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Part I.—Original Articles.

A PSYCHOMETRIC STUDY OF SENILITY.

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PROBLEM.

THE writer undertook to try out a number of mental tests on a group of senile patients and to submit a tentative battery for a further investigation of senescence.

This article deals with the selection of tests and the results of the full scale on 20 seniles. In all, 38 patients were tested, and the results on the second group, who appeared clinically to be more demented, will be reported later.

Very little work has been done in the measurement of senility (1), so that some preliminary criteria seemed to be necessary. It was decided that about an hour for each patient would be adequate, preferably in two sessions. Standardized tests would be first choices, administration and scoring ought to be objective and simple, and the material should be compact, and with enough variety to hold the interest of both subject and examiner.

In considering what functions one should test the recent work of Thurstone and Thurstone (2) was borne in mind. From repeated large scale studies they managed to isolate six " primary mental abilities " which they called : The verbal-comprehension factor V, the word fluency factor W, the space factor S, the number factor N, the memorizing factor M, and the inductive or reasoning factor R. To give a better balance to the scale a few simple motor tests were included.

SELECTION OF TESTS.

The first step was to look for reputable adult tests. Until recent years adult testing had received insufficient attention, but from about 1936 it began to come into the limelight. The work of Weisenburg, Roe, and McBride (3), and of Wechsler (4), are landmarks in this field, and items were selected from their scales.

A good deal of work has been done on mental " deterioration," and the following tests, most of which have been used for this purpose, were tried :

Babcock's Deterioration Scale, Rylander's Scale, items from the Terman and Merrill Scale, Bender's Visuomotor Gestalt Test, Cattell's Recognition of Designs and Nonsense Syllables, Picture Memory, and Colour Reversal, Dworetski's Pictures, Kohs' Block Designs, Porteous Mazes, Raven's Matrices, Trist's Progressive Shapes, the Shipley-Hartford Retreat Scale, Grace Kent's Oral Emergency test and her Written Tests for the clinic.

In all, nearly eighty short tests or items were tried before the present scale took shape. Only five of the Babcock tests were retained, the rest being discarded for various reasons, such as poor discrimination, too easy or too difficult material, timing difficulties—i.e. where separate items are timed—subjectivity of scoring, etc. All the Terman and Merrill items dropped out, mainly because the age range

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is too narrow. Some of these are, none the less, very useful clinically where insight into pathological mental function is wanted, e.g. Proverbs, Verbal and Pictorial Absurdities, Minkus Completion, Dissected Sentences, and Memory for Designs.

The above, and other relevant considerations, eliminated Kent's Written Tests, most of Rylander's Scale, two of Wechsler's Verbal Tests, and all except four of the others mentioned.

On the whole the battery is too long, and a shorter one, consisting of the items starred (Table I), is a useful combination. It should be emphasized that tests are the psychologist's tools, and his skill in using and interpreting them largely determines the quality of the results.

Subjects.

The 20 patients were seen in two London hospitals. Their ages ranged from 68 to 83 (median = 77 ± 4·5). Thirteen of the 20 were born in London and had spent most of their lives there. Vocationally, the group consisted of 1 professional, 1 skilled, 6 semi-skilled, and 12 unskilled workers.

In all cases the attitude towards the tests and the examiner were satisfactory. Occasional petulance and irritability were easily smoothed over. One or two became a little suspicious as to the purpose of the tests, and wondered if they had done something wrong or if they were to be transferred. These were told frankly

Table I.—*Tentative Test Battery for Seniles, showing Order of Presentation and Estimated Time in Minutes.*

No.	Test.	Time.	Average M.A.
1	Information: Personal	..	..
	Impersonal	..	..
1	Photographic recognition	4	..
2	*Picture memory	1	..
3	*Reading speed (monosyllables)	1	9·5
4	*Naming months forward	..	12·5
5	*Naming months reversed	1	11·5
6	*Repeating digits forward	..	(14·5)
7	*Repeating digits reversed	1	(11·5)
8	*Recall of paragraph—immediate	2	9·5
9	Block designs (Kent)	..	7·5
10	*Colour naming	..	..
11	*Colour reversal	3	..
12	*Recall of paragraph—delayed	2	7·0
13	*Vocabulary	8	..
14	Tapping	4	..
15	*Cube imitation	2	..
16	*Naming animals	1	..
17	*Naming birds	1	..
18	*Arithmetic	4	..
19	Tracing—letter "S"	1	..
20	Tracing—star	1	..
21	*Maze tracing	5	7·5
22	Writing speed—name	1	..
23	Writing speed—"U.S.A." (in full)	1	..
24	*Cube packing	3	..
25	*Sentence memory	4	11·5

