed boxes*" item. The relative frequency of passes above mental age indicated that it is easier for adults than its position suggests. Qualitatively, it was uninteresting.

Stanford-Binet: Miscellaneous tests.—The remaining Stanford Binet tests do not easily link with others and will be considered in the order in which they appear in the scale.*

In "*paper cutting*" at the lower levels, the group D patients showed characteristically slow and inadequate comprehension of the task. At the S.A. III level the test is extremely difficult, consequently seldom valuable.†

"*Plan of search*," formerly the "ball-and-field" test, was disappointing. Patients in all groups commonly replied, "I'd go round and round," but without attempting to draw their path. This reply may or may not indicate knowledge of the correct procedure, and this doubt was not always dispelled by their drawings. Most subjects perfunctorily complied with the request to "draw it" with a continuous line rapidly drawn without removing the pencil from the paper. To avoid retracing the same line, the pencil was forced towards the centre at the end of each circuit, thus, almost inevitably, producing the correct plan. Moreover, even when testees drew more carefully, they often, for the sake of neatness, drew concentric circles and not spirals, although their previous verbal responses proved that they had correctly solved the problem. These difficulties in scoring seriously diminished the value of the test. The most reliable differences between the groups was in the rapidity and degree of comprehension of the task.

Failure of the group D patients on "*orientation*" was not surprising, since the material is amongst the most "abstract" in the scale. The demented patients could be compared with those suffering from Pick's disease who could reproduce from memory a pattern, made with little sticks, which reminded them of something "concrete," but could not reproduce the position of a single stick because this could not be remembered except by its abstract quality of having a certain location in space.‡ Guessing was prominent. Replies, such as "About North-East," etc., were often given, revealing, besides guessing, a childish attempt at display.

In "*orientation*" at S.A. III the group D patients usually failed in both parts, the non-demented in part b. As Terman and Merrill admit, part b is to some extent a catch question, occasionally failed by very intelligent persons.

"*Codes*" was the hardest item in the scale up to and including the A.A. level for the group A non-demented subjects. The task was always slowly comprehended. The group D patients almost invariably completely failed to understand it. At best, they merely copied the word "Hurry." The common complaint was that "There is no 'H'," etc., so that they could not directly substitute the letters in "Hurry" from a completed model—a purely mechanical procedure.

Babcock: "Naming objects," "Pronunciation," and "Opposites."—Reference has already been made to these items. The first is essentially a test of co-operation, simple retardation, and so on. The results of the others supported the assumption of some decline in vocabulary ability in the group D subjects.

* Failures below year VII were too few to merit consideration.

† It is, in my experience, the hardest single item in the scale even for very superior adults.

‡ See Goldstein and Katz (1937).

Babcock : Rote repetition tests.—These include “*naming the days*,” “*naming the months*,” and “*saying the alphabet*.” The group D patients were slowest and made most errors in all three tests. As the material presented little difficulty, this indicated that apart from other deficiencies, the severely demented patients were slower than others on tasks well within their powers.

Babcock : “Days” and “Months reversed.”—These tests differ from the rote repetition tests in demanding more emotional control. An important factor in the failure of the group D patients was that they were more hampered than the others by perseveration. In the midst of reversing, they sometimes started to give the sequences in the usual order, perseverating established custom. They also lost points through slow comprehension of the task. Some tried to name the days backwards literally, as “*Yadrutas*,” etc.!

Babcock : Items of information.—Questions on “*personal information*” and “*old school knowledge*” were answered readily, the material being familiar through everyday usage. Here too, however, was evidence of diminished speed in easy tasks. On the other hand, items of “*current information*” and “*locating cities*” were difficult for all groups. This indicated that even in non-demented subjects after 50 years of age, there is diminution of interest in affairs not directly concerned with their everyday lives, and that this deficiency may be equally well demonstrated by questions on a variety of topics. In serious dementia, the diminution is very great indeed. In addition, these items revealed the emotionalism, excuses and escape behaviour, and tendency to guess rather than to admit ignorance, of the group D patients. “*Locating cities*” was more valuable here than “*general information*.”

