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The Usefulness of the Clinical Tests of the Sensorium

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Although the clinical tests of sensorium (CTS) are widely used as a quick check of mental efficiency (Slater and Roth, 1969), they have come together in a haphazard way and their validity has been questioned (Shapiro *et al.*, 1956). For example, a patient may be able to perform well on so-called memory tests such as Digit Span and Babcock Sentence and still have a florid memory disturbance (Roth and Hopkins, 1953; Zangwill, 1946).

We wished to investigate some of the variables influencing patients' scores. Our hypotheses were:

1. More intelligent subjects would obtain higher scores.
2. Subjects with longer schooling would gain higher scores.
3. In adults, increasing age would be associated with lower test scores.
4. Repetition of tests would lead to increased test scores.
5. Patients with impaired cerebral function (diagnosed as 'brain syndromes' in A.M.A. Standard Nomenclature of Diseases) would obtain lower scores than other groups of patients.
6. The presence of anxiety or depression would decrease test scores.

Method

The CTS used were those three forms outlined in our previous paper (Withers and Hinton, 1971). The psychiatric subjects were 108 patients, 57 male and 51 female, consecutively admitted to the unit for investigation and treatment. The non-psychiatric subjects were 40 medical or surgical in-patients, 20 male and 20 female, matched for age, sex, Mill Hill Vocabulary Scale Score and social group, with a sample of 40 representative of the entire psychiatric group of 108. The non-psychiatric subjects had no mental disturbance apparent to their ward sister.

The initial testing was within three days of admission, the second testing between the fifth and seventh days and the final test was when the consultant psychiatrist judged that the patient had reached his optimal level. A Latin square design decided the order of using the three test forms and whether the psychologist or junior psychiatrist would give the test.

The consultant psychiatrists made their initial diagnosis from the case presentation and then heard the results of the CTS, reviewing the diagnosis as necessary. They again reconsidered the diagnosis at the time of discharge. For each day on which a psychiatric patient did the CTS the consultant psychiatrist rated the severity of the mental disorder (on a five point scale from 'severe' to 'nil'). On the same days the senior nurse would fill in a check list of signs and symptoms; relevant to this study were indications of anxiety and depression.

During a patient's first week in hospital and also when he was judged to be at his optimum he would be given by a nurse Raven's Standard Progressive Matrices and the Mill Hill Vocabulary Scale, Form 1 Senior. The psychologist administered the Wechsler Adult Intelligence Scale (WAIS) when the patient was at his optimum.

The results of most of the investigations were punched onto cards and submitted to the multivariate counter programme of the University of London Computer Unit. Comparisons between groups, by means of 't' tests (and where necessary, the technique valid for small samples, see Moroney, 1951) were carried out.

Results

1. *Intelligence*

Standardized tests of intelligence given at

the optimal time gave a mean IQ (WAIS) of 110, SD 14; the Matrices test mean percentile was 73, SD 28; and Mill Hill percentile 64, SD 24.

Every subtest but one from the initial CTS correlated significantly ($P < \cdot 01$) with the initial Matrices test (mean percentile 68, SD 30) and with the later-administered WAIS, the correlations ranging from ·23 to ·62. Correlations with the Mill Hill Test (mean percentile 64, SD 24) were also statistically significant at the 1 per cent level, values ranging from ·27 to ·56, excepting the Logical Memory and Telephone Number Recall tests.

The correlations between the CTS, Mill Hill, Matrices and WAIS, when all were assessed at the final optimal state, are given in Table I. The intercorrelations were similar to the first occasion of testing, all subtests correlating significantly with the WAIS. In general the CTS subtests correlated significantly but at a slightly lower level with the Mill Hill and Matrices tests. The insignificant correlations, regarding the Mill Hill scale, were with the time taken for Serial Sevens and the Delayed Logical Memory test and, regarding the Matrices, with the Immediate Recall of Address and Telephone Number.

So there is little doubt that intelligence, as measured by standardized tests, has a significant bearing on CTS results, even when patients are mentally disturbed at the time of testing. It was noted, however, that the correlations between the Mill Hill Scale and those subtests involving the recall of presented words were higher at the 'optimal level' retesting.

