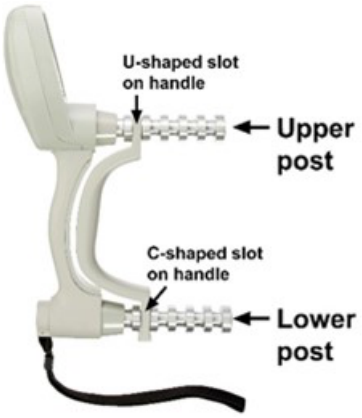
Standardized procedure & script for muscle strength testing

Grip Strength

Equipment

- Calibrated Jamar Plus+ Dynamometer
- Standardized chair (preferably with arm rests)



Test set-up and digital dynameter operation

- Test dominant hand. If unable (e.g. because of recent injury/surgery, hand pain or arthritis, etc.), test non-dominant hand and record reason.
- If ambidextrous, test self-reported most dominant hand and record
- Dynamometer handle can be removed by pushing the lower end of the handle so that the 'C' shaped slot rotates away from lower post
- To replace handle, identify the desired handle position and replace the handle by first slipping its 'U' shaped slot onto the upper post and the 'C' shaped slot onto corresponding position on the lower post. **Note:** the concavity of the handle should face away from the dial when reassembled
- If handle does not stay in place (i.e. is loose), there is a set screw on the handle that can be tightened
- Press 'ON/OFF' button to turn on dynamometer
- Check units on the right of the display reads 'KG'. If it reads 'LB', remove battery cover and toggle black switch to 'KG'
- Press 'SELECT TEST' until a '1' is displayed to the upper left on the display
- Press 'TEST' to prepare the dynamometer for measurement. The '1' should blink/flash
- When a test is complete, press 'RESET' to clear the display
- Pressing 'TEST' will make the '1' blink/flash indicating that the dynamometer is ready for a another test
- Press 'ON/OFF' button to turn dynamometer off at the completion of testing

Test procedure and data recording

- With the dynamometer in handle position #2 (see above) and participant sitting, say and do the following:

> *"We are going to measure your grip strength by having you squeeze this device as hard as you can. The device will not move when you squeeze, but your strength will be recorded"*
> (Demonstrate the device as it measures force)

- Reset the dynamometer output, pass it to the participant and say:

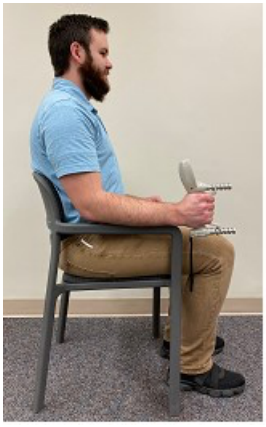
> *"Now you try just to get a feel for it. For this practice, just squeeze gently…How does that feel?"*

- Testing should be performed in handle position #2; however, modify handle position if needed for comfort if patient's hand is very small (move handle to position #1) or large (move handle to position #3)
- Record the handle position
- Reset the output and say:

"We are going to measure your strength up to three times to get consistent results. During each test, I want you to gradually squeeze keeping your arm still and without it moving forward or out to the side."

(Demonstrate inappropriate motions)

"Do you have any questions?"



- Ensure participant is sitting with upright posture and feet flat on the floor (see image to right). Elbow should be at approximately a right angle (90 degrees flexion) with forearm resting on arm of chair (or slightly [i.e. 2-3 finger widths] away from body when no arm rest is present), and wrist over the end of the chair arm with thumb up (i.e. forearm in mid-pronation/supination)
- When the participant holds the dynamometer, the dynamometer should not rest on the arm of the chair or the participant's leg
- Tester can provide support under bottom of dynamometer if subject is unable to hold it in an upright position
- With the participant correctly positioned as described above, reset the output, pass them the participant the dynamometer, and say with consistent tone and volume:

"Ready? Squeeze…squeeze…squeeze. Now, stop!"

- Let the participant squeeze for 3 seconds before saying stop
- Trunk should be kept in the same position during the test without leaning forward or backward, and there should be no motion of the arm during the test
- Record the output to the nearest tenth-of-a-kilogram and reset the output
- Allow 30 seconds to pass before repeating the test with the participant in the correct positioning and by saying with consistent tone and volume:

"Ready? Squeeze…squeeze…squeeze. Now, stop!"