Babcock : Tests of memory.—The group differences for “*digits forward*” were more significant than for “*digits reversed*”—a surprising result, which I can only account for by supposing some error in the original assessment of the relative difficulty of the items. Clearly, however, ability in the immediate reproduction of meaningless data was in inverse ratio to dementia. This was further exemplified by the results on the “*Knox cube*” test. This test allows of two approaches—either by memorizing the pattern of movement or by mentally numbering the blocks and memorizing the sequence of numbers. The second is indubitably easier. Questions proved that this method was used by few patients in any group and by none in group D.

The simply applied digits tests were among the best in the scale for demonstrating some of the qualitative deficiencies in the group D patients. These subjects exhibited incomplete comprehension of the task by repeating, until corrected, each digit as the examiner read it. Whereas the common errors of the non-demented subjects were to use the right digits in the wrong order, and, as they admitted, to forget the last two or three where the span was wide, group D patients perhaps remembered the first one or two, then merely guessed, often supplying more than the required number of digits, and perseverating from custom sequences, such as 6, 7, 8, 9. Emotionalism and escape behaviour were very prominent, and subsequently recurred on every item in the scale where the patient, having once failed, suspected that his memory was again to be tested. A characteristic of the seriously demented subjects was to attempt a rapid immediate response before the primary impression faded. The better patients muttered the sequence to themselves until they had learned it.

Immediate reproduction of meaningful material is tested by “*repetition of sentences*” and “*immediate paragraph memory*.” In these, success depends not only on accurate fixation of the material, but also on the clearness with which it is apprehended and the degree of insight into the test requirements. The group D patients did not appreciate, for example, the error of substituting “*full*” for “*filled*” in sentence 17. Their guesses, when failing, were qualitatively poor, often mere strings of words approximating the sound of the original sentence, but without meaning. In the “*paragraph memory*” test, excuses and attempted evasions were noticeable as soon as demented subjects realized that their memory was to be tested, their emotionalism and agitation visibly increasing as the examiner continued to read. Guessing and confusions were prominent. Poor insight was indicated by the frequency of comments, proving that the report was thought to be one of actual facts.

“*Designs from memory*” was a useful test. Emotionalism and escape behaviour

occurred as on other memory tests. Incomplete comprehension of the task was proved by attempts to copy the designs before they were removed. The poor performance of the group D patients on this test was, however, mainly the result of their defective apprehension of the material, exemplifying their impaired "abstract approach." Thus, their drawings of the first design showed the flags pointing in various directions without hint of a coherent pattern. For c_1 and c_2 they drew oblongs with bars placed at random in sufficient number to correspond with their concrete image of the original, but with no evidence that the relational elements in the design had been appreciated. On d they usually failed completely, for here apperception of the relational elements is at a premium and the designs are too complicated to be held as a purely sensory image, even the outer shape being confused by the internal complexity. *The same applies to the *Stanford-Binet "designs from memory."* Here, however, the outer oblong is fairly clear. Group D patients usually reproduced this, but merely guessed at the internal design. Even when insufficiently accurate to score on this test, the drawings of the non-demented subjects were obviously superior in quality to those of the group D subjects. On the Stanford Binet designs and on Babcock's c and d , demented patients often exhibited perseveration by drawing the second design very much like the first. As with "digit span," there was often a tendency to rush the response before the first impression faded, so much so that some patients wanted the examiner to remove the designs and let them start drawing before the expiration of the ten seconds.

An interesting observation was that in the execution of the drawings irrespective of their content, the group D patients were notably inferior to the others. They drew clumsily, their lines were irregular and tremulous, their physical movements either timid and hesitant or impulsively careless, or, indeed, alternating between the two. Even when consciously attempting to do so, they could not easily draw parallel lines or lines of equal length. These signs of defective motor control in dementia were confirmed in other tests.