The tests were derived from the following sources:

Tests 2, 10, 11, 15: Cattell, R. B. (1936), *Guide to Mental Testing.*

Tests 3, 21: Burt, C. (1921), *Mental and Scholastic Tests.*

Tests 4, 5, 8, 12, 22, 25: Babcock (1930), *An Experiment in the Measurement of Mental Deterioration.*

Tests 6, 7, 13, 18: Wechsler, D. (1939), *Measurement of Adult Intelligence.*

Test 14: Burt, C. (1909), *Brit. J. Psychol.*, **3**, 94.

Test 23: Downey, J. (1923), *The Will-Temperament and Its Testing.*

Tests 1, 16, 17, 19, 20, 24: cf. p. 370 of this article.

Test 9: Kent, G. H. (1934), *J. App. Psychol.*, **18**, 578.

The tests marked * form a useful shortened scale which takes about 40 minutes.

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that we wanted to compare their efforts with those of younger men. On the whole, the patients seemed to enjoy the incursion into their daily routine, and the project gave them another topic of conversation. From the writer's point of view they were as interesting to test as children.

Treatment of Results.

As the scale is a mixture of standardized and unstandardized tests, scores were converted into ranks, both on each test and on the full scale; the Spearman rank difference formula was used to calculate the correlation coefficients, which were afterwards transmitted into product-moment coefficients.

Estimates of the mental status of the patients were made in two ways, neither of them being very satisfactory. Firstly, mental ages were computed on eleven of the tests. This notation is obsolete for adults, but it has some use here for comparison with previous work on the decline of mental functions.

Table II.—*Order of Difficulty in the Tests and Comparison with Previous Findings.*

(A) *Most Difficult.*

Present scale.	Previous results.	
Arithmetic, Wechsler	Analogies	Army Alpha.
Colour reversal, Cattell	Arithmetic	..
Cube imitation, Knox	*Associations, hard	Army Alpha.
Digits reversed, Wechsler	" Commonsense "	Army Alpha.
Mazes, Porteous	*Directions, hard	..
Months reversed, Babcock	Digit-symbol	Woodworth-Wells.
Paragraph memory, Babcock	..	..
Picture memory, Cattell	..	..
Reading speed, Burt	*Gestalt completion,	Bender.
	*Memory for designs	..
	Number completion	Army Alpha.
	*Paragraph recall	..
	Picture arrangement	Wechsler.
	*Digits reversed	Wechsler.
	Similarities	Wechsler.
	Also " logical procedure, organization, speed, and recall of unfamiliar material."	

(B) *Moderately Difficult.*

Block designs, Kent	*Associations, easy	..
Digits forward, Wechsler	Arithmetic	Army Alpha.
Naming animals and birds	*Counting backwards	Babcock.
Sentence memory, rote, Babcock	Directions, oral	Army Alpha.
Vocabulary	*Digits forward	Wechsler.
	Dissected sentences	Army Alpha.
	*Feature profile	Wechsler.
	*Information	Wechsler.
	*Sentence memory	..
	*Vocabulary	Wechsler.
	*Block design	Wechsler.

(C) *Least Difficult.*

Colour naming, Cattell	Comprehension	Wechsler.
Cube packing	Opposites	Army Alpha.
Photo recognition	Picture completion	Wechsler.
Tapping	Synonyms	..
Tracing	(Vocabulary)	Wechsler.
Writing, name, etc., Babcock	(Information)	Wechsler.

Tests marked * are classified by Wechsler, roughly, on the basis of various published studies and his own experience. They relate to the measurement of senile dementia.

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Secondly, weighted scores on the three " Bellevue " tests were averaged and I.Q's. calculated from Wechsler's conversion tables (verbal scale). Two sources of error come in here: (*a*) Three tests instead of five were used for I.Q. estimates, and (*b*) the figures were derived by extrapolation as Wechsler's highest age group is 55 to 59. The errors in I.Q's. are not likely to be more than a few points either way.

As a list of raw scores or ranks would not be very illuminating, mental ages for the appropriate tests are shown in Table I.

