Chapter 28: Outcome Measures

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28.1 Introduction

Why use outcome measures?

Despite past evidence that suggested clinicians in the rehabilitation field did not regularly use outcome measures (Cole et al. 1994; Deathe et al. 2002; Skinner et al. 2006), there is mounting evidence that now confirms more clinicians are now reporting their findings using some ordinal or quantifiable outcome measure (Kay et al. 2001; Skinner et al. 2006).

Good science and good clinical practice depends upon sound information, which in turn relies on sound measurement. Measurement enables health care professionals and researchers to describe, predict and evaluate in order to provide benchmarks and summarize change related to the condition and care of individuals with spinal cord injury. Using datasets facilitates tracking of patient outcomes in relation to healthcare costs. Clinical investigators recognize that using an appropriate outcome measure, to determine the validity of a therapeutic intervention, is the key to establishing or changing the models of best practice.

There is a sincere desire to move beyond minimal data collected through datasets such as the mandatory Canadian Institutes of Health Information (CIHI) Rehabilitation Minimum Data Set or the Functional Independence Measure (FIM). Nevertheless there is a lack of validated measures for many disciplines within rehabilitation research. There is also uncertainty as to the strength and limitations for each type of assessment.

SCIRE Outcome Measures will provide information on the psychometric properties and the clinical use of 104 measures, giving the reader the necessary confidence to move their clinical practice and research forward on a more rigorous basis.

*For the purposes of this review the terms listed (screen, tool, instrument, measure, scale) will be used interchangeably to indicate a method used to capture data in a standardized manner.

Why assess measures used with the SCI Population?

Why is there a need to assess the psychometric or clinometric properties of an outcome measure in different clinical populations? This is a fair question. For example, there is a considerable body of research suggesting the Functional Independence Measure (FIM) is a valid and reliable measure. Do we really need to test it in different diagnostic populations? The short answer is ‘absolutely’. The long answer is a bit academic, but important all the same.

The FIM was developed to assess the burden of care in the stroke population (Granger et al. 1986). There has been significant investment in the development of the FIM and it has become the gold standard for the assessment of basic function (e.g. transfers, mobility, dressing, grooming, bowel and bladder). In fact it is core to the minimum dataset used in many administrative databases such as the CIHI Rehabilitation Reporting System and the Uniform Data Set for Medical Rehabilitation Centers in the United States. Despite the popularity of FIM (now a proprietary entity) and its universal
recognition, the attempts to use it across a broad range of disabling physical disorders, including SCI, has revealed deficiencies and inadequacies. In fact, Catz and colleagues (1997) created the Spinal Cord Independence Measure (SCIM) in response to frustrations related to using the FIM to categorize the functional changes associated with Activities of Daily Living (ADL) during SCI rehabilitation. The results demonstrate that the responsiveness, or the ability to detect change, is better in the SCIM than the FIM (Catz et al. 1997; 2006; Itzkovich et al. 2003).

Another example is the Short Form-36 (Ware & Sherbourne 1992) and its lesser cousin the Short-Form-12. These extremely popular generic surveys of health related Quality of Life (QOL) include items which are oriented around activity limitation at the personal level, as well as participation or restriction at a societal level (e.g. can you lift and carry and object; can you climb stairs?). It seems obvious that a good proportion of the SCI population would not be able to complete many of these activities. This is why it is critical to assess that each survey item is first and foremost appropriate for the level of SCI being assessed, as unacceptable items can alter the individual’s response (seriousness to answer) or confound the data from each study cohort. This stance does not mean that new tools should be created for every diagnosis, health condition or situation (Streiner & Norman 2004), but it does make sense that existing tools must be validated for each study population so they are both sufficiently accurate and sensitive to detect a meaningful difference in a functionally significant clinical endpoint between the experimental and control groups of the trial (Steeves et al. 2006).

If the above reasons are not compelling enough, Portney and Watkins (2000), in their discussion of generalizability theory (the concept of reliability theory in which measurement error is viewed as multidimensional) remind us that establishing the population-specific reliability is essential especially to clinical practice. The nuances of many factors such as pain, spasticity and deformity can alter the reliability of any obtained result. In short, while a lack of evidence does not mean evidence is lacking, we are obligated to demonstrate and document the reliability and validity of a test score in order to have faith in our results.

**Inclusion Criteria for Measurement Tools of Interest to SCI**

Initially the measures targeted for this review included any and all tools for which there was at minimum one study that examined psychometric properties (reliability, validity, responsiveness) using a spinal cord population. More specifically, only those peer-reviewed manuscripts that directly reported values for their sample of SCI individuals were included. In the original version, a list of 168 tools was originally derived (approximately 10 were different formats of a similar tool), and another 28 new tools were found while completing the update. Given the vast number of tools inclusion criteria was further narrowed to select tools for review based on clinician familiarity and interest (47 for version 1, 29 for version 2, 15 for version 3, 13 for version 4, for a total of 104 measures).

For version 1, a table identifying all tools was developed and clinicians (nurses, occupational therapists, physiatrists, physical therapists, psychologists, recreation therapists and social workers) from GF Strong Rehabilitation Centre (Vancouver, British Columbia) and Parkwood Hospital (London, Ontario) were surveyed. Tools were then
selected for review based on receiving at least 5 tallies of interest and/or familiarity. A similar process was carried out for identifying pertinent tool for inclusion in the updates. A table was developed that identified all new tools along with those tools that were not included in the original version. Clinicians and scientists then reviewed the list and selected 29 tools to include in the update.

Note, we recognize that in many randomized controlled trials investigators assess the reliability between their raters. We do not include these studies because mostly, these efforts are to ensure stability of the results within the research team; therefore the results are not to generalize to the larger pool of tool users. As a result, the statistical model chosen to calculate the intra class correlation coefficient (ICC) for example is different given this purpose (Shrout & Fleiss 1979). Given the dearth of RCTs conducted in SCI research the number of studies lost is potentially very small.

Searching the Literature

The Pubmed, MedLine, CINHAL, Embase, HaPI, PsycInfo, and Sportdiscus electronic databases were searched (1986 to January 2006 for Version 1, from 2006 to January 2008 for Version 2, from 2008 to January 2010 for Version 3, and from 2010 to January 2013 for Version 4) in an effort to locate papers reporting on measures. Additional searching was conducted by archiving the references of papers obtained from the electronic search. The key word spinal cord injury was used across each of the databases while the following terms varied in combination with spinal cord injury depending on the database used: validation studies, instrument validation, external validity, internal validity, criterion-related validity, concurrent validity, discriminant validity, content validity, face validity, predictive validity, reliability, interrater reliability, intrarater reliability, test-retest reliability, reproducibility, responsiveness, sensitivity to change, evidence-based medicine, outcome measures, clinical assessment tools, scales and measures. A database file was established using RefWorks to organize potential articles of interest. After eliminating duplicate manuscripts data extractors reviewed titles and abstracts in order to retain relevant papers. At this point all of the articles were read and the relevant information (reliability, validity and responsiveness coefficients and descriptions) was extracted. See Appendix 1 on page 28-8 for a copy of the data extraction form.

Classifying the Measures

To assist with the process or organizing the tools we used 2 frameworks:
1) The World Health Organization’s ICF Framework
2) a locally developed clinical framework

The conceptual framework developed by the World Health Organization is called the International Classification of Functioning, Disability and Health or ICF for short (WHO 2001). See Figure 28.1. The advantages of using this framework include: 1) it is well recognized and used by the international community; 2) it was created to provide standard language for use when discussing health and health-related domains; 3) other reviews of outcome measures have used the ICF for similar purposes (Salter et al. 2005).
28.1 INTRODUCTION

Figure 28.1 Overview of the International Classification of Function, Disability and Health

According to the clinical practice guidelines (Consortium for Spinal Cord Medicine 1999) the expected outcomes after SCI range from basic physiological function such as motor/sensory function to higher level outcomes such as functional independence and social integration. The ICF accounts for these within the 4 constructs of its Functioning and Disability component. The tools were classified according to the body function/structure, activity and participation constructs. Table 28.1 briefly outlines the definitions.

Table 28.1 Definitions for Body Function/Structure, Activity and Participation

<table>
<thead>
<tr>
<th>Functioning (positive aspect)</th>
<th>Disability (negative aspect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body function – the physiological functions of the body systems including psychological functions.</td>
<td>Impairment – problems with body function or structure.</td>
</tr>
<tr>
<td>Body structure – the anatomical parts of the body such as organs, limbs and their components.</td>
<td></td>
</tr>
<tr>
<td>Activity – the execution of a task or action by an individual</td>
<td>Activity Limitation – difficulties an individual might experience in completing a given activity.</td>
</tr>
<tr>
<td>Participation – involvement in a life situation.</td>
<td>Participation Restriction – problems an individual may experience with involvement in a life situation.</td>
</tr>
</tbody>
</table>

Quality of life (QOL) surveys are a newly emerging category of outcome measurements. To capture these assessment tools, we included an additional dimension in order to help classify QOL tools. While some clinical physiologists might question whether QOL is a true ‘outcome’ tool, the Food and Drug Administration (FDA) asks that QOL assessments be included as part of any clinical trial protocol and program (often as a secondary outcome measure). Since the perceived benefit by the target market population of any therapeutic intervention is an important consideration, we have included QOL in our review.

Three classifiers knowledgeable to both outcome measures and the ICF independently categorized all of the tools (N=104). The classifiers later met to reconcile any disagreement about classification of the tools. When a multidimensional tool covered more than one construct (e.g. activity and participation) they placed it in the category
where the tool had the most items. The tools were divided once again into sub-classifications based on the sub-domains within each of the body function/structure, activity and participation areas. Upon classification into the main domains, the tools were further categorized into appropriate subgroups based on the ICF definitions. See Table 28.2 which outlines these subcategories.

During the completion of the version 3 update, new measures were found that did not easily fit into any one of the ICF domains or the QoL category. Currently, we have included these measures in the ‘Body Functions/Structures’ category. While we acknowledge this is not a perfect fit, we considered it to be the best option until new iterations of the ICF are available.

**Table 28.2 Subcategories used for classifying tools**

<table>
<thead>
<tr>
<th>Body Functions/Structures</th>
<th>Activities</th>
<th>Participation</th>
<th>Quality of Life</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mental functions &amp; structures of the nervous system</td>
<td>• Learning and applying knowledge</td>
<td>• Domestic life</td>
<td>• Subjective</td>
<td>• Physical</td>
</tr>
<tr>
<td>• Sensory functions and pain &amp; the eye, ear and related structures</td>
<td>• General tasks and demands</td>
<td>• Interpersonal interactions and relationships</td>
<td>• Objective</td>
<td>• Social</td>
</tr>
<tr>
<td>• Functions &amp; structures involved in voice and speech</td>
<td>• Communication</td>
<td>• Major life areas</td>
<td></td>
<td>• Attitudinal</td>
</tr>
<tr>
<td>• Functions &amp; structures of the cardiovascular, haematological, immunological and respiratory systems</td>
<td>• Mobility</td>
<td>• Community, social and civic life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Functions &amp; structures of the digestive, metabolic and endocrine systems</td>
<td>• Self-care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Functions &amp; structures of the genitourinary and reproductive systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Neuromusculoskeletal and movement-related functions &amp; structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Functions of the skin and related structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Assessing the measures**

The team of reviewers who assessed each tool consisted of clinicians and scientists who have long established expertise in a wide variety of relevant research areas. Combining their knowledge of SCI with the data on the properties of the outcome tools allowed us to generate the summaries for this chapter.

Countless numbers of books and manuscripts have been written classifying and discussing psychometric principles and standards for the selection or validation of clinical tools. It is not our intent to replicate this process, but instead refer the reader to a couple of key dispositions such as Streiner and Norman’s Health Measurement Scales (2003) and Portney and Watkin’s chapters (4, 5 and 6) on reliability and validity (2000). For an excellent overview that provides insightful tips for selecting tools directly related
to rehabilitation, read Finch and colleagues Physical Rehabilitation Outcome Measures (1999).

Data was extracted from manuscripts reporting findings about the psychometric properties and several “pragmatic” factors for each of the various tools. In accordance with similar projects designed to review outcome measures (Salter et al. 2005) we relied heavily on the work by Fitzpatrick and colleagues (1998) for the methods and standards related to data extraction. Our evaluation criteria as well as a quick definition of terms used are presented in Table 28.3 and our standard for quantifying the rating where possible are presented in Table 28.4. Common acronyms used are presented in Table 28.5. For an example of the data extraction forms used for the project see Appendix 1.

**Table 28.3 Criteria for Rating Outcome Measures**

<table>
<thead>
<tr>
<th>Interpretability</th>
<th>The degree to which one can assign qualitative meaning (that is, clinical or commonly understood connotations) to an instrument’s quantitative scores or change in scores (Fitzpatrick et al. 1998, MOT 2002). Common measures include the SEM, MDC, and MCID (expanded on below). These are termed “clinically relevant values” in the Clinical Summary because these values allow a clinician to determine when a patient’s change in score actually indicates a change in the patient’s health/ability/function status.</th>
</tr>
</thead>
</table>
| Standard Error of Measurement (SEM) | Amount of error that can be considered measurement error. In a set of repeated scores, response consistency is measured (i.e. test-retest reliability or intra-rater reliability) and measurement error can be determined. (rehabmeasures) When data is available in articles to calculate SEM, we did so using the following formula: \[ SEM = \text{standard dev. of sample mean} \times \sqrt{1 - ICC} \] where:  
  - the standard deviation of the sample mean is for the first trial, if multiple trials were conducted  
  - ICC is the intra-class correlation for test-retest reliability or intra-rater reliability |
| Minimal Detectable Change (MDC) | Refers to the minimal amount of change in the instrument’s score that reflects true change (noticeable change in ability) by a patient between two time points (ensures change isn’t the result of measurement error). (Strokengine) When data is available in articles to calculate MCID, we did so using the following formula: \[ MDC = SEM \times 1.96 \times \sqrt{2} \] |
| Minimally Clinically Important Difference (MCID) | The smallest difference in score in the domain of interest which patients perceive as beneficial. Changes between baseline and follow-up are examined in relation to their benchmark for a MCID, which was the patient’s follow-up assessment in a transition item of whether they were worse, better, or the same compared with the baseline assessment. (Strokengine). This |
value is less commonly reported, as it requires asking patients to assess what change in score provides actual tangible improvements in the underlying construct being measured.

<table>
<thead>
<tr>
<th>Reliability</th>
<th>Does the instrument produce results that are reproducible (free from random error) and internally consistent? (expanded on below) <em>(Fitzpatrick et al. 1998, MOT 2002)</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Consistency</td>
<td>Based on the basic principle that several related observations provide more reliable estimate than a single observation. Therefore, it measures how inter-correlated items of a measure are with each other and the total score; that is, if the items are all measuring aspects of a single attribute or construct. Generally assessed using Cronbach’s alpha, item-to-item and item-to-scale correlations. <em>(Fitzpatrick et al. 1998, Terwee et al. 2007)</em></td>
</tr>
<tr>
<td>Reproducibility</td>
<td>Does the score give us an actual indication of the individual’s status or is it noise/random error? We can measure this by taking repeated measures of an individual and examining whether the results stay the same, when the domain of measurement has not changed for the individual. The length of time between measurements should be long enough that individuals do not recall their previous answers, but not so long that it is possible the domain being measured has changed. Generally assessed using correlation statistics including intra-class correlation coefficient (ICC), Pearson’s coefficient, Spearman’s coefficients and kappa coefficients. <em>(Fitzpatrick et al. 1998, Salter et al. 2005)</em></td>
</tr>
<tr>
<td>Test-retest reliability</td>
<td>Repeat measurements of the same test are taken by an individual and their scores are examined for degree of difference between the tests</td>
</tr>
<tr>
<td>Inter-rater reliability</td>
<td>Repeat measurements of the same individuals are made by different raters and the scores are examined for degree of difference.</td>
</tr>
<tr>
<td>Intra-rater reliability</td>
<td>Repeat measurements of the same individuals are made by the same rater over a period of time and scores are examined for degree of difference</td>
</tr>
<tr>
<td>Validity</td>
<td>Does the instrument measure what it claims to measure? <em>(Fitzpatrick et al. 1998, MOT 2002)</em> The degree to which scores of an instrument are consistent with hypotheses, with regard to: 1) internal relationships, 2) relationships to scores of other instruments, and 3) differences between relevant groups.</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Does the instrument detect clinically important changes</td>
</tr>
</tbody>
</table>
28.1 INTRODUCTION

(perhaps reflecting therapeutic effects) over time? (Fitzpatrick et al. 1998)

Generally assessed with effect size or standardized response mean (expanded on below)

**Effect size**

The size of change on a measure that occurs to a group between assessments compared with the variability of scores of that measure.

Commonly calculated as the difference between mean scores at assessments divided by the standard deviation of baseline scores. Usually expressed in standardized units that permit comparisons between instruments.

**Standardized Response Mean**

Differs from effect size only in that the denominator is the standard deviation of change scores in the group (take account of variability in change scores rather than baseline scores)

**Floor/ceiling effects**

Floor (ceiling) effects occur when an instrument’s lowest (highest) score is unable to assess a patient’s level of ability, meaning that it is not possible to report most favorable or worst health states.

Usually measured by recording the number and percentage of participants with the highest and lowest score.

**Acceptability**

How acceptable is the instrument in terms of completion by the participant – does it represent a burden? Can the assessment be completed by proxy? (Fitzpatrick et al. 1998)

**Feasibility**

Is the instrument easy to administer and process? (Consider extent of effort, burden, expense and disruption to staff/clinical care arising from administration of the instrument) (Fitzpatrick et al. 1998)

---

**Table 28.4 Standard for Rating Outcome Measures**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Reliability</th>
<th>Validity</th>
<th>Responsiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXCELLENT</td>
<td></td>
<td></td>
<td>Evidence of change in expected direction using methods such as standardized effect sizes:^3</td>
</tr>
<tr>
<td>(+++)</td>
<td>IC1</td>
<td>ICC and Kappa Coefficient1</td>
<td>Construct or Convergent and Concurrent2</td>
</tr>
<tr>
<td></td>
<td>≥ 0.80</td>
<td>≥ 0.75</td>
<td>≥ 0.60</td>
</tr>
<tr>
<td>ADEQUATE</td>
<td></td>
<td></td>
<td>Evidence of moderate/less change than expected; conflicting evidence</td>
</tr>
<tr>
<td>(+++)</td>
<td>0.71 – 0.79</td>
<td>≥ 0.4 – 0.74</td>
<td>≥ 0.31 - 0.59</td>
</tr>
</tbody>
</table>
### 28.1 INTRODUCTION

| POOR (+) | ≤ 0.70 | ≤ 0.4 | ≤ 0.31 | ≤ 0.70 | 1. Weak evidence based solely on p-values (statistical significance) | 2. Floor or ceiling effects:*  
Excellent | Adequate | Poor |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No floor or ceiling effects</td>
<td>Floor and ceiling effects is ≤ 20% of patients who attain either the minimum (floor) or maximum (ceiling) score.</td>
<td>&gt; 20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Applicable (-)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 28.5 Commonly used Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>ICF domain</th>
<th>International Classification of Functioning, Disability and Health domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICC</td>
<td>Intra-Class Correlation</td>
</tr>
<tr>
<td>Spearman r</td>
<td>Spearman correlation coefficient</td>
</tr>
<tr>
<td>tx</td>
<td>Treatment</td>
</tr>
<tr>
<td>DOI</td>
<td>Duration of Injury</td>
</tr>
<tr>
<td>UE</td>
<td>Upper Extremity</td>
</tr>
<tr>
<td>LE</td>
<td>Lower Extremity</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>SEM</td>
<td>Standard Error of Measurement</td>
</tr>
<tr>
<td>MDC</td>
<td>Minimal Detectable Change</td>
</tr>
<tr>
<td>MCID</td>
<td>Minimal Clinically Important Difference</td>
</tr>
<tr>
<td>SRM</td>
<td>Standardized Response Mean</td>
</tr>
<tr>
<td>ES</td>
<td>Effect Size</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>IQR</td>
<td>Inter-Quartile Range</td>
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<tr>
<td>RMSEA</td>
<td>Root Mean Square Error of Approximation</td>
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<tr>
<td>CFA</td>
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<tr>
<td>TLI</td>
<td>Tucker Lewis Index</td>
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<td>QOL</td>
<td>Quality of Life</td>
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<td>SCI</td>
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<tr>
<td>SCL</td>
<td>Spinal Cord Lesion</td>
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<td>MS</td>
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</tr>
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<td>TBI</td>
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<tr>
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<td>Female</td>
</tr>
<tr>
<td>M</td>
<td>Male</td>
</tr>
<tr>
<td>PT</td>
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</tr>
<tr>
<td>OT</td>
<td>Occupational Therapist</td>
</tr>
<tr>
<td>AB</td>
<td>Able-Bodied</td>
</tr>
<tr>
<td>AUC</td>
<td>Area Under Curve</td>
</tr>
</tbody>
</table>

*Floor and ceiling effects is calculated as the proportion of patients who attain the minimum (floor) or maximum (ceiling) score.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ROC</td>
<td>Receiver Operating Characteristic</td>
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<tr>
<td>CI</td>
<td>Confidence Interval</td>
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<tr>
<td>YPI</td>
<td>Years Post-Injury</td>
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<td>PCA</td>
<td>Principal Component Analysis</td>
</tr>
<tr>
<td>NS</td>
<td>Non-significant</td>
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### Appendix 1: Outcome Measure Data Extraction Form

<table>
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<th>Reviewer ID:</th>
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<th>Total articles:</th>
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<th>Study Design</th>
<th>Setting</th>
<th>Population (sample size, age) and Group</th>
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<tbody>
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**1. RELIABILITY**

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<th>Test-retest, Inter-rater, Intra-rater</th>
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**2. VALIDITY**

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**3. RESPONSIVENESS**

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**4. FLOOR/CEILING EFFECT**

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**5. INTERPRETABILITY**

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</tbody>
</table>

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28-15
Introduction References


28.2 Body Function/Structure

We start our review with outcome measures that represent the areas of body function and structure as they can be considered the foundational for any personal activity, quality of life, and societal participation.

The majority of outcome measures used in clinical rehabilitation come from the Body Function and Body Structure components of ICF (Dahl 2002). While the components covered under this dimension are still mechanistically complex and by and large unresolved in terms of clinical treatment (e.g. motor function, spasticity, autonomic nervous system activity, or pain), when compared to the complexity or validity of the tools used to assess activity or activity limitation at the personal or societal level (e.g. self-care, community function, and quality of life), these measures of SCI function are perhaps more straightforward. Of course, this really underscores the complexity of valid SCI outcome assessments!

The outcome measures reviewed under this category include:

28.2.1 Mental Functions & Structures of the Nervous System

- Beck Depression Inventory (BDI)
- Brief Symptom Inventory
- CAGE Questionnaire
- Center for Epidemiological Studies Depression Scale (CES-D)
- Depression Anxiety Stress Scale-21 (DASS-21)
- Fatigue Severity Scale (FSS)
- Hospital Anxiety and Depression Scale (HADS)
- Patient Health Questionnaire (PHQ-9)
- The Symptom Checklist-90-Revised (SCL-90-R)
- Scaled General Health Questionnaire-28 (GHQ-28)
- Zung Self-Rating Depression Scale (Zung SDS)

28.2.2 Sensory Functions and Pain & the Eye, Ear and Related Structures

- Brief Pain Inventory
- Classification System for Chronic Pain in SCI
- Donovan SCI Pain Classification System
- The Multidimensional Pain Inventory - SCI Version
- Multidimensional Pain Readiness to Change Questionnaire (MPRCQ2)
- Quantitative Sensory Testing (QST)
- Tunk's Classification Scheme
- Wheelchair Users Shoulder Pain Index (WUSPI)

28.2.3 Functions & Structures of the Cardiovascular, Haematological, Immunological and Respiratory System

- Six-Minute Arm Test (6-MAT)
- Wingate Anaerobic Testing (WAnT)

28.2.4 Neuromusculoskeletal and Movement-Related Functions & Structures

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- Ashworth Scale & Modified Ashworth Scale
- Hand-Held Myometer
28.2 BODY FUNCTION/STRUCTURE

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28.2.1 Mental Functions & Structures of the Nervous System

Beck Depression Inventory (BDI)

- one of the most widely used screening instruments for measuring the severity of depression in adults and adolescents.
- self-report inventory composed of items relating to depressive symptoms (hopelessness and irritability), cognitions (guilt or feelings of being punished), and physical symptoms (fatigue, weight loss, and lack of interest in sex). The BDI can be used with, but is not limited to, persons with SCI.

ICF Domain:

Body Function – Subcategory: Mental functions

Number of Items:

21

Instructions for Administration and Scoring:

Administration:

- patient-reported; patient reads the scale and marks the statements that have been true during the past week.
- Each item consists of 4 statements that range from a mild/neutral (mild=0) to severe (severe=3).
- Completion of the BDI is normally approximately 10 minutes, though completion time may vary due to patient’s level of depression.

Equipment: None.

Scoring: Items are summed such that the measure’s total score is between 0 – 63.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores reflect more symptoms of depression.
- no normative data have been established for the SCI population
- standard cut-off (from Beck et al. 1998) for the general population are as follows:
  0-9: indicates minimal depression
  10-18: indicates mild depression
  19-29: indicates moderate depression
  30-63: indicates severe depression
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English
Beck Depression Inventory (BDI)

Training Required:

None.

Availability:

Can be found at: http://www.ibogaine.desk.nl/graphics/3639b1c_23.pdf

Clinical Considerations:

- Several somatic symptoms included in the BDI are common in SCI and may be confused with symptoms of depression. Therefore, BDI score may be artificially inflated among SCI patients, resulting in higher levels of depression than is actually the case.
- Easy to administer but administrators should be aware of any physical limitations that may affect scores.
- The BDI is quick and easy to administer.

Measurement Property Summary:

There are no studies reporting psychometric properties for the BDI other than Interpretability values for the SCI population at this time.
Brief Symptom Inventory

- The (BSI) is the shortened version of the Symptoms Checklist-90.
- The BSI is a 53-item questionnaire covering nine symptom dimensions of depression:
  1) Somatization
  2) Obsession-compulsion
  3) Interpersonal sensitivity
  4) Depression
  5) Anxiety
  6) Hostility
  7) Phobic anxiety
  8) Paranoid ideation
  9) Psychoticism
- 3 global indices of distress are also used: Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total. These measure number and intensity of reported symptoms, as well as current or past level of symptomatology.

ICF Domain:

Body Function – Subcategory: Mental Functions

Number of Items:

53

Instructions for Administration and Scoring:

Administration:

- Self-report format.
- Respondents rank each item on a 5-point scale ranging from 0 (not at all) to 4 (extremely).
- Rankings represent the intensity of distress over the past week.
- The scale reportedly takes less than 8-12 minutes to complete.

Equipment: None.

Scoring: Scoring is done by hand calculation.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Scores are interpreted by comparison to age-appropriate norms but no normative data or cutoff scores have been established for the SCI population.
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).
• Higher normative scores are recommended for SCI populations due to the somatic items.

Languages:
The instrument requires only a reading knowledge equivalent to that of a sixth grade education and is available in English, Spanish & French.

Training Required:
Minimal training is required to administer the BSI. A specialized degree in health care with an appropriate license or certificate is required to purchase copyrighted forms and manual from the publisher.

Availability:
The actual scale and manual can be purchased here: http://psychcorp.pearsonassessments.com/HAIWEB/Cultures/en-us/Productdetail.htm?Pid=PAbsi

Clinical Considerations:
• The BSI is a well-known and well-accepted instrument.
• The BSI is best used to screen for global psychological distress.
• The inclusion of somatic items may cause an overestimation of psychiatric symptoms in individuals with SCI.
• Normative data are available for a variety of non-SCI populations. The Zung Self-Rating Depression Scale was found to have higher sensitivity compared to the BSI when identifying individuals with depression.
• The BSI was not written for the SCI population, therefore, some items may not be appropriate.
• This test is simple and easy to administer.

Measurement Property Summary:
# of studies reporting psychometric properties: 3

Reliability:
• Internal consistency is **excellent** (Cronbach’s α=0.96).
  [Tate et al. 1993]

Validity:
• Correlation of the BSI is excellent with the:
  o ATD-PA QOL (Spearman’s ρ=-0.71)
  o SWLS (Spearman’s ρ=-0.64).
• Correlation of the BSI- Depression subscale is **excellent** with the Depression Anxiety Stress Scale – Depression subscale (Pearson’s r =0.71)
• Correlation of the BSI Anxiety scale is **excellent** with the Depression Anxiety Stress Scale – Anxiety subscale (Pearson’s r=0.61).

Responsiveness:
No values were reported for the responsiveness of the BSI for the SCI population.
Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the BSI for the SCI population.
CAGE Questionnaire

• 4 item screening questionnaire used to identify those individuals for whom more extensive evaluation of alcohol use is recommended

• the oldest and likely most extensively used questionnaire across a variety of clinical and research settings. Originally developed for use with adults, it has been used in elderly populations as well.

ICF Domain:

Body Function – Subcategory: Mental Functions.

Number of Items:

4

Instructions for Administration and Scoring:

Administration:

• self report pen/paper or interview format.

• Time for administration is approximately 5 minutes.

• Responses of “yes/no” to the following:

  o Have you ever felt you should Cut down on your drinking?
  o Have people Annoyed you by criticizing your drinking?
  o Have you ever felt bad or Guilty about drinking?
  o Have you ever taken a drink first thing in the morning (Eye opener) to steady your nerves or get rid of a hangover?

Equipment: None.

Scoring:

• Typically, two or more of the questions answered affirmatively are considered to be “CAGE positive”, though some suggest a positive response to a single item warrants more in-depth investigation of consumption.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

• Score correlates positively with pre-SCI consumption patterns and a greater incidence of medical complications (Tate 2003).

• In non-SCI populations, the CAGE test scores >=2 has a sensitivity of 93% and a specificity of 76% for the identification of problem drinkers (Bernadt et al. 1982). There have been recommendations to lower the cutoff to a score of 1 for the identification of problem drinkers.

• no cut-points or normative data have been established for the SCI population

• published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).
Languages:

English

Training Required:

None

Availability:

Freely available online

Clinical Considerations:

- Susceptible to underreporting. Minimum age 16 years, and not recommended for use with adolescents.
- Questions refer to whole life history rather than a particular period. Thus, the questionnaire does not discriminate between active and inactive drinkers and should be used in combination with information regarding usual consumption patterns (e.g., frequency/quantity/heaviest consumption). In some populations, such inquiry can inhibit responses to CAGE questions, if it precedes them.
- The CAGE contains sensitive items, therefore clinicians should take care to carefully present the questions.
- The CAGE is simple and easy to administer.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
No values were reported for the reliability of the CAGE questionnaire for the SCI population.

