"MINI-MENTAL STATE"

A PRACTICAL METHOD FOR GRADING THE COGNITIVE STATE OF PATIENTS FOR THE CLINICIAN*

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INTRODUCTION

EXAMINATION of the mental state is essential in evaluating psychiatric patients.[1] Many investigators have added quantitative assessment of cognitive performance to the standard examination, and have documented reliability and validity of the several "clinical tests of the sensorium".[2,3] The available batteries are lengthy. For example, WITHERS and HINTON's test includes 33 questions and requires about 30 min to administer and score. The standard WAIS requires even more time. However, elderly patients, particularly those with delirium or dementia syndromes, cooperate well only for short periods.[4]

Therefore, we devised a simplified, scored form of the cognitive mental status examination, the "Mini-Mental State" (MMS) which includes eleven questions, requires only 5–10 min to administer, and is therefore practical to use serially and routinely. It is "mini" because it concentrates only on the cognitive aspects of mental functions, and excludes questions concerning mood, abnormal mental experiences and the form of thinking. But within the cognitive realm it is thorough.

We have documented the validity and reliability of the MMS when given to 206 patients with dementia syndromes, affective disorder, affective disorder with cognitive impairment "pseudodementia"[5,6]), mania, schizophrenia, personality disorders, and in 63 normal subjects.

DESCRIPTION OF THE MMS

The MMS is shown in the appendix. Questions are asked in the order listed and scored immediately. The tester (psychiatric resident, nurse, or volunteer) is instructed first to make the patient comfortable, to establish rapport, to praise successes, and to avoid

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pressing on items which the patient finds difficult. In this setting most patients cooperate, and catastrophic reactions are avoided.

The MMS is divided into two sections, the first of which requires vocal responses only and covers orientation, memory, and attention; the maximum score is 21. The second part tests ability to name, follow verbal and written commands, write a sentence spontaneously, and copy a complex polygon similar to a Bender–Gestalt Figure; the maximum score is nine. Because of the reading and writing involved in Part II, patients with severely impaired vision may have some extra difficulty that can usually be eased by large writing and allowed for in the scoring. Maximum total score is 30. The test is not timed. Detailed instructions for administration are given in the appendix.

METHODS

The MMS was given to two groups of people that we will refer to as Samples A and B. In Sample A (Table 1) are 69 patients chosen specifically as clear examples of clinical conditions (29 with dementia syndromes due to a variety of brain diseases, 10 with affective disorder, depressed type with clinically recognizeable cognitive impairment, 30 with uncomplicated affective disorder, depressed type) and 63 normal, elderly persons similar in age to the patients. All the patients were tested shortly after admission to the New York Hospital Westchester Division, a private psychiatric hospital and the normal subjects were tested at a Senior Citizens Center and at a retirement apartment complex. Thirty-three of the 69 patients in Sample A were retested after treatment. The patients with dementia were treated according to their clinical conditions. They occasionally received tricyclic antidepressants or phenothiazines as well as treatment for medical illnesses. The patients with depression were treated with antidepressants and/or ECT. They also may have received medical treatments.

Sample B (Table 2) is a patient group formed by taking consecutive admissions to the hospital and giving them the MMS shortly after admission. It was intended to be a standardization sample and came eventually to consist of 137 patients (9 patients with dementia, 31 patients with affective disorder, depressed type, 14 patients with affective disorder, manic type, 24 with schizophrenia, 32 with personality disorder with drug abuse, and 27 with neurosis). These diagnoses were made by M.F. on review of the hospital chart employing the diagnostic criteria described below and without knowledge of the MMS scores. Subsets of patients from both Samples A and B were extracted for age-matched studies (Table 1B) concurrent validity (Table 3) and test-retest reliability (Table 4).

The following diagnostic criteria were used for both Sample A and B:

Dementia. A global deterioration of intellect in clear consciousness.

Affective disorder, depressed type, with cognitive impairment. A sustained feeling of depression with an attitude of hopelessness, worthlessness or guilt accompanied by disturbances in orientation and memory which occurred after the onset of the depression.

Affective disorder, depressed type, uncomplicated. A sustained feeling of depression with an attitude of hopelessness, worthlessness or guilt and with no notable cognitive defect.

