

Capabilities of Upper Extremity Test

CUE-T™

Manual of Administration

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INSTRUCTIONS TO TESTERS:

Two examiners are required to conduct this test. Examiners are responsible for counting repetitions, ensuring appropriate technique, and timing each task. If it is not possible to have two examiners, the test should be videotaped and repetitions counted afterwards.

For each item, explain and demonstrate to the subject, and allow the subject to practice the task once before testing the item. When testing involves right and left sides, the subject should practice with the right arm/hand before testing the right side and again with the left arm/hand before testing the left side.

When beginning each task, press the timer when you say “GO.”

If subject cannot complete the task during practice, check if subject can do enough to count as a partial repetition. Score as partial or unable to do as appropriate and move to other side/next item. You do not need to time for 30 seconds or progress to higher weights.

If an item permits partial completion of one repetition, this applies only to the first repetition. Multiple partial completions are not counted.

If the subject is unable to progress toward completion of a repetition for 5 seconds, you can stop timing and record the number of completed repetitions. Ask if the subject can continue first. Do not stop just because they are dropping items or if they are taking a break.

Give encouragement during the trial of items requiring multiple repetitions. Correct errors in performance immediately and do not count the repetition performed incorrectly.

If the test subject is not returning to the starting point during an item, the tester should re-instruct the test subject to do so, but do not stop timing and do not restart the test.

If the subject drops an item, place another one at the spot where it was last picked up (die, pencil) or place it back in his/her hand (chip). Do not stop timing or restart test.

Scoring:

Record data as indicated on the data collection sheet.

These raw scores will be converted to a five-point scale, from 0 to 4.

Instructions to subject:

“This tool is an assessment of upper extremity function. During the assessment, you will be asked to do a variety of tasks involving the use of your arms and hands. For several of the items, you will be asked to complete as many repetitions as possible in the time allowed. For these items, please take care to perform each specified action quickly but accurately, as each repetition must be completed in order to be counted.”

ITEM 1: REACH FORWARD

ACTION

Reach forward with your arm to touch something directly in front of you at shoulder level.

INTENT

To determine how far in front of the body a person can move the arm at shoulder level.

EQUIPMENT

Timer, yardstick with Velcro attached, round target, wood block with L-bracket, clamp, 2 kg weight, (height adjustable table), nonslip mat.

CRITICAL ELEMENTS

Must have subject in (wheel)chair with back against backrest. Target is positioned in front of the subject at shoulder height and at limit of passive reach of the hand directly in front of the shoulder (forward flexion, no adduction/abduction).

EQUIPMENT SET-UP

Place wood block with L-bracket on nonslip mat. Use the clamp to secure yardstick to L-bracket on wood block.

Position yardstick on the table in line with shoulder. Put 2 kg weight on wood block to steady it during testing.

PROCEDURE SET-UP

Subject is seated in (wheel)chair with back against backrest. Hands are resting on thighs. Position the yardstick in front of the subject in line with shoulder and stabilize the base with a 2 kg weight. Passively extend the subject's arm fully at 90-degrees of shoulder flexion. Set target at level of hand so the subject can just touch target



without leaning forward. The subject can touch target with knuckles if unable to fully extend fingers. Set timer to go backwards from 30 seconds to zero.

Start position: Hand on ipsilateral thigh.

DIRECTIONS TO SUBJECT

Reach out and touch the round marker with your right (left) hand and return your hand to your lap. Do not lean forward. Keep your back against the back of the chair. Please practice this now.

(Subject performs action).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully... Are you ready?

(Wait for response)

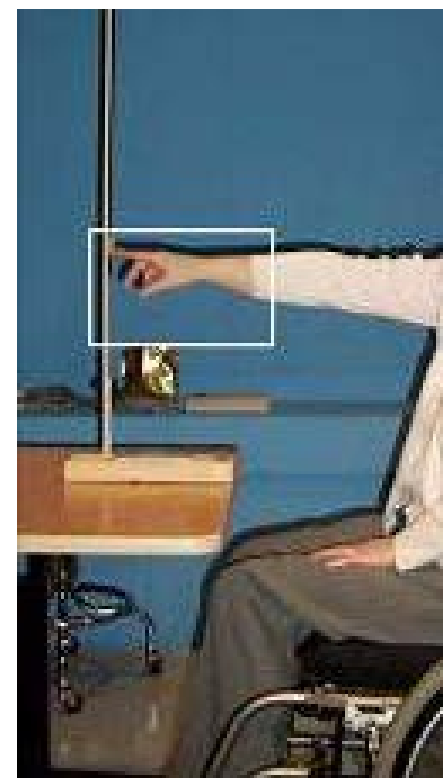
Begin when I say GO. Press timer when you say “GO.”

SCORING

Record number of full repetitions in 30 seconds.

Full completion is when hand returns to thigh after touching target.

Partial completion requires hand at shoulder level, at least half way to the target – see box in picture.



NOTES

First, have subject practice reaching to the target and returning hand to thigh to be sure they understand the task and that you only count full repetitions. If subject can't complete task during practice, check if subject can do enough to count as a partial repetition. Score as partial or unable to do as appropriate and move to other side/next item.

IMPORTANT: Give encouragement and feedback during testing. If subject misses target, instruct subject to be sure to touch the marker. Examiner does not count that repetition. Do not stop or restart test.

ITEM 2: REACH UP

ACTION

Raise your arm directly over your head, like you were raising your hand in class.

INTENT

To determine how high subject can get hand directly above body.

EQUIPMENT

Timer, height adjustable table, yardstick, wood block with L-bracket, clamp.

CRITICAL ELEMENTS

Yardstick serves as a visual marker to be sure that the hand is raised above the head rather than in front of the subject. **Limit of allowable distance in front of body is the length of the upper arm. This applies if the arm is raised out to side – hand cannot be further lateral from body than length of upper arm.** If the shoulder does not flex to 90-degrees, measure the distance from shoulder to elbow and place the yardstick at that distance in front of shoulder.

EQUIPMENT SET-UP

Use clamp to secure yardstick to L-bracket on block of wood. Place yardstick on the table so it is aligned with the elbow when the shoulder is forward flexed to 90-degrees.

