
COGNITIVE FUNCTION TEST PROTOCOL

I. MINI-MENTAL STATE EXAMINATION

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 6, 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. 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".

1. Subject preparation

The exam should take place in a quiet setting without interruptions or distractions.

2. Procedure

General

- When the interviewer cannot determine whether an answer is correct, record notes in the margin so the scoring can be reviewed later.
- Check "correct" when the response is correct.
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.

Specific items

Introduction: "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."

Q 1a-e - Orientation: "What is today's date?"

- 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.
- **Clinic use box (for modified scoring):**
 - Coding for month and date (day of the month)
 - For the specific month and date, check whether the response was exactly correct, missed by 5 days or less when at the beginning or end of month (e.g. On April 4, ppt. says month is March or on April 28, ppt. says month is May), missed by one month when not within 5 days of the beginning or the end of the month, missed by more than one month, refused, or don't know.

Note: The scoring for the date is independent of the month (i.e. if a participant says that the date is June 5th and it is actually May 5th, then the date is correct but the month is wrong).

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

Q1f-j - Orientation: "Where are we?"

- 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 1g - "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.
- **Part j - "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.
- "Don't know" is considered an error and should be coded as such.

Q2 - Registration: "I am going to name three items. After I have said them, I want you to repeat them. Remember what they are because I am going to ask you to name them again in a few minutes. 'Apple', 'Table', 'Penny'. Please repeat the three words for me.

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.

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.

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.

Check "correct" for each word repeated on the first trial. The order in which they are repeated is not important.

Again, "don't know" is considered an "error".

Q3 - Attention and Calculation: "Now I am going to spell a word forwards and I want you to spell it backwards. The word is world. W - O - R - L - D." Say the word "world" and then spell it slowly, about one second for each letter. Then ask the patient to "spell it backwards, that is, in reverse order." Repeat the forward spelling if necessary, but not after spelling starts.

As the participant spells the word backwards, write down the letters in the order she says them in the spaces provided on the scoring form. Check "correct" for each letter answered correctly, and "error" for those letters that are incorrect or the participant doesn't know.

Scoring: Both the full MMSE score and the modified score will be calculated automatically when the data is entered.

Q4 - Recall: Ask the patient "What are the three words that I asked you to remember?"

For each word not recalled, provide a category clue (e.g. "a piece of fruit"); if the subject still cannot give the correct answer, provide three choices, (e.g. "orange, banana, apple"). Use only the specified cues and choices.

For each item, record whether it was recalled without any prompt, recalled with one prompt, or recalled with two prompts. They do not have to be recalled in any particular order to count.

If the participants refuses for any particular item or doesn't know, record this in the blanks provided.

Q5-6 - Naming "What is this called?"

- Show the wrist watch, then the pencil, to the subject. The pencil should be a standard sharpened wooden pencil with eraser.
- Check "correct" for each correct answer. Correct answers for "watch" include "wrist watch" and "timepiece."
- Check "error" for each incorrect answer.
- Check "Not attempted/Refused" if the subject is visually impaired and document in the margin and in the exam comments.

Q 7 - Repetition: Say "I would like you to repeat a phrase after me. The phrase is: 'NO IFS, ANDS, OR BUTS.'

- Pronounce the individual words clearly but with the 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.
- Check "correct" when the phrase is repeated correctly.
- Check "error" when the phrase is not repeated exactly.

Q 8 - Reading: "Read the words on this card and then do what it says."

- Hand the participant the card.

- 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, and document in the margin and in the exam comments.

Q9 - Three stage command: "I'm going to give you a piece of paper. When I do, take the paper in your right hand, fold the paper in half with both hands, and put the paper down on your lap."

- After reading the full command, hold the paper within reach of the subject (not preferentially toward the right or left hand).
- Do not repeat the command, coach the subject through the task, or give visual clues.
- Check "correct" for each step of the activity which is completed as directed.
- Check "error" for each step that is not completed as directed.

Q10 - Writing "Write any complete sentence on that piece of paper for me."

- Use the same paper as in the previous question.
- 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, and document in the margin and in the exam comments.

Q11- Copying: Show the subject the intersecting pentagons and ask her to copy it exactly as it is. "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:

- a 5 sided figure with approximately equal sides, or
- a 5 sided figure with unequal sides, i.e. ratio of any two sides is ≥ 2 to 1, or
- an enclosed figure that has other than 5 sides, or
- a nonenclosed figure consisting of 2 or more lines, or
- no figure at all (less than 2 lines).

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

If participant is completely unable to draw the figure or can't see the figure, then record this on the form.

Intersection: In addition, in the designated space, record whether the intersection between the two pentagons was:

- a 4 cornered enclosure, or
- an intersection that is other than a 4 cornered enclosure, or
- no enclosure at all.

SCORING THE PENTAGON DRAWING

(The score is automatically calculated in Omnis, the database system, based on the boxes checked. The scoring algorithm used is below.)

The score is determined as follows:

- 1) **4 points** for each 5 sided figure with approximately equal sides;
- 2) **3 points** for each 5 sided figure with unequal sides, i.e. ratio of any two sides is ≥ 2 to 1;
- 3) **2 points** for each enclosed figure that has other than 5 sides;
- 4) **1 point** for each nonenclosed figure consisting of 2 or more lines; and
- 5) **2 points** for an intersection of the two figures that is a 4 cornered enclosure, **1 point** for an intersection that is other than a 4 cornered enclosure.

CALCULATING A FINAL SCORE:

Two scores will be computed automatically by the data system when the data are entered. One will be for the full MMSE, based on the scoring algorithms below. The second will be based on the modified scoring system used in SOF since baseline.