Subtest 16 tests "*retention*." According to Babcock, the score should be higher than on test 8, but in all groups the reverse was true. Indeed, this was one of the hardest items in the scale. Qualitatively, there were no features not seen on test 8.*

Powers of "*recognition*" (tests 20 and 23) declined progressively from group A to group D. Qualitatively, the most conspicuous differences between the groups were that the successes of the group D patients tended to be concentrated in the first few examples, whereas those of the other groups were more evenly spread; and, of course, that guessing was rife in the group D patients.†

Babcock: Learning tests.—As was expected, all patients found the "*substitution*" test difficult. It had special virtues in that the task is easy to understand, and that given time, every patient had the satisfaction of completing it. Group D patients exhibited slowness in comprehension and execution, and clumsiness in holding the pencil and writing. Most notably, however, they displayed their inability to profit from experience and the poverty of their reserve of emotional control. The first was shown by their laboured reference to the key down to the last figure, not even design No. 1 being incidentally learned. The second was particularly well revealed, because in this test the same task must be repeated for a comparatively long time. As the test proceeded, the strain showed on the patient, as in children, by his shuffling on the seat, frowning, tighter and clumsier grasp of the pencil, increased depth and frequency of respiration and other such signs.

The results of the "*paired associates*" item again indicated in serious dementia deficient capacity to profit from experience. Some group D patients displayed incomplete comprehension of the task by repeating the words after the examiner. Perseveration was strikingly exhibited by repetition of the same mistake in each

* I confess to difficulty in evaluating this test. It seems to me that its presentation in the scale as at present makes it susceptible to factors whose influence varies for each person. For example, the time interval between tests 8 and 16 varies from subject to subject; and, more important, so does the amount of intellectual, emotional and conative energy consumed on the intervening tests, and, therefore, the degree to which these are likely to cause retro-active inhibition.

† I do not propose to discuss the complex question of whether different phases of memory can be separately affected. It may be said that patients who were poor in one of the memory tests were usually poor in all, but that exceptions occurred.

trial. The most conspicuous feature, however, was the emotionalism of the group D subjects. Babcock maintained that knowing that they would have further chances helped her patients to sustain their emotional control. I found, however, that their failure was so gross that even the group D patients were aware of it, and the expectation of further trials which could only emphasize it increased their distress, and thereby still further handicapped them.

Babcock: Motor tests.—The results on the "mazes" were anomalous. But qualitative analysis revealed that in actual fact group D was much the poorest group, thus demonstrating how misleading purely quantitative scores can sometimes be. Whereas the other patients were slow and careful, and once having crossed the line, immediately re-entered the track, the group D subjects soon lost emotional control, and after a usually inhibited start, finished impulsively without much troubling to re-enter the track. Hence, their purely quantitative scores tended to be better than those of the intermediate patients, although their performances were actually poorer. Their behaviour manifested gross lack of integration (*vide infra*).

In "writing a sentence," however, the task is so simple that lack of integration and emotional control can have but little influence. The failure of the group D subjects therefore calls for further explanation. The manner of holding the pencil, of writing, of adjusting the paper, in addition to the quality of script and alignment all indicated diminution of speed, accuracy and efficiency of neuromuscular functions in the demented subjects. Other tests (e.g. "designs from memory," "Porteus mazes") provided similar evidence.

Babcock: Date.—This test is a poor one, as the result is subject to so many variable influences.

*Kohs' block test.**—Qualitatively the Kohs' block test was very interesting. Many of the qualities of behaviour exhibited on the vocabulary and verbal tests were again manifested by the group D subjects. They were slow in comprehending the task, some needing to copy a full size model before they understood it. Minor manifestations of facility and lability occurred, and excuses and escape behaviour were common, especially when difficulty was encountered, to which their reaction was often poor. They did not stop working, even while they grumbled at the "childish nonsense," "playing with bricks like children" and "being too old for these games," but the quality of their work deteriorated. "They lost their heads" is what the layman would say, and became slightly agitated or irritable. These complaints illustrated, too, their poor insight into the test situation. Perseveration was prominent. The severely demented patients placed a block, removed it and replaced it in exactly the same way again and again. They continually looked for reassurance and guidance. Lack of insight and defective self-criticism were very conspicuous.

