

**PERFORMANCE-BASED MEASUREMENTS  
CHAIR STANDS AND TIMED UP AND GO TEST**

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## 1. Background and rationale

Direct assessments of physical performance have become standard measurements in epidemiological studies in the elderly. These assessments generally tap multiple domains of physiological performance, including lower extremity strength, balance, coordination, and flexibility. The assessment techniques used in MOST have been derived from several previous studies, are reliable when performed in a standardized fashion, and are well tolerated by elderly participants.

Two performance-based measurements are discussed in this manual: chair stands, and time up and go test.

## 2. Use of the stopwatch



The stopwatch will be used to measure the time it takes to complete a task from the beginning of the activity until the conclusion. Press the middle (mode) button to make sure you are in stopwatch mode. The display should read **0:0000**. To time the task, just press the right-hand button (labeled STA/STP) at the top of the stopwatch to begin, and press again when the task is completed. The time is digitally displayed on the stopwatch. To get the display to read **0:0000** again, press the left (lap) button. Time is displayed as minutes:seconds.hundredths of a second.

### **3. General considerations**

#### **3.1 Footwear**

To eliminate the effect of different footwear on test performance these tests should be performed in comfortable walking shoes with minimal or no heels and non-slippery soles.

#### **3.2 Approach to standardization**

Both tests are administered by a certified examiner. Since motivation and level of understanding can have a significant impact on performance, the exams should be administered strictly according to the protocol and in the following sequence:

- Determine whether any exclusions or special test procedures apply.
- Explain the procedure to the study participant making sure that key points from the suggested script are conveyed.
- Demonstrate the procedure using suggested script.
- Ask the participant if they have any questions.
- Re-explain the procedure briefly using suggested script.
- Ask the participant to perform the procedure.
- Begin all timed procedures with the words, "Ready? Go!"

After the timed up and go test and again after the repeated chair stands ask the participant if pain during the exam affected their ability to do the exam.

##### **3.2.1 Instructions and encouragement**

Use the script provided to make sure that all key points are covered when you describe the test and how to perform it properly. You should not provide additional description or encouragement beyond the key points provided by the standard scripts.

If a participant questions the need for detailed verbal instruction, respond that you explain each test in detail since this is the best way to make sure that everyone does the test in a similar manner.

##### **3.2.2 Demonstration**

Demonstrate each test for the participant. Remind the participant not to begin to do the maneuver until after you have demonstrated it.

It is very important that the examiner demonstrate each exercise correctly. Experience has shown that participants follow more closely what the examiner does rather than what they say.

If the exercise is demonstrated incorrectly, the participant following the example will do the exercise incorrectly and may be scored as “Unable” even though they may actually have been able to perform it correctly.

If the participant indicates that they do not understand the test, demonstrate it again rather than relying on repeated verbal instructions. Repeat the demonstration only once. If the participant still does not understand, go on to the next component of the test.

### **3.3 Scoring**

#### **3.3.1 Not attempted/refused**

If a test is not attempted because the participant refuses or cannot understand the instructions, record “Participant refused.” If the examiner or participant deems the test unsafe or beyond the participant’s ability, for whatever reason, record “Not attempted/unable” on the scoring form. Record a reason why the test was not attempted on the Follow-up Clinic Visit Procedure Checklist.

#### **3.3.2 Attempted/unable to test**

If a test is attempted but cannot be completed or scored, record “Attempted, unable.”

## **4. CHAIR STANDS**

### **4.1 Equipment and supplies**

- Digital stopwatch
- Standard chair: straight back chair without arms, flat, level, firm seat; seat height 45 cm at front
  - Both sites use a standard arm chair with dimensions slightly different than what the protocol states just above. The standard arm chair at each site has a seat height of 41cm.

## **4.2 Safety issues and exclusions**

- This test should not be performed by a participant who needs the assistance of another person to transfer or walk
- Walking aids may not be used in the chair stand tests.
- The vast majority of participants should be able to attempt this test. Exclusion from the chair stands test will be based on an individualized assessment of impairments and safety concerns. The examiner will describe the chair stand test, and then discuss with the participant whether they can safely perform it given any physical problems or disabilities present. For example, a participant who does not feel safe without using aids should be excluded. Refusal or inability to perform the test will be recorded on the data form. If the examiner or participant determines that it is not safe to perform the test, record “not attempted/unable.”

## **4.3 Participant and exam room preparation**

If the participant is wearing inappropriate footwear (e.g. high heels or flip flops), the test can be performed without shoes if appropriate footwear is not available. The standard chair should be placed on a nonslip surface (low pile carpeting works well) with the back of the chair against a wall for stability. There should be adequate room in front and on the sides of the chair for the examiner and the participant to maneuver freely.