Table II shows the approximate order of difficulty in the 25 tests and a comparison with previous findings. This difficulty order was based on an analysis of the following criteria:

(1) Correlation with age within the group—bearing in mind that chronological age is not the only determinant of senility.

(2) The score variance in the different tests; which is partly a function of content, length, method of scoring, etc.

(3) The extent to which the tests discriminate between degrees of dementia, i.e. as between the two groups of patients.

(4) Relative mean scores, viz. mental ages.

(5) Proportion of failures.

(6) Correlation of the various tests with the full scale.

The results shown in Table II will be discussed from the point of view of different functions.

Table III shows the patients' I.Q's., together with estimates of the present mental efficiency of each patient as compared with the average level for ages 20 to 24, which Wechsler found to be the peak ages on his Bellevue scale.

Table IV gives the correlation of each test with age and with the full scale.

TABLE III.—*Estimates of Present and Former Mental Status of Twenty Senile Patients from Three "Bellevue" Verbal Tests.*

Subjects.	Age	Estimated intelligence quotients.	Estimated efficiency quotients.	Estimated efficiency quotients (vocabulary).
1	70	128	142	149
2	83	101	79	117
3	79	116	113	138
4	78	91	60	43
5	81	104	85	149
6	72	105	91	106
7	73	110	102	117
8	69	96	74	106
9	74	105	91	149
10	71	86	45	64
11	82	99	64	96
12	77	125	132	149
13	68	119	123	138
14	80	124	127	170
15	82	117	113	138
16	80	101	68	85
17	76	99	68	85
18	69	126	138	138
19	73	81	36	53
20	77	95	60	64
	Av. = 76.	Av. = 106.	Av. = 91.	Av. = 113.

RESULTS.

It will be noticed that the results of this experiment in regard to difficulty order agree substantially with those of previous investigators (Table II). Briefly, the present group of seniles found it difficult to reverse old habit sequences, to retain visual and auditory material of a meaningful kind, and showed impairment in such qualities as judgment, planning, and spatial discrimination.

They were somewhat better at rote memorizing, and in fluency of old associations.

They showed up best on immediate recognition (visual), early acquired habit

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TABLE IV.—*Correlation Between Each Test and* (A) *Age,* (B) *Full Scale.*

Test No.	Correlation with age in the present group.		Correlation with full scale.
1	+·44		+·29
2	+·07		+·54
3	−·41		+·55
4	−·67		+·59
5	−·62		+·76
6	−·28		+·66
7	+·03		+·75
8	−·07		+·56
9	−·63		+·67
10/11	−·01		+·66
12	−·26		+·61
13	+·07		+·70
14	−·42		+·43
15	−·26		+·38
16	−·02		+·70
17	−·06		+·78
18	−·08		+·58
19/20	−·24		+·73
21	−·16		+·86
22/23	−·28		+·71
24	−·21		+·66
25	−·07		+·76
All tests	−·27	All tests *v.* Bellevue	+·71
		All tests *v.* Babcock	+·79
		All tests *v.* memory tests	+·57

patterns, and simple motor tasks. It should be emphasized that these results are merely pointers to the *kind* of functions concerned. Apart from the fact that similarly named tests do not necessarily measure the same thing, any test can be made easier or harder by altering the number and kind of items, or the method of presentation.

The 25 tests were ranked in order of difficulty on each of the criteria mentioned. Since these rank orders did not run in parallel the estimates in Table II were obtained by considering each test in relation to all the criteria, and from observations made at the time of testing.

The correlation of −·268 between scores on the full scale and age within the group gives some indication of the more rapid decline of functions in old age. The writer found correlations little more than zero on a number of adult tests between the ages of 20 and 45.*

We can now discuss the above results in more detail.

The importance of ATTENTION was stressed by Rylander (5) in his study of frontal lobe tumours, and he used preliminary tests which purported to measure attention. Since no test really isolates this factor his example was not followed here. It was considered of more importance to build up a good rapport from the start. Straying of attention is more marked in seniles than in young people; they tend to lapse into a " brown study " or into reminiscence quite easily and have to be recalled to the test situation. To this they usually submit quite readily.

COMPREHENSION is a complex function, compounded of attitude, attention, memory, level of intelligence, sensory status, etc. It became evident that oral questions and instructions must be kept short, as the retention span is considerably curtailed, and repeating questions alters the standardization of the tests. Simplicity of visual material is also indicated for the same reason.

