
COGNITIVE FUNCTION

I. MINI-MENTAL STATE EXAMINATION

1. Background and Rationale

The MMSE is a widely used test of cognitive function among the elderly. It includes tests of orientation, registration, attention, calculation, recall and visual-spatial skills. The MMSE asks the subject to provide information on temporal orientation and to perform certain tasks. The interviewer scores the responses or performance as correct or in error.

In previous SOF visits, we have used a modified version of the MMSE, along with a modified scoring system. 1) We use the short list of items from the MMSE which has been shown to capture most of the variance in score from the full examination. 2) We adopt a modified scoring system for the items that was developed by Dr. Evelyn Teng of the University of Southern California.

At Visit 8, we will administer the full MMSE as well as our modified version. We can easily administer both versions together as one test and then we will just compute two separate scores. The full MMSE may give us a more accurate measure of dementia, but administering the modified version will allow us to compare scores across visits.

For the full MMSE, a score of 27 or over is considered normal (the maximum score is 30). Scores of 24 or less are usually used as a cutpoint in screening for dementia.

It is important that all examiners provide the same degree of encouragement to the participants when they're performing these tests. As in the past, participants should be told that they're "doing a good job".

2. Equipment and Supplies

- No. 2 pencils with eraser (sharpened)
- Stop watch
- "Close your eyes" (Card # 1)
- Several pieces of blank paper
- Intersecting pentagons card (Card # 2)
- Wrist watch

3. Safety Issues and Exclusions

None.

4. Participant and Exam Room Preparation

The MMSE should be administered in a quiet place, with minimal distractions, at a desk or table the participant can use to write on. Unless it is policy at the clinic for examiners to never knock or open a closed examination room door, we strongly encourage that a special sign be posted indicating that the MMSE is being administered and to please not interrupt the test. If a temporary condition that could interfere with a participant's optimal performance cannot be removed, the participant should be moved to another location.

Ask the participant if they are comfortable. Reassure them that this is a routine test of concentration and memory.

5. Detailed Measurement Procedures

5.1 General Issues

Examiners should thoroughly familiarize themselves with the testing procedures and the scoring criteria before using the MMSE test in formal assessment. While the MMSE form contains condensed information from the manual, misunderstandings of this information can easily occur.

In the administration of the MMSE exam, give at least 2 seconds for a response, but do not converse or offer extra help. If the participant says "I don't know" or is unable to give an answer, the examiner may prompt once with the statement, "Please try," or "Give it a try." When a participant gives an incorrect answer the examiner scores accordingly and proceeds to the next item. If the participant asks how they are doing, say, "We appreciate your effort."

Although time limits are set for some items, they are used only for guiding the examiners in pacing the administration and in scoring. The participant should never be told of any time limit on any item. The stop watch should always be kept out of the participant's view.

5.2 General Scoring Issues

The MMSE examination asks the participants to provide information and to perform specific tasks as instructed by the examiner to assess cognitive function. Based on the response or performance of the task, the interviewer marks the appropriate level of "correctness" of the response. The MMSE score will be generated by a computer algorithm after data entry.

How to Score Responses:

- Check "correct" when the response is correct.

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- Check “error” when the response is incorrect.
 - "Don't know" is considered an error and should be coded as such.
 - When a functional disability or physical impairment (such as blindness, illiteracy, or extreme hand tremor) make a valid score impossible, the item should be scored “Not attempted/refused.”
 - When an item is refused but in the judgment of the interviewer the participant would probably have been able to perform the task if attempted, the task is scored “Not attempted/refused”. Record the reason for refusal in the comments sections at the end of the exam booklet.
 - When a task is not attempted, refused, or not completed, because in the judgment of the interviewer the participant was simply unable to do it, or the task was too stressful for the subject, then the task is scored “error” and will be considered an error.

If you cannot determine how to code the response, record notes on a separate sheet of paper so that the scoring can be reviewed later. Bring ambiguities to the attention of the clinic quality control officer.

5.3 Administration

- a) Introduce test to participant.
- b) Script: *“Are you comfortable? I would like to ask you a few questions that require concentration and memory. Some are a little bit more difficult than others. Some questions will be asked more than once.”*
- c) Read each question from the form and mark the appropriate level of response.
- d) Always read scripts exactly as written.
- e) Give at least 2 seconds for the participant to initiate an answer.
- f) Always be discreet with the use of the stopwatch.

Introduction:

Script: *“Now I'd like to ask you some questions to test your memory. Since there is little scientific information on how good the average or typical person's memory is, some of our questions are designed to provide this basic information.”*

If a participant corrects herself while providing any of the answers then do not penalize her. Consider her self-corrected answer the final answer.

5.3.1 Temporal Orientation – Question 1

- Ask for the date. Then ask specifically for parts omitted, e.g., “Can you also tell me what day of the week it is?” “What season it is?”

Use the following schedule for seasons.