Scoring algorithm for the full MMSE:

- If all items are scored as "error" or "correct", then calculate a score by summing Items 1 through 11 (error = 0, correct = 1).
- If any items are scored as 'Not attempted/refused', then

- a) sum the items scored "0-error" and "1-correct"
- b) calculate the maximum possible score of the number of items completed using score "0" and "1".
- c) divide the sum of items by the calculated maximum possible score, then multiply by 30.

3. Training

- Observe administration by experienced staff
- Read and study exam procedure
- Practice on colleagues
- Practice on volunteers

4. Quality control checklist

- Mini-Mental State Examination
 - 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
 - Special problems (impairment, illiteracy, etc.) recorded in exam comments

II. TRAIL MAKING TASK

1. Introduction:

The Trail Making Task was originally published by the Adjutant General's Office, War Department, U.S. Army, in 1944. The test was one of the performance subtests of the Army Individual Test Battery. It consists of Parts A and B, with a sample preceding the test in each part. We will be using Part B only. The Trail Making Test has been incorporated into the Halstead-Reitan neuropsychological test battery. We will be using a modified version of the Halstead-Reitan protocol for administration and scoring. Normative data on performance and on learning effects are available. A number of factors may affect performance, including central processing time, motor speed, motor coordination (tremor), vision, and motivation/depression.

2. Subject Preparation:

The participant should be seated at a table in a comfortable position so that she can write easily. Have a supply of number 2 pencils and a large rubber eraser handy.

"Now we're going to try a couple of paper and pencil tasks. These are not tests with right or wrong answers, but a set of tasks that will be used for comparison purposes with themselves over several years. There will be time limits for each task."

Reassure the participant that she is doing well; make her feel OK about what she is doing. Make sure she understands that there are time limits for each task.

3. Measurement Procedure:

SAMPLE PART B

- a) When ready to begin the test, place the **Part B Sample** sheet, sample side up, flat on the table directly in front of the subject so that she can easily write on it. Give the subject a pencil and say:

"On this page (*point*) are some numbers and letters. When I tell you to, please begin at number 1 (*point to 1*) and draw a line from 1 to A (*point to A*), then from A to 2 (*point to 2*), from 2 to B (*point to B*), B to 3, (*point to 3*), 3 to C (*point to C*), and so on, in order, until you reach the end (*point to the circle marked "end"*). Remember, first you have a number (*point to 1*), then a letter (*point to A*), then a number (*point to 2*), then a letter (*point to B*). Work as fast and accurately as you can. Try not to lift your pencil from the page. Ready! Begin!"

b) If the subject completes the sample correctly, say: "Good. Let's try the next one." Check "Completed correctly" (8) and proceed immediately to Part B test sheet.

c) If the subject makes a mistake on Sample B, point it out and explain it. The following explanations of mistakes serve as illustrations:

"That's not quite right. Let me show you how it should be done.

i) "You started with the wrong circle. This is where you start (*point to No 1*)."

ii) "You skipped this circle* (*point to circle omitted*). You should go from number 1 (*point*) to A (*point*), A to 2 (*point*), 2 to B (*point*), B to 3 (*point*), and so on, until you reach the circle marked 'end' (*point*)." (*Do not actually draw on the page.*)

*If it is clear that the subject intended to touch a circle but missed it, do not count it as an omission. Caution the subject, however, to touch the circles.

Erase the incorrect lines for the participant. Point to the last circle completed correctly and ask her to begin again from that point.

d) If the subject still cannot complete Sample B correctly, take her hand and guide her pencil (eraser end down) through the trail. Return the pencil to the subject with the point down and say: "Remember, begin at number 1 (*point*) and draw a line from 1 to A (*point*), from A to 2 (*point*), 2 to B (*point*), from B to 3 (*point*), and so on, in order, until you reach the circle marked 'end' (*point*). Then say: "Now you try it."

If the subject succeeds this time, check "Completed correctly" (1) and go on to Test Part B. If not, check "Unable to complete correctly" (2) and do not administer Test B.

e) If the participant is unable to see the test circles, has severe difficulty holding a pencil due to hand problems, or has a severe tremor which prevents testing, check "Unable to test" (8) on the form.

TEST PART B

a) Turn the page to Test Part B and say:

"Here is another page with numbers and letters. Do this page the same way. Begin at number 1 (*point to 1*) and draw a line from 1 to A (*point to A*), A to 2 (*point to 2*), 2 to B (*point to B*), and so on, in order, until you reach the end (*point to the circle marked "end"*). Work as fast and as accurately as you can. Try not to lift the pencil from the page. I will be watching you as you work so I can point out any problems as they occur. I'll erase any incorrect lines so the page does not become cluttered, and then you can continue. You will have three minutes to do as much of this as you can. "

Ready! Begin!"

b) Start timing as soon as the subject is asked to begin.

c) Be alert for mistakes. If the subject makes an error, call it to her attention immediately by saying "Excuse me, this line's not quite right." Erase the incorrect lines, and have her proceed from the point the mistake occurred. Do not show her which circle to go to next. Do not stop timing.

Note: To maintain the reliability of the test results, errors must be noted as soon as they occur and erased immediately, and the subject asked to continue immediately.

If she is having difficulty, say "Just do the best that you can."

Errors count only in the increased time of performance.

d) If the subject completes Part B without error at or before 3 minutes (180 seconds) have elapsed, remove the test sheet. Record the time in minutes and seconds.

e) If the subject does not complete the trail within 3 minutes, ask her to stop and thank her for her efforts. Record the last number or letter reached correctly.

f) Rate each subject for hand tremor while performing the sample and/or the test, and record on the scoring form.

4. QC Checklist

- Subject given correct instructions and demonstration
- Mistakes on sample pointed out and corrected (if any)
- Subject told of 3 minute time limit
- Test scored correctly
 - last item reached correctly
 - time coded for those < 180 sec
- Hand tremor noted