## **4.4 Single chair stand: description**

This is a test of ability to stand up from a standard chair without using arms. This task is also used to screen for the ability to do repeated chair stands.

The chair should be placed with the back against a wall for added stability. The participant's feet should be placed squarely on the floor in front of them. The participant should be sitting part-way forward in the chair before standing, hips should be flexed to approximately 90 degrees and knees flexed to slightly greater than 90 degrees so that their heels are somewhat closer to the chair than the back of the knees.

## **4.5 Single chair stand: administration**

1. During the test, the examiner may stand in front of the participant (with arms extended, if appropriate) for the participant's safety during the chair stands.

2. Describe the test.

Script: "This is a test of strength in your legs in which you stand up without using your arms."

3. Demonstrate how arms are to be folded across the chest during the test.

Script: "Fold your arms across your chest, like this, and stand when I say 'Go,' keeping your arms in this position. OK?"

4. Ask the participant to stand.

Script: "Ready, Go!"

If the arms unfold, or the participant puts one or both hands down on the chair to push up, remind them to keep their arms folded snugly across their chest and ask them to repeat the chair stand. It is permissible for the participant to lean the trunk forward over their feet when attempting to stand.

5. If the participant cannot rise without using arms, say:

Script: "OK. Try to stand up using your arms to push off."

6. Score as follows:

Record score.

If the participant stood up all the way without using arms, score as "Stands without using arms." Go on to Repeated Chair Stands.

If the participant uses arms to stand up, score as "Rises using arms."

If the participant attempted but was unable to arise even using their arms, score as "Attempted, unable to stand."

#### **4.6 Repeated chair stands: description**

This is a test of lower extremity strength in which the participant stands up from a seated position five times as quickly as possible. The time it takes to stand five times is recorded.

#### 4.7 Repeated chair stands: administration

1. If the participant can arise from the chair without using arms, attempt the five stands.  
Script: "This time, I want you to stand up five times as quickly as you can keeping your arms folded across your chest."
2. Demonstrate the test using a separate but identical chair to the one the participant is sitting in.

Assume the same sitting position as for the single chair stand. Cross your arms over your chest and then rise as quickly as you can while emphasizing "full standing position," and sit while emphasizing "all the way down."

Script: "When you stand up, come to a full standing position each time, and when you sit down, sit all the way down each time. I will demonstrate two chair stands to show you how it is done."

Rise two-three times as quickly as you can, counting as you stand up each time.

3. Begin the test.

Script: "When I say 'Go,' stand five times in a row, as quickly as you can, without stopping. Stand up all the way, and sit all the way down each time."

"Ready, Go!"

Start timing as soon as the participant begins to stand from the chair. Count: "1, 2, 3, 4, 5" as the participant stands up each time. Stop timing when the participant reaches the fifth full standing position.

4. If the participant is unable to complete the chair stands correctly (e.g., is not coming to a full stand), stop the procedure, repeat the demonstration, wait 1 minute, and begin the procedure again.

5. If the participant stops before completing five stands, confirm that they cannot continue by asking:

Optional script: "Can you continue?"

If they say yes, continue timing. Otherwise, stop the stopwatch.

6. Score as follows:

Record score.

If all five chair stands were completed without the participant using arms, score as "Completes 5 stands without using arms."

If the participant uses arms to stand up, score as "Rises using arms."

Record the number of seconds, to a hundredth of a second, required to complete five stands.

If participant attempted but was unable to complete five stands without using their arms, score as "Attempted, unable to complete," and record the number completed without using arms.

7. Ask the participant:

Script: "Did pain during the exam affect your ability to do this exam?"

#### **4.8 Alert values/Follow-up/Reporting to participants**

These test results have no alert values and are not reported to the participant or physician.

### **5. TIMED UP AND GO TEST (TUG)**

#### **5.1 Equipment and supplies**

- Digital stopwatch
- Standard arm chair (seat height 46cm, arm height 67cm); arms should be wide enough to accommodate all participants; seat should be a hard surface. NOTE: Requirements for this chair are different from the chair for the Chair Stands test.