In addition, the Kohs' test revealed qualities of behaviour not seen on verbal tests. Planfulness is among these. Kohs (1923) believed that the test was one of capacity for analysis and synthesis. It is true that success comes easily if the designs are correctly analysed and the models planfully synthesized. The group D patients were conspicuously poor in this respect. Their performances were highly "concrete," on the basis of purely sensory trial and error matching. They very rarely adjusted the block in their hands before placing it. Even a preliminary attempt to get the right colour combination on top was often absent. The process of building planlessly by trial and error matching methods drew their attention to details rather than to the whole, leading, in turn, to difficulty in isolating errors. They often constructed sections in a wrong fashion, thus producing gratuitous errors which, as usual, they had difficulty in isolating when they found that such sections would not satisfactorily combine with others. Indeed, they often in desperation took the whole model to pieces and started afresh. Sometimes they successfully copied the design, but were uncertain whether their model was right or wrong. Thus arose, also, their characteristic difficulty in completing designs three-quarters constructed.

The errors made by the group D subjects were like those described by Nadel (1938) in patients with frontal lobe lesions. He classified them as mistakes caused by (1) attention to detail irrespective of the relation to the design as a whole; (2) over-impressiveness of the colour elements; (3) inability to utilize the elements of colour and position simultaneously; (4) inability to complete models three-quarters

* Unfortunately, Goldstein and Scheerer's paper (*Psychol. Monographs*, No. 239, 1941) reached this country too late for discussion here.

constructed; and (5) seeking non-existent colour combinations. All these, however, are but the consequence of failure to work planfully on a guiding principle and restriction to "concrete" methods.

The deficiencies of the severely demented patients became increasingly obvious at and after design number 7. On number 7, for example, inability to analyse the design into its constituent blocks resulted in attempts such as those illustrated in Fig. 1. More than once, although given 9 blocks and told that he would require them, the patient attempted to construct design No. 10 out of 4 blocks, as in previous designs. Fig. 1 also exemplifies another common effect of their deficiencies—the attempt to construct a bar of colour out of self-coloured facets rather than by a combination of blocks. This was seen rather better in later designs, where attempts were made to construct such bars running diagonally by putting blocks on the slant (Fig. 2).

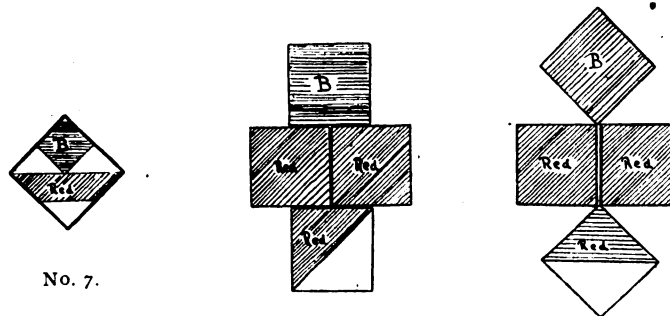


FIG. 1.—Faulty analysis of general configuration in Kohs' block test.* (Shaded portions marked B are blue; unshaded portions, white.)

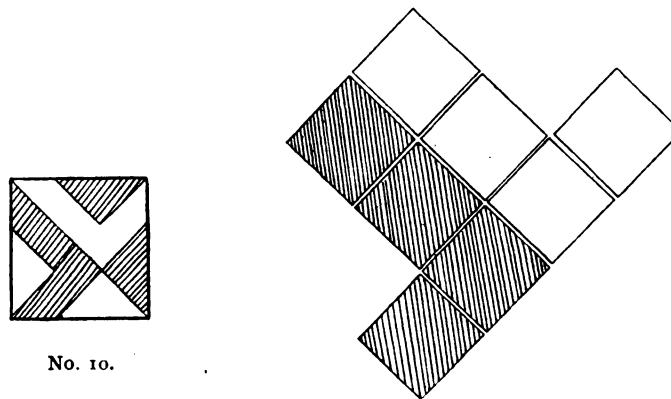


FIG. 2.—Faulty construction of diagonal bars of colour in Kohs' block test by use of self-coloured facets instead of combinations of divided facets. (Shaded portions are blue; unshaded, yellow.)

Another quality excellently revealed by the Kohs' block test was inability to learn, or to profit by experience. The non-demented patients quickly learned to recognize certain recurrent details and to construct them quickly. Often, having constructed an element of a symmetrical pattern, they would construct the opposite equivalent element before continuing the next section. Such behaviour was very seldom displayed by the group D patients.