PROCEDURE SET-UP

Subject seated in chair sideways to table with back against backrest. Align yardstick with elbow when the shoulder is forward flexed to 90-degrees. Hands are resting on thighs.

Tester position: On the side of subject for direct view of the front of the yardstick to verify accurate arm and hand positioning during testing. Set timer to go backwards from 30 seconds to zero.

Start position: Hand on ipsilateral thigh.



DIRECTIONS TO SUBJECT

Raise your right (left) hand directly over your head, like you were raising your hand in class, and return it to your lap. Please practice this now.

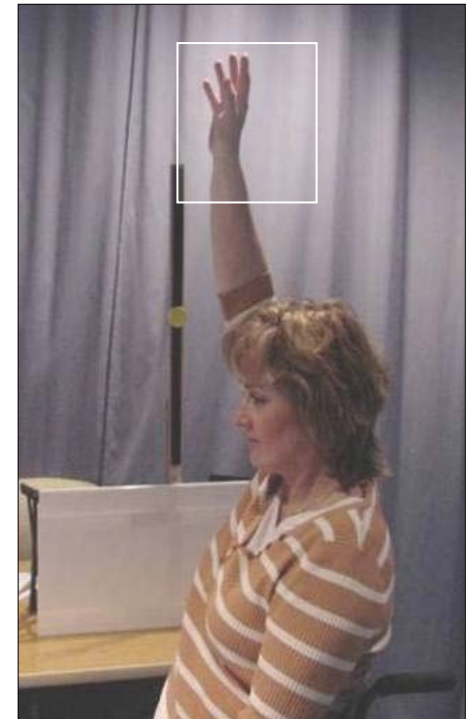
(Subject performs action).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully. ... Are you ready?

(Wait for response)

Begin when I say GO.

Press timer when you say “GO.”



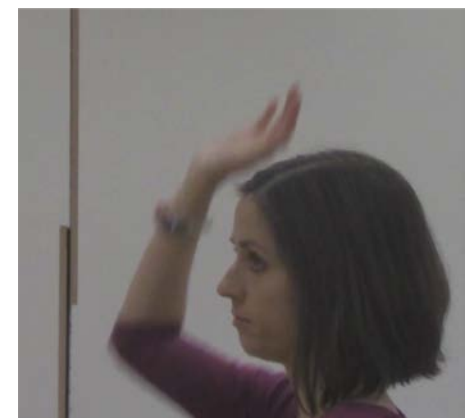
Full completion:
arm fully extended

SCORING

Record number of full repetitions in 30 seconds.

Full completion is reaching above head with elbow straight then returning hand to thigh.

Partial completion requires hand above level of head and behind vertical marker. See picture below on right.



Partial completion:
hand above head

NOTES

Hand must be between subject’s body and yardstick to count. See box in picture to right for acceptable range. During set up or practice be sure subject knows the target area and that only accurate hand raises will count.

Only count complete repetitions.

IMPORTANT: Give encouragement and feedback during testing. If subject does not reach up fully, instruct subject to be sure to raise hand directly over head and do not count that repetition. Do not stop or restart test.

ITEM 3: REACH DOWN**ACTION**

Reach down to touch the floor and sit back up straight, without hooking the arm rest with your other arm or using it to pull yourself up.

INTENT

To determine how far down a person can reach and recover; without using any part of the chair to get back up; reach just lateral to toe of shoe.

EQUIPMENT

Timer, target (round marker); yardstick or tape measure, post-it arrow

CRITICAL ELEMENTS

Subject should be seated in (wheel)chair with target just lateral to 5th toe with hip and knee flexed at 90-degrees and ankle in a neutral position. Subject's knee should not be higher than hip (femur horizontal). If subject has contractures put the target in a spot where 5th toe would be if in the desired position.

During testing, subject cannot use any part of the chair to help return fully upright to a position with the back against the backrest of the chair.

EQUIPMENT SET-UP

With subject seated in chair as described above, place target just lateral to 5th toe. Measure leg length and place arrow half-way down leg (*Note: You can wait to do this until after subject practices. If they can complete the task, measuring half-way down the leg is not necessary. If subject is unable to touch the target and get back up, then measure the distance.*).

PROCEDURE SET-UP

Subject seated in (wheel)chair with back against the backrest. Hands are resting on thighs. Target is placed just lateral to 5th toe of shoe (on foot rest if subject is in wheelchair). Subject's hip should not be flexed more than 90-degrees (knees should not be higher than hips). If this is unavoidable, target should be modified as described above in "Critical Elements" section, so it is an equivalent distance away.

Tester position: on one side of the subject. Be close enough to assist subject if needed to ensure safety. Set timer to go backwards from 30 seconds to zero.

Start position: Subject sitting upright in chair with hand on ipsilateral thigh.

DIRECTIONS TO SUBJECT

Reach down with your right (left) hand to touch the target by your toes and sit back up straight, without hooking with your other arm or using it to pull yourself up. You can push against your legs to help get up, but cannot use any part of the (wheel)chair to help you. You must return to an upright position with your back against the backrest of the chair and your hand on your thigh before reaching down again. If you cannot reach the target and get back up, reach down as far as you can and still recover. Please practice this now.

(Subject performs action.....If unable to complete, measure and mark distance half-way from hip to foot).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully... Are you ready?

(Wait for response)

Begin when I say GO.

Press timer when you say “GO.”

[Note: give up to 3 tries to reach at least half way down and recover for partial completion]



SCORING

Record number of full repetitions in 30 seconds.

Full completion is when subject touches target and returns to sitting up with back against back rest of chair and hand on ipsilateral thigh.

Partial completion requires reaching at least 50% of distance from knee to foot and recovering.

NOTES

ITEM 4: LIFT UP**ACTION**

Raise a large object as high as you can in front of you using both arms.

INTENT

To determine if the arms can lift something overhead like putting something on a shelf. It does not matter how arms are moved (for example, can be locked in extension, or can use triceps). Subject needs to be able to lift objects, not just his/her arms. This is a bimanual task.

EQUIPMENT

Table, yardstick, clamp, weight wrap, chest strap. Weights: two 1/2 kg weights, one 1 kg weight.