- Both sites use a standard arm chair with dimensions slightly different than what the protocol states just above. The standard arm chair at each site has a seat height of 41cm and an arm height of 62cm.
- Cone
- Tape
- Tape measure

## **5.2 Safety issues and exclusions**

- The Timed Up and Go Test will be performed by existing cohort participants only. Participants in the new cohort will not perform the Timed Up and Go Test.
- This test should not be performed by a participant who needs the assistance of another person to transfer or walk
- The subject may use any gait aid that they normally use during ambulation, with the exception of crutches or walkers, which may not be used.
- The participant may not be assisted by another person.
- The vast majority of participants should be able to attempt this test. Exclusion from the Timed Up and Go Test will be based on an individualized assessment of impairments and safety concerns. The examiner will describe the test, and then discuss with the participant whether they can safely perform it given any physical problems or disabilities present. The participant should not perform the test if they exhibit signs of vision, gait, or balance impairment, or severe joint pain that pose a possible safety risk *and*, when questioned, expresses uncertainty in the ability to safely walk short distances. Refusal or inability to perform the test will be recorded on the data form. If the examiner or participant determines that it is not safe to perform the test, record “not attempted/unable.”

## **5.3 Participant and exam room preparation**

Regular foot wear should be worn by the participant. The standard arm chair should be placed on a nonslip surface (low pile carpeting works well). The chair should be stable and positioned in such a way that it will not move when the participant moves from sit to stand and stand to sit. There should be adequate room in front and on the sides of the chair for the examiner and the participant to maneuver freely.

Create a line using tape that is 3 meters (9.8 feet) away from the chair. Then, place a cone on the floor just inside that line. The cone should be seen easily by the participant.

#### **5.4 Timed Up and Go Test: description**

This is a test of ability to stand up from a standard arm chair, walk 6 meters, and sit down in a standard arm chair. There is no time limit.

The participant is allowed to rest their arms on and use the chair's arms during the sit-to-stand and stand-to-sit-movements. The participant's hips should be all of the way to the back of the seat. NOTE: this is different from the starting position for the Chair Stands test.

#### **5.5 Timed Up and Go Test: administration**

1. Describe the test.

Script: "Now we want to measure the time it takes for you to stand up from a chair, walk a short distance at your usual pace around this cone and walk back to the chair and sit down."

2. Demonstrate.

Demonstrate walking to and around the cone, and walking back to the chair. There is NO need to demonstrate standing up and sitting down again in the chair. At the start hips should be all of the way to the back of the seat. Emphasize that for this test it is acceptable for arms to rest on and use the chair's arms during the sit to stand and stand to sit movements.

3. Instructions.

Script: "On the word GO you will stand up, walk to the cone on the floor, walk around the cone to turn around, and walk back to the chair and sit down. Walk at your regular pace."

Start timing on the word "GO" and stop timing when the participant is seated again correctly in the chair with their buttocks touching the seat.

There is no time limit. They may stop and rest (but not sit down) if they need to.

#### **Perform 2 trials of the Timed Up and Go Test.**

4. Score as follows:

Record score.

Score that the 2 trials were done, and record the time it took the participant to perform the test in minutes, seconds and hundredths/seconds.

If the participant attempted but was unable to complete the test, score as “Attempted, unable to complete.”

5. Ask the participant:

Script: “Did pain during the exam affect your ability to do this exam?”

**5.6 Alert values/Follow-up/Reporting to participants**

These test results have no alert values and are not reported to the participant or physician.

**6. Quality assurance**

**6.1 Training and certification**

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

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

**6.2 Certification requirements**

- Complete training requirements
- Conduct exam on two volunteers while being observed by QC officer
  - According to protocol, as demonstrated by completed QC checklist

**6.3 Quality assurance checklist**

**Single chair stand**

- Script correctly and clearly delivered
- Correctly demonstrates single stand, emphasizing keeping arms tight across chest
- If task was not performed, codes and explains reasons
- Correctly completes form
- Reviews form for completeness

**Repeated chair stands**

- Script correctly and clearly delivered
- Correctly demonstrates two stands, emphasizing full stand and return to complete sit
- Says “Ready, Go” for each test
- Counts each chair stand, and stops timing after participant stands up on fifth stand
- If task was not performed, codes and explains reasons
- Correctly completes form
- Reviews form for completeness

**Timed up and go test**

- Script correctly and clearly delivered
- Correctly demonstrates standing from the chair, walking to and around the cone, walking back to the chair, and sitting down in the chair
- Says “GO” to start the test
- Starts timing on the word “GO”
- Stop timing when the participant’s buttocks touch the seat
- If task was not performed, codes and explains reasons
- Correctly completes form
- Reviews form for completeness

**7. Data collection forms**

Please see the Overview of the 144-month Follow-up Visit Operations Manual for an overview of the data collection forms, information on whether each form is in REDCap or TeleForm, and where the forms can be accessed on the study website.