Validity:
- The CAGE questionnaire had significant correlations with:
  - self-reported alcohol abuse history (r=0.53)
  - average number of drinks consumed weekly prior to injury (r=0.38)
  - drug abuse history (r=0.28).
  [Tate et al. 1993]

Responsiveness:
No values were reported for the responsiveness of the CAGE questionnaire for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the CAGE questionnaire for the SCI population.
Center for Epidemiological Studies Depression Scale (CES-D)

- screening measure (NOT a diagnostic tool)
- developed to identify current depressive symptomatology related to major or clinical depression in adults and adolescents.
- Items include depressed mood, feelings of guilt, worthlessness and helplessness, psychomotor retardation, loss of appetite and sleep difficulties.

ICF Domain:

Body Function – Subcategory: Mental Functions.

Number of Items:

There are 10 and 20 item versions of the scale. The most commonly used version of the CES-D is the 20 item version; thus when articles refer to ‘CES-D’, they are usually talking about the 20 item version.

Instructions for Administration and Scoring:

Administration:

- Self report using pen/paper or interview.
- Responses are based on the frequency of occurrence during the past week.
- Uses a 4-point ordinal scale: Rarely or none of the time (less than 1 day); Some or a little of the time (1-2 days); Occasionally or a moderate amount of the time (3-4 days); Most or all of the time (5-7 days).
- The measure is easy to complete (grade 4 reading level) and takes 5 – 10 minutes.

Equipment: None.

Scoring:

- a summary score is calculated.
- range of scores on the CES-D-20 is 0-60 (0-30 for the CES-D-10)

Interpretability:

MCID: not established
SEM: not established for the SCI population, but for a Hepatitis C population, CES-D(20) SEM=0.907 (pre-treatment), 0.977 (4 weeks post-treatment), 1.053 (24 weeks post-treatment). [Clark et al. 2002, “Screening for depression in a hepatitis C population: the reliability and validity of the Center for Epidemiologic Studies Depression Scale (CES-D)”, n=116]
MDC: not established

- a CES-D(20) cutoff score of 16 is indicative of “significant” or “mild” depressive symptomatology, and a cut score of 11 for the shorter version is recommended according to the original validation study on a general population by Radloff 1997. It is equivalent to experiencing six symptoms for most of the previous week or a majority of symptoms on one or two days.
• Higher scores indicate greater symptoms.
• no cut-points or normative data have been established for the SCI population
• published data for the SCI population is available for comparison for both the CES-D and CES-D-10 (see the Interpretability section of the Study Details sheet).

Languages:
Translations are available.

Training Required:
None but knowledge about depression and mental health is helpful.

Availability:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rarely or none of the time (less than 1 day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or a moderate amount of the time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I was bothered by things that usually don’t bother me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. I did not feel like eating; my appetite was poor.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. I felt that I could not shake off the blues even with help from my family or friends.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I felt I was just as good as other people.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. I had trouble keeping my mind on what I was doing.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. I felt depressed.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. I felt that everything I did was an effort.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Item</td>
<td>Score 0</td>
<td>Score 1</td>
<td>Score 2</td>
<td>Score 3</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>8. I felt hopeful about the future.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9. I thought my life had been a failure.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. I felt fearful.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. My sleep was restless.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. I was happy.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>13. I talked less than usual.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. I felt lonely.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. People were unfriendly.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. I enjoyed life.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>17. I had crying spells.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. I felt sad.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. I felt that people dislike me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. I could not get “going.”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total score: ________________________

Possible range of scores is zero to 60, with the higher scores indicating the presence of more symptomatology.

**Clinical Considerations:**
- The CES-D-20 was created for the general population but has been used extensively in SCI (cited in approximately 50 SCI research articles). Shorter versions such as the 10, 8 and 4 item are available but only the CES-D 10 has been assessed in the SCI population.
- The test is simple and quick to administer.

**Measurement Property Summary for the CES-D(20):**
# of studies reporting psychometric properties: 4
28.2 BODY FUNCTION/STRUCTURE

Reliability:

- Internal consistency is **excellent** for the CES-D-20 (Cronbach’s α=0.88-0.91), and the CES-D-10 (Cronbach’s α=0.86).
- Test-retest reliability is **excellent** for both the CES-D-20 (ICC=0.87) and CES-D-10 (ICC=0.85).
- Test-retest reliability for the individual items is **poor to excellent** (ICC=0.11-0.73).

[La Chapelle 2005, Miller et al. 2008]

Validity:

- Correlation of the CES-D-20 is **poor to excellent** for SF-36 subscales (ranging from Pain (Pearson’s r=0.27) to Mental Health (Pearson’s r=0.75)) and **adequate** with the Fatigue Severity Scale (Pearson’s r=0.58).
- The sensitivity was found to be 80.0% and specificity 69.8%.


Responsiveness:

No values were reported for the responsiveness of the CES-D for the SCI population.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the CES-D for the SCI population.

Measurement Property Summary for the CES-D-10:

# of studies reporting psychometric properties: 1

Reliability:

- Internal consistency is **excellent** for the CES-D-10 (Cronbach’s α =0.86).
- Test-retest reliability is **excellent** for (ICC=0.85).
- Test-retest reliability for the individual items is **poor to adequate** (ICC=0.32-0.68).

[Miller et al. 2008]

Validity:

- Correlation of the CES-D-10 is **poor to excellent** for SF-36 subscales [ranging from Physical Function (Pearson’s r =0.37) to Mental Health (Pearson’s r=0.71)].

[Miller et al. 2008]

Responsiveness:

No values were reported for the responsiveness of the CES-D-10 for the SCI population.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the CES-D-10 for the SCI population.
**Depression Anxiety Stress Scale-21 (DASS-21)**

- screening tool for identifying, differentiating and assessing depression, anxiety, and stress in patients with SCI.
- These three negative emotional states: 1) Depression, 2) Anxiety and 3) Stress, represent the test’s 3 subscales.

**ICF Domain:**

Body Function – Subcategory: Mental Functions.

**Number of Items:**

21

**Instructions for Administration and Scoring:**

**Administration:**

- Self-report format consisting of statements referring to the past week.
- The reported time to administer is less than 10 minutes.

**Equipment:** None.

**Scoring:**

- Each item is scored on a 4-point scale (0 = Did not apply to me at all, to 3 = Applied to me very much or most of the time).
- Sum the score of each item to get a total score.

**Interpretability:**

- **MCID:** not established
- **SEM:** not established
- **MDC:** not established
  - Higher scores indicate greater levels of distress.
  - Normative data for the general population are available from the DASS manual which must be ordered, however these are based on the full DASS (42 items).
  - For the DASS-21, the following cut-off scores have been recommended for each subscale (subscale scores = sum of item scores):

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0-4</td>
<td>0-3</td>
<td>0-7</td>
</tr>
<tr>
<td>Mild</td>
<td>5-6</td>
<td>4-5</td>
<td>8-9</td>
</tr>
<tr>
<td>Moderate</td>
<td>7-10</td>
<td>6-7</td>
<td>10-12</td>
</tr>
<tr>
<td>Severe</td>
<td>11-13</td>
<td>8-9</td>
<td>13-16</td>
</tr>
<tr>
<td>Extremely severe</td>
<td>14+</td>
<td>10+</td>
<td>17+</td>
</tr>
</tbody>
</table>

- No normative data have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

Available in English, Portuguese, Arabic and Cantonese.
28.2 BODY FUNCTION/STRUCTURE

Training Required:

None, but training in psychological science (emotion, psychopathology and assessment) is helpful. Reading the manual (http://www2.psy.unsw.edu.au/dass/order.htm) is also recommended.

Availability:

Scoring: Sum the score of each item to get a total score.

Please read each statement and select a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any one statement.

0 = Did not apply to me at all
1 = Applied to me to some degree or for some of the time
2 = Applied to me to a considerable degree or for a good part of time
3 = Applied to me very much or most of the time

<table>
<thead>
<tr>
<th>Depression subscale:</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I felt downhearted and blue</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. I felt that I had nothing to look forward to</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. I felt that life was meaningless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. I felt I wasn’t worth much as a person</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. I was unable to become enthusiastic about anything</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. I couldn’t seem to experience any positive feeling at all</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. I found it difficult to work up the initiative to do things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anxiety subscale:</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. I was aware of dryness of my mouth</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. I experienced difficulty breathing (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. I experienced trembling (e.g. in the hands)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12. I was worried about situations in which I might panic and make a fool of myself</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13. I felt I was close to panic</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. I felt scared without any good reason</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress subscale:</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. I found it hard to wind down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. I found it difficult to relax</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. I felt I was using a lot of nervous energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18. I found myself getting agitated</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. I tended to over-react to situations</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. I felt that I was rather touchy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21. I was intolerant of anything that kept me from getting on with what I was doing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total score: ________________________
Clinical Considerations:

- Excludes many somatic items that may not be relevant to those with SCI and the instrument has greater sensitivity for identifying SCI patients with possible anxiety disorders (Mitchell et al. 2007). The ability to separately measure the three emotional states may be of considerable use for researchers and clinicians. This is an advantage given that measures of anxiety and depression often do not distinguish between these conditions and anxiety is likely more prevalent than depression.

- Only one study has assessed the psychometric properties of the instrument among patients with SCI. Sensitivity of the tool is better for anxiety than depression.

- Comparison of the DASS-21 to clinical judgment showed that the measure has clinical utility (Mitchell et al. 2007).

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
No values were reported for the reliability of the DASS-21 for the SCI population.

Validity:

- Correlation of the DASS-21 Anxiety subscale is excellent with the Brief Symptom Inventory Anxiety subscale (r=0.61)
- Correlation of the DASS-21 Depression subscale is excellent with the Brief Symptom Inventory Depression subscale (r=0.70).
- The Depression subscale of the DASS-21 is reported to have a sensitivity of 57.0% and a specificity of 67.0%
- The Anxiety subscale of the DASS-21 is reported to have a sensitivity of 86.0% and a specificity of 64.0%.

[Mitchell et al. 2008]

Responsiveness:
No values were reported for the responsiveness of the DASS-21 for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the DASS-21 for the SCI population.
Fatigue Severity Scale (FSS)

- originally developed for use among individuals with Multiple Sclerosis
- captures the individual’s experience of mental or psychological fatigue and how it interferes with performing certain activities (exercise, work and family life).

ICF Domain:

Body Function – Subcategory: Mental Function.

Number of Items:

9

Instructions for Administration and Scoring:

Administration:

- Self report scale.
- Participants choose the level of agreement for each question, from 1 = strongly disagree to 7 = strongly agree.
- Ratings are based on their experience of fatigue over the past seven days.
- The scale takes **approximately 5 minutes** to administer.

Equipment: None.

Scoring: Sum the score from each item to get a total score.

Interpretability:


**SEM**: SEM for total FSS (calculated from data in Anton et al. 2008): 0.56

**MDC**: MDC for total FSS (calculated from data in Anton et al. 2008): 1.55

- Scores range from 1-7 with higher scores indicating higher levels of fatigue.
- Scores of 4 and over are indicative of significant fatigue in other populations, such as multiple sclerosis.
- No cut-points or normative data have been established for the SCI population.
- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet)

Languages:

English, German, Turkish and Norwegian.
Training Required:

None.

Availability:

Patients are instructed to choose a number for each of the following statements from 1 to 7 that indicates their degree of agreement with each statement where 1 indicates strongly disagree, and 7, strongly agree.

Patient name: _________________ Date: _________________________

<table>
<thead>
<tr>
<th>Statement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My motivation is lower when I am fatigued</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>2. Exercise brings on my fatigue</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>3. I am easily fatigued</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>4. Fatigue interferes with my physical functioning</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>5. Fatigue causes frequent problems for me</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>6. My fatigue prevents sustained physical functioning</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>7. Fatigue interferes with carrying out certain duties and responsibilities</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>8. Fatigue is among my three most disabling symptoms</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>9. Fatigue interferes with my work, family or social life.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

Total score: ______________

Clinical Considerations:

• The FSS might have difficulties distinguishing fatigue from depression (the influence of pain may influence scores on the FSS)
• Can be used as a screen for fatigue in individuals with SCI. However, results should be interpreted with caution as some items may not have meaning for the SCI population.
• Some of the items may not be reflective of the SCI condition. However, the FSS has been extensively validated in other populations and may be the most widely used measure of fatigue in neurologic disorders.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

• Internal consistency of the FSS is excellent (Cronbach’s α=0.89), and the ICCs for the items range from 0.32 to 0.77.

[Anton et al. 2008]
Validity:

- Correlation of the FSS is **adequate** with the Centre for Epidemiological Studies – Depression scale (CES-D) (Pearson’s r=0.58), and the Short Form-36 (Pearson’s r=-0.48).

  [Anton et al. 2008]

Responsiveness:

No values were reported for the responsiveness of the FSS for the SCI population.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the FSS for the SCI population.
Hospital Anxiety and Depression Scale (HADS)

- assesses anxiety and depression in a non-psychiatric population.
- has 2 subscales: depression and anxiety, both with 7 items.
- Other than physically ill individuals, the HADS is also used with community samples/populations.

ICF Domain:

Body Function – Subcategory: Mental Function.

Number of Items:

14

Instructions for Administration and Scoring:

Administration:

- Self-report format
- Responses are based on the relative frequency of symptoms over the past week, using a four point Likert scale ranging from 0 (not at all) to 3 (very often indeed)
- can be completed in around 5 minutes.

Equipment: None.

Scoring:

- Responses are summed to provide separate scores for anxiety and depression symptomology; each of anxiety or depression scale have a score range of 0-21.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Higher scores indicating greater likelihood of depression or anxiety.
- A cut-off point of 8/21 for the Anxiety subscale gave a specificity of 0.78 and sensitivity of 0.9; a cut-off point of 8/21 for the Depression subscale gave a specificity of 0.79 and a sensitivity of 0.83.
- No normative data for the SCI population has been established
- Published data is available to compare results for individuals with SCI (see interpretability section of Study Details sheet).

Languages:

Versions of the scale are available in English, Arabic, Dutch, French, German, Hebrew, Swedish, Italian, and Spanish.

Training Required:

No special training is required to administer or score the tool.

Availability:
Clinical Considerations:

- It is unclear if the few somatic items influence the reliability and validity of this measure with an SCI population. Further research is needed to confirm psychometric properties within this population.

- The HADS should only be used as a screening instrument. It is one of two instruments with an anxiety specific scale that has had its measurement properties evaluated for the SCI population.

Measurement Property Summary:

# of studies reporting psychometric properties: 4

Reliability:

- Internal consistency of the Anxiety subscale of the HADS is excellent (Cronbach’s $\alpha=0.8463-0.85$)
- Internal consistency of the Depression subscale of the HADS is adequate to excellent (Cronbach’s $\alpha=0.79-0.8122$).

[Woolrich et al. 2006, Berry & Kennedy 2003]

Validity:

- Correlation of the total HADS scale is adequate with the:
  - Life Satisfaction Questionnaire (Pearson’s $r=-0.585$)
  - Sexual Adjustment Scale (Pearson’s $r=-0.49$)
  - Emotional Quality of the Relationship scale (-0.38).

- Correlation of the Anxiety subscale of the HADS is adequate with the:
  - Spinal Cord Lesion Coping Strategies – Acceptance subscale (Pearson’s $r=-0.45$)
  - Spinal Cord Lesion Coping Strategies - Fighting Spirit subscale (Pearson’s $r=-0.40$)

- Correlation of the Depression subscale of the HADS is adequate with the:
  - Spinal Cord Lesion Coping Strategies – Acceptance subscale (Pearson’s $r=-0.58$)
  - Spinal Cord Lesion Coping Strategies – Fighting Spirit subscale (Pearson’s $r=-0.49$).


Responsiveness:

No values were reported for the responsiveness of the HADS for the SCI population.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the HADS for the SCI population.
Patient Health Questionnaire (PHQ-9)

- 9 item screening measure devised to identify probable major depressive disorder (MDD) among adult primary care patients.

ICF Domain:

Body Function – Subcategory: Mental Functions.

Number of Items:

9

Instructions for Administration and Scoring:

Administration:

- Self report; can also be done in interview format.
- Items are rated in terms of how persistent the symptoms have been in the past 2 weeks: 0 – not at all, 1 – several days, 2 – more than half of the days, 3 – nearly every day.
- Administration time is **approximately 5 minutes**.

Equipment: None.

Scoring:

- Score for each individual item is summed to produce a total score.

Interpretability:

**MCID**: not established for the SCI population, but for a sample of older primary care patients (n = 434, mean age = 71 (7.4) years, all participants enrolled in the Improving Mood-Promoting Access to Collaborative Treatment (IMPACT)):

MCID = 5 points


**SEM**: not established for the SCI population, but for a sample of older primary care patients (see Lowe et al. 2004 reference above):

SEM for change due to treatment and no control of prior depression = 2.44

SEM for the same number of DSM-IV depressive symptoms at both assessments = 1.32

**MDC**: not established

- Higher scores indicate increased severity of depression
- A cut-off score of 10 has been reported to indicate major depression.
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English and Spanish versions available

Training Required:
None.

**Availability:**

Measure available online in PDF format Copyright © Pfizer Inc. after agreeing to several conditions including use for research, in clinical programs or physician education (http://www.phqscreeners.com)

**Clinical Considerations:**

- Can be used as a tool to screen for major depression.
- Corresponds with the DSM-IV criteria.

**Measurement Property Summary:**

| # of studies reporting psychometric properties: 5 |

**Reliability:**

- Internal consistency for the overall PHQ-9 scale was reported to be excellent (Cronbach’s $\alpha=0.83-0.89$)


**Validity:**

- Correlation of the PHQ-9 is:
  - excellent with the Older Adult Health and Mood Questionnaire (Spearman’s $\rho=0.781$)
  - adequate with major depressive disorder (MDD) (Spearman’s $\rho=0.530$)
  - adequate with the Satisfaction with Life Scale (Spearman’s $\rho=-0.477$).
- PHQ-9 scores were inversely and adequately correlated with subjective health on the SF-1 (Spearman’s $\rho=0.37$).
- For a 3-item screening test with a score cutoff of 3, a sensitivity of 0.87 and specificity of 0.93 were reported; with a score cutoff of 4, a sensitivity of 0.82 and a specificity of 0.95 were reported.
- For the total PHQ-9, a cutoff of 11 was determined to have optimal diagnostic accuracy of MDD. At this cutoff, the PHQ-9 detected 100% (sensitivity) of those with a diagnosis of MDD and had a specificity of 84%.


**Responsiveness:**

No values were reported for the responsiveness of the PHQ-9 for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the PHQ-9 for the SCI population.
The Symptom Checklist-90-Revised (SCL-90-R)

- screening measure of general psychiatric symptomatology.
- Items include dimensions measuring somatization, obsessive-compulsive, depression, anxiety, phobic anxiety, hostility, interpersonal sensitivity, paranoid ideation, and psychoticism.
- can be used to screen for psychiatric disorders and has been found useful in quantifying a variety of emotional reactions in adults following SCI

ICF Domain:

Body Function – Subcategory: Mental Functions

Number of Items:

90

Instructions for Administration and Scoring:

Administration:

- Self-report questionnaire.
- Patients are asked to rate the severity of their experiences with 90 symptoms over the past week on a 5-point scale ranging from 0 ‘not at all’ to 4 ‘extremely’.
- The symptoms are assigned to 9 dimensions reflecting various types of psychopathology.
- Administration time is usually less than 15 minutes.

Equipment: None.

Scoring:

- Items are summed for a total score.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- The SCL-90-R is normed for 4 groups: adult psychiatric outpatients; adult non-patients; adult psychiatric inpatients; and adolescent non-patients. This information is available in the SCL-90-R manual.
- There is no normative data for the SCI population at this time.

Languages:

The instrument is available in English, Spanish and French.

Training Required:

None formally required.

Availability:
The SCL-90-R test and manual can be purchased at:
http://psychcorp.pearsonassessments.com/HAIWEB/Cultures/en-us/Productdetail.htm?Pid=PAg514

Starter kits are approximately $50.

Clinical Considerations:

- The SCL-90-R is best used to screen for global psychological distress.
- This questionnaire has received much research attention and as a result normative scores are available for a variety of patient and non-patient populations.
- The instrument requires a reading knowledge equivalent to that of a sixth grade education.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:

- Internal consistency of the cognitive/affective depression subscale is excellent (Cronbach’s $\alpha=0.89$).
- Internal consistency of the somatic depression subscale is adequate (Cronbach’s $\alpha=0.62$).
[Buckelew et al. 1988]

Validity:

- The SCL-90-R subscales were correlated with the Medically-Based Emotional Distress Scale (MEDS) which measures the same constructs; correlations were poor to excellent for the SCL-90-R Depression subscale ($r=0.15-0.72$), SCL-90-R Hostility subscale ($r=0.14-0.72$), adequate for SCL-90-R Anxiety subscale ($r=0.48-0.59$) and adequate to excellent for the SCL-90-R Interpersonal Sensitivity subscale ($r=0.44-0.71$).
[Buckelew et al. 1988, Overholser et al. 1993]

Responsiveness:
No values were reported for the responsiveness of the SCL-90-R for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCL-90-R for the SCI population.
**Scaled General Health Questionnaire-28 (GHQ-28)**

- self-report questionnaire
- used for the detection of psychiatric distress related to general medical illness. Respondents indicate if their current “state” differs from his or her usual state - thereby assessing change in characteristics and not lifelong personality characteristics.
- designed to assess 4 aspects of distress:
  1) Depression
  2) Anxiety
  3) Social impairment
  4) Hypochondriasis

**ICF Domain:**

Body Function – Subcategory: Mental Functions

**Number of Items:**

28

**Instructions for Administration and Scoring:**

**Administration:**

- self-administered questionnaire
- patients base their responses on their health state over the past two weeks.
- administration time is usually *approximately 5 minutes*.

**Equipment:** None.

**Scoring:**

- Calculation of total score
- Different scoring methods of scoring are possible, which will affect the total score. The traditional scoring method provided assigns a score of 0 for responses 1 and 2 (“not at all” and “no more than usual”) and a score of 1 for responses 3 and 4 (“rather more than usual” and “much more than usual”). Another scoring method in use assigns a score of 0 for response 1 and a score of 1 for response 2-4 for the 18 negative items, and a score of 0 for responses 1 and 2, a score of 1 for responses 3 and 4 for the 7 positive items.

**Interpretability:**

- **MCID:** not established
- **SEM:** not established
- **MDC:** not established

- Total score range from 0 to 28.
- Higher scores indicate a greater probability of a psychiatric distress.
- Total scores that exceed 4 out of 28 suggest probable distress.
- Cut-points and normative data have not been established for the SCI population.
Languages:
Translated into 38 languages.

Training Required:
No special training is required.

Availability:
Can be purchased from https://shop.psych.acer.edu.au/acer-shop/product/

Clinical Considerations:

- The GHQ-28’s subscales represent dimensions of symptomatology and not distinct diagnoses.
- As the scales are not independent of each other, the total score has better utility to indicate general psychological disorder than the individual scores do to screen for specific psychological disorders.
- Only one study has assessed the construct validity of the GHQ-28 among SCI populations.
- The GHQ-28 is appropriate for individuals who are at least 11 years of age.

Measurement Property Summary:
# of studies reporting psychometric properties: 1

Reliability:
No values have been reported for the reliability of the GHQ-28 for the SCI population.

 Validity:
- Correlation of the GHQ-28 is excellent with the Clinical Interview Scale (r=0.83).
- With the 0011 scoring scheme, optimum discrimination occurred near GHQ 3/4, giving a specificity of 0.82 and a sensitivity of 0.81.
  [Griffiths et al. 1993]

Responsiveness:
No values have been reported for the responsiveness of the GHQ-28 for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the GHQ-28 for the SCI population.
Zung Self-Rating Depression Scale (Zung SDS)

- well-established screening measure of adult depression severity.
- has been used in a variety of mental health areas including primary care, psychiatric, drug trials, and related clinical, institutional, and research settings.

ICF Domain:

Body Function – Subcategory: Mental Functions

Number of Items:

20

Instructions for Administration and Scoring:

Administration:

- Self-report format.
- Symptoms “over the past several days” are rated according to a 4-point (1 to 4) ordinal scale:
  1) Little or none of the time;
  2) Some of the time;
  3) A large part of the time;
  4) Most or all of the time.
- Half the items are worded positively and half are worded negatively (total possible of 80 points). Positive items are reverse-scored.
- Administration is quick (usually less than 10 minutes).

Equipment: None.

Scoring:

- The total score (ranges from 20-80) is obtained by summing scores for all individual items.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores indicate increased depressive symptoms.
- Scores over 50 suggest depression. Scores over 69 indicating severe depression.
- No normative data or cut-points have been reported for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

English, Chinese, Russian, Thai, Czech, Farsi, Indonesian, Lithuanian.

Training required:
No information available on training required.

**Availability:**

Freely available online at:  
http://healthnet.umassmed.edu/mhealth/ZungSelfRatedDepressionScale.pdf

**Clinical Considerations:**

- In some clinical applications the Beck Depression Inventory or the PHQ-9 may be preferable as they survey a two week period and include an item specific to suicidal ideation (this is consistent with DSM–IV criteria for major depression).
- Some items on the Zung SDS may be sensitive to individuals with SCI.
- Easy to administer and score. The positive and negative item wording may be confusing for some individuals.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**

- Internal consistency of the Zung Depression scale is excellent (Cronbach’s \( \alpha = 0.81 \)).  
  [Tate et al. 1993]

**Validity:**

- Correlation of the Zung total score is excellent with the Brief Symptom Inventory – global severity index (Pearson’s \( r = 0.53 \)) and the Brief Symptom Inventory – Depression scale (Pearson’s \( r = 0.52 \)).  
  [Tate et al. 1993, Overholser et al. 1993]

**Responsiveness:**

No values were reported for the responsiveness of the Zung scale for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the Zung scale for the SCI population.
28.2.2 Sensory Functions and Pain & the Eye, Ear and Related Structures

Brief Pain Inventory

- modeled after the McGill Pain Questionnaire
- provides information on the intensity of pain (sensory dimension) and the degree to which pain interferes with function (reactive dimension). It also asks questions about pain relief, pain quality, and the patient’s perception of the cause of pain. The reactive dimension (i.e. the interference scale) of the inventory is often used alone.
- Three modified versions of the BPI – Interference scale have been developed for the SCI population (7-item, 10-item, and 12-item).

ICF Domain:

Body Functions – Subcategory: Sensory Functions.

Number of Items:

Full inventory-17; Interference Scale – 7, 10, 12.

Instructions for Administration and Scoring:

Administration:

• Self-report assessment.
• original BPI interference scale asks participants to rate their pain at the time of responding to the questionnaire (pain now) and also at its worst, least, and average over the previous week with regards to the degree it interferes with mood, physical activity, walking ability, work, social activity, personal relations, and sleep.
• SCI-modified scales use the word “mobility” rather than “walking ability”. Five additional items make up the 12-item scale (self-care, recreational activities, social activities, communication, learning new information). Only the former 3 (self-care, recreational activities, and social activities) are used to make up the 10-item scale.
• Time to administer is **approximately 5-10 minutes** for the short form and **10-15 minutes** for the long form.

Equipment: None

Scoring:

• Pain is rated on a scale of 0 (no interference) to 10 (interferes completely)
• mean of the scores is used as the pain interference score.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
• The range for all 3 composite scores is from 0-10, with higher numbers indicating greater pain-related interference.

• No cut-points or normative data have been established for the SCI population

• published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:
English, French, Chinese, Filipino, Hindi, Italian, Spanish, and Vietnamese

Training Required:

Availability:

Clinical Consideration:
• Clinicians should find the evaluation (self-report or interview) method easy to administer.

Measurement Property Summary:
# of studies reporting psychometric properties: 1

Reliability:
• Internal consistency of the BPI is excellent for the 7-item scale (Cronbach’s α=0.92), the 10-item scale (Cronbach’s α=0.95) and the 12-item scale (Cronbach’s α=0.96).

[Raichle et al. 2006]

Validity:
• Correlation of the SF-36 Mental Health scale is excellent with the various summary scores of the BPI: 7-item (Spearman’s ρ=-0.62), 10-item (Spearman’s ρ=-0.60), 12-item (Spearman’s ρ=-0.61).

[Raichle et al. 2006]

Responsiveness:
No values have been reported for the responsiveness of the BPI for the SCI population at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the BPI for the SCI population.
Classification System for Chronic Pain in SCI

- proposes a pain classification scheme with 2 major categories: neuropathic and musculoskeletal.
- designed to help with the standardization of pain terminology used in the SCI population.
- Pain is categorized by pain location and distribution, as related to level of spinal injury (e.g. above level, at level or below level). This information is combined with a classification of the subject’s SCI pain.
- Neurologic pain – classifications:
  1) SCI pain
  2) Transition zone pain
  3) Radicular pain
  4) Visceral pain
Musculoskeletal pain – classifications:
  1) Mechanical spine pain
  2) Overuse pain

ICF Domain:

Body Function – Subcategory: Sensory Function.

Number of Items:

2 categories of pain with 6 subcategories. Each subcategory has 3 items to classify pain.

Instructions for Administration and Scoring:

Administration:

- clinician-administered but could also be completed by the patient.
- The patient identifies the worst pain problem on a body diagram and indicates whether pain worsens with activity, position or change of position or light touch. This procedure is repeated for second worse pain etc.

Equipment: None.

Scoring: Categorization is outlined in the table below (fill out with +, - or +)

<table>
<thead>
<tr>
<th>Pain Category (major)</th>
<th>Pain Category (Specific)</th>
<th>Location</th>
<th>Related to activity</th>
<th>Affected by position</th>
<th>Worse with light touch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuropathic</td>
<td>SCI Pain</td>
<td>Below injury in area without normal sensation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transition zone pain</td>
<td>At level of injury, bilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radicular Pain</td>
<td>At any dermatome level, usually unilateral, usually radiates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visceral</td>
<td>In abdomen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>Mechanical</td>
<td>In back or neck, often</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>spine pain</th>
<th>bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overuse pain</td>
<td>Often above injury in areas of normal sensation in an incomplete, can be below</td>
</tr>
</tbody>
</table>

+ yes, - no, + maybe

**Interpretability:**

MCID: not applicable  
SEM: not applicable  
MDC: not applicable

- This classification system provides a nice summary table that makes it easy for clinicians to identify key problem areas expressed by the patient.