CRITICAL ELEMENTS

Yardstick is used as marker to be sure that item is raised in front of subject, like putting something on a shelf. Hands should be in front of yardstick. Yardstick is positioned mid-thigh of subject.

For testing: If subject is stronger on one side, then hand on weaker side must be raised at least to subject's eye level to count.

EQUIPMENT SET-UP

Secure wrap on wrists. Opening for weights should face away from subject.

Position yardstick so it is in line with subject's mid-thigh (half-way between the hip and knee). Acceptable range is noted in target box in picture on next page.

Can use a chest strap to help with trunk stability.

PROCEDURE SET-UP

Subject seated in (wheel)chair with back against backrest, and remains sideways to table.

Passively extend subject's arms so hands are as high as possible directly above knees.

Starting position: Hands resting on thighs.

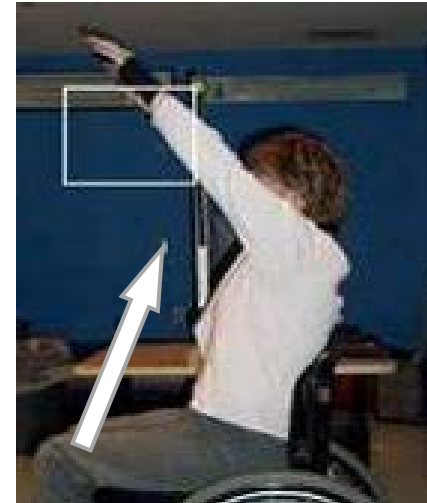


DIRECTIONS TO SUBJECT

Raise your arms directly in front of you as high as possible, like you were going to place an object on a shelf. Please practice this now.

(Subject performs action).

If successful after one lift, sequentially add weight so total weight is 1/2 kg, then 1 kg, then 2 kg, repeating directions after each repetition.



Wrap with weight should be in front of this line when lifted

SCORING

Based on amount of weight lifted.

Full completion is reaching at least as high as the eyes and in front of mid-thigh.

See square illustrated in above figure for target area.

No partial completion credit.

NOTES

For this item hands should be IN FRONT of yardstick, unlike Reach Up where hand is BEHIND yardstick.

ITEM 5: PUSH DOWN**ACTION**

Push down with both arms into your chair enough to lift your buttocks (both sides) off the seat (example: doing a push-up weight shift).

INTENT

To determine if the person has sufficient upper body strength to lift his/her body off seat when sitting.

EQUIPMENT

Stopwatch, wood blocks for wheels if chair does not have functional brakes, armchair (for individuals who are ambulatory).

CRITICAL ELEMENTS

The subject must have something to push on that allows body to be lifted off seat.

This can be the armrest of chair or wheelchair or wheels if there are no armrests and wheels are high enough.

Subjects who can move their legs should have legs crossed in front of them so they cannot help with lifting buttocks off seat.

EQUIPMENT SET-UP

If needed, place wood blocks on either side of wheelchair wheels to keep chair from rolling.

Use the stopwatch to record the time the subject keeps their buttocks off of the seat.

PROCEDURE SET-UP

Subject seated in wheelchair or armchair in an upright position with hands on armrests or wheels.

If the subject cannot position him/herself, the examiner can position the upper extremities for the subject.

If the subject is ambulatory or can move legs, cross the subject's feet in front of him/her, legs extended with heel touching the floor.



DIRECTIONS TO SUBJECT

Use your arms to raise your body off the seat and hold yourself up as long as you can.

Try to stay up for 30 seconds.

[If subject can move legs, add – *don't use your legs to help.*]

Are you ready?

(Wait for response)

Begin when I say GO.

“Go.”

Do not press the timer until the subject fully clears the seat.

Stop timer when subject is unable to keep buttocks off seat.

If subject reaches 30 seconds say “STOP”.



SCORING

Based on duration held. Record time held to nearest 0.1 second.

NOTES

To make sure subject clears seat, have examiner kneel next to (wheel)chair so can clearly see when buttocks is off seat. That same examiner will also start the timer when subject fully clears the seat.

ITEM 6: WRIST UP

ACTION

With your hand palm down, curl your wrist upwards, keeping your forearm on the table or armrest.

INTENT

To evaluate the ability to extend the wrist.

EQUIPMENT

Timer, height adjustable table, wood block with L-bracket, clamp, protractor, arm strap, post-it arrow,

Protractor has 0 degrees in center, range -90 to +90.

CRITICAL ELEMENTS

Hand should be over edge of surface so that wrist can be in full flexion.

Determine available range of wrist extension by passively extending wrist; do not force into extension.

Forearm should be stabilized on surface during testing so that it does not come off surface. This can be done by using a strap or by manually holding the forearm just above the wrist.

EQUIPMENT SET-UP

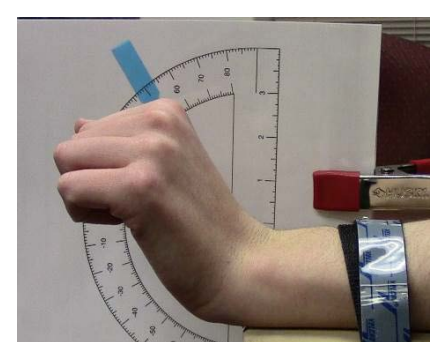
Use yardstick-wood block set-up on floor and clamp protractor to top of yardstick and align as described below.

If arm is on table, you can clamp protractor to L-bracket on table.



PROCEDURE SET-UP

Subject seated in (wheel)chair with arm on armrest or next to table with forearm positioned on table, hand flexed over edge with palm down. Protractor card should be on the side of the subject's hand, with zero degree at axis of rotation of wrist. **Measure and record** available passive ROM at the head of the 2nd MCP joint. Put an arrow on protractor 10 degrees less than full passive range



(see picture). Subject must then extend the wrist at least this far to count.

Secure forearm with Velcro strap if positioned on armrest. If forearm is on table stabilize using manual pressure just above wrist during testing.

DIRECTIONS TO SUBJECT

Curl your wrist up as high as possible and then lower it all the way down. Keep your arm on the arm rest. Please practice this now.