Affective disorder, manic type. A sustained feeling of elevated mood with an attitude of overconfidence or exaggerated self-importance.

Schizophrenia. Either Schneider's first rank symptoms in the absence of affective symp-

TABLE 1.

Sample A

A. Mini Mental State Scores on Admission

Diagnosis	N	Age	Sex M/F	$\bar{X}$	MMS S.D.	Range	Mann-Whitney U	P
Dementia	29	80.8	12/17	9.6	5.8	0-22	45	< .001
Depression with cognitive Impairment	10	74.5	7/3	19.0	6.6	9-27	65.8	< .001
Affective Dis., Depressed	30	49.8	9/21	25.1	5.4	8-30	1178 (Z=6)	< .001
Normal	63	73.9	27/36	27.6	1.7	24-30		

B. Mini Mental Scores on Admission: Age-Matched Sample

Diagnosis	N	Age	Age Range	Sex M/F	$\bar{X}$	MMS S.D.	Range	Mann-Whitney U	P
Dementia	8	76	75-79	2/6	6.9	4.7	1-14	4	< .001
Depression with cognitive Impairment	8	76	70-86	5/3	18.4	5.7	9-27	8.5	< .006
Affective Dis., Depressed	8	74	69-79	1/7	26.1	4.4	17-30		

C. Mini Mental State Scores of Patients Tested Before and After Treatment

Diagnosis	N	Age	Sex M/F	$\bar{X}$	MMS S.D.	Range	$\bar{X}$	MMS S.D.	Range	$\bar{X}$ days between tests	Wilcoxon T (1 tail)	P
Dementia	14	81.4	6/8	10.5	6.6	0-22	11.1	5.7	1-19	29	20	NS
Depression with cognitive Impairment	7	75.0	5/2	18.3	5.8	13-27	23.4	2.4	21-26	36	1.0	< .025
Affective Dis., Depressed	12	58.9	3/9	25.5	5.0	14-30	27.2	3.7	16-30	51	10.5	< .025

TABLE 2.

Sample B

Diagnosis	N	Age	Sex M/F	$\bar{X}$	MMS S.D.	Range
Dementia	9	74.4	3/6	12.2	6.7	1-22
Depression	31	50.7	16/15	25.9	4.2	9-30
Mania	14	39.5	6/8	26.6	3.5	20-30
Schizophrenia	24	44.6	14/10	24.6	6.6	1-30
Personality Disorder with Drug Abuse	32	34.3	17/15	26.8	2.5	19-30
Neurosis	27	25.6	15/12	27.6	2.4	21-30

toms or the presence of a personality deterioration associated with thought disorder and emotional incongruence without first rank symptoms.

Personality disorder with drug abuse. Absence of all above symptoms with a history of drug abuse, including alcohol.

Neuroses. Presence of psychological symptoms appearing to arise from the combination of a particular life situation and vulnerable character but with the specific absence of symptoms characteristic of the other syndromes.

TABLE 3.

Sample for MMS – IQ Correlation

Diagnosis	N	Age	Sex M/F
Dementia	7	78	3/4
Depression with cognitive Impairment	8	76	6/2
Depression	8	55	3/5
Schizophrenia	2	68	1/1
Neurosis	1	22	0/1

TABLE 4.

Test-Retest Reliability

Type of Reliability	Sample Composition	N	Age	Sex M/F	MMS 1 X	MMS 1 S.D.	MMS 1 Range	MMS 2 X	MMS 2 S.D.	MMS 2 Range	# days between tests	Wilcoxon T (2 tail)	Wilcoxon P	Pearson r	P
24 hr. retest (1 tester)	various types of depressive symptoms	22	41.2	3/19	24.2	7.1	2-30	25.3	7.0	1-30	1	45	NS	0.887	<.0001
24 hr. retest (2 testers)	various types of depressive symptoms	19	45.6	7/12	23.9	4.7	13-30	25.2	5.1	13-30	1	22	NS	0.827	<.0001
28 day retest clinically stable patients	dementia, depression, schizophrenia	23	74.1	6/17	19.3	10.0	1-30	19.2	9.2	1-29	27.7	42	NS	0.988	<.0001

RESULTS

Validity

The MMS separated the three diagnostic groups in Sample A from one another and from the normal group. Of a total possible score of 30, the mean score for patients with dementia was 9·7, depression with cognitive impairment 19·0, and uncomplicated affective disorder, depressed 25·1. The mean score for normals was 27·6. Thus, the MMS scores agreed with the clinical opinion of the *presence* of cognitive difficulty and as the cognitive difficulty is usually less in depression than in dementia the scores dispersed in a fashion agreeing with the *severity* of the difficulty.