**Languages:**

N/A

**Training Required:**

None formally required, but a background in pain knowledge is useful.

**Availability:**

N/A

**Clinical Considerations:**

- This tool has the most reliable (within ($\kappa=0.68$) and between ($\kappa=0.66$) raters), standardized system for classifying pain in people with SCI using well defined terminology.
- The interview format improves utility for those with limited hand function
- There is a high initial patient burden (considerable time is required to complete the assessment); however, follow up sessions require less time.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- The strength of agreement between raters in categorizing pain problems was **adequate** for both the method of reporting on questionnaire ($K=0.68$) and reporting in person ($K=0.66$).  
  [Cardenas et al. 2002]

**Validity:**

No values have been reported for the validity of the Classification System for Chronic Pain in SCI at this time.

**Responsiveness:**

No values have been reported for the responsiveness of the Classification System for Chronic Pain in SCI at this time.
Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the Classification System for Chronic Pain in SCI for the SCI population.
Donovan SCI Pain Classification System
• proposes 5 pain types:
  1) Segmental nerve/cauda equina
  2) Spinal cord
  3) Visceral
  4) Mechanical
  5) Psychic
• combines both mechanistic factors (e.g. slow fibre conduction from skin) and descriptive factors, such as time to onset post-injury, characteristics of pain (e.g. burning, stabbing, dull aching, etc), pain duration, and factors that make it worse or better.

ICF Domain:

Body Function – Subcategory: Sensory Function

Number of Items:
5 possible categories for each pain area.

Instructions for Administration and Scoring:

Administration:
• This information is obtained through a semi-structured, pen and paper interview.
• Up to 40 minutes is required for those with complex issues.

Equipment: None.

Scoring: N/A.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable

Presenting the information in a table format (like the one below) facilitates interpretation and clarity. The table below presents the descriptors for 5 different patients with each type of pain (examples for each category shown).

<table>
<thead>
<tr>
<th>Pain Type</th>
<th>Time of Onset Post Injury</th>
<th>Character</th>
<th>Duration</th>
<th>Aggravating factors</th>
<th>Diminishing factors</th>
<th>Possible causative factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segmental nerve/cauda equina</td>
<td>Days to weeks</td>
<td>Burning</td>
<td>Seconds</td>
<td>Rest</td>
<td>Activity</td>
<td>Slow fibre conduction from skin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stabbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal cord</td>
<td>Weeks to months</td>
<td>Tingling</td>
<td>Constant</td>
<td>Activity</td>
<td>Rest</td>
<td>All fibre conduction within cord</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Numbness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>Visceral</th>
<th>Weeks to months</th>
<th>Burning</th>
<th>Constant</th>
<th>Variable</th>
<th>Variable</th>
<th>Slow fibre conduction from viscera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>Weeks to months</td>
<td>Dull</td>
<td>Variable</td>
<td>Activity</td>
<td>Rest</td>
<td>Slow fibre conduction from muscles or ligaments</td>
</tr>
<tr>
<td>Psychic</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>Preoccupation with unpleasant environmental stimuli</td>
</tr>
</tbody>
</table>

**Languages:**

N/A.

**Training Required:**

Knowledge on the study of pain is recommended.

**Availability:**

<table>
<thead>
<tr>
<th>Pain Type</th>
<th>Time of Onset Post Injury</th>
<th>Character</th>
<th>Duration</th>
<th>Aggravating factors</th>
<th>Diminishing factors</th>
<th>Possible causative factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segmental nerve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cauda Equina</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal Cord</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visceral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Clinical Considerations:**
• The assessment can be time-consuming for those patients with complex pain issues. However, this type of approach may be more suitable for difficult cases as it allows the patients to explain pain in their own language rather than being forced to pick specific descriptors for their pain.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**

- Overall test-retest reliability is 78%; percentage agreement for segmental nerve/cauda equine was 67%, for visceral was 75%, for mechanical was 80% and for spinal cord was 84%.
- Intra-rater agreement ranged from 67-83%.
- Inter-rater agreement ranged from 62-73%.

[Richards et al. 2002, Putzke et al. 2003]

**Validity:**

No values were reported for the validity of the Donovan SCI Pain Classification System for the SCI population.

**Responsiveness:**

No values were reported for the responsiveness of the Donovan SCI Pain Classification System for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the Donovan SCI Pain Classification System for the SCI population.
The Multidimensional Pain Inventory - SCI Version

- theoretically linked to the cognitive-behavioral conceptualization of chronic pain, where emphasis is placed on the assessment of subjective distress and the impact of pain on patient’s lives. A slightly revised version of the MPI was devised for the SCI population.
- consists of 3 sections with 12 subscales (subscales are bracketed):
  - Section 1: Pain Impact (life interference, support, life control, pain severity, affective distress)
  - Section 2: Responses by Significant Others (distracting responses, negative responses, solicitous responses)
  - Section 3: Activities (household activities, activities away from home, social activities, outdoor work).

ICF Domain:
Body Functions – Subcategory: Sensory Functions

Number of Items:
50

Instructions for Administration and Scoring:

Administration:
- self-report questionnaire that may also be administered by a trained assessor.
- Administration takes at least 20 minutes.

Equipment: None.

Scoring:
- Each item is rated on a 7-point scale (0-6).
- Scale scores are computed by summing over all items and then the mean is composed based on the number of scale items.
- A total score is not used.

Interpretability:
MCID: not established
SEM: not established
MDC: not established
  - No information is given regarding norms or meaningful cutoff scores for the SCI population.

Languages:
The MPI-SCI is only available in English (The MPI is available in Swedish, Dutch, German, Italian, Spanish, Portuguese, French and Japanese)

Training Required:
None.

Availability:
The MPI-SCI questionnaire can be found in Appendix A in Widerstrom-Noga et al. “Assessment of the impact of pain and impairments associated with spinal cord injuries”, Arch Phys Med Rehabil, 2002; 83(3): 395.

Clinical Considerations:

- The emphasis of the MPI-SCI is on the assessment of the subjective distress experienced by patients in terms of pain and suffering and how pain impacts the individual’s life. Although evidence supports the use of the MPI-SCI to assess the impact of chronic pain with SCI populations, more psychometric evidence is needed to warrant its sustained use.
- The MPI-SCI was developed specifically for use in SCI populations. The questionnaire can be self-completed or done via interview/proxy and is not considered to be a burden to patients.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

- Internal consistency of the MPI-SCI range from adequate (affective distress – Cronbach’s $\alpha=0.60$) to excellent (Pain Interference with Activities – Cronbach’s $\alpha=0.94$).
- Test-retest reliability for MPI-SCI subscales range from poor (Life Control – ICC=0.26) to excellent (Solicitous Responses – ICC=0.69).

[Widerstrom-Noga et al. 2006]

Validity:

- All MPI-SCI subscales were compared with an instrument evaluating the same constructs by using Pearson correlations.
  - All subscales with the exception of the Perceived Responses from Significant Other subscale were significantly correlated with the related construct.
  - The pain severity subscale was highly ($r=.61$) and significantly ($P<.000$) correlated with the Numeric Rating Scale (NRS) for pain intensity.
  - Life interference was strongly ($r=.61$) and significantly ($P<.000$) correlated with the Pain Disability Index (PDI).
  - Although support was significantly ($r=.23$, $P<.05$) correlated with the appraisal subscale of Interpersonal Support Evaluation List (ISEL), the perceived responses by significant others subscales (negative, solicitous, and distracting responses) were not significantly correlated with the ISEL.

[Widerstrom-Noga et al. 2006]

Responsiveness:

- Persons with tetraplegia scored lower (34.3±16.4) than those with paraplegia 45.0±19.4.
- The magnitude of the effect (effect size) was moderate (0.6).

[Widerstrom-Noga et al. 2006]

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the MPI-SCI for the SCI population.
**Multidimensional Pain Readiness to Change Questionnaire (MPRCQ2)**

- measure of readiness to adopt various pain management and coping strategies.
- made up of two sections and nine subscales. The first section concerns the use of adaptive coping behaviours while the second addresses stopping maladaptive coping behaviours.
  The nine sub-scales include:
  1) Exercise
  2) Task persistence
  3) Relaxation
  4) Cognitive control
  5) Pacing
  6) Avoiding pain contingent rest
  7) Avoiding asking for assistance
  8) Assertive communication
  9) Use of proper body mechanics.

**ICF Domain:**

Body Function – Subcategory: Sensory Functions

**Number of Items:**

69

**Instructions for Administration and Scoring:**

**Administration:**

- Participants rate each of the 69 statements on a scale of 1-7.

**Equipment:** No special equipment is required.

**Scoring:**

- Mean scores are calculated for each of the 9 subscales by summing the responses for each statement and dividing by the number of items.
- Subscale scores range from 1 to 7
- A total score (9-63) can be calculated by summing scores from each of the 9 primary scales.

**Interpretability:**

**MCID:** not established

**SEM:** not established

**MDC:** not established

- Higher scores indicate a greater use of adaptive coping behaviours (or less use of maladaptive ones).
- No cut-off or normative scores have been established for the SCI population
- The MPRCQ2 has been tested in other populations (fibromyalgia and arthritis) so meaningful comparisons can be made.
• Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English.

Training Required:

None.

Availability:

Scoring of the MPRCQ2 is done simply by summing the responses (1–7) for each of the above scales and subscales and dividing by the number of items.

Refer to excel titled “Worksheet_MPRCQ2” for scoring sheet on the SCIRE Outcome Measures website.

There are 2 sections to the MPRCQ2 with different rating systems.

Section 1: Instructions. Please circle the number that best indicates your intention to use each of the following methods of coping with or managing your pain by using the 1 to 7 rating scale below:

1 = I am not doing this now, and am not interested in ever doing it.
2 = I might do this someday but I have made no plans to do it.
3 = I will probably start doing this sometime (in the next 6 months).
4 = I have made plans to start doing this soon (within the next month).
5 = I have recently started doing this (within the past month).
6 = I have been doing this for a while (more than 1 month but less than 6 months).
7 = I have been doing this for a long time (at least 6 months).

<table>
<thead>
<tr>
<th>Section 1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Walk fast, jog, swim (or use an exercise machine) at least 20 minutes 3 times a week or more.</td>
</tr>
<tr>
<td>2</td>
<td>Use imagery to decrease pain.</td>
</tr>
<tr>
<td>3</td>
<td>Distract myself from my pain.</td>
</tr>
<tr>
<td>4</td>
<td>Tell people I am close to what is on my mind.</td>
</tr>
<tr>
<td>5</td>
<td>Stand straight when I carry something heavy.</td>
</tr>
<tr>
<td>6</td>
<td>Tell myself often that I can manage the pain and its effects on my life.</td>
</tr>
<tr>
<td>7</td>
<td>Stretch my muscles (for at least 10 minutes) 3 times a week or more.</td>
</tr>
<tr>
<td>8</td>
<td>Break up tasks into smaller pieces to get more done.</td>
</tr>
<tr>
<td>9</td>
<td>Ignore the pain.</td>
</tr>
<tr>
<td>10</td>
<td>Use correct posture when sitting.</td>
</tr>
<tr>
<td>11</td>
<td>Express my feelings openly.</td>
</tr>
<tr>
<td>12</td>
<td>Exercise for at least 30 minutes 3 times a week or more.</td>
</tr>
<tr>
<td>13</td>
<td>Listen to a relaxation tape to relax.</td>
</tr>
<tr>
<td>14</td>
<td>Work steadily, but at a reasonable pace.</td>
</tr>
</tbody>
</table>
Put the pain in the background.
Reassure myself often that I am managing my pain well.
Alter the pain with my mind to something less unpleasant.
Use slow, deep breathing to relax.
Keep on doing what I want to do despite pain.
Keep my back straight when I am sitting.
Lift weights, do push-ups, or sit-ups (for at least 20 minutes) 3 times per week or more.
Concentrate on a hobby or chore to distract myself from pain.
Think about the pain differently so it is less upsetting.
Disregard the painful sensations.
Pace my activities so I don’t get tired too soon.
Alter the pain with my mind so it is less intense.
Let others know what I want and need.
Use my mind to distract myself from the pain.
Lift heavy objects safely by keeping my back straight.
Put the pain sensations out of my thoughts.
Meditate to relax.
Remind myself often that I will feel better in the future.
Ignore the pain sensations.
Exercise the muscles where I hurt (for at least 5 minutes) 3 times a week or more.
Try not to slouch when I am sitting.
Picture calming images to relax.
Keep on doing what I need to do despite pain.
Pace myself so I can keep working slowly and steadily.
Tell myself often that I am doing well despite the pain.
Think about the pain differently so that it hurts less.
Use self-hypnosis to relax.
Disregard the pain.
Tell people I am close to how I feel.
Exercise to increase muscle strength (for at least 20 minutes) 3 times a week or more.
Work at a reasonable pace (not too fast or slow).
Practice relaxing the different muscles in my body.
Bend at the knees instead of the waist when lifting.
Put the pain sensations in the back of my mind.
Pay attention to something else when I hurt.
Not think about how the pain feels.
Stretch the muscles where I hurt (for at least 5 minutes) 3 times a week or more.
Pace myself so that I don’t have to take long breaks.
Section 2:

**Instructions.** The following questions are slightly different than those that you have already answered. For the remaining questions, please circle the number that best indicates your intention to stop using each of the methods of coping with or managing your pain by using the 1 to 7 rating scale below:

1 = I am doing this now and am not interested in ever stopping.
2 = I might stop this someday, but I have made no plans to stop doing it.
3 = I will probably stop doing this sometime (in the next 6 months).
4 = I have made plans to stop doing this soon (within the next month).
5 = I have recently stopped doing this (sometime in the past month).
6 = I have not done this for a while (more than 1 month but less than 6 months).
7 = I have not done this for a long time (at least 6 months).

<table>
<thead>
<tr>
<th>Section 2</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Ask for help with chores when I hurt.</td>
</tr>
<tr>
<td>54</td>
<td>Think about how bad the pain feels.</td>
</tr>
<tr>
<td>55</td>
<td>Rest when I hurt.</td>
</tr>
<tr>
<td>56</td>
<td>Sit down to rest when I hurt.</td>
</tr>
<tr>
<td>57</td>
<td>Ask for help with cleaning because of my pain.</td>
</tr>
<tr>
<td>58</td>
<td>Tell myself “I can’t go on with this pain.”</td>
</tr>
<tr>
<td>59</td>
<td>Allow pain to keep me from doing what I need to do.</td>
</tr>
<tr>
<td>60</td>
<td>Think about how overwhelming the pain feels.</td>
</tr>
<tr>
<td>61</td>
<td>Lie down to rest when I hurt.</td>
</tr>
<tr>
<td>62</td>
<td>Ask others for help when I hurt.</td>
</tr>
<tr>
<td>63</td>
<td>Worry about the pain.</td>
</tr>
<tr>
<td>64</td>
<td>Rest because of pain.</td>
</tr>
<tr>
<td>65</td>
<td>Tell myself “I can't stand this pain.”</td>
</tr>
<tr>
<td>66</td>
<td>Ask for help with lifting or carrying because of pain.</td>
</tr>
<tr>
<td>67</td>
<td>Let pain prevent me from doing what I need to do.</td>
</tr>
<tr>
<td>68</td>
<td>Allow pain to stop me from doing what I want to do.</td>
</tr>
<tr>
<td>69</td>
<td>Think thoughts that make me feel worse.</td>
</tr>
</tbody>
</table>

7 = I have not done this for a long time (at least 6 months).

Total score for Exercise: \( (1 + 7 + 12 + 21 + 34 + 44 + 51) / 7 = \) __________
Total score for Task persistence: \( (19 + 37 + 59 + 67 + 68) / 5 = \) __________
Total score for Relaxation: \( (2 + 13 + 18 + 31 + 36 + 41 + 46) / 7 = \) __________
Total score for Cognitive Control: \( (a + b + c + d + e) / 5 = \) __________
  a. Diverting Attention: \( (3 + 22 + 28 + 49) / 4 = \) __________
  b. Coping Self-Statements: \( (6 + 16 + 32 + 39) / 4 = \) __________
  c. Reinterpreting Sensations: \( (17 + 23 + 26 + 40 + 48) / 5 = \) __________
  d. Avoiding Catastrophizing: \( (54 + 58 + 60 + 63 + 65 + 69) / 6 = \) __________
  e. Ignoring Pain: \( (9 + 15 + 24 + 30 + 33 + 42 + 50) / 7 = \) __________
Total score for Pacing: \( (8 + 14 + 25 + 38 + 45 + 52) / 6 = \) __________
Total score for Avoid Pain Contingent Rest: \( (55 + 56 + 61 + 64) / 4 = \) __________
Total score for Avoid Asking for Assistance: \( (53 + 57 + 62 + 66) / 4 = \) __________

28-61

MPRCQ2
Total score for Assertive Communication: \((4 + 11 + 27 + 43) / 4\) = __________

Total score for Proper Body Mechanics: \((5 + 10 + 20 + 29 + 35 + 47) / 6\) = __________

Total MPRCQ2 score = __________

The Total MPRCQ2 score is the sum of the 9 primary scales.

**Clinical Considerations:**

- The MPRCQ2 is more practical to use than the original MPRCQ as the statements have been simplified and the number of response items expanded from 6 to 7 options, which provides a more accurate assessment along the readiness to change continuum. It is easily administered and easy to score. The multidimensional subscales allow specific aspects of readiness to change to be examined.

- Answering the questions do not represent a significant burden to SCI patients. A self-administered format is recommended but an interviewer or proxy could be used in the case of severe physical disability.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**

- Internal consistency of the MPRCQ2 is **poor to excellent** (Pacing – Cronbach’s \(\alpha=0.64\) to Ignore Pain-Cronbach’s \(\alpha=0.91\) and Cognitive Control – Cronbach’s \(\alpha=0.91\)).

  [Nielson et al. 2003, Nielson et al. 2008]

**Validity:**

- MPRCQ total scores correlated significantly and:
  - adequately with the SOPA (Survey of Pain Attitudes) subscale of control (\(r=0.51\), \(P=.0001\))
  - poorly with SOPA subscale of harm (\(r=-0.24\), \(P=.03\)).

- MPRCQ total scores correlated significantly and:
  - poorly with the PSOCQ (Pain Stages of Change Questionnaire) subscale of contemplation (\(r=0.29\), \(P<.006\))
  - adequately with the PSOCQ subscale of action (\(r=0.60\), \(P<.0001\))
  - adequately with the PSOCQ subscale of maintenance (\(r=0.66\), \(P<.0001\)).

  [Nielson et al. 2003, Nielson et al. 2008]

**Responsiveness:**

No values were reported for the responsiveness of the MPRCQ2 for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the MPRCQ2 for the SCI population.
Quantitative Sensory Testing (QST)

- used to quantify the neurological dysfunction associated with neuropathic pain
- measures thresholds for mechanical detection, vibration detection, cool and warm detection and cold and hot pain sensations. Assessment of thresholds can be used to evaluate the involvement of different nervous system functions (Nathan et al, 1986).

ICF Domain:

Body Function – Subcategory: Sensory Function

Number of Items:

6

Instructions for Administration and Scoring:

Administration:

- clinician-administered
- performed by administering six different threshold tests including: the mechanical detection threshold, the vibration detection threshold, the cool and warm threshold detection and the cold and hot pain threshold at eight standard test sites on the various dermatomes (Felix & Widerstrom-Noga, 2009).
- Threshold values are recorded at either the first or last detectible level of intensity.
- If the maximum stimulus is reached without the patient indicating sensation, the maximum value is recorded as threshold.

Equipment:

- QST requires several pieces of equipment to ensure accurate threshold detection (vibrameter, algometer, aesthesiometer, brush, MSA thermotest, rolltemp)

Scoring:

- For each location, the high and low threshold detection values for each of the six stimuli are recorded.
- The high and low scores are averaged and can be compared to data from ‘un-injured’ populations.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable

- Threshold measurements for pressure and vibration can evaluate large-fiber and dorsal column function, while thresholds for thermal detection and pain can be used to assess small-fibre and spinothalamic tract function (Nathan et al, 1986).

Languages:

N/A

Training Required:
Clinicians need to be trained in the use of each piece of equipment.

**Availability:**

N/A

**Clinical Considerations:**

- Thermal pain thresholds may be particularly useful when used in combination with self-report measures of neuropathic pain for the development of pain management strategies. QST may not feasible as a general test used across clinical sites due to the necessary equipment, but may be feasible for specific clinics that focus on pain and pain management.
- For each QST threshold, several measurements need to be taken in different dermatomes. Thresholds are to be measured both for increasing and decreasing intensity. Patient burden is extensive; testing must be in person at a clinic or hospital. QST has been used extensively to assess the functional integrity of the somatosensory system among various populations (Felix & Widerstrom-Noga, 2009). Preliminary evidence indicates high reliability among SCI participants. A significant correlation was found between average thermal pain thresholds (ATPT) and the severity of self reported pain. The scale was not developed specifically for the SCI population, although preliminary research shows it can be used within this group without any adaptations.
- QST requires several pieces of equipment to ensure accurate threshold detection. Clinicians need to be trained in the use of each piece of equipment. Though there are instructions that are to be read to the patient prior to each test, these were not found in the original publication (Felix & Widerstrom-Noga, 2009).

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

- Reliability of the different methods of the QST ranged from **adequate to excellent**.
- Test-retest reliability for vibration threshold and cold pain ranged from **adequate to excellent** (ICC=0.65-0.90).
- Test-retest reliability for cold and warm sensation ranged from **poor to excellent** (ICC=0.23-0.81).


**Validity:**

- Significant (P<.05) correlations were found between:
  - warm sensation and light touch (right L4, K=0.31)
  - cold sensation and light touch (right L4, K=0.30; left S1, K=0.28)
  - vibration and light touch (right L4, K=0.25; left L4, K=0.29)
  - cold sensation and pinprick (right L5, K=0.29)
  - vibration and pinprick (right L4, K=0.33).


**Responsiveness:**
No values were reported for the responsiveness of the QST for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the QST for the SCI population.
Tunk’s Classification Scheme

- identifies 11 types of pain for those with spinal cord injury according to the lesion level.

<table>
<thead>
<tr>
<th>Above the lesion level</th>
<th>At the lesion level</th>
<th>Below the lesion level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Myofacial</td>
<td>4) Radicular</td>
<td>8) Diffuse burning</td>
</tr>
<tr>
<td>2) Syringomyelia</td>
<td>5) Hyperalgesic border reaction</td>
<td>9) Phantom</td>
</tr>
<tr>
<td>3) Non spinal cord</td>
<td>6) Fracture</td>
<td>10) Visceral</td>
</tr>
<tr>
<td></td>
<td>7) Myofacial (incomplete lesion)</td>
<td>11) Myofacial (incomplete lesion)</td>
</tr>
</tbody>
</table>

ICF Domain:

Body Function – Subcategory: Sensory Functions

Number of Items: N/A.

Instructions for Administration and Scoring:

Administration:

- clinician-administered; information is obtained through a semi-structured interview.
- This pain classification allows the clinician to describe the general location and whether the pain differentiates between several types of pain.
- Administration time is usually 15-20 minutes, but it may take longer for more complex cases.

Equipment: None.

Scoring: N/A.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable

Languages: N/A.

Training Required:

No formal training is required but knowledge about neuro-anatomy and physiology - specifically sensation and theories of pain is an asset. This system requires considerable knowledge from the clinician classifying the pain as well as from other health care professionals who may be using the information to help with pain management.

Availability:

Can be found in Putzke et al. 2002.
Clinical Considerations:

- The classification system does not follow a systematic method for acquiring the data from the patients, thus obtaining consistent information from one time to another or between individuals very difficult. This system is very clinician dependent as it requires considerable knowledge about the various origins of pain to be able to interpret the patient’s comments into the defined classification scheme.

- Although this system has merit for giving more categories for which to describe the various types of pain an individual may have, it most likely would be useful for more complex pain cases where more time is allocated towards understanding the origins of the individual’s pain.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

- Rate of agreement across all raters was 17%.  
[Putzke et al. 2003]

Validity:
No values were reported for the validity of Tunk’s Classification Scheme for the SCI population.

Responsiveness:
No values were reported for the responsiveness of Tunk’s Classification Scheme for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the Tunk’s Classification Scheme for the SCI population.
Wheelchair Users Shoulder Pain Index (WUSPI)

- measures the functional cost of shoulder pain in wheelchair users.
- targets activity limitation resulting from shoulder pain on a 10 visual analogue scale, covering 4 subsections which include transfers, wheelchair mobility, self-care, and general activities. The anchors for the items range from 0 “no interference due to pain” to 10 “completely interferes due to shoulder pain”.
- composed of 15 items in the areas of transfers, wheelchair mobility, self-care and general activities.

ICF Domain:

Body Function – Subcategory: Sensory Functions

Number of Items:

15

Instructions for Administration and Scoring:

Administration:

- self report
- Administration time is usually around 5 minutes.

Equipment: None.

Scoring:

- The total score (ranges from 0-no pain to 150-extreme pain) is derived by adding the individual item scores.

Interpretability:

MCID: not established
SEM:

WUSPI index SEM and MDC values (calculated from data in Curtis et al. 1995b):

<table>
<thead>
<tr>
<th>WUSPI Index item scores</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed-wheelchair</td>
<td>0.21</td>
<td>0.58</td>
</tr>
<tr>
<td>Car-wheelchair</td>
<td>0.16</td>
<td>0.45</td>
</tr>
<tr>
<td>Tub/shower-wheelchair</td>
<td>0.34</td>
<td>0.95</td>
</tr>
<tr>
<td>Load wheelchair in car</td>
<td>0.20</td>
<td>0.57</td>
</tr>
<tr>
<td>Wheelchair mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10-min duration</td>
<td>0.48</td>
<td>1.33</td>
</tr>
<tr>
<td>Ramp/uneven</td>
<td>0.53</td>
<td>1.46</td>
</tr>
<tr>
<td>Self-care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lift object from overhead</td>
<td>0.59</td>
<td>1.64</td>
</tr>
<tr>
<td>Put on pants</td>
<td>0.16</td>
<td>0.45</td>
</tr>
<tr>
<td>Put on T-shirt</td>
<td>0.37</td>
<td>1.03</td>
</tr>
<tr>
<td>Put on button-down shirt</td>
<td>0.15</td>
<td>0.42</td>
</tr>
<tr>
<td>Wash back</td>
<td>0.37</td>
<td>1.03</td>
</tr>
<tr>
<td>General activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work/school activities</td>
<td>0.18</td>
<td>0.50</td>
</tr>
</tbody>
</table>
28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transfers</strong></td>
<td>-----</td>
</tr>
<tr>
<td>Bed - Wheelchair</td>
<td></td>
</tr>
<tr>
<td>Car - Wheelchair</td>
<td></td>
</tr>
<tr>
<td>Tub/Shower - Wheelchair</td>
<td></td>
</tr>
<tr>
<td>Sofa – Wheelchair</td>
<td></td>
</tr>
<tr>
<td><strong>Wheelchair Mobility</strong></td>
<td>-----</td>
</tr>
<tr>
<td>Wheeling &gt; 10 min. duration (e.g. wheeling to work)</td>
<td></td>
</tr>
<tr>
<td>Up ramp / incline</td>
<td></td>
</tr>
<tr>
<td>Sporting activities (e.g. recreation or organized sport)</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Care</strong></td>
<td>-----</td>
</tr>
<tr>
<td>Lift objects from overhead</td>
<td></td>
</tr>
<tr>
<td>Put on pants</td>
<td></td>
</tr>
<tr>
<td>Put on T-shirt</td>
<td></td>
</tr>
</tbody>
</table>

MDC: see above

- Higher scores indicate more limitation due to pain.
- No information is available regarding norms or meaningful cut scores for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet).

Languages:

English.

Training Required:

No special training is required to administer or score the questionnaire.

Availability:

Scored on how much shoulder pain has affected 15 activities in the patient’s life from 1 to 10. If not applicable, write N/A.
| General Activities |  ---- | 
| Wash back |  | 
| Brush hair |  | 
| Work/School activities (e.g. computer/desk work) |  | 
| Sleeping |  | 
| Total sum: |  | 

**Clinical Considerations:**
- The WUSPI is a simple and effective joint specific method of quickly determining the degree of interference due to pain when doing typical tasks of daily living.
- This tool is specific to shoulder pain. It does not obtain information about the type or frequency of pain experienced during the activities. No strategies are suggested to assist with scoring if a person indicates they do not do certain activities (e.g./ load their chair into a car).
- No psychometric evidence is available for responsiveness and the majority of research for reliability and validity has been conducted using a mixed sample (not just SCI).
- The WUSPI is quick and easy to administer.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**
- Internal consistency is excellent for WUSPI-Pain (Cronbach’s $\alpha=0.98$), WUSPI-difficulty (Cronbach’s $\alpha=0.96$) and WUSPI-complete (Cronbach’s $\alpha=0.97$).
- Test-retest reliability is excellent for individual items (ICC=0.84-0.99) and for total score (ICC=0.99).
[Curtis et al. 1995a, Curtis et al. 1995b]

**Validity:**
- WUSPI has significant (P<.01) correlations with Abduction (Pearson’s r=-0.49) and Flexion (Pearson’s r=-0.48).
[Curtis et al. 1995b]

**Responsiveness:**
No values were reported for the responsiveness of the WUSPI for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the WUSPI for the SCI population.
28.2.3 Functions & Structures of the Cardiovascular, Haematological, Immunological and Respiratory System

Six-Minute Arm Test (6-MAT)
- assesses cardiovascular fitness in people with SCI
- involves 6 minutes of sub-maximal arm ergometry at a constant power output. This single stage test is simple and quick to administer clinically.

ICF Domain:

Body Function – Subcategory: Functions & Structures of the Cardiovascular, Haematological, Immunological and Respiratory Systems

Number of Items:
N/A

Instructions for Administration and Scoring:

Administration:
- clinician-administered
- clinicians can determine the appropriate power output through use of published guidelines.
- Baseline outcome variables of heart rate and ratings of perceived exertion are determined by recording the client’s exercising heart rate during the final 30 seconds of the test, and recording their RPE (Borg’s rating of perceived exertion) at the end of the test.
- should be re-administered at the same PO for follow up tests, including those to assess changes resulting from cardiovascular fitness interventions.
- takes 6 minutes to administer.

Equipment:
- arm ergometer
- heart rate monitor
- RPE scale

Scoring:
- scores over several administrations are compared to assess changes resulting from cardiovascular fitness interventions.