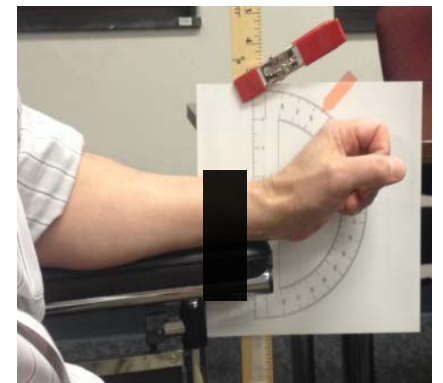
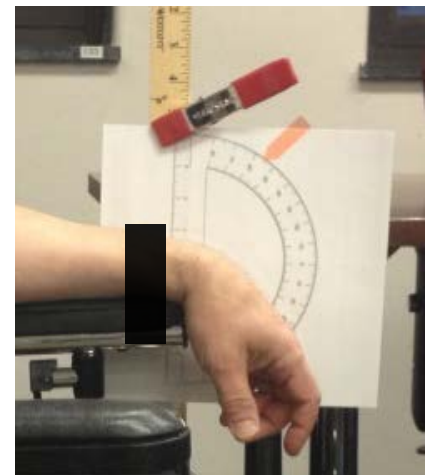
(Subject performs action).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully. Are you ready?

(Wait for response)

Begin when I say GO.

Press timer when you say “GO.”



SCORING

Full completion is raising wrist to target and returning to flexed position.

Partial Completion requires wrist lift at least to neutral.

NOTES

Give encouragement and feedback during testing. If subject does not curl wrist up fully, instruct subject to be sure to raise hand all the way to target. Do not count that repetition. Do not stop or restart.

ITEM 7a: ACQUIRE-RELEASE PART 1 – GRASP DYNAMOMETER**ACTION**

Place the hand around the dynamometer in a position to grasp.

Extend the fingers to release dynamometer without pulling arm away.

INTENT

To determine if the subject can use a **cylindrical grasp** to **acquire** and **release** an object.

EQUIPMENT

Standard hand-held dynamometer.

CRITICAL ELEMENTS

Hold dynamometer in front of subject's hand. Reaching is not a part of this task.

Do not allow subject to pull arm away and tear fingers off of dynamometer.

EQUIPMENT SET-UP

Set handle in position 3 of dynamometer. Check that dynamometer is zeroed.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position with the elbow at subject's side and flexed to about 90 degrees, wrist in neutral rotation, thumb up. If subject cannot hold their arm up in front of dynamometer, place forearm on the table or the armrest of wheelchair. Present dynamometer in front of subject at mid-clavicular line.

Position dynamometer just in front of hand. If unable to acquire, position the subject's hand in standard position around dynamometer.

DIRECTIONS TO SUBJECT

Get your right (left) hand around the dynamometer handle in a position to squeeze. Do not use your other hand to help.

If unable to do, position subject's hand around dynamometer.

Now open your hand to release the dynamometer. You need to open your fingers enough so you are not touching the handle. Do not just pull your hand off the dynamometer.

**SCORING**

Mark yes or no for acquire and release portion of test.

No partial completion credit.

NOTES

Score acquire and release BEFORE first trial. Yes/No.

Subject must be able to open hand/extend fingers enough to get fingers around handle and close in position to squeeze (see picture). Palm and fingers should both be touching the dynamometer. Subject can use tenodesis to acquire, i.e. flex wrist to help open hand and extend wrist to close fingers around handle. Can also use tenodesis to release as long as fingers open enough so not touching dynamometer.

ITEM 8: GRASP DYNAMOMETER

ACTION

Squeeze the dynamometer as hard as possible.

INTENT

To determine if the subject can **generate force** using **cylindrical grasp**.

EQUIPMENT

Standard hand-held dynamometer

CRITICAL ELEMENTS

Start with subject's hand around dynamometer. Force dial should be facing you, not subject. Be sure you are reading force in kilograms, not pounds.

Check that dynamometer is zeroed before starting. Squeeze and release. Dial should drop to zero. Force indicator should stay at maximum value.

EQUIPMENT SET-UP

Set handle in position 3 of dynamometer.

Check that dynamometer is zeroed correctly.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position with the elbow at subject's side and flexed to about 90 degrees, wrist in neutral rotation, thumb up. If subject cannot hold their arm up in front of dynamometer, place forearm on the table or the armrest of wheelchair. Have subject get hand around handle or help position hand.

DIRECTIONS TO SUBJECT

You are going to squeeze the handle with your right (left) hand 3 times.

Start when I say go. Squeeze as hard as possible until I say stop.

Are you ready? (Wait for response) *Go. Squeeze, squeeze, squeeze.....Stop.*

Record force measurement in kg. Set force indicator back to zero.

Repeat two more times.

SCORING

Record force in kg to nearest 1/2 kg.

NOTES

Give encouragement during trials. Kg is smaller number if both pounds and kg listed.

ITEM 9: LATERAL PINCH

ACTION

- A. Grasping a thin object using lateral pinch.
- B. Holding an object tightly using lateral pinch.

INTENT

To determine if the subject can use **lateral pinch** to hold an item.

EQUIPMENT

Stop watch, credit card, pinch dynamometer

CRITICAL ELEMENTS

Part A. Subject needs to be able to maintain grasp of a thin card.

Part B. Force measurements are in kilograms. Be sure to read correct values.

Check that pinch meter is zeroed correctly before starting.

EQUIPMENT SET-UP

Zero pinch meter. Squeeze and release. Needle should drop to zero. Force indicator should stay at maximum value.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Positioning is the same as for Grasp Dynamometer, except palm is down.

Part A: Hold credit card vertically in front of subject's hand.

Part B: Hold pinch meter vertically in front of subject's hand.