TABLE I

Correlations between clinical tests of the sensorium and Mill Hill vocabulary scale, progressive matrices and WAIS in 104 psychiatric patients tested on reaching optimal level of improvement

(Correlations of ·195 significant at 5 per cent level, ·230 at 1 per cent level and ·254 at 0·1 per cent level.)

	Mill Hill	Matrices	WAIS
Orientation	·22	·33	·50
Days reversed	·29	·21	·48
Serial 7's:	·34	·55	·58
Time	—·17	·30	·33
Address:			
Immediate	·40	·16	·45
Delayed	·33	·35	·51
Telephone:			
Immediate	·29	·09	·38
Delayed	·32	·39	·50
Sentence	·37	·21	·49
Logical memory:			
Immediate	·29	·37	·49
Delayed	·17	·40	·45
Digits:			
Forward	·20	·20	·33
Backward	·33	·35	·52
Story:	·36	·33	·57
Point	·40	·34	·49
General information	·41	·40	·67
Mill Hill		·41	·63
Matrices			·61

2. *Education*

The mean age of ending full-time education for this group was 15·6 years, SD 1·7, and there was a correlation of ·28 ($P < \cdot 01$) between the WAIS and years of education.

At the first testing, nine of the sixteen CTS subtest scores did not correlate at a statistically significant level with the years of schooling; the highest level was ·38 for general information. At the third testing eleven of the subtests correlated significantly with years of education, but the highest correlation, for Serial Sevens, was ·32.

The findings confirmed that, directly or indirectly, there is some relationship between CTS scores and length of schooling but the relationship has little predictive value.

3. *Age*

The correlations between age and subtest scores were not high. In four tests there was a statistically significant decline with age; these correlations were with Delayed Recall of Telephone Number (— ·24), Sentence Recall (— ·22), and Logical Memory tests (Immediate — ·30, Delayed — ·25). Accuracy in Serial Sevens increased slightly with age, correlation ·22. (The means and standard deviations of each subtest for the various age groups are obtainable on request).

4. *Repetition of tests*

These patients showed some improvement in CTS subtest scores on repetition, an

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effect which had been noted at a statistically significant level for five subtests during the initial reliability studies. In this psychiatric group many patients had shown clinical changes between tests, so the inquiry into the effects of test repetition alone has been limited to 38 subjects whose clinical assessments showed no change.

There was a general trend towards small improvement on retesting this group. On four items (second testing of Serial Sevens and Logical Memory tests, third testing of Reversing Days of the Week and Delayed Recall of Telephone Number) the increase in score was significant at the 5 per cent level according to the 't' test for small samples. So there was some support for this hypothesis.

5. *Brain syndromes (organic psychoses)*

The psychiatric patients performed the CTS less well than the group of medical and surgical patients did, except for Digit Span and General Information (see Table II).

Allocation of psychiatric patients to the diagnostic subgroups was initially made by the consultant without knowing the CTS results. Subsequent knowledge of the results influenced only two of over 100 diagnoses; these diagnoses lay between dementia and agitated depression, and the CTS inclined one diagnosis to dementia (later confirmed as Alzheimer's disease) and the other to depression (recovered).

Of the 12 patients with brain lesions only six had brain syndromes (from cerebro-vascular disease 1; hypoglycaemia 1; cortical atrophy 2; Alzheimer's disease 1; and post-traumatic epilepsy with dementia 1). The other six patients had temporal lobe epilepsy without other history or evidence of brain damage. The patients in the rest of the psychiatric group were suffering from schizophrenia, psychoneurosis, affective, psychophysiologic or personality disorders (A.M.A. classification).

The brain syndrome group certainly had low scores on the CTS, and in comparisons between the non-psychiatric and the brain syndrome patients there were statistically significant differences on all subtests except for Digit Span and for Reversing the Days of the Week. Delayed recall tended to show greater defect than immediate recall did (see Table II).

The comparisons between the brain syndrome group and the psychiatric representative sample (contamination present) showed the brain-damaged group to have significantly lower means for Orientation and the Delayed Recall of a Telephone Number ($P < \cdot 05$) and for the Immediate Recall involved in Logical Memory ($P < \cdot 01$) and Sentence Repetition ($P < \cdot 001$).