Interpretability:

MCID: not established
SEM: Heart rate SEM = 7.12 beats/min (95% CI, during 6-MAT) (Hol et al. 2007)
VO2 SEM = 1.62 mL/kg/min (95% CI, during 6-MAT) (Hol et al. 2007)
MDC: Heart rate MDC = 19.74 beats/min
VO2 MDC = 4.49 mL/kg/min
• normative data not established for SCI population
• published data is available for comparison for the SCI population (see the Interpretability section of the Study Details sheet).
• Used after a fitness intervention or as a follow up measure, 6-MAT results can determine changes in fitness level.
• Decrease in heart rate and/or RPE may indicate an increase in cardiovascular fitness, whereas an increase in heart rate and/or RPE may indicate a decrease in cardiovascular fitness.

Languages:

N/A

Training Required:

None

Availability:

Procedure:
Heart rate measurements are continually recorded throughout the study. Blood pressure should be measured before and after the test.

Before the study commences, ask your subjects to empty their bladders to minimize any episodes of autonomic dysreflexia.

Subjects are asked to complete a single, 6-minute stage of submaximal exercise on a standard arm cycle ergometer. The power output (PO) is selected for each individual based on their manual muscle strength, ASIA motor score and physical activity level (see table below). The aim is to attain a steady heart rate of 60%-70% of age-predicted maximum heart rate or a rating of 11-15 on the Borg RPE scale.

PO selection:
For subjects with tetraplegia:
Set PO to 10W if: Power wheelchair user OR ≤ grade 4 wrist extension
Set PO to 15W if: Manual wheelchair user
Set PO to 20W if: Manual wheelchair user AND grade 5 wrist extension AND physically active (engaged in physical activity at least 3 times a week as measured by PASIPD)

For subjects with paraplegia:
Set PO to 30W if: female – inactive
Set PO to 40W if: female – active OR male – inactive
Set PO to 50W if: female – competitive athlete OR male: active
Set PO to 60W if: male – competitive athlete

An increase of 5 W/min for individuals with tetraplegia and 10 W/min for paraplegia are provided. The final steady-state heart rate is averaged over the last 30 sec of the 6 minute test.

6-MAT Worksheet
Patient Name: _______________ Date: ____________________
6-MAT

Initial Power Output (PO): ___________ Watt

Increase in power output for each minute: ___________ Watt/minute

During the final 30 seconds of the test
Baseline Outcome Variables of Heart Rate: _______________ beats/minute

Borg Scale - Ratings of Perceived Exertion (RPE): ___________ (6-20 points)

Clinical Considerations:

- The 6-MAT is a practical, easy to complete test that can be administered to all fitness levels.
- The test was designed specifically for individuals with SCI.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
- The 6-MAT was performed twice, 1 week apart. Test-retest reliability was excellent for both heart rate (ICC=0.90) and VO₂ (ICC=0.81).
  [Hol et al. 2007]

Validity:
- Excellent correlation between VO₂ peak and:
  - 6-MAT VO₂ (r=0.92),
  - 6-MAT power output (r=0.73)
  - 6-MAT heart rate (r=0.63).
  [Hol et al. 2007]

Responsiveness:
No values were reported for the responsiveness of the 6-MAT for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the 6MAT for the SCI population.
**Wingate Anaerobic Testing (WAnT)**

- method of assessing muscle power.
- involves a 30 second maximal effort trial on a leg or arm ergometer.
- first validated in able-bodied individuals to use as a predictor of physical performance of anaerobic activities.
- Arm WAnT has been used in persons with paraplegia to compare to performance of upper limb anaerobic tasks such as transferring in and out of the car and 26m wheelchair sprints.

**ICF Domain:**

Body Functions – Subcategory: Functions and Structures of the Cardiovascular, Haematological, Immunological and Respiratory Systems

**Number of Items:**

N/A.

**Instructions for Administration and Scoring:**

**Administration:**

- clinician-administered
- The individual “free wheels” on an arm ergometer with no resistance for 3-5 minutes, after which they increase the cadence to 100 rev/min. The resistance load is then applied (3.5% body weight) and the subject pedals as fast as they can for 30 seconds, followed by a 1-2 minute cool down without resistance.

**Equipment:** Arm ergometer, computer and software.

**Scoring:**

- The ergometer system is typically linked to a computer with specific software to calculate peak power based on resistance and speed (the highest average power output at any given 5 sec period) and mean power (average power output over a 30 sec trial).

**Interpretability:**

**MCID:** not established  
**SEM:** not established  
**MDC:** not established

- The higher the outcome measures (peak and mean power), the greater strength the individual exhibits.
- No normative data or cut-points have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

N/A.
Training Required:
Minimal training required to learn administration and setup of software and ergometer.

Availability:
Available from: http://www.brianmac.co.uk/want.htm

Clinical Considerations:

• This is the only standardized test to monitor upper extremity strength and power. Most assessments look at aerobic function rather than anaerobic tasks. This test has been shown to be valid and reliable across a wide range of able bodied and disabled individuals, including those with paraplegia. It is also a well-established protocol that has been used in many populations so comparisons are possible.

• The test is relatively easy and inexpensive to administer with the appropriate equipment; however, the initial expenditure is significant.

Measurement Property Summary:
# of studies reporting psychometric properties: 5

Reliability:
• Test-retest reliability of the WAnT for peak power output $P_{\text{peak}}$ and mean power output $P_{\text{mean}}$ are excellent for both the paraplegic group and the tetraplegic (C5-C7) group.

• Values of $P_{\text{peak}}$ and $P_{\text{mean}}$ were significantly associated between trials, with calculated $r^2$ values of 0.92 and 0.94 respectively.

• Values of $P_{\text{peak}}$ were significantly ($P<.05$) associated between trials for the C5 ($r^2 = .945$), C6 ($r^2 = .975$) and C7 ($r^2 = .934$) groups.

• Values of $P_{\text{mean}}$ were also significantly ($P<.05$) associated between trials for the C5 ($r^2 = .983$), C6 ($r^2 = .962$) and C7 ($r^2 = .879$) groups.

[Jacobs et al. 2003, Jacobs et al. 2005]

Validity:
No values were reported for the validity of the WAnT for the SCI population at this time.

Responsiveness:
No values were reported for the responsiveness of the WAnT for the SCI population at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the WAnT for the SCI population.
### 28.2 BODY FUNCTION/STRUCTURE

#### 28.2.4 Neuromusculoskeletal and Movement-Related Functions & Structures

**ASIA Impairment Scale (AIS)**

- The AIS is a multi-dimensional approach to categorize motor and sensory impairment in individuals with SCI. It identifies sensory and motor levels indicative of the most rostral spinal levels demonstrating “unimpaired” function.
- Currently on its 6th edition
- 5 point ordinal scale, based on the Frankel scale, classifies individuals from A” (complete SCI) to “E” (normal sensory and motor function):
  - **A**: complete. No sensory or motor function is preserved in the sacral segments S4-S5.
  - **B**: sensory incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5 (light touch, pin prick at S4-S5 or deep anal pressure), AND no motor function is preserved more than three levels below the motor level on either side of the body.
  - **C**: motor incomplete. Motor function is preserved below the neurological level and more than half of key muscle functions below the single neurological level of injury (NLI) have a muscle grade less than 3.
  - **D**: motor incomplete. Motor function is preserved below the neurological level and at least half of key muscle functions below the NLI have a muscle grade of 3 or greater.
  - **E**: normal. If sensation and motor function as tested with the ISNCSCI are graded as normal in all segments, and the patient had prior deficits, then the AIS grade is E. Someone without an initial SCI does not receive an AIS grade.

- Twenty-eight dermatomes are assessed bilaterally using pinprick and light touch sensation and 10 key muscles are assessed bilaterally with manual muscle testing. The results are summed to produce overall sensory and motor scores and are used in combination with evaluation of anal sensory and motor function as a basis for the determination of AIS classification.

- AIS scores are considered essential when classifying persons with SCI as to their neurological status. AIS scores are routinely collected in administrative data bases such the Model Systems and CIHI National Rehabilitation Reporting System.

**ICF Domain:**

**Number of Items:**
N/A

**Instructions for Administration and Scoring:**

**Administration:**
- Clinician-administered; clinical examination conducted to test whether sensation is 0-absent; 1-impaired or 2-normal.

---

ASIA Impairment Scale
• Muscle function is rated from 0-total paralysis to 5-normal (active movement, full ROM against significant resistance).
• The presence of anal sensation and voluntary anal contraction are assessed as a yes/no.
• Time to administer can range from 10 minutes to 1 hour.

**Equipment:** No specialized equipment is required.

**Scoring:**
• Bilateral motor and sensory levels and the AIS are based on the results of these examinations.

**Interpretability:**

**MCID:** not established for the SCI population

**SEM:** Reported in Furlan et al. 2008 based on data from Kirshblum et al. 2004
- Mean (SEM) AIS motor score at 1 year post-injury: 45.2 (22.8)
- Mean (SEM) AIS motor score at 5 years post-injury: 46.6 (23.3)

**MDC:** Reported in Furlan et al. 2008 based on data from Clifton et al. 1996, for the 1992 AIS/IMSOP:
- AIS motor score: 0.29
- AIS pin-prick sensory subscore: 7.8
- AIS light-touch sensory subscore: 12.95

- The AIS scores are clearly defined and understood by most clinicians.
- Normative data and published data (for comparison) for the SCI population are available (see the Interpretability section of the Study Details sheet).

**Languages:**

N/A

**Training required:**

Training is mandatory.

**Availability:**

Available from: www.asiaspinalinjury.org

**Clinical Considerations:**

• This is an internationally recognized standard that is widely used for research and clinical purposes. Its development and continued evolution are well grounded in expert clinical consensus thereby ensuring high content validity. However, inter-rater reliability for assignment of motor and sensory levels and AIS classifications is less than optimal. Enhanced training methods and materials have been recommended to improve this.
• The exam is generally well tolerated although sensory testing for those with severe hypersensitivity may be uncomfortable and testing for anal sensation/voluntary contraction can result in the stimulation of a bowel movement.
• The test may pose a significant clinician/patient burden unless the clinician is experienced and well-practiced in the test.
• Preservation of function in the sacral segments (S4-S5) is key for determining the AIS.
Measurement Property Summary:

# of studies reporting psychometric properties: 10

Reliability:
- For total AIS scores, the agreement was slightly better for motor than for sensory scores, and better for light touch than for pin-prick scores, but still well in the “substantial” range for all three scores (all ICCs>0.96, P<0.01).

Validity:
- Correlation of the AIS was excellent with the Motor Capacities Scale (r=0.744).
- Correlation with the Functional Independence Measure was excellent for AIS-motor (r=0.91), and adequate with AIS-light touch (r=0.58) and AIS-pinprick (r=0.55).
- Correlation with the Quadriplegic Index of Function was excellent for AIS-motor (r=0.91), AIS-light touch (r=0.64) and AIS-pinprick (r=0.65).

Responsiveness:
No values have been reported for the responsiveness of the AIS for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the AIS for the SCI population.
Ashworth Scale & Modified Ashworth Scale

• measure of spasticity developed as a simple clinical classification to assess the anti-spastic effects of carisoprodol in multiple sclerosis. These measures have been adopted for measuring spasticity in a variety of other diagnoses, including SCI.

• 5-point nominal scale using subjective clinical assessments of tone ranging from 0 – ‘no increases in tone’ to 4 – ‘limb rigid in flexion or extension [abduction/adduction]’. An additional grade was added (1+) for the MAS to enhance sensitivity and accommodate hemiparetic patients who typically graded at the lower end of the scale.

Brief introduction video to the Ashworth scale

ICF Domain:


Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

• clinician-administered; both tests (Ashworth and MAS) are clinical examinations performed on a relaxed patient in the supine position.

• The muscle is assessed by rating the resistance to passive range of motion (ROM) about a single joint.

Equipment: None.

Scoring:

• Value is simply reported.

Interpretability:

MCID: not established
SEM: not established
MDC: not established for the SCI population but in a stroke population, initial change in muscle tone/spasticity in response to botox treatment was an approximately 1-point decrease on the MAS scale reflecting a clinically significant improvement [Shaw et al. 2010, n=333, adults with upper limb spasticity due to stroke >1 month post-injury. “BoTULS: a multicentre randomised controlled trial to evaluate the clinical effectiveness and cost-effectiveness of treating upper limb spasticity due to stroke with botulinum toxin type A, Prepress Projects.”]

• The Ashworth scale is easily interpretable with discrete categories that reflect clinical experience.

• The MAS adds an additional grade at the lower end of spasticity.

• No normative data have been published for the SCI population
• published data is available for comparison for the SCI population (see the Interpretability section of the Study Details sheet).

Languages:

N/A

Training Required:

None specifically indicated, however the observation of resistance is subjective and requires experienced clinical judgment.

Availability:

Procedure:
Place the patient in a supine position.

When testing a muscle that primarily flexes a joint, place the joint in a maximally flexed position and move to a position of maximal extension over one second.

When testing a muscle that primarily extends a joint, place the joint in a maximally extended position and move to a position of maximal flexion over one second.

Scoring:

<table>
<thead>
<tr>
<th>Score</th>
<th>Modified Ashworth Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No increase in muscle tone</td>
</tr>
<tr>
<td>1</td>
<td>Slight increase in tone</td>
</tr>
<tr>
<td>1+</td>
<td>Slight increase in tone, with a catch, followed by minimal resistance</td>
</tr>
<tr>
<td>2</td>
<td>More marked increase in tone, but affected part(s) easily moved.</td>
</tr>
<tr>
<td>3</td>
<td>Considerable increase in tone and passive movement difficult.</td>
</tr>
<tr>
<td>4</td>
<td>Affected part(s) rigid in flexion or extension.</td>
</tr>
</tbody>
</table>

Modified Ashworth Scale Testing Form

Patient name: ______________________________ Date: ________________

Muscle tested: _____________________________ Score: ____________
Muscle tested: _____________________________ Score: ____________
Muscle tested: _____________________________ Score: ____________
Muscle tested: _____________________________ Score: ____________

Clinical Considerations:
• This measure is commonly used in the clinical setting to assess spasticity in people with SCI. However, it should be noted that spasticity is a multi-faceted construct with individual components of spasticity weakly related to each other suggesting that different clinical scales measure unique aspects of spasticity.
• This measure assesses single-joint resistance to passive ROM or a velocity dependent stretch reflex. They do not address spasm frequency or severity, nor do they differentiate between phasic and tonic components of spasticity. Therefore, the overall construct of spasticity is best measured with an appropriate battery of tests including the Ashworth or MAS.
• The Ashworth and MAS are well-tolerated by patients.
• This measure is easily administered during routine clinic visits and doesn’t require specialized equipment.

**Measurement Property Summary:**

| # of studies reporting psychometric properties: 15 |

**Reliability:**
• Inter-rater reliability is **adequate** (ICC=0.56).

**Validity:**
• Correlation of Ashworth (hip, knee, ankle) with SCATS (clonus, flexion, extension) was **adequate to excellent**.
• Correlation of Ashworth (hip, knee, ankle) with Penn Spasm Frequency Scale (PSFS) was **adequate**.

Spearman’s \( \rho \) correlations:

<table>
<thead>
<tr>
<th></th>
<th>Hip</th>
<th>Knee</th>
<th>Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSFS</td>
<td>0.43</td>
<td>0.43</td>
<td>0.51</td>
</tr>
<tr>
<td>Hip</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clonus</td>
<td>0.56</td>
<td>0.65</td>
<td>0.60</td>
</tr>
<tr>
<td>Flexion</td>
<td>0.55</td>
<td>0.47</td>
<td>0.40</td>
</tr>
<tr>
<td>Ext</td>
<td>0.98</td>
<td>0.88</td>
<td>0.61</td>
</tr>
</tbody>
</table>


**Responsiveness:**
• With intrathecal baclofen treatment, Ashworth scores were found to significantly decrease (\( P<.0001 \)).

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the Ashworth Scale for the SCI population.
Hand-Held Myometer

- a portable device used as a quantitative method of muscle contraction (primarily for upper limb).
- Testing is performed using one of two techniques, 1) make or 2) break.
  - The ‘make’ technique requires the examiner to resist a maximal voluntary contraction by the patient, thereby producing an isometric contraction.
  - In the ‘break’ technique, the examiner applies adequate force to overcome the patient, thereby producing an eccentric contraction.

ICF Domain:

Body Function and Structures – subcategory: Neuromusculoskeletal and Movement-Related Functions & Structures

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- Clinician administered; performance measure.
- The mean force of three administrations for each muscle group tested is preferred and some investigators suggest a practice trial. 5 to 10 seconds rest break between trials is suggested.
- The starting position of the individual and the myometer is critical (though it seems starting position has not been standardized in the literature for different muscles)
- Encouragement to maximize muscle contraction is suggested.
- **30 minutes** is required for a bilateral assessment of the upper extremities. Additionally, multiple position changes are required to capture maximal muscle contractions.

Equipment:

- A myometer.

Scoring:

- The recommended unit of measurement is kg in order avoid interpretation issues. Measurements are generally rounded to the nearest kg.

Interpretability:

**MCID:** not available

**SEM & MDC:**

SEM and MDC calculated from data in Aufsesser et al. 2003:

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Tester 1</th>
<th>Tester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SEM (lbs)</td>
<td>MDC (lbs)</td>
</tr>
<tr>
<td>Muscle</td>
<td>Force 1</td>
<td>Force 2</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Left biceps</td>
<td>5.05</td>
<td>14.01</td>
</tr>
<tr>
<td>Right biceps</td>
<td>2.94</td>
<td>8.15</td>
</tr>
<tr>
<td>Left triceps</td>
<td>2.91</td>
<td>8.08</td>
</tr>
<tr>
<td>Right triceps</td>
<td>3.26</td>
<td>9.04</td>
</tr>
<tr>
<td>Left wrist extensors</td>
<td>2.71</td>
<td>7.51</td>
</tr>
<tr>
<td>Right wrist extensors</td>
<td>2.94</td>
<td>8.14</td>
</tr>
</tbody>
</table>

- Normative values for various adult age groups for the general population are available.
- A predicted muscle force can be calculated by taking into consideration the individual's sex, weight, and age.
- By comparing the predicted force to the observed force, an estimate of percentage of deficit may be determined.
- No normative data for the SCI population have been reported.

Languages:

N/A.

Training Required:

No formal training required, but examiners should be familiar with the techniques and proper administration.

Availability:

Myometers are available for purchase from medical/rehabilitation equipment vendors.

Clinical Considerations:

- Myometer testing presents an objective, quantifiable method of measuring muscle strength. However this does not necessarily reflect function.
- Initial cost of the myometer may be seen as a limitation to its general use.
- Computer software is available to assist with data analyses.
- It is superior to manual muscle testing for detection of mild to moderate weakness and changes in muscle strength. It also eliminates potential bias from the evaluator for various age groups and gender.

Measurement Property Summary:

# of studies reporting psychometric properties: 8

Reliability:

- Inter-rater reliability is **poor to excellent** (ICC=0.21-0.89). This variability may be due to the lack of standardization for starting position and for muscles tested.
- Intra-rater reliability is **excellent** (ICC=0.93-0.99) for the make technique for the biceps, triceps and wrist extensors.
• Intra-rater and inter-rater reliability has been tested for a variety of muscles (elbow flexors and extensors, shoulder rotation, plantar flexors, intrinsic hand muscles, etc.)

Validity:
• Correlation of hand-held myometry with Manual Muscle Testing ranges from:
  o **poor to excellent** for individuals with paraplegia (Spearman’s $\rho=0.26-0.67$)
  o **adequate to excellent** for individuals with tetraplegia (Spearman’s $\rho=0.50-0.95$).

Responsiveness:
No values were reported for the responsiveness of hand-held myometry for the SCI population at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in hand-held myometry for the SCI population.
Penn Spasm Frequency Scale (PSFS)

- 2 component self-report measure of the frequency of reported muscle spasms which is commonly used to quantify spasticity.
- developed to augment clinical ratings of spasticity and provide a more comprehensive understanding of an individual’s spasticity status.
- The first component is a 5 point scale assessing the frequency with which spasms occur ranging from “0 = No spasms” to “4 = Spontaneous spasms occurring more than ten times per hour”. The second component is a 3 point scale assessing the severity of spasms ranging from “1 = Mild” to “3 = Severe”. The second component is not answered if the person indicates they have no spasms in part 1.

ICF Domain:

Body Function – Subcategory: Neuromusculoskeletal & Movement-related Functions and Structures

### Number of Items:

2

### Instructions for Administration and Scoring:

**Administration:**

- self-report
- Patients report their perceptions of spasticity with regards to frequency and severity.

**Equipment:** None.

**Scoring:** N/A

**Interpretability:**

- MCID: not established
- SEM: not established
- MDC: not established

- The specific grades are simple to interpret although no standardization of time frame is specified for test administration (i.e. within the last hour, day, week, etc.) and specific grades for spasm severity may mean different things to different people.
- No normative data have been reported so far for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

English.

**Training Required:**
No training is required; however, understanding spasticity likely improves the scale’s utility.

**Availability:**
See the article ‘Penn et al. 1989’ for details.

**Clinical Considerations:**
- The scale is subject to concomitant subclinical conditions such as fullness of the bladder, development of a symptomatic urinary tract infection, anxiety level, room temperature, subject comfort, and many other conditions.
- In general, self-report measures of spasticity correlate only moderately with clinical examination suggesting that the elements of spasticity evaluated in the physical examination do not represent what is important to persons with SCI spasticity. To more fully understand spasticity as experienced by the client, self-report spasticity measures are an important adjunct to other clinical measures of spasticity.
- The PSFS is easy to understand, presents minimal patient burden (easy to administer during routine clinical visits).

**Measurement Property Summary:**

**Reliability:**
No values have been reported on the reliability of the PSFS for the SCI population at this time.

**Validity:**
- Correlation of the PSFS is **adequate** with the Ashworth tested on the hip (Spearman’s $\rho=0.43$), knee (Spearman’s $\rho=0.43$) and ankle (Spearman’s $\rho=0.51$), and the SCATS tested on the clonus (Spearman’s $\rho=0.59$), flexor (Spearman’s $\rho=0.41$) and extensor (Spearman’s $\rho=0.40$).
  

**Responsiveness:**
- After administration of IT Baclofen, Ashworth was reduced from 4±1 to 1.2±0.4 (P=.0001) with a concomitant decrease in spasm frequency of 3.3±1.2 to 0.4±0.8 (P<.0005).
- After mean follow-up of 19.2 months, Ashworth was 1.0± 0.1 and PSFS was 0.3± 0.6.
  

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the PSFS for the SCI population.
Spinal Cord Assessment Tool for Spastic Reflexes (SCATS)

- physiologically based measure for spastic reflexes for use in individuals with SCI.
- developed in response to the demand for a standardized, simple clinical measure that encompasses the primary spastic reaction in the SCI population.
- The SCATS is split into 3 subscales, each addressing a separate spasm:
  1) Clonus
  2) Flexor spasms
  3) Extensor spasms.
  For each subscale, the spasm is triggered and then rated with a score ranging from 0 – 3.

ICF Domain:


Number of Items:

3

Instructions for Administration and Scoring:

Administration:

- clinician-administered.
- SCATS clonus is measured by rapid passive dorsiflexion. The degree of spasm is rated between 0 (no spasm) – 3 (severe spasm lasting longer than 10 seconds).
- SCATS flexor spasm is measured by applying a pinprick stimulus to the medial arch with the knee and hip extended straight. The degree of spasm is rated between 0 (no spasm) and 3 (severe spasm, 30 knee and hip flexion).
- SCATS extensor spasm is measured by extending the hip and knee joints from with the knee and hip extended at 90 and 110 degrees. The degree of spasm is rated between 0 (no spasm) and 3 (severe spasm, longer than 10 seconds).

Equipment:

- Equipment to quantitatively measure joint angle changes.

Scoring: N/A

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Scores in each subscale range from 0 - 3, with scores above zero indicating the presence of spasm.
- Scores of three indicate severe spasms.
The results of the SCATS will indicate to the clinician the type(s) of spasticity present in an individual, as well as the degree of severity of each type of spasticity.

No normative data for the SCI population has been reported.

Languages:
N/A

Training Required:
Administration should be done by a trained clinician

Availability:

<table>
<thead>
<tr>
<th>R</th>
<th>L</th>
<th>SCATS: Clonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>no reaction</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Mild &lt;3 secs</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3&lt; Moderate &lt;10 secs</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Severe &gt; 10 secs</td>
</tr>
</tbody>
</table>

Clonus of the plantarflexors was quantified in response to a rapid passive dorsiflexion of the ankle (A). The ankle was dorsiflexed at an angle that triggered clonus, and the duration of clonic bursts was timed. An ordinal rating from 0 to 3 was determined by the duration of clonic activity where 0 is no reaction; 1 is mild, clonus was maintained less than 3 seconds; 2 is moderate, clonus persisted between 3 and 10 seconds; and 3 is severe, clonus persisted for more than 10 seconds.

<table>
<thead>
<tr>
<th>R</th>
<th>L</th>
<th>SCATS: flexor spasms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>no reaction</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>less than 10° of excursion in flexion at the knee and hip or extension of the great toe</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>moderate, 10° to 30° of flexion at the knee and hip</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>severe, 30° or greater of knee and hip flexion</td>
</tr>
</tbody>
</table>

With the knee and hip extended to 0°, the clinician applied a pinprick stimulus for 1 second to the medial arch of the subject’s foot (B). Excursion of the big toe into extension, ankle dorsiflexion, and knee and hip flexion were visually observed for severity. The rating scale consisted of a score from 0 to 3, where 0 is no reaction to stimulus; 1 is mild, less than 10° of excursion in flexion at the knee and hip or extension of the great toe; 2 is moderate, 10° to 30° of flexion at the knee and hip; and 3 is severe, 30° or greater of knee and hip flexion.

<table>
<thead>
<tr>
<th>R</th>
<th>L</th>
<th>SCATS: extensor spasms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>no reaction</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Mild &lt;3 secs</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3secs &lt; Moderate &lt;10 secs</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Severe &gt; 10 secs</td>
</tr>
</tbody>
</table>

With the contralateral limb extended, the tested knee and hip were positioned at angle of 90° to 110° of hip and knee flexion, and then both joints were simultaneously extended. One hand cupped the heel while the other was placed on the outside of the thigh (C). Once a reaction was elicited, the duration of visible muscle contraction in the quadriceps muscle was measured by observing superior displacement of the patella. The timed scale (0–3) that was used for clonus was also
Clinical Considerations:

- The SCATS does not gather information on patient perspective, an important aspect of spasms, as some spasms are perceived as beneficial to the patient.
- Each subscale is quick (<5 sec) to administer; however, if a spasm is elicited, spasm duration is patient specific and could be enduring.
- The SCATS appears to be comprehensive in differentiating three different spastic responses.
- As spasms are often uncomfortable for individuals with SCI, and the SCATS is recommended to be done in tandem with self reporting measures of spasm, there is the possibility of high respondent burden in terms of both length and comfort. The measure could be conducted during a home visit or at a clinic/hospital.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
No values were reported for the reliability of the SCATS for the SCI population.

Validity:
- SCATS – clonus, flexor spasm and extensor spasm correlated significantly and **adequately to excellently** with kinematic and electromyographic measures (Spearman’s $\rho=0.69-0.94$).
- SCATS extension correlated significantly and **excellently** with Ashworth-hip flexors (Spearman’s $\rho=0.98$) and Ashworth-knee flexors (Spearman’s $\rho=0.88$), and **adequately** with Ashworth-ankle plantar flexors (Spearman’s $\rho=0.61$).  
  [Benz et al. 2005]

Responsiveness:
No values were reported for the responsiveness of the SCATS for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCATS for the SCI population.
Spinal Cord Injury Spasticity Evaluation Tool (SCI-SET)

- assesses the impact of spasticity on daily life in people with SCI.
- requires participants to recall their past 7 days when rating spasticity on a scale ranging from -3 (extremely problematic) to +3 (extremely helpful).

**ICF Domain:**

Body Function – Subcategory: Neuromusculoskeletal & Movement-related Functions and Structures

**Number of Items:**

35

**Instructions on Administration and Scoring:**

**Administration:**

- self-report questionnaire.
- can be administered in person or over the phone.

**Equipment:** None.

**Scoring:**

- Total score (-3 to +3) is generated by summing all the responses from the applicable items then dividing the sum by the number of applicable items

**Interpretability:**

**MCID:** not established

**SEM** for SCI-SET score (calculated from data in Adams et al. 2007): 0.17

**MDC** for SCI-SET score (calculated from data in Adams et al. 2007): 0.47

- No meaningful cut points or norms have been established for the SCI population
- Published data is available for comparison (see Interpretability section of the Study Details sheet).

**Languages:**

English.

**Training Required:**

None.

**Availability:**

Instructions to the patient:

“For each of the following, please choose the answer that best describes how your spasticity symptoms have affected that area of your life during the past 7 days. When I talk about “spasticity symptoms”, I mean:

a) uncontrolled, involuntary muscle contraction or movement (slow or rapid, short or prolonged)

b) involuntary, repetitive, quick muscle movements (up and down, side to side)

c) muscle tightness

d) what you might describe as “spasms”
Please let me know when a question is not applicable to you.”

Rating scale: (print one out for the patient to refer to)
-3 = extremely problematic
-2 = moderately problematic
-1 = somewhat problematic
0 = no effect
1 = somewhat helpful
2 = moderately helpful
3 = extremely helpful

Scoring:
The SCI-SET is scored by summing all the responses from the applicable items then dividing the sum by the number of applicable items, generating a total score between -3 and +3.