DIRECTIONS TO SUBJECT

A. *Grasp this credit card using your right (left) thumb and the side of your index finger and hold it for 5 seconds.*

B. *Now hold this pinch meter the same way you held the credit card and squeeze as hard as you can. You will do this three times. Start when I say go. Squeeze as hard as possible until I say stop.*

Are you ready? (Wait for response) **Go. Squeeze, squeeze, squeeze.....Stop.**

Record pinch force in kg. Repeat two more times

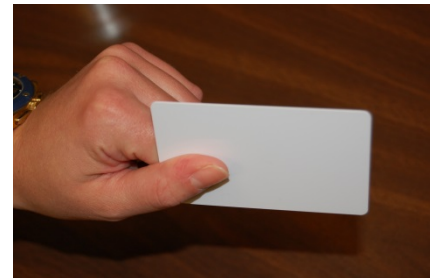
SCORING

A. Mark appropriate block on scoresheet. B. Record force to nearest 1/2 kg.

NOTES

Give encouragement during testing. Zero marker after each trial.

Kg is smaller number if both pounds and kg listed.



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ITEM 10-11: PULL-PUSH**ACTION**

Pull or slide an object that is on a table, towards you.

INTENT

PULL: Asking if the person has sufficient elbow flexion/shoulder extension to move objects of different weights toward body.

PUSH: Asking if the person has sufficient elbow extension/shoulder forward flexion to move objects of different weights away from body.

EQUIPMENT

Small round pan with foam board glued to bottom to increase friction, and wrist strap already attached, two 1/2-kg wts, one 1-kg wt, one 2-kg wt, yardstick, round marker.

**CRITICAL ELEMENTS**

If subject does not have strong grasp, secure hand to strap on pan. Should be snug so subject can push without pan slipping to side. May need a second strap around hand to hold fingers onto strap. Wrist position is not critical – wrist can flex or extend during push. Subject should not use body to pull/push; must use arm.

EQUIPMENT SET-UP

Secure subject's hand in wrist strap attached to round pan. Strap should be secured tightly so subject does not need to use grasp.

**PROCEDURE SET-UP**

Subject seated in (wheel)chair in an upright position, not bending his/her body forward. Subject should be close to table. Position the subject's right(left) upper extremity in an extended position resting across the table, in mid-clavicular line, with the elbow positioned at 20 degrees of flexion. (See picture). Have subject hook fingers through strap and tighten strap. For subjects without good grasp, you can wrap a second strap around closed fingers so they don't slip off. Place

yardstick to the outside of the subject's arm and place round marker at level of MP joints to indicate starting position for pull (and end position for push).



DIRECTIONS TO SUBJECT

Drag the pan towards you until your hand reaches the edge of the table. Then push it away from you until your hand reaches the round marker. Please practice this now. (Subject performs action) If successful with empty pan, repeat with progressively higher weights until end. Reposition subject's hand if unable to do by his/her self.

	Total weight
1st trial: Empty pan	> no weights
2 nd trial: Add ½ kg	> ½ kg
3 rd trial: Add ½ kg	> 1 kg
4 th trial: Add 1 kg	> 2 kg
5 th trial: Add 2 kg	> 4 kg

SCORING

Check box with highest weight completed for PULL and PUSH separately.

NOTES

Each direction (pull/push) is a separate action scored separately.

For example, if able to pull 1/2 kg but unable to push, continue testing PULL at higher weights.

Must move pan fully in one direction to count.

No credit for partial completion.

ITEM 7b: ACQUIRE-RELEASE PART II – Container**ACTION**

Grasp and release a large object (top of plastic container) with the tips of the fingers.

INTENT

To determine if the subject can **acquire** an object using DIP flexion of all four fingers and thumb (**wide precision grip**), and **release** an object.

EQUIPMENT

Plastic container with lid.

CRITICAL ELEMENTS

You can stabilize the container while subject is trying to acquire.

Acquire and release are scored separately.

**EQUIPMENT SET-UP**

Position empty container upright in front of subject, mid-clavicular line next to hand.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Container placed mid-clavicular line in front of subject. Position the subject's right(left) upper extremity on the table, with elbow at subject's side and flexed to 90-degrees. Forearm is straight (i.e., shoulder in neutral rotation), and thumb up.

DIRECTIONS TO SUBJECT

I want you to grasp the top of the container with your thumb and fingertips like this, (demonstrate or show picture of proper grasp), then let go of the container by opening your fingers, not pulling your arm away. (Demonstrate proper release).

Please practice this now. (Subject performs action. Stabilize container if necessary). *OK, now grasp the container.*

(If subject is unable to acquire, position hand on lid to test release). *Release the container.*

SCORING

Check YES or NO for acquire and for release.

NOTES

ITEM 12: CONTAINER

ACTION

Grasp a large object – plastic container with the tips of the fingers and lift it up.

INTENT

To determine if the subject, using DIP flexion of all four fingers and thumb (**wide precision grip**), can **maintain** hold of an object.

EQUIPMENT

Plastic container, two ½ kg weights, height adjustable table, stopwatch.

CRITICAL ELEMENTS

This item is concerned with strength of grasp. You should position subject's hand in proper position on the lid if subject unable to do so.

EQUIPMENT SET-UP

Position empty container upright on table in front of subject.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Position the subject's right(left) upper extremity on the table, with the elbow at subject's side and flexed to 90 degrees. Forearm is straight (i.e. shoulder in neutral rotation), and thumb up. Position empty container in front of subject, at mid-clavicular line next to hand. Use stopwatch or watch with second hand to time lift.

DIRECTIONS TO SUBJECT

Grasp the top of the container with your thumb and fingertips, then lift the container and hold it for 5 seconds. Please practice this now.

(Subject performs action).

If unable to acquire, position hand on lid to test grasp.

OK, lift the container now. (Time for 5 seconds)

You can put the container down.

If successful, add 1/2 kg weight and repeat.

If successful, add another ½ kg (to increase weight to 1 kg) and repeat.



SCORING

Check box with highest weight lifted for required time.

NOTES

ITEM 13: PINCH DIE (2-finger tip)**ACTION**

Prehension: Pick up a small object (die) using thumb and index finger and tip prehension.

INTENT

To determine if the subject can use **tip prehension** to pick up a small object.

EQUIPMENT

Two pairs of dice, timer, post-it arrow markers, small tape measure.

CRITICAL ELEMENTS

Object is a small light cube 1.6 cm per side.

Have extra die ready in case subject drops a die and it rolls away.

Must alternate picking up die. Do not move same one twice in a row.

Must use prescribed grasp pattern. Watch and correct if subject switches type of grasp.