To be sure that these scores were not due to age effects and unrelated to clinical conditions an age-matched group was drawn from Sample A and showed an identical dispersal of scores according to diagnosis (Table 1b). Mean initial Mini-Mental Status score for

patients with depression under 60 yr-of-age was 24·5 and for patients over 60 was 25·7. These scores were not significantly different.

Thirty-three patients in Sample A were tested prior to and after treatment appropriate to their conditions. Patients with dementia most of whom have uncorrectable brain disease could be expected to show little change in a valid test of cognitive state, whereas those with depression and an associated cognitive difficulty (pseudo dementia) should show a considerable gain with treatment. These expectations are borne out in the results. There is no significant change in the MMS of dementia, a small but significant increase in the depressed patients, and a large and significant increase in those depressed patients with symptoms of cognitive difficulty.

Graphs charting the change-over time in the Mini-Mental State in three patients with improving cognitive states illustrate its usefulness serially and are further examples of how the MMS changes with the clinical state. The examples include a patient recovering from a head injury (Fig. 1), a patient recovering from a metabolic delerium (Fig. 2), and a patient recovering spontaneously over $2\frac{1}{2}$ months from a depression accompanied by severe cognitive impairment (Fig. 3).

Sample B was drawn in order to improve the impression of validity by standardizing the
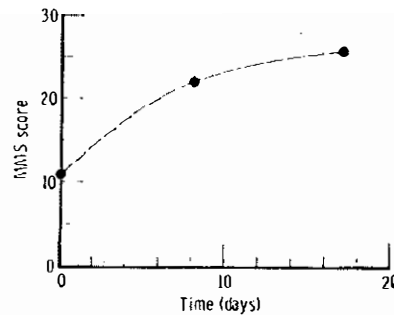

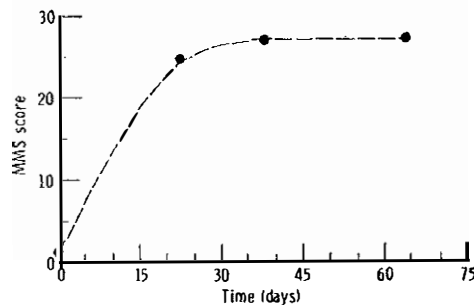FIG. 1. Serial Mini-Mental State Scores of a patient recovering from a head injury.

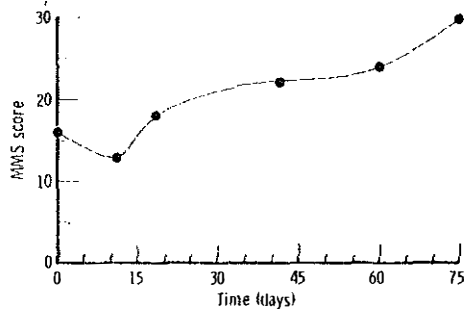FIG. 2. Serial Mini-Mental State Scores of a patient recovering from a metabolic delerium.

FIG. 3. Serial Mini-Mental State Scores of a patient recovering spontaneously from a
depression accompanied by severe cognitive impairment.

MMS in a consecutive series of admission. One hundred and thirty-seven consecutive
admissions were examined. Their mean MMS scores were: dementia 12·2; affective disorder,
depressed 25·9; mania 26·6; schizophrenia 24·6; personality disorder with drug abuse
26·8; and neuroses 27·6. The minor differences in mean scores between Sample A and B
for dementia and depression are not significant. In Sample B the means are similar for all
diagnostic groups except dementia. However, amongst the groups with similar means those
with depression and schizophrenia had a much wider range of scores than the other diag-
nostic groups or normal subjects in Sample A. Scores below 20 were found only in functional
psychosis or dementia with but one exception; a score of 19 in a patient who had a history
of drug abuse.