Items on the SCI-SET:

<table>
<thead>
<tr>
<th>During the last 7 days, how have your spasticity symptoms affected:</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. your showering?</td>
<td></td>
</tr>
<tr>
<td>2. your dressing / undressing?</td>
<td></td>
</tr>
<tr>
<td>3. your transfers (to and from bed, chair, vehicle, etc.)?</td>
<td></td>
</tr>
<tr>
<td>4. your sitting positioning (in your chair, etc.)?</td>
<td></td>
</tr>
<tr>
<td>5. the preparation of meals?</td>
<td></td>
</tr>
<tr>
<td>6. eating?</td>
<td></td>
</tr>
<tr>
<td>7. drinking?</td>
<td></td>
</tr>
<tr>
<td>8. your small hand movements (writing, use of computer, etc.)?</td>
<td></td>
</tr>
<tr>
<td>9. your ability to perform household chores?</td>
<td></td>
</tr>
<tr>
<td>10. your hobbies / recreational activities?</td>
<td></td>
</tr>
<tr>
<td>11. your enjoyment of social outings?</td>
<td></td>
</tr>
<tr>
<td>12. your ability to stand / weight-bear?</td>
<td></td>
</tr>
<tr>
<td>13. your walking ability?</td>
<td></td>
</tr>
<tr>
<td>14. your stability / balance?</td>
<td></td>
</tr>
<tr>
<td>15. your muscle fatigue?</td>
<td></td>
</tr>
<tr>
<td>16. the flexibility of your joints?</td>
<td></td>
</tr>
<tr>
<td>17. your therapy / exercise routine?</td>
<td></td>
</tr>
<tr>
<td>18. your manual wheelchair use?</td>
<td></td>
</tr>
<tr>
<td>19. your power wheelchair use?</td>
<td></td>
</tr>
<tr>
<td>20. your lying positioning (in bed, etc.)?</td>
<td></td>
</tr>
<tr>
<td>21. your ability to change positions in bed?</td>
<td></td>
</tr>
<tr>
<td>22. your ability to get to sleep?</td>
<td></td>
</tr>
<tr>
<td>23. the quality of your sleep?</td>
<td></td>
</tr>
<tr>
<td>24. your sex life?</td>
<td></td>
</tr>
<tr>
<td>25. the feeling of being annoyed?</td>
<td></td>
</tr>
<tr>
<td>26. the feeling of being embarrassed?</td>
<td></td>
</tr>
<tr>
<td>27. your feeling of comfort socially?</td>
<td></td>
</tr>
<tr>
<td>28. your feeling of comfort physically?</td>
<td></td>
</tr>
<tr>
<td>29. your pain?</td>
<td></td>
</tr>
</tbody>
</table>
## 28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. your concern with falling?</td>
<td></td>
</tr>
<tr>
<td>31. your concern with getting injured?</td>
<td></td>
</tr>
<tr>
<td>32. your concern with accidentally injuring someone else?</td>
<td></td>
</tr>
<tr>
<td>33. your ability to concentrate?</td>
<td></td>
</tr>
<tr>
<td>34. your feelings of control over your body?</td>
<td></td>
</tr>
<tr>
<td>35. your need to ask for help?</td>
<td></td>
</tr>
</tbody>
</table>

**Sum:** _____________

**Total score (sum/35):** _____________

### Clinical Considerations:
- The SCI-SET can be used as a tool for medical management decisions as well as a measurement of current treatment effects.
- Spasticity is known to be highly variable, fluctuating on a daily and even hourly basis. Current levels of spasticity may overshadow a seven-day recall of the impact of spasticity. Repeated administration may therefore be necessary to provide a more accurate picture of the impacts spasticity has on daily life.
- The SCI-SET was developed specifically for the SCI population.
- The scale is easy to administer and score. Definitions of ‘spasm’ and the scale responses are clearly outlined in the instructions.

### Measurement Property Summary:

**# of studies reporting psychometric properties:** 1

#### Reliability:
- The SCI-SET was administered 3 times, 3 weeks in a row, on the same day of the week. Internal consistency of the SCI-SET is excellent (Cronbach’s $\alpha=0.90$), as is the test-retest reliability (ICC=0.91).
  
  [Adams et al. 2007]

#### Validity:
- The SCI-SET score is significantly and negatively correlated as expected to several spasticity scales:
  - self-assessment of spasticity severity (Pearson’s $r=-0.48$, P<.001)
  - self-assessment of spasticity impact (Pearson’s $r=-0.61$, P<.001)
  - the Penn Spasm Frequency Scale (Pearson’s $r=-0.66$, P<.001).
- The SCI-SET score was not significantly correlated to the Functional Independence Measure- motor score (P=.12).
  
  [Adams et al. 2007]

#### Responsiveness:
No values were reported for the responsiveness of the SCI-SCS for the SCI population.

#### Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCI-SCS for the SCI population.
Surface Electromyography (sEMG)

- non-invasive technique used to measure muscle activity (both voluntary and involuntary) in individuals with neuromuscular conditions.

ICF Domain:

Body Function – Subcategory: Neuromusculoskeletal & Movement-related Functions and Structures

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- Surface electrodes are placed on the skin overlying the muscles of interest.
- Patients are instructed to voluntarily activate lower limb muscles to provide either maximal muscle strength or to perform simple movements (e.g. ankle flexion/extension).

Equipment:

- Surface electrodes
- Monitoring equipment.

Scoring: N/A.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable

- No normative values for the SCI population have been reported and interpretation of the data is not standardized.

Languages:

N/A.

Training Required:

Special training is mandatory to conduct and interpret the results.

Availability:

N/A. Refer to references for various protocols in reference papers.

Clinical Considerations:

- sEMG recordings can complement the clinical examination specifically by providing objective and quantifiable measures of muscle activity. They have been shown to be valid in comparison to the clinical testing of motor strength and might be of highest value to monitor motor recovery in incomplete SCI.
• As these measures need special training and equipment they will be most suitable in the frame of clinical research studies rather than for clinical day-to-day routine.
• The technique is well tolerated and is much less intrusive than needle EMG, so there is minimal burden for patients. However, an EMG can range in cost from several hundred to over a thousand dollars depending on features, and requires skilled processing and interpretation.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 4

**Reliability:**
- Correlation analysis results showed an **adequate to excellent** correlation for 3 repeated measures ($r= 0.83-0.98$ for magnitude, $r= 0.77$ to $0.88$ for similarity index (SI)).
- Flexion movements ($r=0.95\pm0.03$ for magnitude and $r=0.86\pm0.03$ SI) showed significantly higher correlation than extension movements ($P<.05$).
  
  [Lim & Sherwood 2005]

**Validity:**
- An SI value of 0.85 was found to separate AIS-C and AIS-D groups with a sensitivity of 0.89 and a specificity of 0.81.
  

**Responsiveness:**
No values have been reported at this time for the responsiveness of sEMG for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the sEMG for the SCI population.
28.2.5 Functions of the Skin

Abbruzzese Scale

- based on the Norton and Gosnell scales
- designed to assess the risk of pressure sore development in acute and long-term care settings

Domains include:
1) general health
2) mental status
3) activity
4) mobility
5) continence
6) nutrition
7) predisposing disease.

ICF Domain:

Body Function – Subcategory: Functions of the Skin

Number of Items:
9

Instructions for Administration and Scoring:

Administration:
- Clinician-administered; raters indicate the client status based on personal observation or chart review
- items are scored on a 4-point scale, either 0 – 3, or 0, 1, 4, 6 depending on the item
- requires approximately 5-10 minutes to administer.

Equipment: None.

Scoring:
- Addition of the scores from each of the 9 items to produce an overall score between 0 (best prognosis) and 30 (worst prognosis)

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Neither normative data nor published data is available for comparison for the SCI population at this time.
- Higher scores indicate increased risk of developing a pressure ulcer.

Languages:

English
**Training Required:**

None but knowledge of skin health is helpful.

**Availability:**

Unable to locate a copy of the scale at this time.

**Clinical Considerations:**

- This tool incorporates different domains in a patient’s life to assess the risk of pressure sore development in both acute and long-term care settings.
- The measure is well accepted by persons with disabilities
- This assessment is quick and comes at minimal discomfort to the patient

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

No values were reported for the reliability of the Abruzzese measure for the SCI population.

**Validity:**

- The Abruzzese measure was 60.1% accurate in predicting pressure ulcer development; it has a sensitivity of 21.8% and a specificity of 84.6%.
- The Abruzzese measure is significantly and poorly correlated with the stage of the first pressure ulcer (r=0.241) and the number of ulcers developed (0.212).
  
  [Salzberg et al. 1999]

**Responsiveness:**

No values were reported for the responsiveness of the Abruzzese measure for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the Abruzzese measure for the SCI population.
Braden Scale

- an assessment tool for determining a patient’s risk level for incurring skin breakdown. It has been tested in both acute care and long-term-care settings. Items were developed based on expert consensus.

- The scale evaluates the patient in six domains:
  1) sensory perception
  2) moisture
  3) activity
  4) mobility
  5) nutrition
  6) friction and shear
  For each domain, a 1-3 or 1-4 point ordinal scale is used.

ICF Domain:

Body Function – Subcategory: Functions of the Skin

Number of Items:

6

Instructions on Administration and Scoring:

Administration:

- clinician-administered; raters indicate client status in the six domains (which could be based on personal experience or chart review).

- Time for administration is **approximately 5-10 minutes**.

Equipment: None.

Scoring:

- Each domain is given a rating of 1-4 based on descriptive criteria provided on the scoring sheet, which are summed for a total of 6-23.

- Scoring instructions are relatively detailed.

Interpretability:

MCID: not established
SEF: not established
MDC: not established

- Higher scores are equivalent to better prognosis.

- Although a cut off score of 16 was originally suggested as indicative of those who develop a pressure sore (100% sensitivity and 64% sensitivity) (Bergstrom et al. 1987), 11 or less has been suggested for an ICU trauma population and less than or equal to 10 has been suggested for individuals with SCI.

- No normative data for the SCI population has been found at this time

- Published data for the SCI population is also available for comparison (see the Interpretability section of the Study Details sheet).
Languages:
Many languages such as English, Spanish, French and Portuguese.

Training Required:
None

Availability:
The scale, scoring information (free) and a videotape manual ($150 US) are available: www.Bradenscale.com. An assessment form can be found here: http://www.in.gov/isdh/files/Braden_Scale.pdf

Clinical Considerations:
- The scale omits items previously found to be important predictors of pressure ulcer development for people with SCI and includes three factors (sensory perception, mobility and nutritional variables) that were not significantly related to pressure ulcer development for individuals with SCI. Though the reliability of the scale has been demonstrated in a variety of settings, it has not specifically been tested with individuals with SCI.
- There is minimal examiner and no respondent burden (the patient is not asked to perform any special activities).

Measurement Property Summary:
# of studies reporting psychometric properties: 3

Reliability:
No values have been reported at this time for the reliability of the Braden Scale for the SCI population.

Validity:
- Correlation of the Braden Scale is adequate with:
  - the stage of the first pressure ulcer (Spearman’s $\rho = -0.353$)
  - the number of ulcers developed (Spearman’s $\rho = -0.431$).
- It was found that sensory perception, mobility and nutritional variables were not significantly related to pressure ulcer development. Moisture was the most important predictive variable.

Responsiveness:
No values were reported at this time for the responsiveness of the Braden Scale for the SCI population.

Floor/ceiling effect:
- A ceiling effect was reported (21% of patients attained a ‘high risk’ score).
  [Wellard 2000]
Gosnell Measure

- developed to identify individuals living in extended care and over the age of 65 who were at risk for developing a pressure ulcer.

- Patients are evaluated on five domains:
  1) mental status
  2) continence
  3) mobility (the amount and control of movement of one's body)
  4) activity (ability to ambulate)
  5) nutrition (the process of food intake).

- Evaluation also includes recording of: vital signs (which includes temperature pulse respirations and blood pressure), skin condition (which includes appearance, skin tone and sensation) and medications, but these are not scored.

ICF Domain:

Body Function – Subcategory: Functions of the Skin

Number of Items:

5

Instructions for Administration and Scoring:

Administration:

- clinician-administered; raters indicate client status on each of the items (which could be based on personal experience or chart review).

- Scales are scored based on descriptive criteria provided on the scoring sheet.

Equipment: None.

Scoring:

- a summary score is produced by summing item scores; the summary score ranges from between 5 (worst prognosis) to 20 (best prognosis).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores generally indicate less risk for development of a pressure ulcer.

- Normative data has not been established for the SCI population.

Languages:

English

Training Required:

None formally required.

Availability:

Instructions:
After observation, assess the patient on the 5 categories in the Gosnell scale: mental status, continence, mobility, activity and nutrition. Additionally, record the patients’ vital signs, describe skin status (appearance, tone and sensation) and all medications patients are receiving.

**Scoring:**
A rating scale was developed where each category is rated. Total score ranges from 5 to 20. Lower scores indicate poorer health status.

**Rating scale:**

**MENTAL STATUS** (assessment of one’s level of response to his environment):
- **Unconscious** (1) – nonresponsive to painful stimuli
- **Stuporous** (2) – total disorientation. Does not respond to name, simple commands or verbal stimuli.
- **Confused** (3) – partial and/or intermittent disorientation to temperature, pulse and respiration. Purposeless response to stimuli. Restless, aggressive, irritable, anxious and may require tranquilizers or sedatives.
- **Apathetic** (4) – lethargic, forgetful, drowsy, passive and dull, sluggish, and depressed. Able to obey simple commands. Possibly disoriented to time.
- **Alert** (5) – oriented to time, place and person. Responsive to all stimuli and understands explanations.

**CONTINENCE** (amount of bodily control of urination and defecation):
- **Absence of control** (1) – incontinent of both urine and feces
- **Minimally controlled** (2) – often incontinent of urine with occasional to often incontinence of feces
- **Usually controlled** (3) – incontinent of urine and/or feces once in a while, or has Foley catheter and is incontinent of feces
- **Fully controlled** (4) – total control of urine and feces

**MOBILITY** (amount and control of movement of one’s body):
- **Immobile** (1) – does not assist self in any way to change position. Is unable to change position without assistance. Is completely dependent on others for movement.
- **Very limited** (2) – requires assistance to change position. Offers minimal assistance in helping to change one’s position. May have contractures, paralyses, and so on.
- **Slightly limited** (3) – able to control and move all extremities but some degree of limitation may be present. Requires the assistance of another person to change position.
- **Full** (4) – able to control and move all extremities at will. May require the use of a device, but can turn, lift, pull, balance and attain sitting position at will.

**ACTIVITY** (ability of an individual to walk):
- **Bedfast** (1) – is confined to bed during entire 24-hour day.
- **Chairfast** (1) – walks only to a chair; requires assistance to do so or is confined to a wheelchair.
- **Walks with help** (3) – able to walk with assistance of another person, braces, or crutches. May have limitation on stairs. May have unsteady gait.
Ambulatory (4) – is able to walk unassisted. Rises from bed unassisted. With the use of a device such as a cane or walker, is able to ambulate without the assistance of another person.

NUTRITION (process of food intake):
- Poor (1) – seldom eats a complete meal; eats only a few bits of food a meal. Is dehydrated and has minimal fluid intake.
- Fair (2) – occasionally refuses a meal or frequently leaves the larger portion of a meal. Must be encouraged to take fluids.
- Good (3) – eats some food from each category of the Basic Four every day. Drinks 6-8 glasses of fluid every day. Eats the major portion of each meal served – or is receiving tube feedings.

ASSESSMENT OF SKIN STATUS – descriptions:
- Skin appearance (description of observed skin characteristics): dry, oily, wrinkled, scaly, flaccid and so on.
- Skin tone (degree of turgor and tension of the skin determined by pinch at specific high-risk sites for pressure sores): hard, moderate, loose.
- Skin sensation (response of an individual to tactile stimuli of the epidermis. Identified high-risk sites for pressure sores stimulated for touch and two-point discrimination): None, slight, moderate, great.

Patient Name: ____________________________ Date: ____________________________

| Date: | Mental Status: 5-alert 4-apathetic 3-confused 2-stuporous 1-unconscious | Continence: 4-fully controlled 3-usually controlled 2-minimally controlled 1-absence of control | Mobility: 4-full 3-slightly limited 2-very limited 1-immobile | Activity: 4-ambulatory 3-walks with assistance 2-chairfast 1-bedfast | Nutrition: 3-good 2-fair 1-poor | Total score: |
|-------|-----------------------------------------------------------------|-------------------------------------------------|----------------|-----------------------------------------------------------------|----------------|
|       |                                                                 |                                                                                           |                |                                                                 |                |
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<thead>
<tr>
<th>Date:</th>
<th>Vital signs: T, P, BP*</th>
<th>Skin appearance:</th>
<th>Skin tone:</th>
<th>Skin sensation:</th>
<th>Medications:</th>
<th>Comments:</th>
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*T=temperature, P=pulse rate, BP= blood pressure

Clinical Considerations:
- The scale omits items found to be important predictors of pressure ulcer development for people with SCI such as pulmonary disease, serum creatinine,
extent of paralysis, severe spasticity, age, tobacco use/smoking, disease, cardiac disease, renal disease, and living in a nursing home or hospital.

- If the data required is normally collected as part of patient care, items on the scale would not represent a burden to either the client or the assessor. If not, the scale would place considerable rater burden and some respondent burden.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**
No values were reported for the reliability of the Gosnell measure for the SCI population.

**Validity:**
- The Gosnell measure was 62.2% accurate in predicting pressure ulcer development; it has a sensitivity of 18.4% and a specificity of 90.4%.
- The Gosnell measure is significantly and poorly correlated with the stage of the first pressure ulcer (Spearman’s ρ=0.254) and the number of ulcers developed (Spearman’s ρ=0.297).

[Salzberg et al. 1999]

**Responsiveness:**
No values were reported for the responsiveness of the Gosnell measure for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the Gosnell measure for the SCI population.
Norton Measure

- the first pressure ulcer risk assessment that was developed and was intended for use with a geriatric hospital population.

- The measure, based on the researcher’s clinical expertise, considers five domains relevant to skin condition:
  1. physical condition
  2. mental condition
  3. activity
  4. mobility
  5. incontinence.

They are measured on an ordinal scale from 1 to 4.

ICF Domain:

Body Function – Subcategory: Functions of the Skin.

Number of Items:

5

Instructions for Administration and Scoring:

Administration:

- Raters indicate client status based on personal observation or chart review.
- Scales are scored on a domain specific ordinal scale from 1 to 4.
- This tool takes 5-10 minutes to administer.

Equipment: None.

Scoring:

- Though each item comes with standardized descriptive criteria on the score sheet, descriptors for item scoring are very brief.
- A summary score ranging from 5 – 20 is calculated.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores equal better prognosis.
- A cut-off score of 14 has been suggested to identify individuals at risk for developing pressure sores. However, there is currently no research evidence to support the use of this value.
- No normative data has been established for the SCI population.
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:
N/A

**Training Required:**

None but expertise in pressure ulcer risk assessment is needed.

**Availability:**

Can be found online at: [http://www.nutrition411.com/wrc/pdf/w0513_norton_pressure_sore_risk_assessment_scale_scoring_system.pdf](http://www.nutrition411.com/wrc/pdf/w0513_norton_pressure_sore_risk_assessment_scale_scoring_system.pdf)

**Clinical Considerations:**

- The Norton is a commonly used scale with a variety of populations. However, it omits items previously found to be important predictors of pressure ulcer development for people with SCI such as pulmonary disease, serum creatinine, extent of paralysis, severe spasticity, age, tobacco use/smoking, disease, cardiac disease, renal disease, and living in a nursing home or hospital. The reliability of the scale has not been demonstrated with the SCI population. The Norton was the worst measure for predicting stage and number of pressure ulcers in individuals with SCI during the first 30 days of admission compared to the SCIPUS, SCUIPUS-A, Braden, Gosnell and Abruzzese.

- The Norton scale is quick to administer and easy to score. There is no patient burden.

**Measurement Property Summary:**

- # of studies reporting psychometric properties: 3

**Reliability:**

No values were reported for the reliability of the Norton measure for the SCI population.

**Validity:**

- The Norton measure was 60.8% accurate in predicting pressure ulcer development; it has a sensitivity of 5.8% and a specificity of 95.6%.
- The Norton measure is significantly (P<.01) and poorly correlated with the stage of the first pressure ulcer (Spearman’s $\rho=-0.192$) and the number of ulcers developed (Spearman’s $\rho=-0.197$).
- ROC analysis for the Norton measure yielded an AUC of 72 (95% CI: 64-81). [Salzberg et al. 1999, Wellard 2000, Ash 2002]

**Responsiveness:**

No values were reported for the responsiveness of the Norton Measure for the SCI population at this time.

**Floor/ceiling effect:**

- 86% of patients are at no risk, 8% are at risk and 2% are at high risk when the risk ratings from Norton et al. 1962 are used. [Wellard 2000]
Spinal Cord Injury Pressure Ulcer Scale (SCIPUS)

- developed as a measure of the risk for pressure ulcer development for individuals with SCI who are in a rehabilitation centre.

- Items for the scale were identified based on statistical analysis of data from 176 individuals with SCI, which compared development of pressure ulcers with demographic variables and potential pressure ulcer risk factors. Every patient is evaluated in fifteen domains:
  1) Level of activity
  2) Mobility
  3) Complete SCI
  4) Urine incontinence or constant moistness
  5) Autonomic dysreflexia or severe spasticity
  6) Age
  7) Tobacco use/smoking
  8) Pulmonary disease
  9) Cardiac disease
  10) Blood glucose levels: > 110 mg/dl
  11) Renal disease
  12) Impaired cognitive function
  13) In a nursing home or hospital
  14) Albumin < 3.4 or T, protein < 6.4
  15) Hematocrit < 36.0%.

- Most items are scored dichotomously as either present or absent, but 4 items have three response options.

ICF Domain:

Body Function – Subcategory: Functions of the Skin.

Number of Items:

15

Instructions for Administration and Scoring:

Administration:

- clinician-administered; raters indicate client status based on personal knowledge of the client or chart review.

- Dichotomous items are given a weighted score of 0 when absent and 1 or 2 when present

- Non dichotomous items are given a weighted score based on the descriptive criteria provided on the scoring sheet. For example, the presence of pulmonary disease (ICD codes 450, 460-519 & 796.0) = a score of 2.

Equipment: None.

Scoring:

- By adding domain scores together a summary score is calculated.

Interpretability:
MCID: not established  
SEM: not established  
MDC: not established  

- Scores range from 0 (best prognosis) to 25 (worst prognosis).  
- A cut off score of 6 has been suggested to indicate clients at risk for pressure ulcer development.

Languages:  
N/A.

Training Required:  
None.

Availability:  
Can be found in Salzberg et al. 1996 or at:  

Clinical Considerations:  
- Although the SCIPUS is reported to be the best measure for individuals with SCI, the reliability of the scale has not been demonstrated with this population. The scale was developed specifically for use in rehabilitation centers and has not been tested in community dwelling populations.
- There is minimal burden related to administering or scoring the scale if tests for diabetes, albumin and hemocrit are already part of the patient’s medical record. Otherwise the blood tests required would be invasive and create respondent burden.

Measurement Property Summary:  
# of studies reporting psychometric properties: 2

Reliability:  
No values have been reported for the reliability of the SCIPUS for the SCI population at this time.

Validity:  
- The optimal balance of sensitivity (75.6%) to specificity (74.4%) was found at a cut-off point of ≥6 for SCIPUS score. The positive predictive value was 92.4% and the negative predictive value was 42.7%.
- Correlation of the SCIPUS is adequate with the stage of the first pressure ulcer (Spearman’s ρ=0.343) and with the number of ulcers developed (Spearman’s ρ=0.339).  
[Salzberg et al. 1996, Salzberg et al. 1999]

Responsiveness:  
No values have been reported for the responsiveness of the SCIPUS for the SCI population at this time.
Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCIPUS for the SCI population.
Spinal Cord Injury Pressure Ulcer Scale Acute (SCIPUS-A)

- developed as a measure of the risk for pressure ulcer development for individuals with SCI during the acute phase of injury (within 30 days of admission).

- Items for the scale were identified based on statistical analysis of data from 226 individuals with SCI, which compared development of pressure ulcers with demographic variables and 50 potential pressure ulcer risk factors. It evaluates eight domains:
  1) Extent of paralysis
  2) Moisture
  3) Serum creatinine
  4) Incontinence
  5) Albumin
  6) Mobility
  7) Pulmonary disease
  8) Level of activity.

ICF Domain:

Body Functions – Subcategory: Functions of the Skin.

Number of Items:

8

Instructions for Administration and Scoring:

Administration:

- clinician-administered; raters indicate client function status based on personal experience or chart review.

- Response categories are either dichotomous (present/absent (score = 1 to 2 or 0, respectively) or have 3 to 5 options. For example, for ‘extent of paralysis’ - absent (i.e. no paralysis) is awarded a score of 0, paraparesis:1, quadriparesis:4, paraplegia:8 and quadriplegia:10.

Equipment: None.

Scoring:

- Scales are scored based on descriptive criteria provided on the scoring sheet.

- As noted above, responses to each item are awarded a value between 0 to 1-10 and these are added together to create a summary score ranging from 0-25.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Lower scores equal better prognosis.

- Sensitivity and specificity percentages are provided at a variety of cut-off scores.

- No normative data has been established for the SCI population
• Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

English.

Training Required:

None.

Availability:

Unable to locate the scale for use at this time.

Clinical Considerations:

• The SCIPUS-A scale is a quick and easy to use measure that provides predictive information about risk of pressure sore development. Despite the good content validity, other validity evidence is only adequate, and there has been no reliability or responsiveness testing with these individuals with SCI.

• Designed for individuals with SCI.

• There is minimal burden related to administering or scoring the scale if tests for albumin and serum creatinine are already part of the patient’s medical record. Otherwise the blood tests required would be invasive and create respondent burden.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:

No values have been reported for the reliability of the SCIPUS-A for the SCI population at this time.

Validity:

• For the SCIPUS-A, the best balance point was found at a cut-off point of ≥18, which gave a sensitivity of 88.5% and a specificity of 59%. The SCIPUS-A (71%) was the most accurate in predicting pressure ulcer development, followed by the SCIPUS (65.9%), Braden (62.3%), Gosnell (62.2%), Abruzzese (60.1%) and Norton (60.8%) scales.

• Correlation of the SCIPUS is adequate with the stage of the first pressure ulcer (Spearman’s ρ=0.488) and with the number of ulcers developed (Spearman’s ρ=0.519).

[Salzberg et al. 1999, Ash 2002]

Responsiveness:

No values have been reported for the responsiveness of the SCIPUS-A for the SCI population at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCIPUS-A for the SCI population.
Stirling’s Pressure Ulcer Severity Scale

- used to describe the severity of pressure ulcers.
- derived from previously published UK scales developed by a consensus panel of national tissue viability experts. This observational scale has 5 stages ranging from stage 0 to stage 4, where:
  0 - no clinical evidence of a pressure sore
  1 - discoloration of the intact skin
  2 - partial-thickness skin loss or damage involving epidermis and/or dermis
  3 - full-thickness skin loss involving damage or necrosis of subcutaneous tissue but not extending to underlying bone, tendon or joint capsule
  4 - full-thickness skin loss with extensive destruction and tissue necrosis extending to bone, tendon or capsule.

The scale has several variations, with the most common being the 1 and 2-digit scales, where the nature and severity of the ulcer are graded.

ICF Domain:

Body Function – Subcategory: Functions of the Skin

Number of Items: N/A.

Instructions for Administration and Scoring:

Administration:
- clinician-administered
- Using the 1-digit scale, raters indicate the severity of the ulcer from 0 to 4, according to the stage definitions.
- Using the 2-digit scale, raters indicate the severity of the ulcer according to the stage definitions and specific descriptors. For example, for stage 0 there are three descriptors, 0.1 - normal appearance, intact skin; 0.2 - healed with scar ring, and 0.3 - tissue damage, but not assessed as a pressure sore.

Equipment: None.

Scoring:
- The scale has 5 stages (0-4), where zero represents no clinical appearance and four indicates full thickness skin loss with extensive destruction extending to bone, tendon or joint capsule.
- The two digit version includes more detailed ulcer descriptors.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable
- Differentiation between the grade descriptors depends on clinical identification of the tissues. Differentiation requires not only observing the wound bed, but also having sufficient knowledge to distinguish the different tissue layers.
• The higher the grade of the ulcer, the greater the severity of the ulcer.
• Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

N/A.

Training Required:

To ensure basic understanding of skin and soft tissue anatomy and relevant physiological concepts, practitioners should undergo training prior to using the scale.

Availability:

The 2-digit Stirling Scale is rated out of 4 stages with subratings in each stage. The 1-digit Stirling Scale is simply the 4 stages with no subratings.

Stage 0: No clinical evidence of a pressure sore.
0.1 Normal appearance, intact skin
0.2 Healed with scarring
0.3 Tissue damage, but not assessed as a pressure sore.

Stage 1: Discoloration of intact skin (Light finger pressure applied to the site does not alter the discoloration).
1.1 Non-blanchable erythema with increased local heat.
1.2 Blue/purple/black discoloration. The sore is at least stage 1.

Stage 2: Partial-thickness skin loss or damage involving epidermis and/or dermis.
2.1 Blister.
2.2 Abrasion.
2.3 Shallow ulcer, without undermining of adjacent tissue.
2.4 Any of these with underlying blue/purple/black discoloration or induration. The sore is at least stage 2.

Stage 3: Full-thickness skin loss involving damage or necrosis of subcutaneous tissue but not extending to underlying bone, tendon or joint capsule.
3.1 Crater, without undermining of adjacent tissue.
3.2 Crater with undermining of adjacent tissue.
3.3 Sinus, the full extent of which is unknown.
3.4 Full-thickness skin loss but wound bed covered with necrotic tissue (hard or leathery black/brown tissue or softer yellow/cream/grey slough) which masks the true extent of tissue damage. The sore is at least stage 3. Until debrided it is not possible to observe whether damage extends into muscle or involves damage to bone or supporting structures.

Stage 4: Full-thickness skin loss with extensive destruction and tissue necrosis extending to underlying bone, tendon or joint capsule.
4.1 Visible exposure of bone, tendon or capsule.
4.2 Sinus assessed as extending to bone, tendon or capsule.
Patient Name: ____________________ Date: ____________________

<table>
<thead>
<tr>
<th>Location of pressure sore on body</th>
<th>Rating</th>
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**Clinical Considerations:**

- Observational pressure ulcer grading scales are open to bias and subjectivity resulting from individual interpretations. These interpretations reflect clinician knowledge and ability to identify anatomical structures and changes.

- The Stirling scale is easy to use, has good ulcer description, and good choice of descriptors. The descriptors in the 2-digit version enable a more accurate grading in comparison to other pressure ulcer severity scales. However, because the stage 1 descriptor of the scale focuses on skin discoloration, the validity of the Stirling scale is questionable when used with dark-skinned patients as this criteria may be masked by the skin pigment.

**Measurement Property Summary:**

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<th># of studies reporting psychometric properties: 1</th>
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**Reliability:**

No values were reported for the reliability of the Stirling’s Ulcer Severity Scale for the SCI population.

**Validity:**

- When the scales were treated as continuous variables, there were significant and **poor** correlations between the Stirling scores and both the Norton (Spearman’s $\rho=0.28$) and the Waterlow scores (Spearman’s $\rho=0.38$), but not the Braden scores.

- When the scales were treated as categorical variables (at risk, high risk, very high risk), only the Waterlow scores were significantly correlated to the Stirling scores (Spearman’s $\rho=0.32$).

