

## STUDY OF OSTEOPOROTIC FRACTURES (V4)

### Cognitive Function Tests Protocol

#### I. MINIMENTAL STATE EXAMINATION

##### 1. Introduction:

We are using a modified version of the MiniMental State Examination (MMSE). There are two types of modifications. 1) We will 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 will adopt a modified scoring system for the items that was developed by Dr. Evelyn Teng of the University of Southern California.

##### 2. Measurement Procedures:

The following is the list of items and their scoring procedures:

##### Q 1 - Temporal Orientation: "What is today's date?" (day and month)

If the participant doesn't automatically give you the month, ask her what month it is. There is a range of possible scores depending on how close the reported date is to the actual date. If she starts to say the wrong date but quickly corrects her answer, record the corrected answer and score it as correct.

##### Coding for month

1=Correct

2=Small mistake: 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).

3=Larger mistake: missed by one month when not within 5 days of the beginning or the end of the month.

4=Missed by more than one month.

7=Refused

8=Don't know

9=Missing

##### Coding for day of month (actual date)

1=Correct

2=Missed by 1 or 2 days

3=Missed by 3-5 days

4=Missed by more than 5 days

7=Refused

8=Don't know

9=Missing

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).

**Q 2 - Registration:** "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 am going to ask you to name them again in a few minutes. 'Shirt,' 'Brown', 'Honesty'. 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.

Score one point for each word repeated on the first trial. The order in which they are repeated is not important.

**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 shes says them in the spaces provided on the scoring form. To determine the number of errors, use the correct spelling of 'world' backwards provided on the form and the guidelines below. In addition, three pages of examples of how to score this test are attached.

Score according to the following rules:

1) Mark one error for each change needed to correct the reverse spelling to DLROW (ie if you only have to move one letter to correct the spelling, then that's just one error, no matter how many spaces you had to move that letter).

Examples: Participant spelled it

DROLW - 1 error (only need to change the L and it's correct)  
 DORLW - 2 error (need to change L and R)  
 DRLOW - 1 error (need to change L)  
 WROLD - 3 error (need to change W, D, and L)

2) When there are two or more possible ways to make corrections, mark the lower or lowest number of errors.

3) Refusal to do the entire task counts as 5 errors. Partial refusal should be scored as in rule 1.

4) Transposition of two letters counts as only one error.

**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. "something to wear"); if the subject still cannot give the correct answer, provide three choices, (e.g. "shoes, shirt, socks"). 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- 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." 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  $\geq 2$  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**  
(to be built in to the system - not to be scored at the clinics)

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  $\geq 2$  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.

## 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.

III. DIGIT-SYMBOL SUBSTITUTION TASK

**1. Introduction:**

This test is thought to be a more sensitive measure of dementia than the Mini-Mental State Examination.

**2. Measurement Procedures:**

a) Place the task sheet before the participant.

"Look at these boxes across the top of the page. On the top part of each box are numbers from one through nine. On the bottom part of each box there is a symbol. Each symbol is paired with a number."

"Down here (*point to the four rows of boxes*) are boxes with numbers on the top, but the bottom part is blank. What I want you to do is to put the correct symbol in each box like this."

Fill in the first three sample boxes for the participant.

"Now I want you to fill in all the boxes up to this line." (*Point to the line separating the samples from the test proper.*)

b) If the subject completes the sample, check the box "Sample completed" (1) and proceed with the task.

**Note:** Completing the sample is defined as filling in all the boxes. The symbols do not have to be correctly coded to complete the sample.

c) If the participant has difficulty completing the ten sample items or does not understand the task, you may help her complete the sample items. If the participant still has difficulty or does not understand the sample task, the task should not be continued. Check "Unable to complete sample" (2) and record zeros for "Number completed" and "Number incorrect".

d) Participants with visual limitations or hand difficulties should be given the opportunity to complete the sample. In this case, if the participant cannot complete the sample, "Unable to test" (8) should be checked rather than scoring zeros.

e) After the demonstration and practice is complete point to the first box following the sample items and say:

"When I tell you to begin, start here and fill in the boxes in these four rows. Do them in order and don't skip any. Proceed from left to right and work from the top to the bottom. You'll have 90 seconds. Please try to work as quickly as possible. We don't expect you to finish. Let's begin."

f) Stop the participant after 90 seconds. Say,

"That's good. Now let's do something different."

g) Scoring

Record the number of symbols completed (completed = filled in) and the number coded incorrectly.

Single blank spaces between two completed items do not count as either symbols completed or symbols coded incorrectly. If two or more blanks occur consecutively, the task is considered to be finished, and no coding after that point is counted as either completed or incorrect.

The score on the Digit-Symbol Substitution Task is the number of symbols correctly coded in 90 seconds. This score will be calculated by computer from the number completed and the number incorrect.

If the participant attempts the sample or any part of the task, scores must be assigned. If the sample is completed, and then the participant balks at the actual task, the score for that task should be zero for "Number completed" and "Number incorrect".

If the interviewer knows that a participant is dyslexic, and will therefore draw some types of symbols backward, or notices a consistent pattern of image reversal, then symbols that are drawn exactly backward can still be counted as correct. In the usual clinical situation, they would not be counted as correct, but since we are interested in change over time, they should be counted as correct.

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