Concurrent validity was determined by correlating MMS scores with the Wechsler Adult
Intelligence Scale, Verbal and Performance scores in a group of patients selected from
Sample A and B because they had both a MMS and WAIS Performance in the same week.
See Table 3 for the diagnostic and age distribution of this group. For Mini-Mental Status
vs Verbal IQ, Pearson r was 0·776 ($p < 0.0001$). For Mini-Mental Status vs Performance
IQ, Pearson r was 0·660 ($p < 0.001$).

Reliability

The MMS is reliable on 24 hr or 28 day retest by single or multiple examiners. When
the Mini-Mental Status was given twice, 24 hr apart by the same tester on both occasions,
the correlation by a Pearson coefficient was 0·887. Scores were not significantly different
using a Wilcoxon T. To note examiner effect on 24 hr test retest reliability the MMS was
given twice, 24 hr apart by two examiners. The Pearson r remained high at 0·827. The
scores did not change; Wilcoxon T was not significant (Table 4). Thus the scores seem
stable even when multiple examiners are used, the practice effect is small.

When elderly depressed and demented patients chosen for their clinical stability were
given the Mini-Mental Status twice, an average of 28 days apart, there was no significant
difference in these scores by the Wilcoxon T and the product moment correlation for
test 1 vs test 2 was 0·98. (See Table 4.)

DISCUSSION

The MMS is a valid test of cognitive function. It separates patients with cognitive disturbance from those without such disturbance. Its scores follow the changes in cognitive state when and if patients recover. Its scores correlate with a standard test of cognition, the Wechsler Adult Intelligence Scale (WAIS).

Before considering its uses, it is an elementary but important point that as with any examination of cognitive performance, the MMS cannot be expected to replace a complete clinical appraisal in reaching a final diagnosis of any individual patient. Cognitive difficulties arise in a number of different clinical conditions. This is demonstrated by the overlapping of scores on the MMS in several categories here. Accurate diagnosis, including appraisal of the significance of cognitive disabilities documented in the MMS, depends on evidence developed from the psychiatric history, the full mental status examination, the physical status and pertinent laboratory data.

But the MMS does have a number of valuable features for clinical practice even though it cannot carry alone the diagnostic responsibility. As it is a quantified assessment of cognitive state of demonstrable reliability and validity, it makes more objective what is commonly a vague and subjective impression of cognitive disability during an assessment of a patient. It can provide this quantification easily requiring only a few minutes to complete. It can be repeated during an illness and shows little practice effect. Thus it is ideal for initial and for serial measurements of this important aspect of mental functioning and can demonstrate worsening or improvement of this feature over time and with treatment.

As with any other quantified assessment of cognitive function such as the WAIS with which it correlates so well, the MMS permits comparisons to be drawn between intellectual changes and other aspects of mental functioning. We have found it particularly useful in documenting the cognitive disability found in some patients with affective disorder (Post's pseudodementia) and the improvement of this symptom with appropriate therapy for the mood disorder. Other applications that demand a quantitative assessment of cognitive function might be expected.

The MMS as it is extracted from the clinical examination has an advantage in assessment of patients and clinical problems not so obvious in tests such as the WAIS that are designed for other purposes such as prediction of school or occupational performance. Thus failures in the MMS on orientation, memory, reading and writing have much clearer implications than do failures in digit symbol, picture completion or vocabulary subtests of the WAIS in terms of a patients capacity to care for himself. These implications from the MMS score are easily appreciated by other professionals such as lawyers, judges and social workers concerned with such issues as the patient's competency to manage his daily affairs. It can therefore aid in bringing to the patient the social supports that he needs.

Finally we have found the MMS useful in teaching psychiatric residents to become skilful in the evaluation of the cognitive aspects of the mental status. It provides them with a standard set of questions replacing what is often a bewildering variety of individual approaches. Those questions that it employs have obvious clinical pertinence and cover most of the categories of cognitive disability. Since it can be done quickly and gives a score it draws the resident's attention to global improvements or declines in cognitive state. It also though because special attention is focused on memory and language functions will reveal

the partial cognitive disabilities seen in the aphasic and the amnestic syndromes. As it becomes a routine, we have found an increase in resident interest and competence in assessing and managing the conditions that affect cognitive functioning such as dementia and delerium.