On the other hand, the brain syndrome group was small and its average age significantly greater than that of other groups. Although generally lower, the range of scores usually overlapped the range of scores obtained from other groups.

The brain syndrome subjects were comparable on the WAIS Full Scale IQ. Their mean IQ was 109, SD 12 while the means from the other diagnostic groups ranged from 103 to 114. The mean verbal IQ for the organic psychoses group was 118, SD 13, compared with means ranging from 107 to 116 for other diagnostic groups; their mean performance IQ was 99, SD 12, other groups ranged from 97 to 109. The brain syndrome group also demonstrated the expected superiority of Mill Hill Vocabulary level over that of Progressive Matrices. (There was an opposite trend in the normal and psychoneurotic groups.)

6. *Affect*

The influence of mood change was first sought by comparing CTS subtest scores of patients with affective or psychoneurotic disorders with the control group (see Table II). The affective group, 31 depressed and 3 hypomanic, obtained significantly lower scores in Delayed Recall of Address, Logical Memory, Story, and General Information tests. The psychoneurotic patients, some of whom demonstrated anxiety, only differed from controls in the Story test.

A sounder basis for detecting the influence of anxiety depended on nurses' ratings on the day of testing. Table III shows that 14 patients anxious on first testing did significantly better in some items on retesting when free of anxiety; the subtests showing change were Orientation,

TABLE

Mean scores with standard deviations for clinical tests of sensorium and intelligence tests for 40 matched controls compared with, compared with matched

(P * < ·05, ** < ·01, *** < ·001); mean

	matched controls Mean	SD	Psychiatric sample Mean	SD	Brain syndrome Mean	SD	Affective disorder Mean	SD
TESTS								
Orientation	8·7	0·5	8·4	0·8*	7·2	1·3***	8·4	0·3
Days reversed	7·0	0·2	6·6	1·2*	6·8	0·4	6·7	1·2
Serial 7s:	12·4	2·4	11·8	2·5	10·0	3·8*	12·1	2·2
Time	64·3	44·0	113·1	97·5**	136·3	65·3**	114·0	90·8
Address:								
Immediate	6·5	1·1	6·5	1·1	6·5	1·1	6·4	1·1
Delayed	5·1	1·7	4·0	2·3*	2·7	2·4**	4·1	2·3*
Telephone number:								
Immediate	1·9	0·3	1·9	0·3	1·8	0·4	1·8	0·4
Delayed	1·1	0·4	0·8	0·5***	0·3	0·5***	0·8	0·6
Sentence	4·5	2·7	5·0	2·9*	0·8	1·5**	4·6	2·8
Logical memory:								
Immediate	10·6	3·3	8·7	3·5*	5·4	2·3***	7·8	3·8*
Delayed	9·7	3·3	7·8	4·1*	5·0	4·0**	7·2	4·2*
Digits:								
Forward	7·1	1·3	7·0	1·5	6·7	0·5	6·7	1·7
Backward	4·7	1·2	4·6	1·3	3·7	1·1	4·5	1·2
Story:	7·3	1·2	5·8	2·4***	4·2	2·9***	5·8	2·6**
Point	4·0	1·0	2·4	1·6***	2·0	1·7***	2·8	1·9**
General information	14·0	1·7	13·2	2·2	12·2	3·0*	12·6	2·8*
PATIENTS								
Number	40		40		6		33	
Age	37·2	14·7	35·7	14·5	57·0	8·9**	44·1	15·1
School leaving age	15·8	1·5	16·0	1·5	15·5	1·3	15·9	1·7
WAIS IQ	—	—	—	—	109·4	11·7	111·2	13·3
Matrices percentile	87·8	16·4	69·8	31·2**	42·3	20·9***	69·7	29·8**
Mill Hill percentile	70·2	20·4	70·6	20·5	65·7	24·1	67·2	25·1

Serial Sevens and Logical Memory. (The effect of repetition, as shown by the non-anxious group, was insignificant). Only the Digit Repetition test showed an initial significant difference between the anxious and non-anxious groups.