Finally, this test provided splendid opportunities to observe the qualities of behaviour described by Earl (1937), namely, overactive, excited movements, or timid, hesitant, inhibited movements, or alternating periods of both. This lack of integration, as Earl called it, was perhaps the most conspicuous characteristic of the group D patients in this test.

As was true of other timed tests, extension of the time limit rarely enabled patients to solve items they were unable to solve within it.

Porteus mazes.—The group D patients here exhibited most of the qualities seen on other tests, in particular, slow and incomplete comprehension of the task, "concrete approach," perseveration, inability to profit by experience, and lack of integration. They not only required to have the task explained slowly, simply and at great length, but made errors proving that even then they had not fully grasped the idea; for example, on the year VI and VII mazes, they failed to cut across open spaces, but followed the walls of a blind alley, returning to the same spot, then continuing correctly; and on the year IX maze they went round the square. In both cases, questions proved that they knew they had not taken the shortest path, but did not understand that alleys could be by-passed. Further, on the years XI, XII and XIV mazes, they often removed their pencils from a gap near the centre, believing that once they had escaped from the central "cell" they were "right outside." "Concrete approach" was exhibited by the fact that they rarely attempted to solve the problems by inspection or by mentally tracing the path in reverse before starting to trace with the pencil.* They worked almost exclusively by jumps from gap to gap, planning, at the most, but one step ahead, and confined all the time to the immediate practical task. Perseveration and inability to profit by experience were displayed by repetition of the same error on succeeding trials.

Best of all, the Porteus mazes revealed lack of integration in severe dementia. Sometimes demented patients studied the problem for five minutes before putting pencil to paper, and it was a remarkable testimony to the validity of timed tests that such patients very rarely succeeded. Sometimes inhibition occurred halfway along the path. Then pitiable and grotesque indeed were the efforts simultaneously to keep pencil on paper and to look round, over and under the arm, once again providing evidence of physical clumsiness. Eventually the pencil was reluctantly dragged a millimetre or two, and a further long period of inhibition ensued. Thus, the gaps showed characteristic deep impressions of the pencil point and peculiar untidy wriggles. On the other hand, impulsive, over-excited activity was equally common. Group D patients commonly took turnings without thought, and were halfway down a blind alley before realizing the mistake. Less impulsive but still over-active patients rushed through gaps, but, at the last moment, retrieved their errors, causing characteristic spikes. Alternating periods of inhibition and excitement were not uncommon, and may be considered highly suggestive of severe dementia.

Passalong test.—Qualities repeatedly encountered on other tests were exhibited by group D subjects on the Passalong test. They commonly removed blocks, or merely rotated the whole box so that the position of the blocks became the same as on the plan but, of course, with the red block still at the blue end—herein displaying incomplete comprehension of the task. Excuses and evasions were less common than with most tests as the patients usually treated it as an entertaining puzzle. For the same reason they threw out fewer feelers for reassurance and guidance. Perseveration was very obvious, the same useless move being many times repeated.

At the highest level this test is solved by perceiving the relation of plans 4 and 5, and the inter-relation of plans 6, 7, 8 and 9. I have, however, only once seen it solved in this way. The usual method is trial and error, but with insight into the utility of the moves, and with capacity to forecast, within limits, the effects of each move, and, above all, to profit from previous experience. The deficiency of the group D patients in the last respect was displayed more prominently on this than on any other test. It is often necessary to make space for the wide red block by moving one of two small blue blocks inwards then downwards, so that they come to lie at right angles to their previous direction. Even though unable to explain his procedure, the non-demented patient, in contrast to those in group D, usually learned to recognize when this move was required and quickly accomplished it. Group D patients rarely showed signs of having insight into their activity, or of capacity to forecast the effects of their moves.

* I found that more interesting results were obtained by allowing the patients to study the problems as long as they wished, than with the stricter technique which prohibits this.