The decline of REASONING power was demonstrated in the preliminary stages, when a larger number of tests was in use. Unless one gave a good deal of prompting the patients were unable to do much with such tests as Burt's Reasoning Tests,

* The senile group is too small for really reliable correlation coefficients.

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Raven's Matrices, Kent's Essential Properties, Shipley's Abstraction, etc. Categorical thinking showed up badly on the sorting tests, e.g. Rothman's Test, using various articles of common use, and a test of shapes. If one is to use such tests on seniles one must have either a simpler version with short instructions, or use a carefully worked out prompting technique with a secondary measure of the amount of help required by the subject. This method has been explored successfully by Trist (6) in testing G.P.I's. The only reasoning test in the present battery is the arithmetic test from the " Bellevue " scale, which is quite suitable for seniles.

MEMORY tests were affected to some extent by sensory impairment, but none of the patients failed on this account, and if we are to measure senility we cannot exclude factors which are part of the process. Visual recognition appeared to show up better than visual recall, as one would expect, although no strict comparison is possible and both subjects and items are few. Rote memory was much better than logical memory, which suffered severely. In the recall of the Babcock paragraph (both immediate and delayed) all the mechanisms noted by Bartlett (7) occurred, e.g. omissions, elaborations, displacements, condensations, dramatizations, etc. The Babcock item is rather dull, however, and a more interesting paragraph with a similar number of " ideas " showed a better recall. The latter has not been included in the scale as it has no standardization.

FLUENCY and speed of associations is partly a function of the material used. Old rote habits, like naming the days of the week or months of the year, hold up well, though subject to a general retardation in senile functioning. In all the fluency tests there was markedly more blocking (longer and more frequent gaps in production) than in younger people. The only test in this section, where there was occasional forgetting of the task, was colour naming, but this was partly due to competition from some of the test material which the subject is required to ignore.

The SPATIAL factor was studied by the use of such tests as Kohs' Blocks, Progressive Matrices, and Porteous Mazes. The first two seemed to be too difficult to give sufficient variation of scores, apart from being rather long. Most of the block designs employ two-colour blocks divided diagonally, and the patterns are half size with no dividing lines between the blocks. This created difficulty for the seniles, some of whom seemed to become immobilized, whilst others rang the changes on a number of queer constructions. Goldstein (8), faced with a similar difficulty in cases of schizophrenia and cerebral lesion, used a progressive prompting and facilitating technique, This method is enlightening to the clinician, but the writer found it far too long, and therefore substituted a set of full colour designs used by Grace Kent, primarily on children. These proved to be about the right level, and showed quite a good variation in scores. In the Matrices test the subjects seemed to be rather bewildered when they reached the more conceptual part (late in Set B), and required undue prompting. Because of their failing sight they tended to complain of blurring of the patterns.

Porteous Mazes turned out to be one of the better tests in the scale, and gave another justification of its thirty years' existence. It has the highest correlation with the total scale, and a wide range of scores. Ranking these scores in order shows a steady linear drop through the series. The performances were interesting to watch : all the reactions mentioned by Porteous (9) and Brody (10) came out. A dynamic test such as this, where the subject's thinking is translated into action, is useful. (The reader is referred to chapters 3 and 6 of Porteous's *The Practice of Clinical Psychology*.) It is interesting that in a study of vitamin B deficiency (where some of the symptoms are similar to those of senility) by O'Shea, O'Shea and Higbe (11), it was shown that impaired maze performance was the one significant manifestation of deficiency, and the authors claimed to be able to assess the degree of deficiency by the amount of impairment in the maze performance.*

In the MOTOR tests both speed and steadiness were impaired. In senile patients, who are, in a sense, out of life's main stream, the time set is weakened, and the writer had to stress, in the timed tests, that they were to be done as quickly as possible. Some cases showed marked unsteadiness and disturbance under this imposition, and there was often a long warming-up period in which performance was rather poor and scanty. The time set would often fade during a test and have to be reasserted. In general, the senile likes to go along at his own pace and is disturbed by any interference with his routine. In the tests he may wander from

* Unfortunately these results were only on a few cases.

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the point or " play about." There was noticeable awkwardness in the handling of materials, with slowness, and tremors, due to decline of neuromotor facility, stiff joints, oedema, etc., as well as to emotional upset. Whilst it may be true that old people are less emotional, the test situation, especially if timed, may throw them out of gear. There was a low correlation between speed and steadiness —some patients were steadier when working quickly, others when they slowed down. The problem of individual differences in tempo is important in modern life, and the disturbances due to enforced tempo have not been sufficiently studied. They can be studied particularly well in old people.