<u>Month</u>	<u>Season</u>
January-February	Winter
March	Winter or Spring
April-May	Spring
June	Spring or Summer
July-August	Summer
September	Summer or Fall
October-November	Fall
December	Fall or Winter

- If all or part of the date is supplied (e.g. month and day, or month, day and year), record as appropriate and do not ask those questions again. If she starts to say the wrong date but quickly corrects her answer, record the corrected answer and score it as correct.
- Check the date “correct” only if the exact day (e.g. the 5th) of the month is given correctly.
- “Don’t know” is considered an error and should be coded as such.

For **questions 1a through 1e**, write the participant’s response on the line provided and then score by filling in the correct bubble (as outlined above).

Exception: For 1c and 1e also go to the bottom of the page to the “Clinic Use Only” box and fill in the bubble which corresponds to the month and the date that they provided in parts 1c and 1e. For example, if the date is January 7, 2001 and they say that it is January 9, 2001 the month would be coded as correct and the date would be coded as missed by 1 or 2 days. This additional information is necessary to calculate the modified-MMSE score.

5.3.2 Spatial Orientation – Question 2

- Ask the participant where she is. Then ask specifically for the parts omitted, e.g., “Can you also tell me what city we are in?” “What floor are we on?”
- Part 2b - “What county are we in?”
Either the county the participant lives in or the county the clinic is in should be considered correct answers. This question was developed a long time ago when a

person's county was much more important. The important thing for SOF is whether the participant seems to understand where she is and how that place fits in with the larger scope of things. If you are not sure of the correct zip code for the participant's home you can fill in the zipcode that they provide on the line and then check their zipcode after you are done with the interview.

- Part 2e - "What is this address?"
Since the participants will be in a potentially unfamiliar building, the name of the office building or set of offices should be considered a correct response. In order to be considered correct they must give the name of the building, such as "University of Minnesota Clinic", simply "Osteoporosis Clinic" would not be considered a correct answer.
- "Don't know" is considered an error and should be coded as such.

For **questions 2a through 2e**, write the response on the provided line and fill in the appropriate bubble.

5.3.3 Registration – Question 3

Script: *"I am going to say three words that I want you to remember. After I have said them I want you to repeat them. Remember what they are because I'm going to ask you to name them again in a few minutes. 'Ball, tree, flag'."*

- a) Say the three words clearly (enunciation is important) and slowly (about one second for each). After you have said all 3, ask her to repeat them.
- b) **This first repetition determines her score (0-3)**, but keep saying them until she can learn all 3: try as many as 6 times. When she repeats all three correctly in one response, go on to the next question.
- c) If she does not learn all 3 after six attempts, then you cannot test her ability to recall the items: mark the box indicating that she was unable to learn the three words. The participant must be able to repeat all 3 words to be retested. If she can only repeat 1 or 2 of the 3 then she is not tested for recall in question 4.
- d) Check "correct" for each word repeated on the first trial. **The order in which they are repeated is not important.**
- e) Again, "don't know" is considered an "error".

5.3.4 Mental Reversal – Question 4

Script: *"Now I am going to spell a word forwards and I want you to spell it backwards, that is, in reverse order. The word is WORLD, W-O-R-L-D."*

- For each letter indicate if they recited it in the correct order. They can have two letters subscribed and marked “error” and still get other letters correct. For example if they say to you “D-R-L-O-W”, then a, d, and e would be coded as “correct” and b and c would be coded as “error/DK”.

5.3.5 First Recall of Three Words – Question 5

Script: “*What three words did I ask you to remember earlier?*”

- a) The words may be repeated in **any** order.
 - For words that are readily repeated check “recall, no prompt”.
- b) For each word not readily reported, provide the prompt indicated on the form. Do not wait more than 3 seconds for spontaneous recall and do not wait more than 2 seconds after giving the prompt before moving on.
 - For words that are reported after the prompt check “recall, after prompt”.
- c) If the participant repeats an incorrect form of the correct word, e.g., "balls" for "ball" or "flagged" for "flag", mark error,DK.
- d) When the participant does not answer or answers incorrectly after the prompt:
 - Mark “refused” when no answer is given or "error/DK" when an inaccurate response was given after the prompt.

5.3.6 Identification - Question 6

6a – “What is this called?”

Show the pencil/wrist watch to the participant.

NOTE: The pencil should be a standard sharpened wooden pencil with eraser.

6b -- “What is this called?”

Correct responses for Question 6b include:

- Watch
- Wrist watch
- Timepiece

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- If the participant cannot name the item within 2 seconds or gives an incorrect answer, do not help or question again. Mark "Error/DK" if they attempt or "not attempted/refused" if no answer is suggested.
 - Check "Not attempted/Refused" if the subject is visually impaired

5.3.7 Repetition – Question 7

Script: *"I'd like you to repeat the following phrase after me. The phrase is 'No ifs, ands or buts'.*

- Pronounce the individual words distinctly but with normal tempo of a spoken sentence. Enunciate clearly; include the 's' at the end of "if's" "and's" and "but's."
 - Allow only one attempt.
 - Mark "Correct" if the participant recites the entire phrase correctly.
 - Mark "Error/DK" when any word is not correctly repeated (including when the "s" is not pronounced).
 - If no response is given or the participant refuses mark "Not attempted, refused".