EQUIPMENT SET-UP

With subject seated in (wheel)chair next to table, place marker 1 in mid-clavicular line in front of subject. Place marker 2 on table about 4 inches (10 cm) medial to first mark. Place dice above and below marker 1 as shown in figure.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position, arm positioned on table in neutral position. Position the subject's right (left) upper extremity on the table, with elbow at subject's side and flexed to 90-degrees. Forearm is straight (i.e., shoulder in neutral rotation), and thumb up. Dice are positioned on the same side as the arm being tested.

DIRECTIONS TO SUBJECT

Only use your right(left) thumb and first finger to grasp this die. Pick it up and put it next to the other mark, then repeat with other die. Continue moving dice back and forth. (Demonstrate for subject).

Please practice this now. (Subject performs action).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully. Are you ready? (Wait for response)

Begin when I say GO. Press timer when you say “GO”.

SCORING

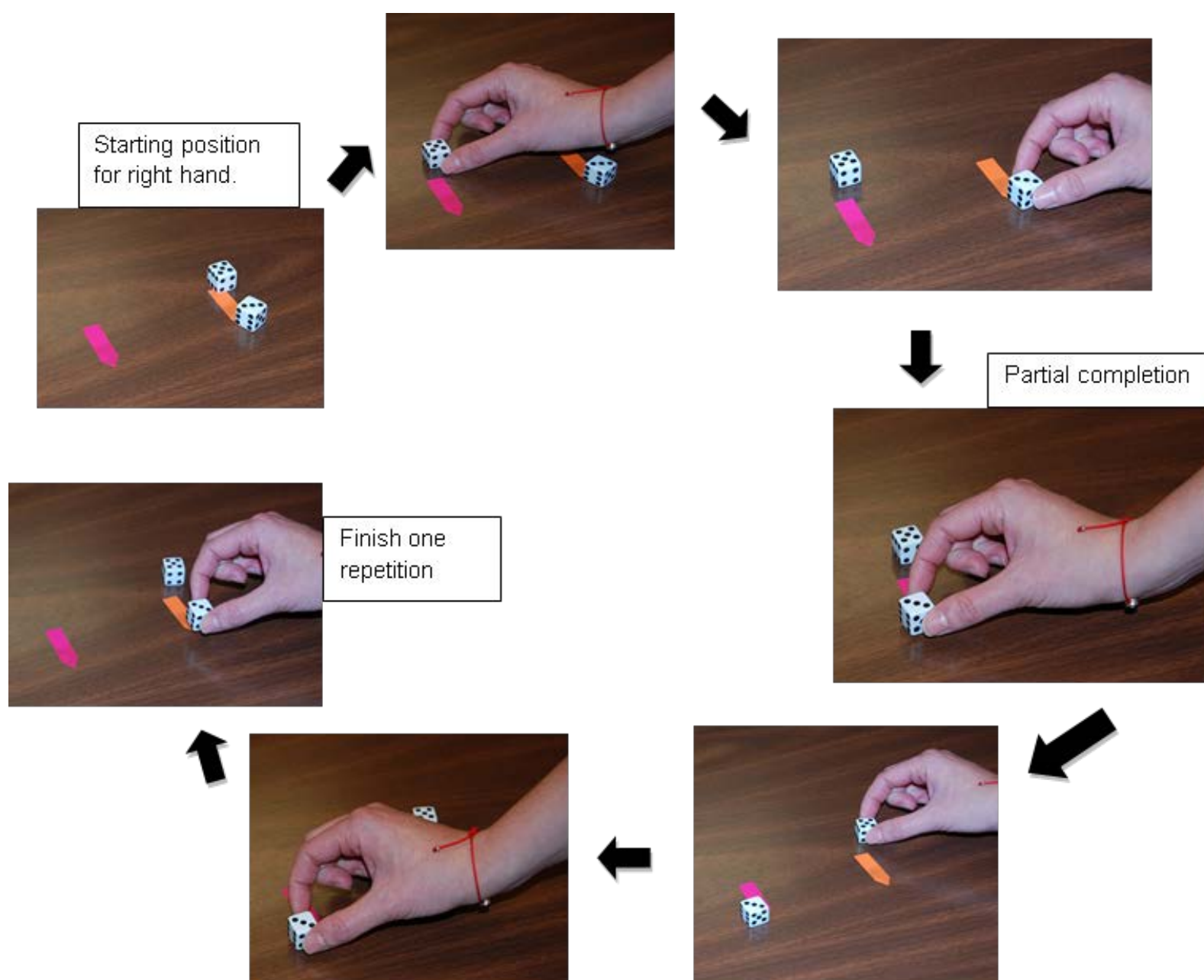
Record number of full repetitions completed in 30 seconds.

Full completion is moving both dice from marker 1 to marker 2 and back to marker 1.

Partial completion requires moving both dice to marker 2.

NOTES

If subject drops die, and can reach it, have subject pick it up and continue. If die rolls away, put another at marker where that die was picked up. Do not stop or restart test. Give encouragement and correct incorrect grasp promptly.



ITEM 14: PENCIL (3-finger tip)**ACTION**

Pick up a small object (pencil) using 3-jaw chuck prehension.

INTENT

To determine if the subject can use **3-jaw** chuck (tripod pinch) to pick up a small object (pencil).

EQUIPMENT

Timer, several unsharpened #2 pencils, wood block with holes 10 cm apart, nonslip mat.

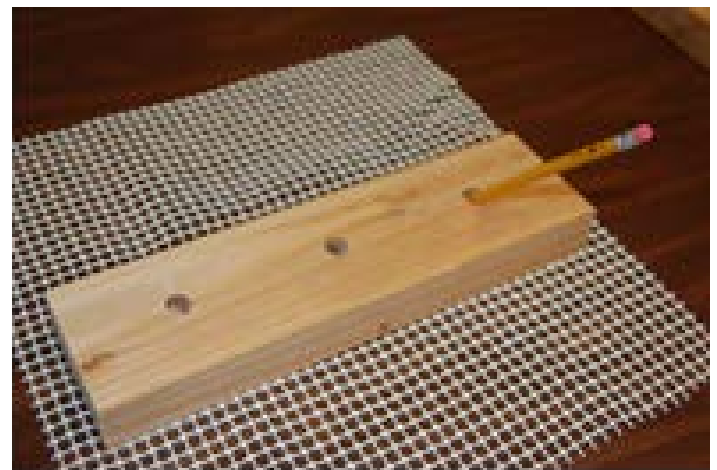
CRITICAL ELEMENTS

Slot for pencil is only slightly larger than diameter of pencil. Slot angled 30 degrees from vertical. Have extra pencils. If subject drops a pencil, place another in slot where it was picked up.