The Passalong test ranked next to the Porteus mazes in revealing lack of integration. Over-forceful pushing of the blocks, slow hesitant movements and alternating periods of both kinds of motor behaviour were very often seen, particularly, as Earl (1937) found in morons, when difficulty was encountered. The differences in this respect between groups A and D were especially conspicuous.

In the present chapter evidence has been presented indicating that the most valuable signs of dementia obtained through mental tests are provided by the qualitative aspects of the patient's performance. In order to make this point clear, stress has been laid on the conspicuous differences between groups A and D. It is therefore worth repeating that these differences were not absolute. Groups A and D were poles in a continuous series in which, as expected, group (B + C) occupied an intermediate position. All the qualities described were sometimes shown by the group A subjects, and are occasionally displayed even by very superior adults. What appears to be especially suggestive of dementia is the frequency and intensity of these qualities, particularly when displayed in tests which, judging by the subject's vocabulary ability, occupational history and so on, should be easy for him. The psychometrician hoping to use these observations as an aid in the diagnosis of dementia must realize that much depends on himself. No hard and fast rule can be established for his guidance. All that can be done is to indicate how to recognize the various significant qualities in the patient's performance. Their evaluation, however, is the psychometrist's own problem—a separate and individual problem, moreover, for each individual patient—the solution of which is reliable in proportion to his experience and psychological insight.

V.

THE NATURE OF DEMENTIA.

Clinically, the demented person is one whose behaviour is less intelligent than formerly. He is commonly described as childish and simple, and the diagnosis is usually clinched by his failure to perform a few—often unstandardized—mental tests. Failure in cognitive ability is regarded as the primary symptom. The mental-age levels of the group D patients prove, however, that such a psychopathology fails to explain all the facts. Miss Babcock's work implies recognition of this, although she nowhere argues the point in detail. She stressed the importance in dementia of the discrepancy between "intellectual capacity" and "intellectual efficiency," impairment of which was displayed predominantly by diminished speed in intellectual work and by difficulty in new learning. Unfortunately, she failed to explain why and how impaired efficiency happens.*

The solution of the problem lies in the fact that intelligent behaviour depends on affective-conative in addition to cognitive factors. These factors are better investigated by consideration of the qualitative aspects of test performance than of the quantitative results. The qualitative deficiencies found to be conspicuously exhibited by demented patients were:

- (1) Lack of insight into the test "set."
- (2) Slow and incomplete comprehension of tasks.
- (3) Lack of insight into the quality of performance—defective self-criticism.
- (4) Low level of planfulness.
- (5) Failure to profit from experience—difficulty in new learning.
- (6) Impaired "abstract behaviour."
- (7) Emotionalism—lability and facility. Tendency to become distressed by failure, but to be easily flattered, and cheered by apparent success. Expectation of reassurance and guidance.
- (8) Poor reserve of emotional control—difficulty in sustaining the level of performance.
- (9) Lack of integration.
- (10) Poor reaction to difficulty.
- (11) Excuses and escape behaviour.

* Yacorzynski (1940, 1941) suggested that demented fail on the Babcock test because the problems can be solved only by specific methods, whereas success on the vocabulary test can be achieved by a "number of separate and qualitatively different acts of unequal difficulty."

- (12) Guessing.
- (13) Memory defects.
- (14) Loss of speed.
- (15) Defective neuro-muscular control—including mispronunciation.

The first five of these are admittedly cognitive in character. So, also, are memory defects, and, for the most part, impairment of "abstract behaviour." Certainly, there is some decline in cognitive functions—in intellectual capacity—in dementia; but its importance must not be exaggerated. Numbers 7 to 11, and possibly "guessing," are not cognitive, but affective-conative in character. These also are the qualities most characteristically displayed in dementia. It is mainly these qualities which distinguish patients above the "imbecile level," but unable to sustain themselves in society from those who, with no greater cognitive capacity, nevertheless live normal lives free from signs of dementia. This observation accords with both theoretical and clinical considerations. Psychometric studies in later maturity indicate that a person may suffer diminution in intellectual power to deal with novel situations and rely mainly on the products of past intelligence without gross impairment of social competence (Brody, 1942a). But it is inconceivable that he could survive much diminution in his affective-conative functions—in the urge to adapt himself to life's requirements with the intellectual weapons most suited to him, or in the emotional control of these weapons. If in dementia there is weakness in these respects, failure of social competence despite adequate cognitive capacity can be understood. Clinically, the association of symptoms of affective-conative weakness with those of cognitive failure is a commonplace. Symptoms such as dependence, poverty of initiative, and emotional instability or inadequacy are, one may say, never absent in dementia.