[Wellard 2000]

**Responsiveness:**

No values were reported for the responsiveness of the Stirling’s Ulcer Severity Scale for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the Stirling’s Ulcer Severity Scale for the SCI population.
Waterlow Scale

- used to assess the risk for pressure ulcer development.
- created to provide better sensitivity and specificity than the Norton by increasing the number of items used. Every patient is evaluated on 8 items:
  1) Age
  2) Sex
  3) Body build
  4) Appetite
  5) Continence of urine and feces
  6) Mobility
  7) Skin appearance in risk areas
  8) Special risks (disorders associated with tissue malnutrition, neurological deficits, medication, recent surgery or trauma)

ICF Domain:

Body Function – Subcategory: Functions of the Skin

Number of Items:

8

Instructions for Administration and Scoring:

Administration:

- clinician-administered; raters indicate client status based on personal knowledge of the client or chart review.
- Items are scored as either dichotomous (yes/no) or on domain specific scales that range from 0-1 to 3-5. Domains are scored based on descriptive criteria provided on the scoring sheet (for example, ‘body build’: average – 0; above average – 1; obese – 2; below average - 3).
- Administration time is usually 5-10 minutes.

Equipment: None.

Scoring:

- Scores are totaled to produce a summary score from 3 (best prognosis) to 45 (worst prognosis).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Interpreting scores is difficult given lack of detail in item descriptions.
- Scores of 10+ denote risk of developing a pressure ulcer, 15+ high risk and 20+ very high risk. No rationale is provided for how these numbers were determined.
- No normative data or cut-points have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).
### Languages:

English.

### Training Required:

None but reading the manual is recommended.

### Availability:

Scoring:
Add up the scores from each category to get the total Waterlow score.

If sum =
10-15 – At Risk
15 – 20 – High Risk
20+ - Very High Risk

Patient Name: ___________________ Date: __________________________

Several scores per category can be used.

<table>
<thead>
<tr>
<th>Build/Weight for height</th>
<th>Appetite</th>
<th>Tissue Malnutrition</th>
<th>Neurological deficit</th>
<th>Major surgery/trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>Average</td>
<td>Terminal cachexia</td>
<td>Diabetes, MS, CVA motor/sensory, paraplegia</td>
<td>Orthopaedic – below waist, spinal</td>
</tr>
<tr>
<td>Above average</td>
<td>Poor</td>
<td>Cardiac failure</td>
<td></td>
<td>On table for over 2 hours</td>
</tr>
<tr>
<td>Obese</td>
<td>NG tube/ fluids only</td>
<td>Peripheral vascular disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below</td>
<td>NBM/ anorexic</td>
<td>Anaemia</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Smoking</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Build/Weight for height</td>
<td>Appetite</td>
<td>Tissue Malnutrition</td>
<td>Neurological deficit</td>
<td>Major surgery/trauma</td>
</tr>
<tr>
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<td>Diabetes, MS, CVA motor/sensory, paraplegia</td>
<td>Orthopaedic – below waist, spinal</td>
</tr>
<tr>
<td>Above average</td>
<td>Poor</td>
<td>Cardiac failure</td>
<td></td>
<td>On table for over 2 hours</td>
</tr>
<tr>
<td>Obese</td>
<td>NG tube/ fluids only</td>
<td>Peripheral vascular disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below</td>
<td>NBM/ anorexic</td>
<td>Anaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smoking</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Build/Weight for height</td>
<td>Appetite</td>
<td>Tissue Malnutrition</td>
<td>Neurological deficit</td>
<td>Major surgery/trauma</td>
</tr>
<tr>
<td>Average</td>
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<td>Terminal cachexia</td>
<td>Diabetes, MS, CVA motor/sensory, paraplegia</td>
<td>Orthopaedic – below waist, spinal</td>
</tr>
<tr>
<td>Above average</td>
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<td>Cardiac failure</td>
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<td>On table for over 2 hours</td>
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<td>Obese</td>
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<tr>
<td>Below</td>
<td>NBM/ anorexic</td>
<td>Anaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clinical Considerations:

- The Waterlow scale is quick and easy to use screen that provides predictive information about the risk of developing a pressure sore.
- The scale omits items previously found to be important predictors of pressure ulcer development for people with SCI in acute and rehabilitation settings. The reliability of the scale has not been demonstrated with a SCI population, but poor inter-rater reliability has been reported in other populations.
- The scale is easy to score and administrate with no patient burden.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reactivity:
No values were reported for the reliability of the Waterlow scale for the SCI population.

Validity:
- The Waterlow scale was significantly and poorly correlated to the Stirling’s ulcer severity scale whether the scales were treated as continuous variables (Spearman’s $\rho=-0.28$) or categorical variables (Spearman’s $\rho=0.32$).
- ROC analysis yielded an AUC of 76 (95% CI: 68-84).
[Wellard 2000, Ash 2002]

Responsiveness:
No values were reported for the responsiveness of the Waterlow Scale for the SCI population at this time.

Floor/ceiling effect:
- 64% of patients were reported to be high risk, while the remaining 36% of patients were reported to be at very high risk.
[Wellard 2000]
28.2.6 Functions of the Reproductive System

Emotional Quality of the Relationship Scale (EQR)

- useful in looking at aspects of relationships experienced by individuals with SCI. It measures affection, emotional intimacy and communication.

More specifically, the EQR scale measures:
  - feelings of affection and intimacy
  - ability to solve problems within the relationship
  - ability to communicate about sex with the partner
  - satisfaction with these areas and the relationship as a whole.

ICF Domain:

Body Functions – Subcategory: Functions of the Reproductive System.

Number of Items:

7

Instructions for Administration and Scoring:

Administration:

- Self-report instrument that takes approximately 2-5 minutes to complete.

Equipment: None.

Scoring:

- Scores are summed resulting in a composite score that ranges from a minimum score of 7 to a maximum of 28.

- Items are scored on a four-point ordinal scale ranging from 4 (very great) to 1 (very poor).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores indicates that the emotional quality of the relationship is stronger.
- Mean values for SCI patients range from approximately 22 to 24.
- There are no definitions and classifications of the results provided.
- No cut-points or normative data have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English.

Training Required:
Though no special equipment or training is required, items can elicit an emotional response that may require professional attention.

**Availability:**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Scale Point</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affection:</strong> How are your emotional feelings towards your partner?</td>
<td>From very great to very poor</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Communication:</strong> Do you express your feelings of affection for your partner?</td>
<td>From very often to very seldom</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Satisfaction:</strong> Are you satisfied with your partner’s way of expressing his or her feelings of affection for you?</td>
<td>From very satisfied to very dissatisfied</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Satisfaction:</strong> Have you considered divorce or separation?</td>
<td>From never to very often</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Problem Solving:</strong> How is your ability to handle problems within the relationship?</td>
<td>From very satisfying to very dissatisfying</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Communication:</strong> Can you and your partner communicate about sexual concerns?</td>
<td>From very easily to not at all</td>
<td>4-1</td>
</tr>
<tr>
<td><strong>Satisfaction:</strong> Are you, most of the time, satisfied with your relationship as a whole?</td>
<td>From very much to not at all</td>
<td>4-1</td>
</tr>
</tbody>
</table>

Sum the points up to get a score from 7 – 28.

**Clinical Considerations:**

- 30% - 40% of the subjects thought the questions regarding sex were difficult to answer.
- Due to the lack of current literature using this tool, other more mainstream methods such as client interview should be used in conjunction with this scale.
- The tool could feasibly be used for individuals with both tetraplegia and paraplegia.
- Staff burden is limited given the self-report nature of the scale

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

- Internal consistency of the EQR is excellent (Cronbach’s α=0.85). [Kreuter et al. 1994a, Kreuter et al. 1994b]

**Validity:**

- The EQR is significantly (p<.01) and poorly correlated with the:
28.2 BODY FUNCTION/STRUCTURE

- Sexual Behaviour Scale (Pearson’s r=0.45)
- Hospital Anxiety and Depression Scale (Pearson’s r=-0.38)
- Quality of Life (Visual Analog Scale) (Pearson’s r=0.37).

[Kreuter et al. 1994b, Kreuter et al. 1996]

**Responsiveness:**
No values were reported for the responsiveness of the EQR for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the EQR for the SCI population.
Knowledge, Comfort, Approach and Attitude towards Sexuality Scale (KCAASS)

- developed to assess the training needs and professional skills of staff working in sexuality rehabilitation with SCI patients.
- Four subscales are found within the questionnaire:
  1) knowledge (14 items)
  2) comfort (21 items)
  3) approach (5 items)
  4) attitudes (5 items)

ICF Domain:

Body Function – Subcategory: Functions of the Reproductive System.

Number of Items:

45

Instructions for Administration and Scoring:

Administration:

- The KCAASS is administered by interview, but can be self-administered.
- A four-point Likert scale is used for all subscales, where 1=no knowledge/no discomfort/strongly disagree and 4=excellent knowledge/high discomfort/strongly agree.
- **Approximately 10-15 minutes** is required to complete the scale.

Equipment: None.

Scoring:

- Summary scores for each of the four aspects of sexuality are calculated.
- Higher scores represent greater knowledge and skills.
- The subscales comfort, approach and attitude are reverse scored.
- A maximum composite score of 200 is obtained by summing up the subscales.

Interpretability:

MCID: not established  
SEM: not established  
MDC: not established

- Scores for each scale provide an assessment of where education time should be allocated when creating a sexual education program.
- No normative data have been established for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet).

Languages:

English.
Training Required:

Knowledge about disability and sexuality is recommended.

Availability:

Can be found in Kendall et al. 2003.

Clinical Considerations:

- The KCAASS addresses a broad range of potential topics, which helps identify specific areas that should be focused on when developing sexual education programs for staff working within the spinal cord population.
- Information elicited from this tool could enhance the quality and comfort of sexual education for both the staff and client.
- The KCAASS was developed specifically for use within the SCI population

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:

- Internal consistency is excellent for the total KCAASS (Cronbach’s $\alpha$=0.962) and the KCAASS subscales – knowledge (Cronbach’s $\alpha$=0.926-0.929), Comfort (Cronbach’s $\alpha$=0.972-0.977), Approach (Cronbach’s $\alpha$=0.835-0.865), and poor to excellent for the KCAASS subscale Attitude (Cronbach’s $\alpha$=0.641-0.802).

Validity:

- Correlations between KCAASS subscales and KCAASS total are as follows:
  - Knowledge-total = 0.757
  - Comfort-total=0.938
  - Approach-total=0.676
  - Attitude-total=0.297

Responsiveness:

- Pre and Post education subscale scores (knowledge, comfort, approach, and attitude) all showed significant change at $P<.001$.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the KCAASS for the SCI population.
Sexual Attitude and Information Questionnaire (SAIQ)

- developed to evaluate the impact of counseling programs and sexual education for persons with SCI and their partners.
- considers both sexual behavior and sexual/non-sexual concerns, illustrating a client-centered questionnaire.
- The SAIQ consists of 4 scales:
  1) Sexual Information
  2) Sexual Behavior Acceptability
  3) Sexual Concerns
  4) Non-sexual Concerns.
Each subscale presents separate information: higher scores for scale I suggest individuals are knowledgeable about physiological aspects of sexual functioning, higher scores on scale II represents acceptance of sexual behaviors, higher scores on scale III indicates little concern about sexual functioning, and higher scores on scale IV suggests considerable concern about non-sexual functioning.

ICF Domain:

Body Function – Subcategory: Functions of the Reproductive System

Number of Items:
39

Instructions for Administration and Scoring:

Administration:
- self-report questionnaire.
- Administration and scoring of the tool takes approximately 10-15 minutes.

Equipment: None.

Scoring:
- scored using a 6-point Likert-scale (from ‘totally disagree/extremely concerned’ to ‘totally agree/not concerned’).
- The subscales are scored independently of one another. Scale I is scored according to the number of items answered correctly and Scales II - IV by summing ratings across items.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Normative data for the SCI population are not available and no meaningful cut points have been established.
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:
28.2 BODY FUNCTION/STRUCTURE

Training Required:

If the SAIQ is used as part of a counseling or training program then staff training is required.

Availability:

Available from the authors – contact Brockway JA; Dept of Rehabilitation Medicine, University of Washington Medical School, Seattle, Washington.

Clinical Considerations:

• The SAIQ may prove to be a useful tool to evaluate the effectiveness of sexual counseling and education programs designed for individuals SCI. It may also be useful for identifying individuals who would benefit from such a program.

• The questionnaire may require updating, as there has been a considerable increase in public awareness and understanding of issues such as erectile dysfunction since its publication in 1980.

• The SAIQ is easy to complete and the phrasing is clear; however, the content may be culturally sensitive.

Measurement Property Summary:

# of studies reporting psychometric properties:

Reliability:

• Split-half reliability of the SAIQ subscales are:
  o excellent for Sexual Concern (r=0.79-0.82)
  o excellent for Non-sexual Concern (r=0.81-0.90)
  o adequate to excellent for Sexual Information (r=0.72-0.77)
  o adequate for Sexual behavior acceptability (r=0.47-0.68).

• Test-retest reliability is adequate to excellent for SAIQ subscales (r=0.69-0.91). [Brockway & Steger 1981, Brockway et al. 1978]

Validity:

• Correlations between subscales of the SAIQ are as follows: [Sexual Information (I), Sexual Behavior Acceptability (II), Sexual Concerns (III), and Non-Sexual Concerns (IV)]
  o I and: II (r=0.30), III (r=0.27), IV (r=-0.29)
  o II and: III (r=0.06-0.27), IV (r=-0.23-0.07)
  o III and IV (r=-0.44-0.82)
[Brockway & Steger 1981, Brockway et al. 1978]

Responsiveness:

• Means are given for pre and post sex education and counseling.

  • A t-test for correlated means was used to evaluate score changes after the counseling; Sexual Information (t=1.17), Sexual Behaviour Acceptability (t=2.14), Sexual concern (t=2.50), Non-sexual concern (t=0.04).
[Brockway et al. 1978]
Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SAIQ for the SCI population.
**Sexual Behaviour Scale (SB)**

- measures the sexual expressions used by couples. Items cover touching, kissing, stimulation of genital and other erogenous zones, and sexual intercourse.

**ICF Domain:**

Body Function – Subcategory: Functions of the Reproductive System

**Number of Items:**

7

**Instructions for Administration and Scoring:**

**Administration:**

- self-report instrument.
- The time taken to complete the SB is **less than 5 minutes**.

**Equipment:** None.

**Scoring:**

- Items are summed resulting in a composite score that ranges from a maximum value of 49 to a minimum value of 7.

**Interpretability:**

- **MCID:** not established
- **SEM:** not established
- **MDC:** not established

- There are no definitions or classifications, cut point or norms for the SCI population provided to assist with interpreting the scores.
- No descriptions of scores are given, other than the higher the score the better.
- Published data for the SCI population are available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

English.

**Training Required:**

No special training is required.

**Availability:**

Unable to locate this scale for use at this time.

**Clinical Considerations:**

- The SB allows a couple to gain insight into the type and degree of sexual expression they experience together. The information obtained from this tool might be useful in assisting couples with issues related to sexual intimacy.
• There is limited information found on the SB thus further study is required before recommending this tool for clinical use.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

- Internal consistency of the SB Scale is **excellent** (Cronbach’s $\alpha=0.96$).
  [Kreuter et al. 1994a, Kreuter et al. 1994b]

**Validity:**

- Persons with SCI scored significantly lower on the SB scale than the control group ($P<.001$).
  [Kreuter et al. 1996]

**Responsiveness:**

No values were reported for the responsiveness of the SB scale for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the SB scale for the SCI population.
Sexual Interest, Activity and Satisfaction Scale (SIAS) & Sexual Activity and Satisfaction Scale (SAS)

- both tools investigate the sexual activity and satisfaction of individuals with SCI.
- SIAS covers 3 domains: 1) sexual desire, 2) sexual activity, and 3) sexual satisfaction.
- SAS covers 2 domains: 1) sexual activity and 2) sexual satisfaction.

ICF Domain:
Body Function – Subcategory: Functions of the Reproductive System

Number of Items:
SIAS - 6 items; SAS – 3 items

Instructions for Administration and Scoring:

Administration:
- Both scales are self-report but may be administered in interview format if required.

Equipment: None.

Scoring:
- The response items can be summed without weights or standardization.

Interpretability:
MCID: not established
SEM: not established
MDC: not established
- Higher scores indicate greater sexual activity and satisfaction.
- No normative data for the SCI population has been reported at this time.
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:
Only English so far.

Training Required:
No special training is required to score or administer the scales.

Availability:
The SIAS was not found.
The SAS is shown here:

<table>
<thead>
<tr>
<th>Questions</th>
<th>Scale Point</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual activity: How often do you and your partner engage in sexual activity, with or without intercourse?</td>
<td>From every day to never</td>
<td>8-1</td>
</tr>
</tbody>
</table>
### Clinical Considerations:

- Detailed explanation of the purpose of the scale modification is not provided in the literature.
- This tool is one of the better-researched measures within the area of sexual interest and satisfaction: There is strong psychometric support for the scales. However, the items may contain content that is culturally sensitive.
- Both of these tools may be clinically useful to assist in understanding, describing and quantifying the sexual activity and satisfaction of individuals with SCI (both tetra and paraplegia).
- Ultimately, these tools may also be effective in evaluating the effectiveness of sex specific interventions.

### Measurement Property Summary:

#### # of studies reporting psychometric properties: 3

#### Reliability:
- Internal consistency is **excellent** for the SAS scale (Cronbach’s α=0.87) as well as for the SIAS scale (Cronbach’s α=0.86).
  
  [Kreuter et al. 1994a, Kreuter et al. 1996]

#### Validity:
- Correlation of the SIAS is significant and:
  - **excellent** with the Sexual Behaviour Scale (Pearson’s r=0.82-85)
  - **adequate** with the Emotional Quality of the Relationship Scale (Pearson’s r=0.55-0.57)
  - **adequate** with the Hospital Anxiety and Depression Scale (Pearson’s r=0.49).
  
  [Kreuter et al. 1994a, Kreuter et al. 1996]

#### Responsiveness:
No values were reported for the responsiveness of the SIAS or SAS for the SCI population.

#### Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SIAS or SAS for the SCI population.
Sexual Interest and Satisfaction Scale (SIS)

- measures sexual adjustment after SCI.
- designed to assess different aspects of sexuality before and after injury.
- has 2 domains: interest in sexuality and sexual satisfaction.

ICF Domain:

Body Function – Subcategory: Functions of the Reproductive System

Number of Items:

6

Instructions for Administration and Scoring:

Administration:

- self-administered then checked by personal interview.
- Four items determine the impact SCI had on sexuality and sexual function using a 4-point response scale (increased=3, unchanged=2, decreased=1, and absent=0). The remaining 2 questions assess general satisfaction after injury and the difference between satisfaction post- and pre-injury, using a modified 7-point visual analogue scale (ranging from very dissatisfied (1) to very satisfied (7)).

Equipment: None.

Scoring:

- The scores for the 2 satisfaction items are rescaled to a range of 0 to 3 in order to enable calculation of a composite score.
- The composite score is a sum of 6 items and has a maximum value of 18 and a minimum value of 0.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Achieving a high score on the SIS illustrates greater sexual adjustment while a lower scorer demonstrates poor sexual adjustments after SCI.
- There are no known cut points or norms for the SCI population to assist with interpretation.

Languages:

Only English so far.

Training Required:

None but knowledge about sexuality is helpful.

Availability:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Questions</th>
<th>Scale Points</th>
<th>Scale Score (0 – 3)</th>
</tr>
</thead>
</table>

Sexual Interest & Satisfaction Scale (SIS)
### 1. Sexual desire
How is your sexual desire now compared to before injury?
- Non-existent (0)
- Decreased (1)
- Unchanged (2)
- Increased (3)

### 2. Importance of sexuality
How important is sexuality to you now compared to before injury?
- Non-existent (0)
- Decreased (1)
- Unchanged (2)
- Increased (3)

### 3. General satisfaction with sex life after injury
How is your relationship, most of the time, with your sexual partner after injury?
- VAS scale*: 1- very dissatisfying
- 7- very satisfying

Reported score*:
__________________

Scale score:
___________________

### 4. General satisfaction after injury compared w/ before injury
How was your relationship, most of the time, with your sexual partner before injury?
Subtract the pre-injury VAS score from the VAS score (1-7) in item #3.
- Post-injury minus pre-injury VAS score**=
- Range: -6 to 6

Reported score**:
__________________

Scale score:
___________________

### 5. Perceived personal satisfaction
How are your possibilities and your ability to enjoy sexuality yourself?
- Very dissatisfying (0)
- Rather dissatisfying (1)
- Rather satisfying (2)
- Very satisfying (3)

### 6. Self-rated ability to give partner satisfaction
How are your possibilities and your ability to give your partner sexual fulfillment?
- Very dissatisfying (0)
- Rather dissatisfying (1)
- Rather satisfying (2)
- Very satisfying (3)

Total score: _______________

For items 3 and 4, the reported scores do not have a range of 0-3. Take the reported score and compare to the tables below to figure out the proper scaled score (0-3) for the composite score (0-18).

* Rescaled to fit the composite score:

<table>
<thead>
<tr>
<th>VAS score range:</th>
<th>Composite score (0-3):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1.1-3</td>
<td>1</td>
</tr>
<tr>
<td>3.1-5.5</td>
<td>2</td>
</tr>
<tr>
<td>&gt;5.5</td>
<td>3</td>
</tr>
</tbody>
</table>

**Rescaled to fit the composite score:

<table>
<thead>
<tr>
<th>VAS difference</th>
<th>Composite</th>
</tr>
</thead>
</table>
### 28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>score range:</th>
<th>score (0-3):</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;-2</td>
<td>0</td>
</tr>
<tr>
<td>-2 to -0.1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>&gt;0</td>
<td>3</td>
</tr>
</tbody>
</table>

Add up the points from each category together to get a final score from 0 – 18.

**Clinical Considerations:**

- The SIS provides a reasonably well-defined spinal cord specific measure that may be useful in eliciting information regarding a sensitive area.

- Although it has not been widely used and psychometric properties have been reported by only one study, it is one of few sexuality scales that have been used within the SCI population.

- The type of SCI needs to be taken into consideration when interpreting the results. Sexual adjustment for those with incomplete injuries may differ considerably when compared to complete injuries. Items should be acceptable to both males and females though items may seem personal and embarrassing to some.

- The SIS was developed for use in the SCI population. It provides a quick review of the individual’s sexual experiences, while factoring in their pre-injury state.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency of the SIS is excellent (Cronbach’s α=0.96).

  [Siosteen et al. 1990]

**Validity:**

- The SIS is excellently correlated with age at injury (Pearson’s r=0.63) and Quality of Life (QL-VAS method) – Dysfunction rating (Pearson’s r=-0.61) and adequately with Total QL rating (Pearson’s r=0.52), QL-Loss of independence (Pearson’s r=-0.49) and QL-Depression (Pearson’s r=-0.45).

  [Siosteen et al. 1990]

**Responsiveness:**

No values were reported for the responsiveness of the SIS scale for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the SIS for the SCI population.
28.2 BODY FUNCTION/STRUCTURE

28.2.7 Functions - General

Spinal Cord Injury Secondary Conditions Scale (SCI-SCS)

• specifically targets secondary conditions associated with SCI that directly and indirectly impact health and physical functioning.

• Items were selected based on 3 criteria: (a) that they represent conditions that are physiologic in nature (vs psychological or environmental); (b) that they are measurable by patient history and physical examination, reported episodes, validated scales, or medical tests or interventions; and (c) those that can be either prevented or managed with medical intervention and/or health behaviors. Items represent problems in the areas of skin, musculoskeletal, pain, bowel/bladder, and cardiovascular.

ICF Domain:

Body Function – Subcategory: General Functions.

Number of Items:

16

Instructions for Administration and Scoring:

Administration:

• self-report questionnaire.

• The rating scale uses a 4-point ordinal scale ranging from 0 (not experienced/insignificant problem never limiting activity) to 3 (significant/chronic problem).

Equipment: None.

Scoring:

• Total score is derived from the sum of the problem ratings.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

• Total scores range from 0 to 48.

• Higher scores indicate greater overall problems with secondary conditions.

• No meaningful cut points, normative data or responsiveness data have been established at this time for the SCI population

• Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

N/A.

Training Required:

None.
### Availability:

Instructions to patient:
For the following 16 health problems, please rate how much each one affected your activities and independence in the last 3 months. If you have not experienced a secondary condition in the last 3 months or if it is an insignificant problem for you, please circle “0.” Use the following scale to rate each of the secondary conditions.

**SCI-SCS Rating System:**
0 = NOT experienced in the last 3 months or is an insignificant problem.
1 = MILD or INFREQUENT problem.
2 = MODERATE or OCCASIONAL problem.
3 = SIGNIFICANT or CHRONIC problem.

Patient name: ___________________________ Date: ______________________

<table>
<thead>
<tr>
<th>Health problem</th>
<th>Description</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure sore(s)</td>
<td>These develop as a skin rash or redness and progress to an infected sore. Also called skin ulcers, bedsores and decubitus ulcers.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Injury caused by loss of sensation</td>
<td>Injury may occur because of a lack of sensation, such as burns from carrying hot liquids in the lap or sitting too close to a heater or fire.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Muscle spasms (spasticity)</td>
<td>Spasticity refers to uncontrolled, jerky muscle movements, such as uncontrolled muscle twitch or spasm. Often spasticity increases with infection or some kind of restriction, like a tight shoe or belt.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Contractures</td>
<td>A contracture is a limitation in range of motion caused by a shortening of the soft tissue around a joint, such as an elbow or hip. This occurs when a joint cannot move frequently enough through its range of motion. Pain often accompanies this problem.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Heterotopic bone ossification</td>
<td>This is an overgrowth of bone, often occurring after a fracture. Early signs include a loss of range of motion, local swelling and warmth at the area to the touch. This condition must be diagnosed by a physician.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Diabetes is a problem resulting from irregularities in blood sugar levels. Symptoms include frequent urination and excessive thirst. This condition is diagnosed by a physician.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Bladder dysfunction</td>
<td>Incontinent, bladder or kidney stones, kidney problems, urine leakage and urine back up are all symptoms of bladder dysfunction. NOTE: there is a separate item for urinary tract infections.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Bowel dysfunction</td>
<td>Diarrhea, constipation, “accidents”, and associated problems are signs of bowel dysfunction.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>This includes infections such as cystitis and pseudomonas. Symptoms include pain when urinating, a burning sensation throughout the body, blood in the urine and cloudy urine.</td>
<td>0 1 2 3</td>
</tr>
</tbody>
</table>
### 28.2 BODY FUNCTION/STRUCTURE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual dysfunction</td>
<td>This includes dissatisfaction with sexual functioning. Causes for dissatisfaction can be decreased sensation, changes in body image, difficulty in movement, and problems with bowel or bladder, like infections.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Autonomic dysreflexia</td>
<td>Autonomic dysreflexia, sometimes called hyperreflexia, results from interference in the body’s temperature regulating systems. Symptoms of dysreflexia include sudden rises in blood pressure and sweating, skin blotches, goose bumps, pupil dilation and headache. It can also as the body’s response to pain where an individual doesn’t experience sensation.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Postural hypotension</td>
<td>This involves a strong sensation of lightheadedness following a change in position. It is caused by a sudden drop in blood pressure.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Circulatory problems</td>
<td>Circulatory problems involve the swelling of veins, feet or the occurrence of blood clots.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Respiratory problems</td>
<td>Symptoms of respiratory infections or problems include difficulty in breathing and increased secretions.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>This is usually experienced as chronic tingling, burning or dull aches. It may occur in an area that has little to no feeling.</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>Joint and muscle pain</td>
<td>This includes pain in specific muscle groups or joints. People who must overuse a particular muscle group, such as shoulder muscles, or who put too much strain on their joints are at risk of developing pain.</td>
<td>0 1 2 3</td>
</tr>
</tbody>
</table>

**Total Score (/48): __________**

**Clinical Considerations:**
- Only one study has assessed the psychometric properties of the SCI-SCS among the SCI population.

**Measurement Property Summary:**
- **# of studies reporting psychometric properties:** 1

**Reliability:**
- The SCI-SCS was administered across 5 time-points, spanning 2 years post-intervention. The internal consistency across each of the time points was **adequate to excellent** (Cronbach’s \( \alpha \)=0.761 – 0.869). The test-retest reliability values across the time points ranged from **adequate to excellent** \( r=0.569-0.805 \).
  
  [Kalpakjian et al. 2007]

**Validity:**
- The SCI-SCS total score has **excellent** correlations with the 6 items of the SF-12, Spearman’s \( \rho \) values range from 0.317 to 0.644.
  
  [Kalpakjian et al. 2007]

**Responsiveness:**
- No values were reported for the responsiveness of the SCI-SCS for the SCI population.
Floor/ceiling effect:

- There are ceiling effects on 3 categories of secondary conditions (>20% scored in the highest category):
  - sexual dysfunction (26.2%)
  - chronic pain (32.3%)
  - joint and muscle pain (29.2%)

- There are floor effects on all 16 categories of secondary conditions (>20% scored in the lowest category):
  - pressure sore (76.9%)
  - injury caused by loss of sensation (76.9%)
  - muscle spasms (41.5%)
  - contractures (67.7%)
  - heterotopic bone ossification (89.2%)
  - diabetes mellitus (87.7%)
  - bladder dysfunction (36.9%)
  - bowel dysfunction (40.0%)
  - urinary tract infections (61.5%)
  - sexual dysfunction (43.1%)
  - autonomic dysreflexia (70.8%)
  - postural hypotension (80.0%)
  - circulatory problems (50.8%)
  - respiratory problems (80.0%)
  - chronic pain (33.8%)
  - joint and muscle pain (29.2%)

[Kalpakjian et al. 2007]
Appraisals of Disability: Primary and Secondary Scale (ADAPSS)

- ADAPSS primary scale assesses ‘an individual’s initial evaluation of an event or situation’. Its secondary scale assesses ‘an individual’s evaluation of their own coping resources, the possibility of these resources being adequate, and the likelihood that these resources can be employed effectively’.

- The scale consists of 6 subscales:
  1) Fearful Despondency
  2) Overwhelming Disbelief
  3) Determined Resolve
  4) Growth and Resilience
  5) Negative Perceptions of Disability
  6) Personal Agency.

ICF Domain:

Body Function – Subcategory: General Functions.

Number of Items:

33

Instructions for Administration and Scoring:

Administration:

- patient-reported; self-administered questionnaire.

- Participants are asked to rate their agreement/disagreement with the statements on a Likert Scale.

Equipment: None.