EQUIPMENT SET-UP

Wood block with holes is placed on table with pencil in the lateral slot.

Set timer to go backwards from 30 seconds to zero.

**PROCEDURE SET-UP**

Subject seated in (wheel)chair at table in an upright position, arm positioned on table in neutral position. Lateral slot with pencil is placed in mid-clavicular line on table in front of subject. The other slot for pencil should be 10 cm medial from first.

Position the subject's right (left) upper extremity on the table, with the elbow at subject's side and flexed to 90-degrees. Forearm is straight (i.e., shoulder in neutral rotation), and thumb up. Examiner stabilizes holder for pencil if needed.

DIRECTIONS TO SUBJECT

Use your thumb and first two fingers of your right (left) hand to grasp this pencil.

Pick it up and put it in the center slot. Then place your hand on the table. Next,

pick up the pencil and return it to the original slot and place your hand on the

table. (Demonstrate for subject using proper grasp)

Please practice this now. (Subject performs action).

Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully.

Are you ready?" (Wait for response) *Begin when I say GO.* Press timer when you say “GO”.

SCORING

Record number of full repetitions completed in 30 seconds.

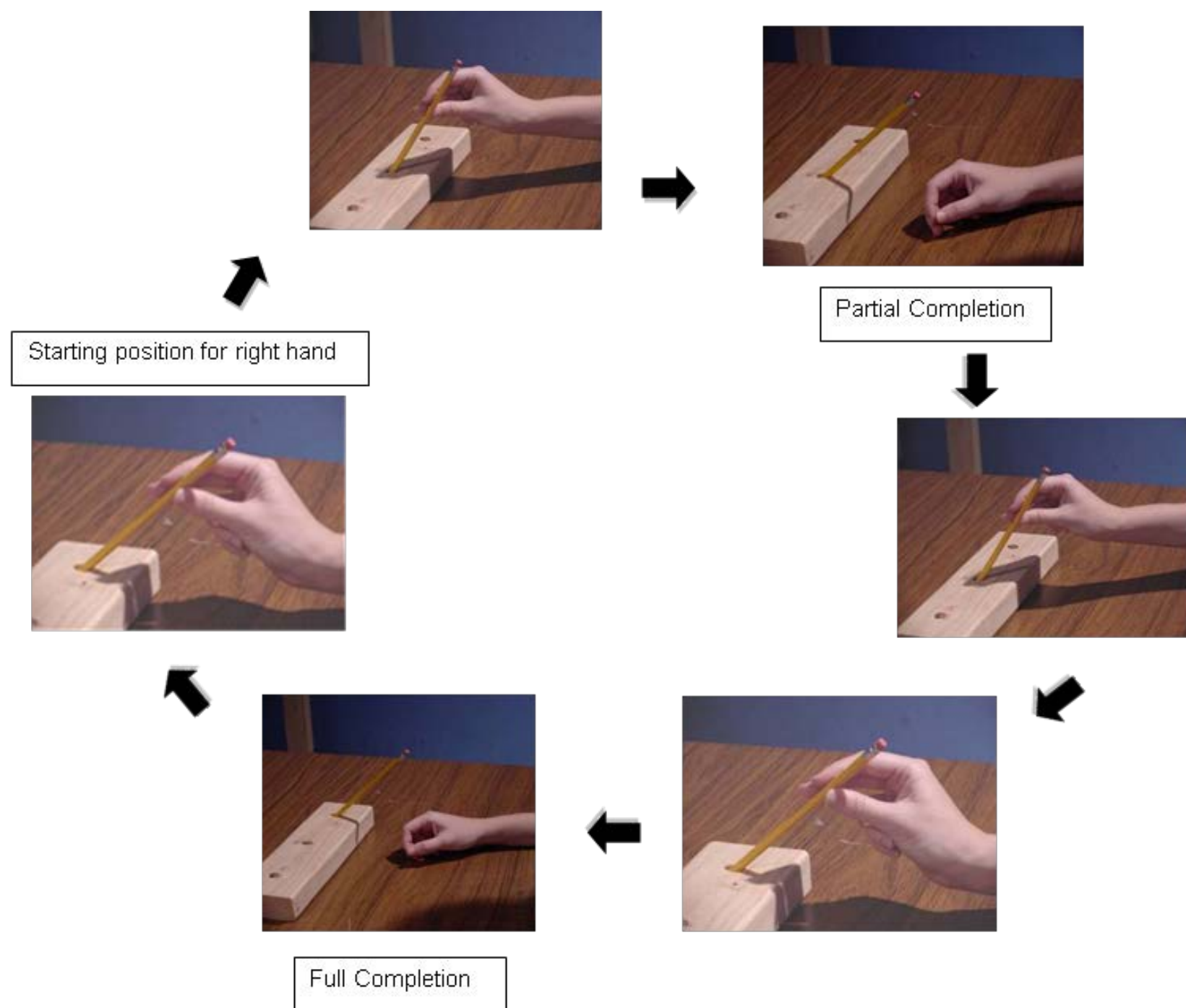
One repetition is moving pencil to middle slot and back to starting point.

NOTES

Partial completion is moving pencil to middle slot.

If subject drops pencil, put another pencil in last slot it was in, continue timing.

Do not stop or restart test.



ITEM 15: MANIPULATE TWO-COLOR CHIP

ACTION

In-hand manipulation of small object.

INTENT

To determine if subject can manipulate a small object using thumb and fingers.

EQUIPMENT

Two-color chip about the size of a quarter, one side contrasting color to other, timer, height adjustable table, extra chips.