- Repeat the test for a third time if the first 2 tests do not provide identical data
- Ask the participant regarding any arm/hand pain during the test that limited performance, with 0 being no pain and 10 being the worst pain they have ever felt. Record pain level.
- Record the maximum of the up to 3 trials.

Sit-to-stand test procedure

Equipment

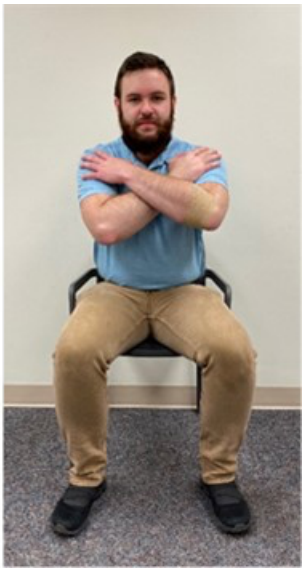
- Count down timer set to 30 seconds
- Digital stopwatch to assess 5-time sit-to-stand time
- Two standardized chairs with seat height of 45 cm.

Test set-up

- Place participant's chair against a wall for stability (should ideally be placed on a nonslip surface [low pile carpeting works well] and/or have rubber tips on the legs)
- Position tester's chair so that participant can see test demonstration
- Test is typically performed in shoes, but can be performed in non-slip/skid socks. Standard socks on a linoleum/vinyl/etc floor represents a fall risk and the test should not be performed.
- If a participant is unsteady and presents a potential risk of falling, stand adjacent to the participant during testing in preparation to provide aid if needed. If concerned about safety, DO NOT perform the test and record reason.
- Document chair height.

Test procedure

- The test is performed **without** the assistance of any walking aid/assistive device
- The test start position is sitting upright in the middle of the chair, feet flat on the floor with hips at a right angle (in 90 degrees flexion) and knees bent to slightly greater than 90 degrees (i.e. so that the heels are somewhat closer to the chair than the back of the knees).
- If participant is short, they may need to sit towards the front of the chair in order for their feet to be flat on the floor. This will result in the hips be in <90 degrees flexion.
- Arms are crossed across the chest, crossing at the wrists and with hands flat



Instructions and demonstration

- With the participant and tester sitting in their chairs, say and do the following:

> *"This is a test of the strength of your legs. It requires you to stand all the way up and sit back down without using your arms as many times as possible in 30 seconds. Let me demonstrate"*
>
> *"Sit in the middle of the chair and fold your arms across your chest like this. When I say 'Ready?, Go!', I want you to stand keeping your arms close to your body."*
> (Before **demonstration**, say: *"Ready? Go!")*

Practice trial

- Ask the participant the following:

> *"Can you try one stand without using your arms for me?...Ready, Go"*

- The participant should push up using their legs without using excessively bending their trunk to create momentum and their arms should stay crossed with arms close to their body. Provide prompts to correct incorrect performance.

Repeat chair stand

- If the participant was able to complete the practice of one chair stand without using their arms, say and do the following:

> *"This time I want you to do as many stands as you can in 30 seconds keeping your arms folded. Each time, I want you to* ***come to a full standing position*** *and, when you sit down,* ***sit all the way down****. Let me demonstrate"*
> (Demonstrate 2 chair stands counting each one)

- Clear the stopwatch, set the countdown timer to 30 seconds, and ask:

> *"Do you have any questions?...Ready? Go!"*

START **Simultaneously** start the stopwatch and countdown timer on "Go!"
Count "1, 2, 3, 4, 5…" with consistent tone and volume as the participant stands up each time (DO NOT provide additional motivational input)

STOP Stop stopwatch when the participant stands up completely for the 5th time
Continue counting "…6, 7, 8…" as the participant completes each subsequent stand

STOP Stop the test when time expires on the 30 second countdown timer

- If the participant does not complete the chair stands correctly (e.g., is not coming to a full stand, begins using arms or trunk for momentum), stop the test, repeat the demonstration, wait 1 minute, and begin the test again
- Document the time taken to complete 5 repeat chair stands as well as the number of chair stands completed in 30 seconds
- If the participant reached a halfway standing position when time elapsed, count it as a stand
- If the participant cannot complete 5 chair stands in 30 seconds, record only the number of completed chair stands
- Ask the participant regarding any leg pain during the test, with 0 being no pain and 10 being the worst pain they have ever felt. Record pain level