Scoring:

- The authors do not provide scoring instructions; however it seems that subscale scores are reported (sum the score from each item of a subscale to get the subscale score).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- High scores on the Fearful Despondency, Overwhelming Disbelief, and Negative Perceptions of Disability subscales represent greater agreement with the appraisals; respondents with higher scores on these subscales are more likely to appraise their injury in terms of loss and threat and to perceive their injury as unmanageable.

- Low scores on the Determined Resolve, Growth and Resilience, and Personal Agency subscales represent greater agreement with the appraisals (though the range of scores is not provided). Respondents with lower scores on these subscales were more likely to appraise their injury in terms of loss and threat and to perceive their injury as unmanageable.
28.2 BODY FUNCTION/STRUCTURE

- No information is given regarding norms or meaningful cut-off scores for the SCI population, although the ADAPSS is still in early stages of development.

**Languages:**

English.

**Training required:**

None.

**Availability:**

Unable to locate a copy of this scale for use at this time but the author can be contacted at: paul.kennedy@hmc.ox.ac.uk for further information.

**Clinical Considerations:**

- Appraisals are important psychosocial variables in SCI populations as they have been found to be good predictors of emotional adjustment. The ADAPSS is useful in the clinical setting to better understand the appraisals which are significant for adjustment to SCI and thus to tailor treatment programs for patients.
- The ADAPSS is a SCI-specific appraisal scale. The questions are straightforward and the scale covers a range of appraisal themes. However, the ADAPSS is still in the early stages of development: its psychometric properties have been evaluated in only one study and it has only been tested in the community-dwelling SCI population.
- A self-administered format is recommended but an interviewer or proxy could be used in the case of severe physical disability. The assessment seems easy to administer and score.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency is adequate to excellent for the ADAPSS subscales (Personal Agency – Cronbach’s α=0.70 to Fearful Despondency – Cronbach’s α=0.85).
- Test-rest reliability for the ADAPSS subscales is adequate to excellent (Cronbach’s α=0.74-0.86).

[Dean & Kennedy 2009]

**Validity:**

- All six ADAPSS subscales were significantly correlated with:
  - the Hospital Anxiety and Depression Scale – Anxiety subscale (Spearman’s ρ=0.187-0.649)
  - the Needs Assessment Checklist – Perceived Manageability scale (Spearman’s ρ=0.345-0.599).

[Dean & Kennedy 2009]
Responsiveness:
No values were reported for the responsiveness of the ADAPSS for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the ADAPSS for the SCI population.
### SCI Exercise Self-Efficacy Scale (ESES)
- SCI-specific scale developed to measure perceived exercise self-efficacy for various types of physical activities.
- requires individuals to indicate their confidence in performing physical activities and exercise. One dichotomous item asks whether the individual has exercised at home and/or in a gym in the past 12 months.

#### ICF Domain:
Body Function – Subcategory: General Functions.

#### Number of Items:
10

#### Instructions for Administration and Scoring:

**Administration:**
- Self-report, pen and paper format.
- requires individuals to respond to items on a 4-point Likert scale (1-not at all true, 4-always true).
- Exercise activity is based on the response to a dichotomous item that specifies whether respondents have exercised ‘at home and/or gym’ vs. ‘no exercise’.
- takes approximately 5 min to administer.

**Equipment:** None.

**Scoring:** The total score is derived by summing the scores for the individual items; possible scores range from 10 to 40.

**Interpretability:**
- MCID: not established
- SEM: not established
- MDC: not established
  - Higher scores indicate greater perceived self-efficacy.
  - The dichotomous item is used to estimate the subject’s average exercise activity.
  - No cut-points and normative data for the SCI population have been established
  - Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet)

**Languages:**
- English

**Training Required:**
- None

**Availability:**
This scale instructs participants to answer on a 4-point rating scale how confident they are with regard to carrying out regular physical activities and exercise.

**ESES Rating Scale:**
1 = not always true
2 = rarely true
3 = moderately true
4 = always true

Patient Name: _________________________ Date: ______________________

<table>
<thead>
<tr>
<th>I am confident....</th>
<th>Rating:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) that I can overcome barriers and challenges with regard to physical activity and exercise if I try hard enough</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>2) that I can find means and ways to be physically active and exercise</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>3) that I can accomplish my physical activity and exercise goals that I set</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>4) that when I am confronted with a barrier to physical activity or exercise I can find several solutions to overcome this barrier</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>5) that I can be physically active or exercise even when I am tired</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>6) that I can be physically active or exercise even when I am feeling depressed</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>7) that I can be physically active or exercise even without the support of my family or friends</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>8) that I can be physically active or exercise without the help of a therapist or trainer</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>9) that I can motivate myself to start being physically active or exercising again after I’ve stopped for a while</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>10) that I can be physically active or exercise even if I had no access to a gym, exercise, training or rehabilitation facility</td>
<td>1 2 3 4</td>
</tr>
</tbody>
</table>

Sum: ________________

Clinical Considerations:

- Self-efficacy is the belief individuals have in their ability to perform certain behaviours to achieve desired outcomes. The ESES measures the subject’s perceived exercise self-efficacy beliefs. Evidence suggests that the adoption of and adherence to regular exercise is influenced by self-efficacy to perform physical activity. Consequently, this scale was developed to address the lack of an exercise self-efficacy tool for people with SCI.
- The ESES was developed specifically for the SCI population based on expert comments and interviews with individuals with SCI. Therefore, it should represent the physical activity and exercise self-efficacy issues of this unique population.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

- Internal consistency of the ESES scale is excellent (Cronbach’s α =0.87-0.93).
- Test-retest reliability employed split-half internal consistency and was found to be 0.8836 (Equal-Length Spearman-Brown test).
28.2 BODY FUNCTION/STRUCTURE

[Kroll et al. 2007]

Validity:
- The ESES is significantly (P<.05) and **poorly** correlated with the Generalised Self Efficacy Scale (Spearman’s $\rho=0.316$).

[Kroll et al. 2007]

Responsiveness:
No values were reported for the responsiveness of the ESES scale for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in ESES for the SCI population.
Moorong Self-Efficacy Scale (MSES)

- developed to measure self-efficacy in performing functional activities of daily living in individuals with SCI.
- consists of two factors: daily activities (e.g. I can maintain my personal hygiene with or without help), and social functioning (e.g. I can enjoy spending time with my friends).

ICF Domain:

Body Function – Subcategory: General Function

Number of Items:

16

Instructions for Administration and Scoring:

Administration:

- self-report questionnaire
- Participants rate their confidence in their ability to complete the 16 tasks on a seven-point Likert scale (1-very uncertain, 7-very certain).
- Approximately 5 minutes is required to administer the test.

Equipment: None.

Scoring:

- The total scale score (16-112) is obtained by summing the individual item responses.
- For the factor or subscale scores, add:
  - for factor “Daily Activities / Instrumental Self-efficacy” subscale score: sum the 7 items (good health, work, accomplishing things, personal hygiene, persistence in learning things, fulfilling lifestyle, household participation)
  - for factor “Social Functioning / Interpersonal Self-efficacy” subscale score: sum the 8 items (maintaining contact, friends, family relationships, unexpected problems, fulfilling lifestyle, leisure, accomplishing things, household participation).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores indicate higher perceived self-efficacy.
- The scale was able to show a mean change of 8 points (84 – 92) over 6 months in a sample of individuals undergoing sub-acute rehabilitation post-SCI.
- No normative data or cut points for the scale have been established for the SCI population as of yet.

Languages:

English

Training Required:
None.

**Availability:**


**Clinical Considerations:**

- The scale is specific to individuals with SCI.
- Individuals with a strong sense of self-efficacy will set challenging goals and have greater expectations resulting from their efforts. Such an efficacious outlook may positively influence rehabilitation efforts. The measurement of self-efficacy in rehabilitation may thus help to identify areas in which individuals with SCI have low self-efficacy of which may be modified via self-efficacy enhancing sources of information.

**Measurement Property Summary:**

- # of studies reporting psychometric properties: 1

**Reliability:**

No values were reported for the reliability of the MSES for the SCI population.

**Validity:**

- The MSES is significantly and **adequately** correlated to Satisfaction with Life Scale scores ($r=0.51$), Personal Resources Questionnaire-2000 (0.56) and the Centre for Epidemiological Studies – Depression Scale – 10 item version (-0.54).

[Miller 2009]

**Responsiveness:**

No values were reported for the responsiveness of the MSES for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the MSES for the SCI population.
Spinal Cord Lesion Coping Strategies Questionnaire (SCL-CSQ)

- developed to measure coping after a sudden onset SCI.
- made up of three domains:
  1) Acceptance of Injury
  2) Social Reliance
  3) Fighting Spirit.
  The acceptance domain measures the extent of reevaluation of life values, fighting spirit domain measures efforts to behave independently, and the social reliance domain measures the tendency towards depended behavior.

ICF Domain:

Body Function – Subcategory: General Functions

Number of Items:

12

Instructions for Administration and Scoring:

Administration:

- self-report scale; can be completed in hard copy, online or over the telephone.
- Participants are asked to answer each question on a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree).

Equipment: None.

Scoring:

- Domain scores are summed and then averaged. Scores range between 1 and 4 for each domain.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores indicate greater affirmation of the domain to coping.
- No cut scores or norms for the SCI population have been reported at this time.
- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet).

Languages:

Swedish, English

Training Required:

None.

Availability:

Each item is rated on a 4-point Likert-type scale ranging from 1-4:
1 = Strongly agree
2 = Agree  
3 = Disagree  
4 = Strongly disagree.

Mean values are computed such that total scores range from 1 to 4.

Patient Name: ___________________ Date: ________________

<table>
<thead>
<tr>
<th>Item:</th>
<th>Rating (1-4):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acceptance</strong></td>
<td></td>
</tr>
<tr>
<td>I have been able to see my lesion in relation to other things in life.</td>
<td></td>
</tr>
<tr>
<td>I think I have accepted my lesion.</td>
<td></td>
</tr>
<tr>
<td>My lesion has made me learn to appreciate new things in life I did not think about before.</td>
<td></td>
</tr>
<tr>
<td>What I have lost physically, I have gained in so many other ways.</td>
<td></td>
</tr>
<tr>
<td><strong>Acceptance domain score (averaged; range 1-4):</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fighting spirit</strong></td>
<td></td>
</tr>
<tr>
<td>I try to make the best of life despite the lesion.</td>
<td></td>
</tr>
<tr>
<td>I refuse to let the lesion rule my life.</td>
<td></td>
</tr>
<tr>
<td>I always try to manage on my own as much as possible.</td>
<td></td>
</tr>
<tr>
<td>It is important for me to set goals that I can fight to achieve.</td>
<td></td>
</tr>
<tr>
<td>I always try to look out for new ways to make life easier.</td>
<td></td>
</tr>
<tr>
<td><strong>Fighting Spirit domain score (averaged; range 1-4):</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Social reliance</strong></td>
<td></td>
</tr>
<tr>
<td>My lesion has taught me that we are all dependent upon others.</td>
<td></td>
</tr>
<tr>
<td>I would feel completely helpless without support from others.</td>
<td></td>
</tr>
<tr>
<td>You have to believe that other people are able to help you.</td>
<td></td>
</tr>
<tr>
<td><strong>Social Reliance domain score (averaged; range 1-4):</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Clinical Considerations:**

- The results of the SCL CSQ are to be used to advise clinicians about specific coping mechanisms of acceptance, fighting spirit and social reliance. Coping strategies have been shown to be associated with emotional well-being. The SCL CSQ is a measure to assess coping efforts, rather than the outcomes of coping which is more typically measured, and may be a more pertinent tool to assess emotional well-being.

- The scale was originally developed for the SCI population.

- The SCL CSQ can be completed online, over the telephone or in person. It is short and simple to complete, and represents no significant burden to the respondent. The scale is simple to administer and score.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**
28.2 BODY FUNCTION/STRUCTURE

- Internal consistency for the SCL-CSQ subscales is as follows:
  - **adequate** for the Acceptance subscale (Cronbach’s $\alpha=0.78-0.79$)
  - **poor to adequate** for the Fighting Spirit subscale (Cronbach’s $\alpha=0.68-0.72$)
  - **poor to adequate** for the Social Reliance subscale (Cronbach’s $\alpha=0.61-0.73$).

[Elfstrom et al. 2002, Elfstrom et al. 2007]

**Validity:**
- Correlation between SCL-CSQ subscales is **poor** for:
  - Acceptance & Fighting Spirit (Pearson’s $r=0.37$)
  - Acceptance & Social Reliance (Pearson’s $r=-0.14$)
  - Fighting Spirit & Social Reliance (Pearson’s $r=-0.13$).
- Correlations between the SCL-CSQ subscales Acceptance and Fighting Spirit are negative, as expected, with the HADS subscales Anxiety and Depression.
- Correlation of the SCL-CSQ Acceptance subscale is **adequate** with the Hospital Anxiety and Depression Scale subscales – Anxiety (Pearson’s $r=-0.45$) and Depression (Pearson’s $r=-0.58$).
- Correlation of the SCL-CSQ Fighting Spirit subscale is **adequate** with the Hospital Anxiety and Depression Scale subscales – Anxiety (Pearson’s $r=-0.40$) and Depression (Pearson’s $r=-0.49$).

[Elfstrom et al. 2002, Elfstrom et al. 2007]

**Responsiveness:**
No values were reported for the responsiveness of the SCL-CSQ for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the SCL-CSQ for the SCI population.
Spinal Cord Lesion Emotional Wellbeing Questionnaire (SCL-EWQ)

- developed to measure emotional consequences after SCI.

- consists of three domains:
  1) Positive emotional outcome of person growth (which determines current positive changes)
  2) Negative outcomes of helplessness (which determines the level of perplexity, out of control and low self-esteem)
  3) Intrusion (which determines the level of bitterness and brooding)

ICF Domain:

Body Functions – Subcategory: General Functions

Number of Items:

12

Instruction for Administration and Scoring:

Administration:

- self-report scale; can be self-completed in hard copy, online or by telephone interview.

- Participants are asked to answer each question on a 4-point Likert Scale (1 = strongly disagree, 2=disagree, 3=agree, 4=strongly agree).

Equipment: None.

Scoring:

- Domain scores are summed and then averaged. Scores range between 1 and 4 for each domain.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher scores indicate greater affirmation of the domain. So, higher scores on the personal growth scale indicate more positive emotional consequences of the SCI and higher scores on the helplessness or intrusion scale indicate more negative emotional consequences.

- No cut scores or norms for the SCI population have been reported.

Languages:

Swedish, English

Training Required:

None

Availability:

Each item is rated on a 4-point Likert-type scale ranging from 1-4:
1 = Strongly agree  
2 = Agree  
3 = Disagree  
4 = Strongly disagree.

Mean values are computed such that total scores range from 1 to 4.

Patient Name: ___________________  Date: __________________

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating (1-4):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Helplessness</strong></td>
<td></td>
</tr>
<tr>
<td>I often feel at a loss without really knowing what to do.</td>
<td></td>
</tr>
<tr>
<td>It often feels like I have no control over my life.</td>
<td></td>
</tr>
<tr>
<td>I often feel isolated - that others do not understand my situation.</td>
<td></td>
</tr>
<tr>
<td>I often feel inferior to people who are not injured.</td>
<td></td>
</tr>
<tr>
<td>I often feel anxious about how my injury might influence my life in</td>
<td></td>
</tr>
<tr>
<td>the future.</td>
<td></td>
</tr>
<tr>
<td>Sometimes I feel like I am ashamed about my lesion.</td>
<td></td>
</tr>
<tr>
<td><strong>Helplessness domain score (averaged; range 1-4):</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Intrusion**                                                        |               |
| I will probably never get over feeling bitter that it had to happen  |               |
| to just me.                                                         |               |
| I often ask myself why I was injured.                                |               |
| My accident feels like an undeserved punishment.                    |               |
| **Intrusion domain score (averaged; range 1-4):**                   |               |

| **Personal Growth**                                                  |               |
| My injury has somehow made me more humble.                           |               |
| I believe the accident has made me more mature.                     |               |
| Since my injury, I feel better about myself.                         |               |
| **Personal Growth domain score (averaged; range 1-4):**              |               |

**Clinical Considerations:**

- The results of the SCL EWQ are used to advise clinicians about specific emotional consequences of a traumatic SCI.
- The SCL EWQ is short and simple to complete. There is no significant respondent burden. The scale is simple to administer and score.
- The scale was originally developed for the SCI population.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency for the SCL-EWQ subscales is:
  - **excellent** for the Helplessness subscale (Cronbach’s $\alpha=0.84$)
28.2 BODY FUNCTION/STRUCTURE

- excellent for the Intrusion subscale (Cronbach’s $\alpha=0.86$)
- adequate for the Personal Growth subscale (Cronbach’s $\alpha=0.75$).

[Elfstrom et al. 2002]

Validity:

- Correlation between SCL-EWQ subscales is (with correlation direction (positive/negative) as expected):
  - adequate for Helplessness & Intrusion (Pearson’s $r=0.63$)
  - poor for Helplessness & Personal Growth (Pearson’s $r=-0.30$)
  - poor for Intrusion & Personal Growth (Pearson’s $r=-0.23$)

[Elfstrom et al. 2002]

Responsiveness:
No values were reported for the responsiveness of the SCL-EWQ for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCL-EWQ for the SCI population.
28.2 BODY FUNCTION/STRUCTURE

Body Function/Structure References

Mental Functions References

BDI:

BSI:

CAGE:

CES-D:
Kuptniratsaikul V, Chulakadabba S, Ratanavijirasil S. An instrument for Assessment of

28-150 BFS References
Depression among Spinal Cord Injury Patients: Comparison between the CES-D and the TDI. J Med Assoc Thai 2002; 85:978-982
Radloff LS. The Use of the Center for Epidemiological Studies of Depression Scale in Adolescents and Young Adults. J Youth Adoles 1991;20:149-166.

DASS-21:

FSS:

GHQ-28:

HADS:
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment and quality of relationships in
Snaith RP. The Hospital Anxiety And Depression Scale. Health and Quality of Life Outcomes, 2003; 1: 29.

**PHQ-9:**

**SCL-90-R:**
28.2 BODY FUNCTION/STRUCTURE

Zung:

Sensory Functions References:

BPI:

Classification System for Chronic Pain in SCI:

Donovan SCI Pain Classification System:

MPI–SCI:

MPRCQ2:

QST:


Tunk's:


WUSPI:


Functions and Structures of the Cardiovascular, Haematological, Immunological and Respiratory Systems References

6-MAT:

Wingate:


28.2 BODY FUNCTION/STRUCTURE


Neuromusculoskeletal and Movement-Related Functions & Structures References

ASIA:


Savic G, Bergstrom EMK, Frankel HL, Jamous MA, Jones PW. Inter-rater reliability of motor and sensory examinations performed according to American Spinal Injury...
28.2 BODY FUNCTION/STRUCTURE


Ashworth:


**Hand-held myometer:**


**PSFS:**


Priebe MM, Sherwood AM, Thornby JI, Kharas NF, Markowski J. Clinical assessment of

SCATS:

SCI-SET:

sEMG:

Functions of the Skin References

Abruzzese:

Braden:
Bergstrom N, Braden BJ, Laguzza A, Holman V. The Braden Scale for Predicting
28.2 BODY FUNCTION/STRUCTURE


Gosnell:

Norton:

SCIPUS:

SCIPUS-A:

Stirling:
28.2 BODY FUNCTION/STRUCTURE


Waterlow:

Functions of the Reproductive System References

EQR:

KCAASS:

Sexual Attitude and Information Questionnaire (SAIQ):

Sexual Behavior Scale:
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment after spinal cord injury (SCI)
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment after spinal cord injury (SCI) -
comparison of partner experiences in pre- and postinjury relationships.

SIAS/SAS:
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment and quality of relationships in
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment after spinal cord injury (SCI)
Kreuter M, Sullivan M, Siosteen A. Sexual adjustment after spinal cord injury (SCI) -
comparison of partner experiences in pre- and postinjury relationships.

SIS:
Siosteen A, Lundqvist C, Blomstrand C, Sullivan L, Sullivan M. Sexual ability, activity,
attitudes and satisfaction as part of adjustment in spinal cord-injured subjects.

Functions - General References

SCI-SCS:
Kalpakjian CZ, Scelza WM, Forchheimer MB, Toussaint LL. Preliminary Reliability and
Validity of a Spinal Cord Injury Secondary Conditions Scale. The Journal of

ADAPSS:
Dean RE, Kennedy P. Measuring Appraisals Following Acquired Spinal Cord Injury: A
Preliminary Psychometric Analysis of the Appraisals of Disability. Rehabilitation

ESES:
Kroll T, Kehn M, Ho PS, Groah S. The SCI exercise self-efficacy scale (ESES):
development and psychometric properties. International Journal of Behavioral
Nutrition and Physical Activity 2007, 4:34.

MSES:
Middleton JW, Tate RL, Geraghty TJ. Self-efficacy and spinal cord injury: psychometric
Miller WC, Anton HA, Townson AF. Measurement properties of the CESD scale among
Miller SM. The measurement of self-efficacy in persons with spinal cord injury:
psychometric validation of the mooring self-efficacy scale. Disability and
Rehabilitation, 2009; 31(12):988-993.

SCL-CSQ:
and psychological outcome in the spinal cord lesioned: development of SCL-
Elfstrom ML, Kennedy P, Lude P, Taylor N. Condition-related coping strategies in
persons with spinal cord injury: a cross-national validation of the Spinal Cord
Lesion-related Coping Strategies Questionnaire in four community samples.
Migliorini CE, Elfstom ML, Tonge BJ. Translation and Australian validation of the spinal
cord lesion-related coping strategies and emotional wellbeing questionnaires.

SCL-EWQ:
and psychological outcome in the spinal cord lesioned: development of SCL-
Migliorini CE, Elfstom ML, Tonge BJ. Translation and Australian validation of the spinal
cord lesion-related coping strategies and emotional wellbeing questionnaires.
28.3 Activity

Activity as defined for use in the International Classification of Function, Health and Disability (WHO 2001) is the execution of a task or action. As such activity can be considered to occur at a person level rather than a systems level such as body function. A debate exists regarding the segregation of activity and participation as separate components or in our case classifications and even the (WHO 2001) acknowledges this difficulty and therefore presents the domains as a single list. Recently Jette et al. (2003) tested the hypothesis that activity and participation were distinct dimensions within physical function. They concluded that distinct concepts were indeed identifiable for mobility and daily activities and social/participation. As such we present physical function. They concluded that distinct concepts were indeed identifiable for mobility and daily activities and social/participation. As such we present tools mobility and self care (daily) activity tools in the following section. The reader is reminded that several tools cross not only domains (mobility, daily activity) but also components (activity, participation). In this case we have classified the tool in the area most clearly represented by measure. For example in a self report questionnaire this would be reflected by the area with the most questions (items).

The outcome measures reviewed under this category include:

28.3.1 Mobility

- 4 Functional Tests for Persons who Self-Propel a Manual Wheelchair (4FTPSMW)
- 6-Minute Walk Test (6MWT)
- 10-Meter Walk Test (10MWT)
- Berg Balance Scale (BBS)
- Box and Blocks Test (BBT)
- Clinical Outcome Variables Scale (COVS)
- Capabilities of Upper Extremity Instrument (CUE)
- Functional Standing Test (FST)
- Graded Redefined Assessment of Strength, Sensibility and Prehension (GRASSP)
- Grasp and Release Test (GRT)
- Jebsen Hand Function Test
- Modified Functional Reach Test (mFRT)
- Pendulum Test (Wartenburg)
- Rivermead Mobility Index (RMI)
- Spinal Cord Injury Functional Ambulation Inventory (SCI-FAI)
- Sollerman Hand Function Test
- Tool for Assessing Mobility in Wheelchair-dependent Paraplegics
- Tetraplegia Hand Activity Questionnaire (THAQ)
- Timed Motor Test (TMT)
- Timed Up and Go Test (TUG)
- Van Lieshout Test Short Version (VLT-SV)
- Walking Index for Spinal Cord Injury (WISCI) and WISCI II
- Wheelchair Circuit (WC)
- Wheelchair Skills Test (WST)

28.3.2 Self Care

- Barthel Index (BI)
- Frenchay Activities Index (FAI)

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28.3 ACTIVITY

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28.3 ACTIVITY

28.3.1 Mobility

4 Functional Tests for Persons who Self-Propel a Manual Wheelchair (4FTPSMW)

- developed to assist clinicians in assessing the effect of different postural supports (e.g. back support and seat cushions) by an experienced group of physiotherapists using a literature review and input from both individuals with SCI and researchers.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

4

Brief Instructions for Administration and Scoring:

Administration:

- clinician-administered
- includes 4 tasks:
  1) timed forward wheeling (23m);
  2) ramp ascent (forward wheeling);
  3) forward vertical reach distance;
  4) one-stroke push.
- Five-minute rest breaks are provided between tasks to limit fatigue.
- takes between 25-35 minutes to complete

Equipment required:

- 23 m corridor
- 1 m measuring stick
- ramp (10.3 m and 1:13 grade
- carpeted surface (1.5 cm pile)
- stop watch.

Scoring:

- wheeling tasks are scored to the nearest second
- reaching and one-stroke push tasks are scored in centimeters.

Interpretability:

MCID: not established
SEM & MDC:

<table>
<thead>
<tr>
<th>SEM and MDC (calculated from May et al. 2003) for the 4 tasks:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEM:</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Forward wheeling</td>
</tr>
</tbody>
</table>
### 28.3 ACTIVITY

<table>
<thead>
<tr>
<th>Forward vertical reach</th>
<th>0.91 cm</th>
<th>2.52 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramps ascent</td>
<td>8.17 seconds</td>
<td>22.65 seconds</td>
</tr>
<tr>
<td>One-stroke push</td>
<td>3.84 cm</td>
<td>10.64 cm</td>
</tr>
</tbody>
</table>

- scoring system is objective and has ratio level properties
- normative data not established for SCI population
- published data is available for comparison for a population with neurological conditions affecting the spinal cord (see the Interpretability section of the Study Details sheet).

**Languages:**

N/A

**Training Required:**

No specific training required.

**Availability:**

Can be found in May LA et al. 2003.

**Clinical Considerations:**

- The 4FTPSMW is a functional test suited for the clinical setting (e.g. the timed forward wheeling task is based on a distance of 23 meters (plus length of the wheelbase) - the average length of a crosswalk in a 4 lane intersection).
- The 4FTPSMW is only relevant to individuals who use a manual wheelchair (i.e. not suited to individuals who use a power wheelchair).
- The tasks were tolerated well by participants. Only the ramp ascent task was difficult for an individual with C6 SCI at 4 months post injury.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Test-retest reliability is **excellent** (r=0.99).
- Inter-rater reliability (found for all tasks except for the one-stroke push) is **excellent** (ICC=0.99).

[May et al. 2003]

**Validity:**

No values were reported for the validity of the 4FTPSMW for the SCI population.

**Responsiveness:**

No values were reported for the responsiveness of the 4FTPSMW for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the 4FTPSMW for the SCI population.
6-Minute Walk Test (6MWT)

- A self-paced test. It measures the distance that a patient can walk on a flat, hard surface in 6 minutes.
- assesses the sub-maximal level of functional capacity.
- The test in its entirety evaluates the integrated response of pulmonary, cardiovascular, and circulatory systems, in addition to level of motor control, functional neuromuscular units, and muscle.

Brief introduction video to the 6MWT

ICF Domain:

Activity – subcategory: Mobility

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- clinician-administered
- may be performed either indoors or outdoors, along a long, flat, straight, and hard surface.
- 6 minutes is required for the actual test
- 5-10 minutes is required to set up and explain the test to the patient
- the American Thoracic Society (ATS) recommends that the walking course should be:
  - 30 meters in length
  - marked at every 3 meters
  - marked with a cone at turn-around points

Equipment required:

- countdown timer
- tape measure
- mechanical lap counter
- cones to mark the turnaround
- chair that can be easily moved along the walking course.

Because the test was originally developed for stroke patients, the American Thoracic Society also recommends that a source of oxygen, sphygmomanometer, telephone, and an automated electronic defibrillator be available.

Scoring:

- total distance walked (rounding to the nearest meter) and the number and duration of rests during the test is reported.
28.3 ACTIVITY

- Physiological measures such as dyspnea and fatigue level can be measured using the Borg Scale and pulse oximetry (baseline heart rate and oxygen saturation) can also be recorded at the beginning and end of the test.

**Interpretability:**

**MCID:** not established for the SCI population, but for a population with Coronary Artery Disease (CAD): [N=81 stable patients with CAD, mean (SD) age: 58.1 (8.7) yrs, 77M/4F] MCID = 23 metres (determined using distribution method)


**SEM:** 16.5 metres (Lam et al. 2008 – calculated from measurements made in van Hedel et al. 2005)

**MDC:** 45.8 metres (Lam et al. 2008– calculated from measurements made in van Hedel et al. 2005)

- Normative data and published data is available for comparison for the SCI population (see the Interpretability section of the Study Details sheet).
- Scores range from 0 meters or feet for patients who are non-ambulatory to the maximum biological limits for normal healthy individuals (approximately 900 meters or 2953 feet).

**Languages:**

N/A

**Training Required:**

No training is required.

**Availability:**


**Clinical Considerations:**

- According to the American Thoracic Society, the 6MWT is easier to administer, better tolerated, and more reflective of activities of daily living than other walking tests.
- There are many sources of variability including height, age, body weight, sex, and motivation.
- The participant uses their typical walking aid during the test.
- Other versions of the test such as the 2 Minute Walk Test and the 10 Meter Walk Test can be administered as part of the 6 MWT.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 6
Reliability:
- Intra-rater reliability is excellent \( r=0.981-0.99 \)
- Inter-rater reliability is excellent \( r=0.970-1.00 \).
[Van Hedel et al., 2005, Scivoletto et al. 2011]

Validity:
- Correlation at 3 months post injury is excellent with:
  - 50 foot walking speed \( r=0.95 \)
  - Walking Index for Spinal Cord Injury (WISCI I) \( r=0.76 \)
  - Timed Up and Go (Spearman \( \rho =0.88 \))
- Correlation at 3 months post injury is adequate with:
  - the Berg Balance Scale (Spearman \( \rho =0.48 \))
  - Lower Extremity Motor Score \( r=0.34 \)
  - WISCI II (Spearman \( \rho =0.60 \)).