CRITICAL ELEMENTS

Chip is different color on each side to make it easier to count full revolutions. Have extra chips available in case subject drops one. Must use fingers and thumb, not palm of hand to turn chip.

EQUIPMENT SET-UP

Have several chips available. Set timer to go backwards from 30 seconds to zero.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Position the subject's right(left) upper extremity on the table, with the elbow at subject's side and flexed to 90 degrees. Forearm is straight (i.e., shoulder in neutral rotation), and palm up. Place chip in subject's hand between thumb and 2nd / 3rd fingertips, painted side up.

DIRECTIONS TO SUBJECT

I want you to turn this chip in your hand over and over using your thumb and fingers. Demonstrate task.

Please practice this now. (Subject performs action). *Now, do that as many times as you can in 30 seconds, making sure you complete each repetition fully. Are you ready?"* (Wait for response) *Begin when I say GO.* Press timer when you say "GO".



SCORING

Record number of revolutions (full turns) in 30 seconds.

Full completion is a full revolution: red (yellow) side up to red (yellow) side up.

Partial completion requires a half revolution without dropping

NOTES

If subject drops chip, replace in starting position in hand. Continue timing. Do not restart test.

ITEM 16: PUSH INDEX - CALCULATOR

ACTION

Pushing an object with extended 1st finger.

INTENT

To determine the subject's ability to use the extended index finger for everyday activities, such as ringing a doorbell.

EQUIPMENT

Calculator with at least 10-digit display, stopwatch, card with sequence of 10 numbers: 735-910-8246 AND 281-495-7360, Practice card: (123-456-7890).

CRITICAL ELEMENTS

Calculator or number keypad arranged like calculator or phone, but not horizontal like a keyboard. Must have 10-digit display and ability to delete last digit entered.

EQUIPMENT SET-UP

Place calculator in front of subject in mid-clavicular line next to hand. Place card with practice number in front of calculator. Stopwatch set to zero. If delete button is not obvious, can mark with sticker.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Position the subject's right (left) upper extremity on the table, with elbow at subject's side and flexed to 90-degrees. Forearm is straight (i.e. shoulder in neutral rotation), and thumb up. Demonstrate use of calculator, including how to delete last number entered. Instruct subject to use the back button indicated on the calculator with a sticker to move back/correct. Have cards for right and left side covered until ready to start.

DIRECTIONS TO SUBJECT

Enter this number in the calculator, pushing the buttons using your first finger.

Please practice this now. Allow subject to practice once, including delete/back.

[123-456-7890]. Clear screen.

Now I'll show you the number to enter next. Begin when I say GO

Show number for right or left hand, and say "GO." Start stopwatch at GO; stop when completed accurately or you reach 90 seconds. Repeat using number for other hand.

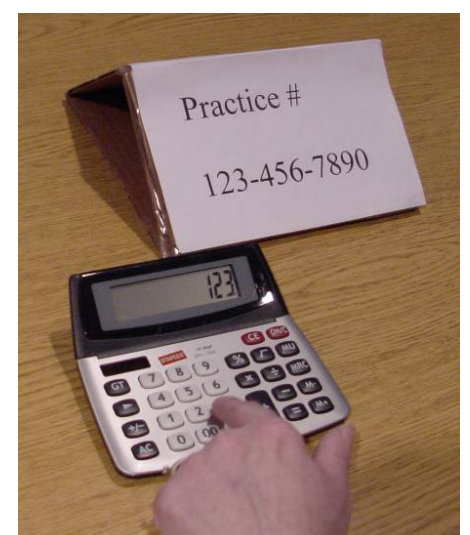
SCORING

Record time to enter correct number to nearest 0.1 second.

NOTES

Maximum time to complete is 90 seconds.

If not finished, mark as unable.



ITEM 17: PUSH THUMB – CELL PHONE

ACTION

Pushing an object using thumb IP flexion.

INTENT

To determine the subject's excursion ability to use thumb to operate a hand-held device, such as using a cell phone or remote control.

EQUIPMENT

Cell phone, stopwatch, card with sequence of 10 numbers: 846-310-5372 and 947-361-0528 Practice card: (123-456-7890)

CRITICAL ELEMENTS

Cell phone must be small enough to fit in palm of hand. Should have buttons, not a touch screen. Must hold phone in same hand as thumb being tested.

EQUIPMENT SET-UP

Place card with practice number on table in front of subject. Stopwatch set to zero. If back button on phone is not obvious, can mark with sticker.

PROCEDURE SET-UP

Subject seated in (wheel)chair in an upright position. Position the subject's right(left) upper extremity on the table, with elbow at subject's side and flexed to 90-degrees.

Forearm is straight (i.e., shoulder in neutral rotation), and thumb up.

Demonstrate use of phone, including how to delete last number entered. Allow subject to practice once. [1234567890].

Place card with number in front of subject. Use different number for right and left hands.

DIRECTIONS TO SUBJECT

Enter this number in the phone, pushing the buttons using your thumb. Please practice this now. Allow subject to practice once, including delete/back. [123-456-7890]. Clear screen.

Now I'll show you the number to enter next. Begin when I say go. Show number for right or left hand, and say "GO." Start stopwatch at GO; stop when completed accurately or reach 90 seconds. Repeat using number for other hand.

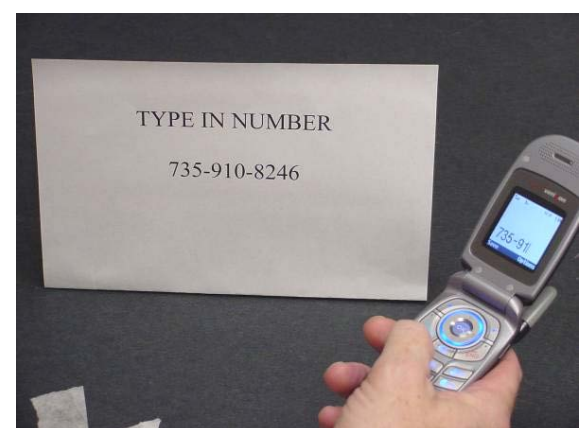
SCORING

Record time to enter correct number to nearest 0.1 second.

NOTES

Maximum time to complete is 90 seconds.

If not finished, mark as unable.



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