

## COGNITIVE FUNCTION\*

### Trail-making Task B

#### 1. Background and Rationale

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 Task 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. Equipment and Supplies

- No. 2 pencils with eraser
- Stopwatch
- Part B sample sheet
- Test Part B

#### 3. Safety Issues and Exclusions

None.

#### 4. Participant and Exam Room Preparation

The participant should be seated at a table in a comfortable position so that he 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 he is doing well; make him feel OK about what he is doing. Make sure he understands that there are time limits for each task.

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\*This chapter is adapted from The Cardiovascular Health Study. We also gratefully acknowledge Dr. Teng for providing the "Manual for the Administration and Scoring of the Modified Mini-Mental State ("3MS Test") which was adapted for the Manual of Operations.

## 5. Detailed Measurement Procedures

### 5.1 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 he 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." Mark 'Yes' on the data collection form and proceed immediately to Part B test sheet.

**c)** If the subject makes a mistake on Sample B, point out and explain the mistake. 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.

Draw a line across the incorrect lines for the participant. Point to the last circle completed correctly and ask him to begin again from that point.

**d)** If the subject makes a mistake during the second attempt of completing the trail, point out the mistake and take his hand and guide his pencil (eraser end down) correctly 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."

Have the participant start at the last circle that was correctly reached. If the subject succeeds after the third attempt time, indicate "Yes" on the data collection form and go on to Test Part B. If the subject cannot complete the test after the third attempt or refuses, indicate "No" on the data collection form and provide the appropriate reason under 'Why not?'

If the participant cannot successfully complete the Sample Test in three attempts, 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, record “No” on the data collection form and indicate "Unable due to physical problems (hand tremor, cast, etc)” as the reason. Do not proceed to Test B.

## **5.2 TEST PART B**

a) Record the time that the Trails B is administered.

b) 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 be drawing a line across any incorrect lines as we go along. You will have five minutes to do as much of this as you can. "

Ready! Begin!"

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

d) Be alert for mistakes. If the subject makes an error, call it to his attention immediately by saying "Excuse me, this line's not quite right." Draw a perpendicular line across the mistake, and have him proceed from the last circle that was reached correctly. Do not show him which circle to go to next. Do not repeat directions once the trails B test has begun (do not say remember letter number letter number). Do not stop timing.

If the participant moves on to a second circle before the examiner can point out the mistake, this should only be counted as 1 mistake because it is a continuation of the first mistake. The participant should be asked to go back to the last correctly reached circle and continue the test. Any self-corrected mistakes are not counted as errors.

**Note:** To maintain the reliability of the test results, errors must be noted as soon as they occur and crossed immediately, and the subject asked to continue immediately. Any administrative errors made by the examiner (i.e. not pointing out a mistake) invalidate the test.

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

**The Trails B test should stop either when the participant completes the test successfully, 300 seconds have passed or 5 errors are made.**

e) If the subject completes Part B without error at or before 5 minutes (300 seconds) have elapsed, remove the test sheet. Record the number of circles connected as 25 and the time in seconds. Record the number of errors as zero.

If the participant completes Part B at or before 5 minutes (300 seconds) have elapsed but has made less than 5 errors that were pointed out to the participant, record the number of circles connected as 25 and the time it took to complete the task in seconds (rounding to the nearest second). Also record the number of errors the participant made.

f) If the subject does not complete the trail within 5 minutes or makes 5 mistakes, ask him to stop and thank him for his efforts. Record the number of circles connected, record the time as 300 seconds, and record the number of errors the participant made. For example, if a participant has correctly connected 10 circles and makes the 5<sup>th</sup> error at the 200 second mark, sites should record that 10 circles were connected, 300 seconds for the time and 5 for the number of errors.

If the participant is determined to finish the test, allow him to complete the task, but record information on the data collection form as though the test was stopped at the 5-minute time limit or after 5 errors were made.

g) If the subject stops before the 5 minute time limit or before 5 errors are made and refuses to continue the test, this should be considered a refusal. Please mark 'Refused' for 'Was the Trails B Test Administered'.

h) Record if the participant is using their dominant hand for the task (if not sure, ask) and if there are peripheral injuries (as described on the form) that would affect their ability to complete the test. Record if the participant has a hand tremor (dominant hand).

## 6. Alert Values/Follow-up/Reporting

To be determined.

## 7. Quality Assurance

### 7.1 Training Requirements

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

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

## 7.2 Certification Requirements

- Complete training requirements
- Conducts exam while being observed by QC officer

## 7.3 Quality Assurance Checklist

- Subject given correct instructions and demonstration
- Mistakes on sample pointed out and corrected (if any)
- Subject told of 5 minute time limit
- Test scored correctly
  - last item reached correctly
  - number of circles, time in seconds, and number of errors recorded correctly
  - draws perpendicular line across mistakes as they occur