5.3.8 Read and Obey – Question 8

Script: *"Read the words on this card and then do what it says."*

- a) Hand Card #1 to the participant.
 - She may read the sentence out loud.
 - Check "correct" when the participant closes her eyes after reading the card.
 - Check "error" when the subject does not close her eyes after reading the card.
 - Check "Not attempted/Refused" if the subject is visually impaired.
- b) As soon as the participant closes their eyes, say: *"Open."*

5.3.9 Three Stage Command – Question 9

Hold up a piece of white paper in plain view of the participant but out of their reach and say:

Script: *“Take this paper with your **right** hand, fold it in half using **both hands**, and put the paper down on your lap.”*

- a) After saying the whole command, hold the paper within reach of the participant.

NOTE: - Do not repeat any part of the command. Do not move the paper toward the participant. Do not move your hand toward the participant as a gesture to take the paper back.

- b) If the participant reaches for the paper right after hearing the first portion of the command, move your hand away from the participant so that the paper is out of reach and continue to state the next two parts of the command without interruption.

- Mark "Correct" for each portion of the command completed correctly.
- Check "Error/DK" for each step that is not completed as directed.
- Mark "Error/DK" for each portion of the command incorrectly completed. This includes:
 - First portion: Participant uses left hand.
 - Second portion: Participant folds the paper more than once.
 - Third portion: Participant hands the paper back instead of putting it down.
 - Participant refuses to do the task.
- Mark "Not attempted/refused" when a physical or functional disability (such as severe arthritis) prevents the participant from answering.

5.1.10 Writing – Question 10

Script: *“Write any complete sentence on that piece of paper for me.”*

- a) Use the same paper as in the previous question.
- b) Repeat the instruction, if necessary.
- Check "correct" when the subject writes a complete sentence:
 - spelling or punctuation errors are OK;
 - sentence should have a subject and verb and make sense;

- commands where the subject is implied, such as “Sit down.” are considered correct.
- Check "error" when the subject does not write a complete sentence.
- Check “Not attempted/Refused” if the subject is visually impaired.

5.3.11 Copying – Question 11

Show the subject the intersecting pentagons and ask her to copy it exactly as it is.

Script: *"Here is a drawing. Please copy the drawing on the same paper. The actual size of the drawing does not matter."*

Allow about 1 minute for copying.

In scoring, do not penalize for self-corrected errors, tremors, minor gaps, or overshoots.

Individual pentagons

For each pentagon (left and right), in the designated column, check only one box to indicate whether the pentagon was either:

- 5 approximately equal sized sides
- 5 sides, but longest:shortest side is = 2 : 1
- other enclosed figure
- 2 or more lines, not enclosed
- no figure

Or:

- unable to draw figure
- unable to see figure
- refused

Only one of the seven boxes should be checked for each pentagon.

Intersection

Record whether the intersection between the two pentagons was:

- 4 cornered enclosure
- enclosure, not 4 corner
- no enclosure

6. Procedures for Performing the Measurement at Home

Same as for in-clinic measurement.

7. Alert Values/Follow-up/Reporting

When the interview is completed, thank the participant without offering specific feedback on their performance. You might say, "Thank you for doing this interview."

8. Quality Assurance

8.1 Training Requirements

The examiner requires no special qualifications or prior experience to perform this assessment. Training should include:

- Read and study manual
- Attend SOF training session on techniques (or observe administration by experienced examiner)
- Practice on volunteers
- Discuss problems and questions with local expert or QC officer

8.2 Certification Requirements

- Complete training requirements
- Explain how to score a question if:
 - Participant has a physical limitation making task impossible
 - Participant has cognitive limitation
 - Participant does not respond or can't remember
 - Participant answers correctly but not within time allotted
- Conducts exam using three test scripts while being observed by QC officer

8.3 Quality Assurance Checklist

- Exam performed in quiet, private area without interruptions
- Missing parts of date asked for
- Missing parts of place asked for
- List of 3 objects read slowly and evenly

- ❑ 3 objects repeated until learned, up to 6x
- ❑ WORLD spelled out slowly, about 1 second per letter
- ❑ WORLD backward errors correctly coded
- ❑ Standard pencil used for naming
- ❑ Individual words and “s’s” in phrase “NO IFS...” clearly enunciated
- ❑ Paper held out in front of subject, NOT TO RIGHT OR LEFT
- ❑ Pentagon drawing correctly scored

9. References

1. Teng, Evelyn Lee, and Helena Chang Chui. 1987. The Modified Mini-Mental State (3MS) Examination. *J. Clin. Psychiatry* 48:8 pp 314-318.