A similar comparison in 14 subjects observed to be depressed (Table IV) showed significant improvement in Serial Sevens, Logical Memory and Story subtests, when their depression had gone. (The non-depressed group on retesting only showed a significant but smaller improvement in the Logical Memory test.) Depression at the initial testing also lowered performance in the same subtests as compared to psychiatric patients without depression.

This gave some support to the hypothesis that depression lowered test scores and so, to a lesser extent, did anxiety.

DISCUSSION

The tests which have become grouped together as the clinical tests of the sensorium are a motley assembly, apparently sustained by habit rather than by any consistent process of standardization and validation. The present results, in keeping with a few other reports published in the last twenty or so years, confirm that some tests do help differentiate organic from functional mental disorders but that others are of little use; and that other factors, particularly general intelligence, need to be taken into account when interpreting the significance of the test results.

II

representative sample of 40 psychiatric patients. Patients with brain syndrome, affective and psychoneurotic disorders also control group.
scores given for other diagnostic groups

Psychoneurosis		Epilepsy		Schizophrenia		Psychophysiologic disorder		Personality disorder	
Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
8·4	1·1	8·2	0·7	8·0	1·3	8·9	0·2	8·3	0·5
6·6	1·2	6·3	1·5	7·0	·0	6·9	0·2	6·7	0·9
11·0	3·6	11·0	4·9	11·0	1·4	11·8	2·4	11·0	3·0
107·8	81·0	76·2	50·3	90·7	76·7	81·9	58·4	66·9	36·5
6·7	·6	6·3	1·1	6·9	0·3	6·7	0·7	6·1	0·9
4·7	2·2	4·8	1·8	3·9	2·3	4·9	1·8	4·6	2·1
1·9	0·4	1·8	0·4	2·0	0	2·0	·0	1·9	0·3
1·0	0·5	0·5	0·8	0·9	0·6	1·1	0·6	0·9	0·6
4·3	3·0	3·2	3·2	5·4	2·5	5·5	1·9	4·2	2·4
9·5	3·5	10·0	3·7	6·8	3·2	9·4	2·8	11·3	2·9
8·2	4·2	9·0	3·5	5·5	4·3	8·5	3·4	9·8	3·3
6·8	1·6	6·3	·8	6·4	1·2	7·2	1·6	6·2	1·0
4·6	1·5	4·0	1·0	4·4	1·1	5·0	1·2	4·7	0·9
6·2	2·0*	6·5	2·1	5·5	1·9	6·8	1·9	6·9	1·6
3·5	1·5	3·7	·9	3·6	1·4	3·5	1·5	2·7	2·1
12·7	3·6	11·5	4·0	11·6	2·5	12·8	2·4	12·2	2·1
29		6		8		17		9	
36·7	14·3	33·5	13·3	30·5	9·8	26·8	16·8	28·7	15·7
15·4	1·4	14·8	2·3	16·4	1·7	15·6	1·6	15·1	1·7
110·9	18·2	108·7	12·6	108·7	10·6	113·6	10·1	102·9	11·7
67·9	31·8**	73·7	34·6	59·4	28·7	75·3	20·6	52·6	34·2
57·4	24·7*	64·3	26·7	68·0	20·9	66·8	22·1	56·9	28·7

The findings of the present investigation are summarized in a simplified form in Table V. This emphasises the consistent influence of intelligence as assessed by the Mill Hill, Progressive Matrices and WAIS tests. The relationship with the length of schooling, shown in the next column, may well be influenced indirectly by intelligence. In 1945, Eysenck and Halstead investigated the relationship between intelligence and some of these clinical tests in a group of 60 neurotic army personnel. They demonstrated that the results in the so-called 'memory' tests were largely accounted for by the intelligence level as measured by the Progressive Matrices test, and their explanation was that the results depended a great deal on the ability to learn.