SUMMARY

A short, standardized form was devised for the serial testing of the cognitive mental state in patients on a neurogeriatric ward, as well as for consecutive admission to a hospital. It was found to be quick, easy to use, and acceptable to patients and testers.

When given to 69 patients with dementia, depression with cognitive impairment, and depression (Sample A), the test proved to be valid and reliable. It was able to separate the three diagnostic groups, it reflected clinical cognitive change, it did not change in patients thought to be cognitively stable, and it was correlated with the WAIS scores. Standardization of the test by administration to 63 normal elderly subjects and 137 patients (Sample B) indicated that the score of 20 or less was found essentially only in patients with dementia, delerium, schizophrenia or affective disorder and not in normal elderly people or in patients with a primary diagnosis of neurosis and personality disorder. The Mini-Mental Status was useful in quantitatively estimating the severity of cognitive impairment, in serially documenting cognitive change, and in teaching residents a method of cognitive assessment.

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APPENDIX

Patient.........................
Examiner ....
Date ....

"MINI-MENTAL STATE"

Maximum
Score   Score

ORIENTATION

5   ( )   What is the (year) (season) (date) (day) (month)?
5   ( )   Where are we: (state) (county) (town) (hospital) (floor).

REGISTRATION

3   ( )   Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he learns all 3. Count trials and record.

Trials

ATTENTION AND CALCULATION

5   ( ) Serial 7's. 1 point for each correct. Stop after 5 answers. Alternatively spell "world" backwards.

RECALL

3   ( ) Ask for the 3 objects repeated above. Give 1 point for each correct.

LANGUAGE

9   ( ) Name a pencil, and watch (2 points)

Repeat the following "No ifs, ands or buts." (1 point)

Follow a 3-stage command:

"Take a paper in your right hand, fold it in half, and put it on the floor" (3 points)

Read and obey the following:

CLOSE YOUR EYES (1 point)

Write a sentence (1 point)

Copy design (1 point)

——————— Total score

ASSESS level of consciousness along a continuum—————————— ——————————
                                                        Alert   Drowsy   Stupor   Coma

INSTRUCTIONS FOR ADMINISTRATION OF
MINI-MENTAL STATE EXAMINATION

ORIENTATION

(1) Ask for the date. Then ask specifically for parts omitted, e.g., "Can you also tell me what season it is?" One point for each correct.

(2) Ask in turn "Can you tell me the name of this hospital?" (town, county, etc.). One point for each correct.

REGISTRATION

Ask the patient if you may test his memory. Then say the names of 3 unrelated objects, clearly and slowly, about one second for each. After you have said all 3, ask him to repeat them. This first repetition determines his score (0-3) but keep saying them until he can repeat all 3, up to 6 trials. If he does not eventually learn all 3, recall cannot be meaningfully tested.

ATTENTION AND CALCULATION

Ask the patient to begin with 100 and count backwards by 7. Stop after 5 subtractions (93, 86, 79, 72, 65). Score the total number of correct answers.

If the patient cannot or will not perform this task, ask him to spell the word "world" backwards. The score is the number of letters in correct order. E.g. dlrow = 5, dlorw = 3.

RECALL

Ask the patient if he can recall the 3 words you previously asked him to remember. Score 0-3.

LANGUAGE

Naming: Show the patient a wrist watch and ask him what it is. Repeat for pencil. Score 0-2.

Repetition: Ask the patient to repeat the sentence after you. Allow only one trial. Score 0 or 1.

3-*Stage command:* Give the patient a piece of plain blank paper and repeat the command. Score 1 point for each part correctly executed.

Reading: On a blank piece of paper print the sentence "Close your eyes", in letters large enough for the patient to see clearly. Ask him to read it and do what it says. Score 1 point only if he actually closes his eyes.

Writing: Give the patient a blank piece of paper and ask him to write a sentence for you. Do not dictate a sentence, it is to be written spontaneously. It must contain a subject and verb and be sensible. Correct grammar and punctuation are not necessary.

Copying: On a clean piece of paper, draw intersecting pentagons, each side about 1 in., and ask him to copy it exactly as it is. All 10 angles must be present and 2 must intersect to score 1 point. Tremor and rotation are ignored.

Estimate the patient's level of sensorium along a continuum, from alert on the left to coma on the right.