It now seems to be established beyond question that VOCABULARY holds up well with age, and is useful as an index to " previous level," though there seems to be some vagueness as to what is meant by " previous." Where a pathological process is slow and insidious the time of onset is not easy to determine ; it may well be many years back. I have shown elsewhere (12) that the use of the vocabulary score as an index of pre-morbid level is not always justifiable. Much depends upon a person's background and interests. As between vocabulary and, say, non-verbal tests one is apt to find about as many discrepancies in scores the one way as the other—in adults at any rate. This means that in some cases another ability may serve better than vocabulary, especially in illiterates and people of low " intelligence " with practical ability. In a fairly recent study (13) the vocabulary (Terman and Merrill) growth curve was markedly different from curves of other tests in that it showed a late peak, i.e. at about the age of 55. If, therefore, a young person is being tested for possible deterioration his vocabulary ability will almost certainly be in the growing stage, whilst many other abilities may have reached their peak. In the present scale 12 out of the 20 patients had higher ranks on the total scale (excluding vocabulary) than on vocabulary alone, although the latter test showed up better than other *verbal* tests. The correlation of a vocabulary with a battery depends upon the kind of tests in the latter. In the present scale there were 14 non-verbal tests, yet the correlation was +·70. The vocabulary test does justify its inclusion, especially if it is one of the definitive kind, where the responses, if recorded verbatim, can be so valuable clinically.

One of the main findings of recent work on mental deterioration is the inability of many " organic " cases to shift from one mental attitude to another, especially from a concrete to an abstract attitude, a lack of resilience which often requires a strong pull to bring about the necessary movement. PERSEVERATION is an aspect of this rigidity, though most of the tests so far used to measure it have appeared to be unsatisfactory. In this study the forward-reverse type of test brought out senile inelasticity very well. In all three of these tests (colour reversal, reversing months and digits) there was a considerable discrepancy between forward and backward scores in terms of amount done or time taken. The more firmly established the habit the more difficult it is to break, hence reversing months shows a greater per cent. loss than does reversing digits. In the colour test the forward part itself is not easy for seniles ; the reversal is very revealing to the observer, as also is reversing months. Blocking, hesitancies, retracing steps, reverting to the forward sequence, and other signs of disturbance appear.

Tests 16 and 17 (naming animals and birds) were placed in apposition with the idea of bringing out perseveration, but it failed in the present group, whilst succeeding in the more demented group.

Perseveration occurs in dementia not only within tests but also between tests, and a changing scene or a variety of different items may be relied upon to produce it. Cameron (13) found, in patients suffering from psychoses of the senium, a greatly increased tendency to perseverate, which interfered with the registration of material, and which, allied to interference with retention by secondary elaboration, contributed to impoverishment of recent memory.

The problem of estimating former mental status presents difficulties, as mentioned. It would be of great assistance to have a number of curves showing the rise and fall of scores from early years to old age on a variety of tests, perhaps for different levels of ability. They should be triple curves, i.e. showing mean and deviation scores. In the present group the two measures of present status available are, as stated, mental ages and I.Q's. on some of the tests. As far as mental age is concerned, Jones and Conrad (14) reported a recession to an average mental age of 14 by the age of 55. Wechsler, in recommending chronological age (adult

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M.A.) denominators for use with the Terman and Merrill scale, suggests M.A. 12 for ages 55 to 59. This estimate is based on his composite age curve for the " Bellevue " scale. The average age for the present group of patients (ages 68 to 83) is between 10 and 11. It is obvious that age curves differ according to the kind of tests used, and the mental age method is much less useful than such measures as percentiles or standard scores. Most English adult tests are now scored in percentiles.

In terms of I.Q. the median score of the seniles is 105 ± 10 points. A rough estimate of the intelligence level on the three " Bellevue " tests at the peak ages of 20 to 24 raises the figure to 113 ± 8 points. According to Wechsler's tables the decline in I.Q. with age is greater as one goes down the scale of intelligence, so that, other things being equal, the more intelligent people will preserve their mental functions longer. This seems to be confirmed by observation and in the present investigation. An alternative and probably better estimate of the present level of the seniles relative to younger people was made from Wechsler's table of efficiency quotients (p. 195). An E.Q. of 100 means that an individual's score is on a par with the average score for the peak ages of 20 to 24 ; an E.Q. greater than 100 indicates a higher efficiency, and an E.Q. less than 100 a lower efficiency than the peak average. The estimated E.Q's. of the seniles range from 42 to 78 (average = 61), so that, subject to small errors of estimation, there is an approximate loss of efficiency in the present group of old people of about 39 per cent. on the average, and on the three tests concerned. The rather doubtful procedure of estimating E.Q's. on vocabulary score alone gave a range of 44 to 80 (average = 69), i.e. an approximate drop of about 31 per cent. from the peak.