Thus, in dementia, there is deterioration and weakness in all aspects of the psyche. Cognitive deficiency is certainly not the only factor and, indeed, the evidence suggests that it is subsidiary to the weakness in affective-conative functions. Here it may be noted that some of the qualities accepted as cognitive may not be entirely so. Binet and Simon (1909, 1916) stressed the importance of the non-cognitive "feeling of propriety" which enters into judgment and insight. Goldstein, too, insists that "abstract behaviour" is not merely cognitive in character, but an attribute of the total personality.

Further there is often in serious dementia a remarkable association of physical deterioration with deterioration in all aspects of mental life. Many signs were seen in the group D subjects of loss of speed and decline in neuro-muscular mechanisms. These and the memory defects and perseveration can safely be assumed to result from pathological changes in the brain. Most seriously demented patients display clinical evidence of more systemic deterioration than is normal for their age. Though it would be unjustifiable to include such deterioration as an integral part of dementia, the regular association of physical and mental deterioration in dementia emphasizes the diffuseness of the deteriorating processes in the majority of cases. This applies not only in senile dementia and secondary dementia—which may be merely senile dementia occurring in a person suffering from a psychosis—but also in dementia caused by syphilis or alcohol or degenerative diseases, such as Huntington's chorea and the pre-senile dementias. There are few conditions which cause dementia which do not also cause symptoms of a more systemic nature. Cerebral tumour and trauma are prominent exceptions.

VI.

SUMMARY.

1. With the purpose of investigating the nature of dementia, mental tests were administered to groups of mental hospital patients clinically estimated to be demented in varying degree. The patients were carefully selected as to age, sex, co-operation, and freedom from disturbances of the stream of mental activity, so that the use of mental tests was valid.

2. Vocabulary score was above average in the non-demented group, about average in the mildly to moderately demented group and rather below average in the severely demented group, indicating, first, that dementia affects patients in

inverse proportion to pre-psychotic ability, second, that some vocabulary deterioration occurs earlier in dementia than has hitherto been supposed, and in the absence of clinical signs thereof.

3. Even in the most demented group, mental level rarely fell to the imbecile level. Since very many normal persons achieve no higher scores, a psychopathology of dementia expressed in purely cognitive terms fails to explain all the facts.

4. The discrepancy between vocabulary level and scores on other tests increased with increasing dementia. Qualitatively, however, the psychometric pattern was similar in all groups. Success or failure in certain listed items of the Stanford Binet scale possesses special significance, but there is no sign of a specific psychometric pattern in dementia. Abilities are levelled down in dementia.

5. Qualitative analysis of the patients' behaviour and of their working methods provided the clearest distinction between the non-demented and demented groups. Fifteen qualities—viz. lack of insight into the test set, slow and incomplete comprehension of tasks, defective self-criticism, low level of planfulness, failure to profit from experience, impaired "abstract behaviour," emotionalism, poor reserve of emotional control, lack of integration, poor reaction to difficulty, excuses and escape behaviour, guessing, memory defects, loss of speed, and defective neuromuscular control—appear to be characteristic of dementia when frequently and intensely displayed, particularly on tests which, judging by the patient's vocabulary level, etc., should be well within his power.

6. Since these qualities are sometimes exhibited by all subjects, their evaluation depends in each individual case on the examiner's judgment.

7. Many of these qualities are not cognitive, but affective-conative in character. In normal senility, although cognitive deterioration may be as severe as in dementia, the affective-conative deterioration is proportionately much less. It thus appears that in dementia all aspects of the psyche are affected, and that although cognitive deterioration occurs, the affective-conative deficiency is probably more important. This accords with both clinical and theoretical considerations.

8. In most conditions which cause dementia, the deteriorating processes are diffuse, involving both mind and body.

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