The standardized intelligence scales give some indication of decline in brain function. Our subjects in the brain syndrome group had a significantly lower score on the Progressive Matrices tests than other psychiatric patients did, whereas the Mill Hill Vocabulary level did not alter appreciably. Roth and Hopkins (1953) found the Matrices test differentiated well senile psychosis from affective disorders in the elderly. This pattern of change of ability with cerebral disease recalls the work of Babcock published in 1930. Her studies were designed to show that mental deterioration leaves the intellectual level related to previous scholastic ability and vocabulary unchanged, but that the mental efficiency in using data from sensory functions is impaired. Babcock designed and

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TABLE III

Mean scores of some clinical tests of the sensorium comparing the anxious with those not anxious, comparing the anxious with their performance after recovery, and comparing those who remained not anxious with their performance on test repetition
(* $P < .05$, ** $P < .01$)

	Anxious 1st Test		Not anxious 1st Test		No longer anxious 3rd Test		Remain not anxious 3rd Test	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Orientation	8·5	0·5	7·8	1·2	9·0	0**	8·4	1·3
Serial 7s:	11·8	2·1	10·0	4·6	13·4	0·9*	10·7	4·3
Time	103·8	76·7	82·6	46·3	56·1	50·0	83·0	40·9
Sentence	4·1	2·7	4·1	3·1	5·9	1·8	3·5	3·0
Logical memory:								
Immediate	7·9	2·5	9·0	3·4	12·9	4·4**	10·4	2·5
Delayed	7·2	2·5	7·4	3·4	14·2	9·7*	9·9	2·2
Digits:								
Forward	7·0	0·7	6·1	1·1*	7·1	1·0	5·8	1·0
Backward	4·7	1·0	2·9	0·9	4·9	0·8	4·1	0·8
Story:	6·6	1·7	6·3	1·9	7·2	1·0	7·4	0·7
Point	3·9	1·8	3·0	1·7	4·0	·8	3·1	1·4
Number of subjects	14		8		14		8	

TABLE IV

Mean scores of some clinical tests of the sensorium comparing the depressed with those not depressed, comparing the depressed with their performance after recovery, and comparing those who remained not depressed with their performance on test repetition
(*$P < .05$, **$P < .01$, ***$P < .001$; n.k. = not known)

	Depressed 1st Test		Not depressed 1st Test		No longer depressed 3rd Test		Remain not depressed 3rd Test	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Orientation	8·1	1·0	8·4	1·0	8·4	0·8	8·6	1·2
Serial 7s:	10·7	3·4	11·1	3·7	13·1	1·4*	12·1	3·2
Time	145·5	108·9	89·7	70·9*	63·2	45·1*	69·4	85·7
Sentence	4·7	3·6	4·1	2·8	6·0	2·0	5·2	2·6
Logical memory:								
Immediate	5·8	2·2	9·4	3·6**	11·0	3·9***	11·6	4·2*
Delayed	4·9	3·1	8·5	4·1**	12·6	10·0*	10·8	4·3*
Digits:								
Forward	7·1	1·4	6·6	1·2	7·1	1·4	6·6	1·4
Backward	4·3	n.k.	4·2	n.k.	5·1	n.k.	4·8	n.k.
Story:	4·7	2·6	6·5	2·1*	6·6	1·9*	7·0	1·3
Point	2·1	1·9	3·5	1·6*	3·6	1·4*	3·6	1·4
Number of subjects	14		43		14		43	

utilized a number of tests of mental efficiency, several of which are included in the CTS. Each of the CTS will now be considered.

Tests of Orientation concerning place and time, identity, were found by Shapiro *et al.* (1956) to be useful in differentiating organic from functional mental illness. Such questions also formed part of the 'information' test used in the investigation by Roth and Hopkins (1953) and, with the Progressive Matrices, were successful in separating affective from dementing conditions. This was also our experience: incorrect answers were most often given by patients with brain syndromes. A

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TABLE V

Summary of factors affecting clinical tests of the sensorium

(+ or − = rise or fall significant at P < ·05; ++ or − − = rise or fall significant at P < ·01; nt = not tested)

	Correlated				't' test					
	Intelligence	Years at school		Age	Repeated test	Brain syndrome	Psycho-neurotic disorder	Affective disorder Anxious		Depressed
Orientation ..	++					− −				
Reversed days ..	++	++			+			nt		nt
Serial 7s: ..	++	++		+	+	−				−
Time	++					− −				− −
Address:										
Immediate ..	++	+						nt		nt
Delayed ..	++	+				− −		nt	−	nt
Telephone:										
Immediate ..	++	+						nt		nt
Delayed ..	++	+		−	+	− −		nt		nt
Sentence ..	++	++		−		− −				
Logical memory:										
Immediate ..	++	+		− −	+	− −		− −	− −	− −
Delayed ..	++	+		− −		− −		−	− −	−
Digits:										
Forward ..	++	++						−		
Backward ..	++	++								
Story:	++					− −	−		− −	−
Point	++					− −			− −	−
General information ..	++	++				−		nt	−	nt

valuable additional point was that the test did not appear to be influenced significantly by the other factors investigated except intelligence.