Gilbert (15), in a comparison of the performance of 20-year-old with 60-year-old males—matched for vocabulary tests—reported " losses " in the latter group varying from 8·5 per cent. to 60·4 per cent. (mean 35·5 per cent.) according to the kind of test. The difficulty-order shown by her tests was substantially the same as in the present study.

An attempt was made to compare the variability of scores *within* individuals in the present group with the variability *between* individuals on the full scale of tests. The probable error of ranks was used as a measure of scatter, and the results of all the patients (38) were used. The figures for the present group were abstracted, and the results showed the proportion of intra- to inter-individual variation to be approximately 85 per cent. This figure is not significantly different from the figure of 80 per cent. found by Hull (16) as the result of a similar comparison.*

There was a definite tendency for the older people in the present group to " scatter " more ($r = +·43$), also for greater variability in the low scorers ($r = -·53$).

It was necessary in this investigation to keep the conditions of testing as ordered as possible, but experiment showed that a better clinical assessment accrued from using fewer tests and " exploiting " them to the full. Many of the items in the battery are particularly suitable for such usage, and the writer has since used the method with interesting results, following the example of Earl, Guttmann, Zangwill *et al.*

As a curtain raiser to the tests the subjects were asked a few questions about themselves and their affairs, and some items of general knowledge, as follows :

Personal.—Full name, age, birthday, date of admission to hospital, last address, names, ages, and birthdays of wife and children if married, or of siblings if single, name of school with age and status on leaving, occupations, names of employers, hobbies, interests, and work in the hospital.

Impersonal.—Name of present Prime Minister and of his precedessor, dates of the last war, date on which the present war started, date of Armistice Day, dates (month and year) of the invasion by Germany of France and Russia.

All were able to give promptly such items as their names, names of wives, children, or siblings, last address before entering hospital, name of school, leaving age and status, often with names of teachers and schoolmates, and jobs held between leaving school and retirement with names and addresses of employers.

All except four knew their birthdays, but there were mistakes as to the year of birth. Ages and birthdays of families were less firmly established.

* Hull's results were derived from a battery of 35 tests given to 107 American High School students. His measure of variance was the Standard Deviation.

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There were no mistakes in naming the Prime Minister, but four failed to name his predecessor correctly, giving names such as Baldwin, Ramsay Macdonald, Lloyd George, and Asquith.

The dates (months and years) of the last war were correct in all but four cases, but the date of the beginning of the present war was poorly recalled—six subjects gave the wrong year (e.g. 1937, 1938, 1941), and all except five failed to give the month correctly. It was perhaps too optimistic to expect the invasion dates to be recalled—only three gave the correct year and none the correct month.

On the whole names and places were recalled much better than dates and figures; this seems to be the case with most people. It occurs in patients recovering from electrical convulsions when one is checking information obtained prior to the fit. Personal memories were superior to impersonal in amount and accuracy; and whilst most of the patients could recall scraps of conversation from my previous visit, only one or two could recall, without prompting, oral material out of the previous test session. Again, remote memory was better than recent, and the flow of reminiscences had to be kept in check.

Most of the patients read at least one daily paper; a few were fairly heavy readers and regular borrowers from the hospital library. The majority wore glasses for reading, and a common complaint was that they needed "stengthening." Few appeared to have personal hobbies or interests other than the wireless, reading, dominoes, or cards. All were up and about and mostly did work in the ward or garden.

As far as could be ascertained from the case-notes and from questioning all the patients were correctly orientated for time and place, e.g. they knew the day, month and year, time of day, name and location of the hospital, names of other patients and hospital staff. Less than half gave correctly the date of their admission to hospital or the date of the test. On the whole one day is very much like another to them, and there is less need or incentive to remember dates, times (except mealtimes) and other data to which people "outside" have to pay attention.

References are given in Table I for most of the tests in the scale, but the following six tests, introduced by the writer, call for a brief description.

