# Graded Redefined Assessment of Strength, Sensibility and Prehension (GRASSP)

## Assessment Overview

### Assessment Area

<table>
<thead>
<tr>
<th>ICF Domain:</th>
<th>Body Function &amp; Structures</th>
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</thead>
<tbody>
<tr>
<td>Subcategory:</td>
<td>Neuromusculoskeletal &amp; Movement-Related Functions &amp; Structures</td>
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**Subscales (domains):**
- Sensation
- Strength
- Prehension

### Summary

The Graded Redefined Assessment of Strength, Sensibility and Prehension (GRASSP) is a clinical impairment measure that incorporates three domains vital to upper limb function: sensation, strength, and prehension. It is a multimodal test comprising 5 subtests for each upper limb: dorsal sensation, palmar sensation, strength, prehension ability and prehension performance. The GRASSP results in 5 numerical scores that provide a comprehensive profile of upper-limb function.

### You Will Need

**Length:**
- Sensation: 3 dorsal locations and 3 palmar locations for each hand
- Strength: 10 arm and hand muscles for each arm
- Prehension: 3 grasping tasks; 6 prehension tasks for each arm

**Equipment:**
- GRASSP kit and manual muscle test equipment

**Scoring:**
Scores for tasks in each section are summed for each subscale score. There is no total score.

**Training:**
- Reading the GRASSP manual is recommended.

### Availability

Available for purchase here: [http://www.grassptest.com](http://www.grassptest.com)

## Assessment Interpretability

### Minimal Clinically Important Difference

- Not established in SCI

### Statistical Error

**Standard Error of Measurement:**
- Strength: Right=1.8, Left=1.9
- Sensation: No data available
- Prehension ability: R=0.6, L=0.6
- Prehension performance: R=2.5, L=1.8

**Minimal Detectable Change:**
- Strength: Right=5.1, Left=5.3
- Sensation: No data available
- Prehension ability: R=1.8, L=1.7
- Prehension performance: R=7.0

### Typical Values

**Mean (SD) Scores:**
- Strength: Right=24.3 (13), Left=25.1 (13.5)
- Dorsal Sensation: R=6.5 (3.2), L=6.7 (3.1)
- Palmar Sensation: R=7.1 (3.6), L=7.2 (3.3)
- Prehension ability: R=4.9 (4.5), L=5.1 (4.3)
- Prehension performance: R=15.6 (9.6), L=14.7 (8.9)
### Measurement Properties

#### Validity – **Moderate to High**

**Moderate** to **High** correlation between the GRASSP subtests, SCIM-self care, & ASIA UEMS:

- **At 1 month post-injury:**
  - Strength & SCIM-self-care: $r = 0.78$
  - Strength & ASIA UEMS: $r = 0.95$
  - Sensation & SCIM-self-care: $r = 0.63$
  - Prehension performance & SCIM-self-care: $r = 0.85$

- **At 12 month post-injury:**
  - Strength & SCIM-self-care: $r = 0.82$
  - Strength & ASIA UEMS: $r = 0.88$
  - Sensation & SCIM-self-care: $r = 0.56$
  - Prehension performance & SCIM-self-care: $r = 0.82$

**Moderate** to **High** predictive validity:

ROC analysis AUC: $r = 0.71$-$0.86$

(Velstra et al. 2015; n=74, 51 males, acute tetraplegia, 16-40 days post-injury)

**Moderate** to **High** correlation between GRASSP and CUE-Q:

$r=0.40$-$0.84$

**Moderate** to **High** correlation between GRASSP and SCIM/SCIM-SC:

- SCIM: $r=0.37$-$0.70$
- SCIM-SC: $r=0.40$-$0.84$

(Mulcahey et al. 2017; n=47, AIS: 14A, 4B, 10C, 8D, 11 Unknown)

#### Reliability – **High**

**High** Test-retest Reliability for all domains of the GRASSP:

- ICC = 0.86-$0.99$

(Kalsi-Ryan et al. 2012; n=72, chronic traumatic tetraplegia, mean time since injury (SD)=7.6 (6.1) years)

**High** Inter-rater Reliability for all domains of the GRASSP:

- ICC = 0.84-$0.96$

(Kalsi-Ryan et al. 2012; n=72, chronic traumatic tetraplegia, mean time since injury (SD)=7.6 (6.1) years)

**Number of studies reporting reliability data:** 3

#### Responsiveness

**Floor/Ceiling Effect:**

Not established in SCI

**Effect Size:**

- **Between 1-12 months post-injury:**
  - Strength: 1.48
  - Sensation: 0.64
  - Prehension ability: 0.99
  - Prehension performance: 1.03

(Velstra et al. 2015; n=74, 51 males, acute tetraplegia, 16-40 days post-injury)

**Number of studies reporting responsiveness data:** 2