Reversing the Days of the Week was included in Babcock's battery of tests of mental efficiency and she found that, although the results corresponded to some extent with the Vocabulary Rating, in the presence of cerebral lesions (general paresis) the results of this test contributed to the decline in the individual's total score of mental efficiency. This test has otherwise had little evaluation. In our subjects a better performance was associated with higher intelligence, more education and practice in the test. It was not significantly affected by brain damage, and its value appears dubious.

Continuous addition and subtraction tests have been used for years by clinicians, including Kraepelin. Hayman (1941) employed the Serial Sevens test on school-children and found that they were able to complete it correctly in two minutes at the age of 13. He found that two out of three adults performed it correctly but many psychiatric disorders lowered the proportion of subjects correctly performing the test. Ruesch (1944) found the Serial Sevens test was a useful pointer in patients who suffered a head injury; the test results related to the extent of coma, confusion and intellectual impairment. Serial Sevens also were used as part of an arithmetic test by Shapiro *et al.* (1956). Although in their first assessment a poor performance in the test was found to be associated with organic mental illness, when the clinical diagnosis was reviewed later by a process designed to avoid possible contamination of the diagnostic process by prior clues to impairment, the arithmetic test no longer differentiated organic from functional disorder. In our series brain syndromes significantly reduced patients' scores in the Serial Sevens test. Depression of mood had a similar effect upon this test, however, and the results also correlated positively with age and length of education. This was the one item in which increasing age was associated with greater accuracy in performance.

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Recalling a Name, Address, and Telephone Number gives scores not easy to interpret as memorization involves a sequence of processes, sometimes divided into registration, retention and retrieval (Inglis, 1970). When Shapiro *et al.* (1956) used the test, the address was repeated until the patient could reproduce it correctly and he was asked to recall it five minutes later. This gave some separation of the learning and retention processes of memory. The clinical value Shapiro *et al.* finally placed on the Address test was similar to that of the Serial Sevens test: the test appeared to discriminate organic and functional cases until they reviewed their diagnostic method. In our subjects, testing recall after two minutes showed impaired functioning in the brain-damaged subjects. Delayed Recall was a little less efficient in elderly subjects and in those with a diagnosis of affective disorder, but these effects were less marked than was the influence of a brain syndrome.

Babcock's work receives its token of appreciation with the attachment of her name to the final sentence of her graded series. Sentence Repetition has been subject to scrutiny and modification by Zangwill (1943); eight failed attempts to repeat the sentence correctly—the subject typically repeating the mistakes—indicated a failure of retention. But Zangwill noted that neurotic patients could give highly variable results, and also reported (1946) that in cases of brain injury, unless dysphasia had been present performance was seldom impaired, even with the amnesic syndrome. Eysenck and Halstead (1945) included the Babcock Sentence in their investigation of memory function and decided, as did Ingham in 1952, that this test was one of intelligence and learning ability rather than of memory. Warburton (1963) reported that many normal subjects failed the Babcock Sentence test according to Zangwill's criteria, the failure rate rising with age and exceeding 50 per cent after the age of 40 years. The subject in our present series confirmed some of these previous observations; the results correlated positively with intelligence and negatively with age. Nevertheless, patients with brain syndrome did perform significantly less well than others on our Sentence Repetition test and alterations of mood did not affect results.

The Logical Memory Test, taken from Year X of the Terman-Merrill Binet test, was found by Shapiro *et al.* (1956) to have no success in distinguishing functional from organic psychosis. We also found it to be an indicator of intelligence; but many conditions adversely affected the subjects' performance—age, organic psychoses, functional disorders and alterations of mood—and so its value in this field is minimal.