Test 1: *Photograph recognition.*

This consists of twelve black and white photos of middle-aged men. They are uniform in size and clarity, and are numbered, the first four being used for individual presentation. In Part 1 the photo (No. 1 first) is shown for 30 seconds; it is then shuffled with the others and the subject is asked to pick it out. This is repeated for the other three photos. The cards are left in the pack after each presentation, with the object of bringing out perseveration, indecision, confusion, etc.

In Part 2 the subject is asked to select from the pack the four photos, in order if possible. (He can be warned at the beginning to expect this—or not—so long as one procedure is followed with all subjects.) The test was not difficult enough to give a good score variation, but could be made so by increasing the number of cards presented to six. This technique is better than presenting half the material at once and asking the subject to separate it from the rest (as in Babcock's method)—it leaves less to chance.

Test 16: *Naming Animals.*

After a trial with the conventional word-association test it was decided that the situation needed more control because of possible emotional blocks in "free" association, and the different degrees to which subjects make use of their immediate environment (this could be obviated to some extent by getting subjects to close their eyes). The subject is asked to give the names of as many animals as he can think of in one minute. The results were satisfactory and gave a good scatter.

Test 17: *Naming Birds.*

As in Test 16.

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Test 19 : *Tracing.*

The subject was given a sheet of paper on which was a large letter " S " composed of dots a quarter of an inch apart ; he was instructed to trace the outline by drawing through the dots and to do it as quickly as he could. Time and errors were recorded. On the whole the test is not to be recommended as the errors are not easy to assess.

Test 20 : *Tracing.*

For this test an eight-pointed star was used instead of a letter " S." It has the same disadvantage as Test 19, i.e. as to error assessment, but it is better in other respects. It requires the subject to make nine changes of direction in tracing—in vertical, horizontal and diagonal. Most of the patients tried to make the test easier by turning the paper, but this was not allowed.

It is quite a good test of combined speed and steadiness and it brings out motor disturbance—both primary and secondary, i.e. due to emotional disturbance.

Test 24 : *Cube Packing.*

The material consists of a wooden box, 4 by 4 by 3 in. deep (or a little over to allow the blocks to fit readily), and 48 1-in. cubes. The subject has to pack the cubes in the box—in three layers—as quickly as he can. The time is recorded.

Even in such a simple test motor disturbances occur, as well as different ways of handling and packing.

Dexterity in handling cubes is also a prime factor in the block design test, which employs easy, full colour designs. The correlation between that test and the present one is +·58.

Summary.

A tentative battery of 25 short tests for the measurement of senescence is described (*cf.* Table I). The scale is the result of the application of nearly 80 tests to senile patients in three London hospitals. It was administered in full to 38 patients in all, and the present findings refer to a group of 20 less seriously demented ones, with an age range of 68 to 83.

The tests are classified into three groups according to the degree of difficulty experienced by the seniles (Table II). The divisions were made on the basis of a number of criteria which emerged during the working up of the results, and are only pointers to the kind of functions involved. Briefly, the most difficult tests were those in which subjects were required to break away from old mental habits and adapt to unfamiliar situations, tests of recent memory (logical), of judgment, planning, and reasoning, or embodying difficult or lengthy instructions. Less difficulty was found with such tests as rote memory, fluency of associations, simple arithmetic, and vocabulary. Performance seemed to be least affected on tests of visual recognition, old mental habits, and simple motor tasks.

It is shown that tests for senility should be short, especially those with oral questions, because of straying attention, impaired comprehension, and short retention. Perseveration is greatly increased in senescence ; it can be brought out merely by having a succession of short, varied items. There is a loss of steadiness and speed on the motor side. The disturbing effect of tests with a time element on the slower acting senile is noted.

The present mental status of the patients is estimated on eleven tests which are scored on the (outmoded) mental age method (Table I) : the average of these is between M.A. 10 and 11. This figure is compared with previous reports on the decline of intelligence.

An estimate of the former mental status of each patient is made by means of efficiency quotients on part of the " Bellevue " scale. These relate each score to the average level for the peak age-group of 20 to 24 years (Table III).

The use of the vocabulary score as an index of former level is discussed.

A comparison of score variation *within* individuals with variation *between* individuals shows a ratio of the former to the latter of approximately 85 per cent.

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Variability of scores within individuals increases with age inside the patient group, also with lower intelligence.

A shortened version of the scale, which takes about 40 minutes, is indicated (Table I).

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