

# Development of an Objective Test of Upper Limb Function in Tetraplegia: The Capabilities of Upper Extremity Test (CUE-T)

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## Objective:

To describe the development of a standardized test of upper limb function in tetraplegia, focused on the domain of functional limitations<sup>1</sup>.

## Statement of Need:

Current clinical trials for neurorecovery in SCI must demonstrate clinically meaningful improvements in order to be deemed effective. However, there is no accepted tool to measure upper limb recovery. A valid tool must be able to detect intrinsic improvement in function separate from better performance of activities resulting from adaptive rehabilitation strategies.

## STEPS IN DEVELOPMENT

### Start with CUE Questionnaire<sup>2</sup> Item

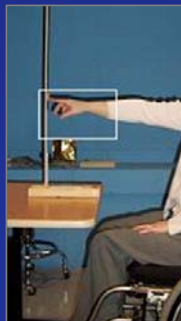
Think about reaching out with your arm to touch something directly in front of you that is at shoulder level: .....how difficult is it to do this using your RIGHT (LEFT) ARM?

### Determine Cognitive Intent

Determine how far in front of body someone can get hand at shoulder level

### Create test procedures

Reach out and touch the round marker with your left (right) hand and return your hand to your lap. Do this as many times as you can in 30 seconds.



## Guiding Principles:

The following principles guided development:

- 1) Items should be appropriate for individuals with tetraplegia
- 2) Items should show insensitivity to learning
- 3) There should be standardized administration
- 4) Items should be scored on an unambiguous scale
- 5) Multiple trials of items should be employed to improve reliability if necessary
- 6) The instrument should be sensitive to changes provided by treatments or interventions
- 7) It should take at most one hour to complete

### Cylindrical (power) grip



### Lateral (key) pinch



## Grasp Patterns Tested

### Tip prehension (two finger)



### 3-jaw chuck



### Wide precision grasp

## Actions included in Final Test:

### REACHING AND LIFTING

- Reach forward
- Reach up
- Reach down
- Lift up to 2 kg over head\*

### PULLING AND PUSHING

- Pull up to 4 kg towards
- Push up to 4 kg away
- Push-up weight shift\*

### WRIST ACTIONS

- Extend
- Pronate
- Supinate

### HAND AND FINGER ACTIONS

- Cylindrical (power) grasp
- Lateral (key) pinch
- Tip prehension (2-jaw)
- Tip prehension (3-jaw)
- Wide precision grasp
- Manipulate small objects
- Press with index finger
- Acquire and release
- Use thumb with handheld item (cell phone)

\*Bilateral items

## Pilot Phase:

The initial test was administered to 10 Occupational Therapy students. After refining procedures, 30 individuals with SCI were tested (see Poster #32). Preliminary analyses found that the push-pull item was too easy, so a piece of foam was glued to the bottom of the container to increase friction.

## Results:

The final test consists of 18 items (see above). Arm items focus on positioning the arm in space and moving objects towards or away from the body. Hand items focus on dexterity and grasping patterns. Scoring for most items is based on number of repetitions in 30 seconds. The test can be administered in less than one hour.

## Conclusion:

The CUE-T is the first comprehensive assessment of upper extremity actions (functional limitations) for SCI. Reliability and responsiveness is underway.

## References:

1. Marino RJ. Domains of outcomes in spinal cord injury for clinical trials to improve neurological function. J Rehab Res Dev 2007; 44(1):113-22
2. Marino RJ, et al. The capabilities of upper extremity instrument: reliability and validity of a measure of functional limitation in tetraplegia. Arch Phys Med Rehabil 1998; 79:1512-1521