The digit span test likewise appears to have little value amongst the CTS. It was used by Babcock (1930) and is part of Wechsler's intelligence scales. Zangwill (1946) and Roth and Hopkins (1953) found a considerable overlap of the test performance of patients suffering from organic or functional disorders. As with the Babcock Sentence, amnesia as gross as that in Korsakov psychosis did not necessarily impair immediate repetition and Inglis (1957) also found that elderly subjects with a memory defect could repeat the sequences of digits adequately. Heilbrun (1958) used the digit span test on a large number of normal subjects, physically ill, and mentally ill patients and found it failed to separate the groups; even when comparison was limited to the extremes of students and brain-damaged the optimal cut-off point led to 30 per cent misclassification. The various diagnostic groups of patients in our series did not differ significantly in their performance of this test.

Repetition of a simple Story—the 'Cowboy' story was used in Henderson and Gillespie's *Textbook of Psychiatry* (1927) and the 'Donkey and Salt' and the 'Neptune and Labourer' tales in Bleuler's textbook (1924)—has similarities to the Logical Memory test. These were the two clinical tests which Shapiro *et al.* (1956) found to have no significant diagnostic value during any part of their study. We found that organic brain disease did impair the Story Repetition and giving the Point of the Story; but so did functional disorders, particularly depression.

General Information tests, used in some intelligence scales, were employed by Babcock (1930) as a test of brain efficiency. Roth and Hopkins (1953) combined such questions with

items of orientation in an information test and found this discriminated well the demented from the depressed. In a further paper (Hopkins and Roth, 1953), they found this test placed patients with arteriosclerotic psychosis intermediately between the distinct affective and senile psychoses, a grouping which accorded well with the clinical course of these three categories of diseases. Shapiro *et al.* (1956) asked their subjects 10 questions on recent general events concerning well-known public happenings, persons and dates; they found significant differences between patients with functional and organic disorders. Our results agree with previous findings in that patients with organic psychoses showed a significant impairment in the General Information test; so, to a lesser extent, did those with an affective disorder.

It has been shown that the CTS have some degree of reliability, in that the results are similar on re-testing. Their ability to separate patients with organic brain disease from other conditions varies. Some tests have been such poor discriminators in previous investigations and in the present inquiry that they do not warrant their continued use for this purpose, while others do show impairment of cognitive function when there is organic psychosis, bearing in mind that other factors may influence test performance.

Many clinicians will feel that there is a place for some simple tests of the sensorium when it is inopportune to use the lengthier, if more precise, standardized measures of general intelligence or other specific tests. Our own preference is to leave out of the CTS the tests of Reversing the Days of the Week and the Digit Span test and, as long as their limitations are recognized, to utilize the tests of Orientation and General Information which have shown their value. There is some support for retaining the Serial Sevens test. In our opinion there is insufficient merit in the 'memory tests' to warrant using all of them. Tests of immediate recall can be deceptive guides but the Sentence Repetition test is simple to perform and not without value. Recall of a Name and Address after a two minute interval can indicate a memory defect; serious consideration should be given to modifying this test so that the subjects learn the address at the beginning of the test; then the ability to retain memory would be tested rather than the immediate learning ability.

Babcock, using the discrepancy between vacabulary level and the mean of her chosen 24 tests of mental efficiency as a guide to mental deterioration, stated 'in further improving the examination the number of tests should be reduced as far as is compatible with reliable results and with keeping it a valid measuring scale for pathological conditions' (1930). We hope we have gone some way towards this.

Summary

The clinical tests of the sensorium, in three equivalent forms, have been used three times each in a balanced order on 108 psychiatric patients and 40 patients without mental disorder. Other intelligence tests and clinical ratings were also used. The small group of patients with organic brain syndromes gave significantly poorer results in many, but not all, of the tests. There was some support for the hypothesis that general intelligence would affect performance, as also the length of education, age, test repetition and disorders of mood. In the discussion and review of these tests it is suggested that the tests of Orientation and General Information are clinically useful, the Serial Sevens and selected tests of recall, especially those involving a period of delay, have a value; but Reversing the Days of the Week and the Digit Span test could be omitted from the CTS

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