Responsiveness:
- The 6MWT differed between 1 month and 3 months (mean score increased from 314 to 473 metres, \( P<.001 \)) and between 3 months and 6 months (mean score increased from 473 to 502 metres, \( P=.01 \)) but not between 6 months and 12 months (mean score decreased from 502 to 495 metres, \( P=.76 \))
[van Hedel et al., 2006]

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the 6MWT for the SCI population.
10-Meter Walk Test (10MWT)

- Assesses short duration walking speed (m/s).
- Has been used in various patient populations including stroke, Parkinson’s disease, general neurologic movement disorders and SCI.

Brief introduction video to the 10MWT

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; performance-based measure.
- Measures the time required to walk 10 meters
- Administration time is usually less than 5 minutes
- Performed using a “flying start”: the patient walks 14 meters and the time is measured for the intermediate 10 meters.
- The individual walks at their preferred walking speed. Individuals can use an assistive device and must wear shoes.
- Can be administered in a clinical setting or in the community

Equipment:

- 14m corridor
- Stopwatch

Scoring:

- The time (to the nearest second) is reported
- Walking speed (m/s) can be calculated

Interpretability:

MCID: not established
SEM: 0.05 m/s (Lam et al. 2008)
MDC: 0.13 m/s (Lam et al. 2008)
- normative data not established for SCI population
- Results of the 10 MWT have been reported in the literature for individuals with incomplete SCI (see the Interpretability section of the Study Details sheet).

Languages:

N/A

Training Required:
Does not require advanced training.

Availability:


Clinical Considerations:

- The 10 MWT only assesses walking speed and does not consider the amount of physical assistance required, devices or endurance.

- The test is conducted in a controlled environment (i.e. lab or hospital setting), so results cannot be directly translated to the environment (i.e. crossing a busy street). The 10 MWT also requires an individual to ambulate a minimum of 14 m. There have been reports in the literature that the distance is not always standardized (i.e. 10 m versus 14 m).

- It appears to be a useful measure in the SCI population for both research and clinical practice. The scale properties (time in seconds or m/s) of the 10 MWT make it a responsive test well suited to evaluating clinical interventions.

- Is suitable for individuals who can, at a minimum, ambulate in household settings (i.e. ≥ 14 m).

- Assessment is easy to set up and administer, and is well-tolerated by most patient groups.

Measurement Property Summary:

- # of studies reporting psychometric properties: 9

Reliability:

- Intra-rater reliability is excellent (r=0.95-0.983)
- Inter-rater reliability is excellent (r=0.974-0.99).

[Van Hedel, Dietz & Wirz 2005, Scivoletto et al. 2011]

Validity:

- Correlations of the 10MWT are excellent with:
  - Walking Index for Spinal Cord Injury (WISCI) (r=0.77-0.85)
  - 6 Minute Walking Test (r=-0.86 - -0.91)
  - Berg Balance Scale (r=0.78-0.86)
  - Timed Up and Go (r=-0.646- 0.89)
  - SCIM-mobility subscale (r=0.89)
  - SCI-Functional Ambulation Inventory – mobility (Spearman ρ =0.756),

- Correlation of the 10MWT (speed) is poor to excellent with WISCI II (Spearman ρ =0.68- 0.795).


Responsiveness:

- The 10MWT differed between 1 month and 3 months (mean time taken to complete the test decreased from 13 to 8 seconds, P<.001) and between 3 months and 6 months (mean time taken to complete the test stayed at 8
seconds, $P=.005$) but not between 6 months and 12 months (mean time taken to complete the test stayed at 8 seconds, $P=.91$)

[Van Hedel et al. 2006]

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the 10MWT for the SCI population.
Berg Balance Scale (BBS)

- Performance based measure of balance with 14 tasks. Tasks progress in difficulty and include functional activities related to balance while reaching, bending, transferring, and standing.
- Originally developed for use with the elderly, the scale has been used in a variety of populations including stroke, Parkinson’s, multiple sclerosis, and recently SCI. Some researchers have used the BBS as the gold standard for balance in measurement studies.

Brief introduction video to the BBS

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

14

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; observer-rated performance measure
- Time to administer is **approximately 20 minutes** (in relatively well functioning older adults). In general, the time required is inversely related to the lower extremity ability of the individual.

Equipment:

- 2 standard chairs (1 with arms and 1 without)
- A stopwatch
- Step or stepstool
- A ruler.

Scoring:

- Each of the 14 tasks are rated on a 5-point scale from 0 (cannot perform) to 4 (normal performance).
- Task scores are summed to yield a total score.
- Total scores range from 0 (severely impaired balance) to 56 (excellent balance).
- Some tasks are rated according to the quality of the performance of the task, while others are evaluated by the time required to complete the task.

Interpretability:

**MCID:** not established
**SEM:** not established for the SCI population, but for a stroke population, SEM = 2.93 for individuals who ambulate with assistance (n=16) [Stevensen 2001, “Detecting change in patients with stroke using the Berg Balance Scale”, n=48, patients >65 yrs of age admitted to stroke rehabilitation unit after acute stroke]
**MDC:** not established for the SCI population, but for a stroke population, MDC = 8.1 for individuals who ambulate with assistance (n=16) [Stevensen 2001, see above for population and article details]
Results from studies of older adults suggest the following cut points: 0-20 = wheelchair bound; 21-40 = walking with assistance; and 41-56 = independent.

Scores below 41 are suggested to indicate increased risk of falling.

Change scores >7 are said to be clinically relevant in studies of older adults. This interpretation has not been validated with SCI populations.

Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:
English, Italian, Turkish, Brazilian-Portuguese, German, Korean, and Dutch.

Training Required:
Raters are typically health professionals with knowledge of balance and trained to assign ratings.

Availability:

Subject Code: ___________

Berg Balance Scale

Grading: Please mark the lowest category which applies.

1. Sitting to Standing
   Instruction: Please stand up. Try not to use your hands for support.
   Grading:
   4: Able to stand no hands and stabilize independently.
   3: Able to stand independently using hands.
   2: Able to stand using hands after several tries.
   1: Needs minimal assistance to stand or to stabilize.
   0: Needs moderate or maximal assistance to stand.

2. Standing Unsupported
   Instruction: Stand for two minutes without holding.
   Grading:
   4: Able to stand safely 2 minutes.
   3: Able to stand 2 minutes with supervision.
   2: Able to stand 30 seconds unsupported.
   1: Needs several tries to stand 30 seconds unsupported.
   0: Unable to stand 30 seconds unassisted.

3. Sitting Unsupported Feet on Floor
   Instruction: Sit with arms folded for two minutes.
   Grading:
   4: Able to sit safely and securely 2 minutes.
   3: Able to sit 2 minutes under supervision.
   2: Able to sit 30 seconds.
   1: Able to sit 10 seconds.
0: Unable to sit without support 10 seconds.

4. **Standing to Sitting**
   
   **Instruction:** Please sit down.
   
   **Grading:**
   
   4: Sits safely with minimal use of hands.
   3: Controls descent by using hands.
   2: Uses back of legs against chair to control descent.
   1: Sits independently but has uncontrolled descent.
   0: Needs assistance to sit.

5. **Transfers**
   
   **Instruction:** Please move from chair to bed and back again. One way toward a seat with arm rests and one way toward a seat without arm rests.
   
   **Grading:**
   
   4: Able to transfer safely with minor use of hands.
   3: Able to transfer safely definite need of hands.
   2: Able to transfer with verbal cuing and/or supervision.
   1: Needs one person to assist.
   0: Needs two people to assist or supervise to be safe.

6. **Standing Unsupported with Eyes Closed**
   
   **Instruction:** Close your eyes and stand still for 10 seconds.
   
   **Grading:**
   
   4: Able to stand 10 seconds safely.
   3: Able to stand 10 seconds with supervision.
   2: Able to stand 3 seconds.
   1: Unable to keep eyes closed 3 seconds but stays steady.
   0: Needs help to keep from falling.

7. **Standing Unsupported with Feet Together**
   
   **Instruction:** Place your feet together and stand without holding.
   
   **Grading:**
   
   4: Able to place feet together independently and stand 1 minute safely.
   3: Able to place feet together independently and stand for 1 minute with supervision.
   2: Able to place feet together independently but unable to hold for 30 seconds.
   1: Needs help to attain position but able to stand 15 seconds with feet together.
   0: Needs help to attain position and unable to hold for 15 seconds.

8. **Reaching Forward with Outstretched Arm**
   
   **Instruction:** Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position.)
   
   **Grading:**
4: Can reach forward confidently more than 10 inches.
3: Can reach forward more than 5 inches safely.
2: Can reach forward more than 2 inches safely.
1: Reaches forward but needs supervision.
0: Needs help to keep from falling.

9. **Pick Up Object from the Floor**
   Instruction: Pick up the shoe/slipper which is placed in front of your feet.
   Grading:
   4: Able to pick up slipper safely and easily.
   3: Able to pick up slipper but needs supervision.
   2: Unable to pick up but reaches 1 to 2 inches from slipper and keeps balance independently.
   1: Unable to pick up and needs supervision while trying.
   0: Unable to try/needs assistance to keep from falling.

10. **Turning to Look Behind Over Left and Right Shoulders**
    Instruction: Turn to look behind you over toward left shoulder. Repeat to the right.
    Grading:
    4: Looks behind from both sides and weight shifts well.
    3: Looks behind one side only; other side shows less weight shift.
    2: Turns sideways only but maintains balance.
    1: Needs supervision when turning.
    0: Needs assistance to keep from falling.

11. **Turn 360 Degrees**
    Instruction: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
    Grading:
    4: Able to turn 360 degrees safely in less than 4 seconds each side.
    3: Able to turn 360 degrees safely one side only – less than 4 seconds.
    2: Able to turn 360 degrees safely but slowly.
    1: Needs close supervision or verbal cuing.
    0: Needs assistance while turning.

12. **Count Number of Times Step Touch Measured Stool**
    Instruction: Place each foot alternately on the stool. Continue until each foot has touched the stool four times.
    Grading:
    4: Able to stand independently and safely and complete 8 steps in 20 seconds.
    3: Able to stand independently and complete 8 steps in more than 20 seconds.
    2: Able to complete 4 steps without aid with supervision.
    1: Able to complete more than 2 steps – needs minimal assistance.
    0: Needs assistance to keep from falling – unable to try.

13. **Standing Unsupported One Foot in Front**
Instruction: Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (DEMONSTRATE to subject.)

Grading:
4: Able to place foot tandem independently and hold 30 seconds.
3: Able to place foot ahead of the other independently and hold 30 seconds.
2: Able to take small step independently and hold 30 seconds.
1: Needs help to step but can hold 15 seconds.
0: Loses balance while stepping or standing.

14. Standing on One Leg

Instruction: Stand on one leg as long as you can without holding.

Grading:
4: Able to lift leg independently and hold more than 10 seconds.
3: Able to lift leg independently and hold 5 to 10 seconds.
2: Able to lift leg independently and hold at least 3 seconds.
1: Tries to lift leg, unable to hold 3 seconds but remains standing independently.
0: Unable to try or needs assistance to prevent fall.

Clinical Considerations:

- The BBS is generally well received among clinicians who specialize in the area of gait and balance training. The tool is only applicable to individuals with incomplete SCI who retain some ability to stand and walk. It has been found to be an appropriate assessment of standing balance for these individuals as shown by its strong associations with various clinical walking evaluations.
- The BBS is limited to those patients with SCI who have some form of standing and/or ambulatory capacity.

Measurement Property Summary:

- # of studies reporting psychometric properties: 4

Reliability:

- Inter-rater reliability was found to range between 0.838 and 0.979 (Kendall’s coefficient of concordance).
  [Wirz et al. 2010]

Validity:

- Correlation of the Berg Balance Scale was excellent with:
  o WISCI (Spearman’s \( \rho = 0.82-0.92 \))
  o WISCI II (Spearman’s \( \rho = 0.816 \))
  o 10 Meter Walk Test (Spearman’s \( \rho = 0.78-0.86 \))
  o Functional Independence Measure (Spearman’s \( \rho = 0.72-0.77 \))
  o Functional Independence Measure-Locomotor subscale (Spearman’s \( \rho = 0.86-0.89 \))
  o Spinal Cord Independence Measure- Mobility subscale (Spearman’s \( \rho = 0.89 \))
  o Timed Up and Go (Spearman’s \( \rho = -0.815 \))
28.3 ACTIVITY

- SCI-Functional Ambulation Inventory- Mobility subscale (Spearman’s ρ=0.74).

**Responsiveness:**
No values were reported for the responsiveness of the BBS for the SCI population.

**Floor/ceiling effect:**
- A ceiling effect was reported (37.5% of subjects with incomplete (AIS D) tetraplegia and paraplegia reached maximal score of the Berg Balance score).
  [Lemay & Nadeau 2010]
Box and Blocks Test (BBT)

- a measure of manual dexterity that requires repeatedly moving 1-inch blocks from one side of a box to another in 60 seconds.
- commonly used in the stroke population to determine manual dexterity.
- measures unilateral function, not bilateral function.

**Brief introduction video to the BBT**

**ICF Domain:**

- Activity - Mobility

**Number of Items:**

N/A

**Instructions for Administration and Scoring:**

**Administration:**

- clinician-administered
- Mathiowetz et al. 1985 describes the standardized dimensions for test materials, procedures and scoring. Individuals are seated at a table, facing the examiner. A rectangular box divided into 2 compartments by a wooden partition is in front of the individual, and 150 coloured wooden blocks are placed in one compartment. The individual is instructed to move as many blocks as possible, one at a time, from one compartment to the other for the duration of 60 seconds.
- The individual’s hand must cross over the partition for the block to be counted towards total score.
- Blocks may be dropped once the hand passes the partition.
- **Approximately 5 minutes** are required for set up, explanation of the instructions to the patient and administration of the test.

**Equipment:**

- Stopwatch
- wooden box with partition (box: 53.7 x 25.4 x 8.5 cm, partition: 25.4 cm x 15.2 cm x 1 cm)
- 150 wooden blocks (2.5 cm cubed)

**Scoring:**

- scored by counting the number of blocks carried over by the individual from one compartment to the other.
- If the individual carries multiple blocks over at a time, this only counts as 1 point.
- If the individual brings the block over the partition and drops it outside of the box, the block still counts.

**Interpretability:**

- **MCID:** not established
- **SEM:** not established
- **MDC:** not established for the SCI population but for a spastic hemiplegia population, MDC for a 2 week training program = 4 blocks per minute, MDC for 6-month follow-up = 6 blocks per minute [Siebers et al. 2010, “The effect of modified constraint-induced...
movement therapy on spasticity and motor function of the affected arm in patients with chronic stroke", n=17]

- No meaningful cut-points or normative data have been established for the SCI population
- the BBT has not been validated for the SCI population
- There is no published data on the SCI population for comparison. However, normative data for able-bodied adults and children have been published by Mathiowetz et al. 1985[a,b].

Normal adults (>20 years old): N=628, 310M, 318F [Mathiowetz et al. 1985a]

<table>
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<tr>
<th>Average BBT score:</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
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<tr>
<td></td>
<td>L</td>
<td>86.4</td>
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<tr>
<td>25-29</td>
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<tr>
<td></td>
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<tr>
<td>30-34</td>
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<tr>
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<tr>
<td>35-39</td>
<td>R</td>
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<tr>
<td></td>
<td>L</td>
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<tr>
<td>40-44</td>
<td>R</td>
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<tr>
<td></td>
<td>L</td>
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<tr>
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<td></td>
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<td>61.3</td>
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</table>
Normal children (6-19 years old): N=471, 231M, 240F [Mathiowetz et al. 1985b]

### Average BBT score:

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<thead>
<tr>
<th>Age</th>
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<th>Male</th>
<th></th>
<th>Female</th>
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<td>74.3</td>
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<tr>
<td>18-19</td>
<td>R</td>
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<td>79.2</td>
<td>8.8</td>
<td>76.0</td>
<td>8.5</td>
</tr>
</tbody>
</table>

### Languages:

N/A

### Training Required:

None required.

### Availability:

Detailed instructions are available from Mathiowetz et al. 1985a “Adult norms for the Box and Block test of manual dexterity”.

### Procedure:

The patient is allowed a 15-second trial period prior to testing. Immediately before testing begins, the patient should place his/her hands on the sides of the box. When testing begins, the patient should grasp one block at a time with the dominant hand, transport the block over the partition, and release it into the opposite compartment. The patient should continue doing this for one minute. The procedure should then be repeated with the non-dominant hand.

### Set-up:

A test box with 150 blocks and a partition in the middle is placed lengthwise along the edge of a standard-height table. 150 blocks should be in the compartment of the test box on the side of the patient’s
dominant hand. The examiner should face the patient so they can view the blocks being transported.

**Patient Instructions (derived from Mathiowetz et al, 1985):**

“I want to see how quickly you can pick up one block at a time with your right (or left) hand [point to the hand]. Carry it to the other side of the box and drop it. Make sure your fingertips cross the partition. Watch me while I show you how.”

Transport three cubes over the partition in the same direction you want the patient to move them. After a demonstration say the following:

“If you pick up two blocks at a time, they will count as one. If you drop one on the floor or table after you have carried it across, it will still be counted, so do not waste time picking it up. If you toss the blocks without your fingertips crossing the partition, they will not be counted. Before you start, you will have a chance to practice for 15 seconds. Do you have any questions?”

“Place your hands on the sides of the box. When it is time to start, I will say ready and then go.”

**Trial period:** Start the stop watch at the word go. When 15 seconds has passed, say "stop." If mistakes are made during the practice period, correct them before the actual testing begins.

On completion of the practice period, transport the cubes to the original compartment.

“This will be the actual test. The instructions are the same. Work as quickly as you can. Ready.” [Wait 3 seconds] “Go.” “Stop.” [After 1 minute, count the blocks and record as described above]

“Now you are to do the same thing with your left (or right) hand. First you can practice. Put your hands on the sides of the box as before. Pick up one block at a time with your hand, and drop it on the other side of the box.”


Return the transported blocks to the compartment as described above.

“This will be the actual test. The instructions are the same. Work as quickly as you can.”

“Ready.” [Wait 3 seconds] “Go.” “Stop.” [After 1 minute, count the blocks and record as described above]

**Scoring:**
The score is the number of blocks carried from one compartment to the other in one minute. Score each hand separately.

**Note:**
1) If a patient transports two or more blocks at the same time, this should be noted and the number subtracted from the total.
2) No penalty should be made if the subjects transported any blocks across the partition and the blocks bounced from the box to the floor or table

**Clinical Considerations:**

- This test is quick and easy to administer

**Measurement Property Summary:**

There are no studies reporting psychometric properties for the BBT for the SCI population at this time.
Clinical Outcome Variables Scale (COVS)

- measure of mobility that has been applied to specific diagnostic groups such as stroke, traumatic brain injury, amputations, and musculoskeletal injuries in a variety of settings (acute, inpatient/outpatient rehabilitation, and community settings).

- Items include rolling, lying to sitting, sitting balance, transfers, ambulation, wheelchair mobility, and arm function.

- 2 subscales have been reported for the COVS: 1) General Mobility subscale (7 items) and 2) Ambulation subscale (5 items)

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

13

Instructions for Administration and Scoring:

Administration:

- 2 versions:
  1) performance (clinician-administered through observation of task performance); can be conducted
  2) Self-report (telephone interview - TCOVS)

- In-person assessment takes approximately 35 minutes.

- Assessment via telephone interview takes approximately 5 minutes (subjects are given the questions ahead of time).

Equipment:

- stopwatch
- Bed sticks
- bed ladders
- lifting blocks
- transfer boards
- leg straps
- exercise mat
- ramp (1 inch to 12 inch rise)
- 6 inch platform

Scoring:

- Each item is scored on a 7-point scale ranging from 1 (fully dependent mobility) to 7 (normal independent mobility).
COV scores are generally reported as a summed total score ranging from 13 to 91. The general mobility subscale has scores that range from 7-49, while the ambulation subscale has scores ranging from 5-35.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Lower scores reflect poorer levels of mobility.
- No cut-points or normative data have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English

Training Required:

Raters should be trained in the administration of both the COVS and TCOVS.

Availability:

A copy of the COVS can be found in the paper by Campbell and Kendall (2003).

Clinical Considerations:

- Both versions of this tool offer a more relevant and complete profile of mobility after SCI when compared with other mobility tools.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:

- Test-retest reliability of the TCOVS (telephone-administered COVS) is excellent (ICC=1.00).
- Equivalence reliability between TCOVS and COVS was found to be excellent (ICC=0.98).
[Barket et al. 2007]

Validity:

- The COVS can discriminate across clinically distinct groups (by lesion level, completeness of injury and walking status) during discharge from hospital and admission to a transitional rehabilitation program.
[Campbell & Kendall 2003]

Responsiveness:

No values were reported for the responsiveness of the COVS for the SCI population.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the COVS for the SCI population.
Capabilities of Upper Extremity Instrument (CUE)

- measures functional limitation and assesses the amount of difficulty experienced in performing specific actions with one or both arms and hands in individuals with tetraplegia.

- Questions focus on the individuals’ ability to reach or lift; pull and push with their arms; move and position their arm and wrist; use their hand and fingers; and press with the tip of the index finger.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

32 total (15 unilateral – left and right, and 2 bilateral).

Instructions for Administration and Scoring:

Administration:

- clinician-administered; interview format (can be in-person or over telephone)
- takes about 30 minutes to complete.

Equipment: None.

Scoring:

- Responses are given on a 7-point scale representing self-perceived difficulty in performing the action, with scores ranging from 1 (unable to perform) to 7 (can perform without difficulty).
- Responses are summed to give a total score (ranges from 32 to 124).
- Left and right arm/hand function can be derived separately.
- A percent of normal function score is also possible using the following algorithm (total score – 32) / 192 * 100%.

Interpretability:

MCID: not established
SEM: for an SCI sample (n=154, 140M/14F, mean (SD) age: 36.7 (11.1) yrs, tetraplegia):
SEM=12.2 (Marino et al. 1998)

MDC: for an SCI sample (n=154, 140M/14F, mean (SD) age: 36.7 (11.1) yrs, tetraplegia):
MDC=33.8 (calculated from data in Marino et al. 1998)

- Item by item results of the test are straightforward to interpret.
- Total scores range from 32 to 124 with higher scores reflecting better function.
- No cut-points or normative data have been established for the SCI population.
• Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English.

Training Required:

None.

Availability:

Scoring:

Item by item results of the test are straightforward to interpret. Total scores range from 32 to 224 with higher scores reflecting better function. Left and right arm/hand function can be derived separately. A percent of normal function score is also possible using the following algorithm: \((\text{total score} - 32) / 192 \times 100\%\).

Read the following instructions to the patient and be sure he/she understands the responses before proceeding to the questions.

"This questionnaire is designed to find out how well you are able to use your arms and hands. I will ask you about a number of actions which some people with spinal cord injury have limitations performing. Please consider whether, on an average day, you have difficulties or limitations performing these actions. By this I mean difficulty doing the action, or trouble doing it as often as you would like or need in order to complete everyday activities. Consider only the specific part of your arm or hand asked about in each question. For example, if asked about pulling something with your arm, do not worry about whether or not you can grab it with your hand.

Pick one of the following responses to indicate how much, if any, limitation you have:"

7 = not at all limited
6 = a little limited
5 = some limitation
4 = moderately limited
3 = very limited
2 = extremely limited
1 = totally limited, can’t do it at all

Patient name: _______________________

Date: _________________

The following questions are about your ability to reach or lift:

Think about reaching out with your arm to touch something directly in front of you that is at shoulder level:

a. How limited are you doing this using your RIGHT ARM? ________________

b. How limited are you doing this using your LEFT ARM? ________________

Think about raising your arm directly over your head, with your arm straight:

a. How limited are you doing motion using your RIGHT ARM? ________________

b. How limited are you doing motion using your LEFT ARM? ________________
Think about reaching down to touch the floor and sitting back up straight, without hooking with your other arm or using it to pull yourself up:

a. How limited are you doing this with your RIGHT HAND? _______________
b. How limited are you doing this with your LEFT HAND? _______________

4. Think about raising a 5-pound object like a heavy blanket over your head using both arms. (Don’t worry about whether you could grab it with your hands, just if you could raise something that heavy over your head):
How limited are you doing this using BOTH ARMS? _______________

The following questions are about your ability to pull and push with your arms:

5. Think about pulling or sliding (without grasping) a light object such as a can of soda, that is on a table, towards you:
   a. How limited are you doing this kind of thing using your RIGHT ARM? __________
   b. How limited are you doing this kind of thing using your LEFT ARM? __________

6. Think about pulling or sliding (without grasping) a heavy object (up to 10 lbs.), that is on a table, towards you:
   a. How limited are you doing this kind of thing using your RIGHT ARM? __________
   b. How limited are you doing this kind of thing using your LEFT ARM? __________

7. Think about pushing a light object such as a can of soda on a table, away from you:
   a. How limited are you doing this kind of thing using your RIGHT ARM? __________
   b. How limited are you doing this kind of thing using your LEFT ARM? __________

8. Think about pushing a heavy object (up to 10 lbs.) on a table, away from you:
   a. How limited are you doing this kind of thing using your RIGHT ARM? __________
   b. How limited are you doing this kind of thing using your LEFT ARM? __________

9. Think about pushing down with both arms into your chair enough to lift your buttocks (both sides) off the seat (do a push-up weight shift):
   How limited are you doing this? __________

The following questions are about moving and positioning your arm and wrist:

10. With your hand on your lap palm down, think about curling your wrist upwards, keeping your arm on your lap:
    a. How limited are you doing this motion using your RIGHT HAND? __________
    b. How limited are you doing this motion using your LEFT HAND? __________

11. Think about turning your hand over-from your palm facing up to facing the floor, keeping your elbow bent at your side (the arm motion someone would make when turning a doorknob or a dial):
    a. How limited are you doing this motion using your RIGHT ARM? __________
    b. How limited are you doing this motion using your LEFT ARM? __________

The following question are about using your hands and fingers:

12. Think about grasping and holding an object like a hammer with your hand:
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a. How limited are you doing this kind of thing using your RIGHT HAND? ________
b. How limited are you doing this kind of thing using your LEFT HAND? ________

13. Think about picking up a small object such as a paper clip or the cap of a tube of toothpaste with the tips of your thumb and first two fingers:
   a. How limited are you doing this kind of thing using your RIGHT HAND? ________
   b. How limited are you doing this kind of thing using your LEFT HAND? ________

14. Think about pinching and holding an object between your thumb and the side of your index finger, such as holding a key:
   a. How limited are you doing this kind of thing using your RIGHT HAND? ________
   b. How limited are you doing this kind of thing using your LEFT HAND? ________

15. Think about grasping a large object like the lid of a 2 pound jar of mayonnaise with the tips of the fingers hard enough to pick the jar up or open the lid:
   a. How limited are you doing this kind of thing using your RIGHT HAND? ________
   b. How limited are you doing this kind of thing using your LEFT HAND? ________

16. Think about using your fingers to manipulate objects, such as holding a coin and turning it over and over with your fingers:
   a. How limited are you doing this kind of thing using your RIGHT HAND? ________
   b. How limited are you doing this kind of thing using your LEFT HAND? ________

17. Think about pressing something with the tip of your index finger (not knuckle) such as dialing a touch-tone phone or ringing a doorbell:
   a. How limited are you doing this kind of thing using your RIGHT HAND? ________
   b. How limited are you doing this kind of thing using your LEFT HAND? ________

Total Score: __________________

Clinical Considerations:

• The CUE has considerable potential clinical appeal because it reflects hand and/or arm function and scores can be derived for either limb, which is appealing given the number of individuals with incomplete injuries.
• The method of item generation (discussions with physical and occupational therapists, with patients, colleagues and experts in scale design) would suggest the CUE is likely to be widely accepted with therapists and individuals with an SCI.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:
• Internal consistency for the CUE is excellent (Cronbach’s α=0.96),
• Test-retest reliability for the total CUE score is excellent (ICC=0.94).
[Marino et al. 1998]

Validity:
• Different unilateral motor levels were significantly different (P<.001) except for those adjacent with each other.
• Correlation of the CUE is excellent with:
  o Functional Independence Measure (Spearman’s $\rho=0.798$)
  o Upper Extremity Motor score (Spearman’s $\rho=0.798$)
  o GRASSP-Sensation subscale (Spearman’s $\rho=0.77$)
  o GRASSP-Strength subscale (Spearman’s $\rho=0.76$)
  o GRASSP-Prehension subscale (Spearman’s $\rho=0.83$).

Responsiveness:
No values were reported for the responsiveness of the CUE for the SCI population.

Floor/ceiling effect:
• One item (item-left hand-5) on the CUE had a borderline floor effect.
[Marino et al. 1998]
Functional Standing Test (FST)

- Assesses an individual's ability to perform one handed reaching tasks while standing.
- Consists of 21 tasks which involve performing both gross and fine motor skills; crossing midline; and lifting and lowering light and heavy objects. Examples of tasks include: lifting light objects down from the lowest shelf; stacking checkers on the counter top at the midline; lifting heavy objects up to the top shelf.

ICF Domain:

Activity – Subcategory: Mobility.

Number of Items:

21 (6 of which are the same as in the Jebsen Test of Hand Function)

Instructions for Administration and Scoring:

Administration:

- Tasks are done as quickly as possible and the individual is allowed to use assistive devices such as knee-ankle-foot-orthoses (KAFO) or functional neuromuscular stimulation.
- The mean time to complete the entire test (i.e. total standing time) was **15.58 ± 2.99 minutes**. Time required for each task ranged from 1.86 to 13.70 seconds for individuals with SCI.

Equipment:

- standard Jebsen Test board
- a set of shelves mounted on a counter top 36 inches high (to simulate a kitchen cabinet).

Scoring:

- time in minutes or seconds to complete each of the 21 tasks is recorded.

Interpretability:

- **MCID**: not established
- **SEM**: not established
- **MDC**: not established

- No normative data or published data was found for the SCI population at this time.

Languages:

- **N/A**

Training Required:

Training is required to administer the test.

Availability:

Unable to locate a copy of this measure at this time.

Clinical Considerations:
• The tasks simulate skills required to work in a kitchen environment but these skills are easily transferred to other environments (e.g. shopping). The tasks cover a broad range of difficulty.
• The specialized equipment may limit its usefulness in some clinical/research settings.
• Was originally developed using able-bodied individuals and has been modified for individuals with SCI. However, the only testing of the FST for SCI has been done in individuals with T3-6 injuries.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

• Test-retest reliability of the FST items ranges from **poor to excellent**:
  o 3 items had **poor** reliability (ICC=0.13-0.37)
  o 10 items had **adequate** reliability (ICC=0.44-0.79)
  o 11 items had **excellent** reliability (ICC=0.81-0.98).

[Triolo et al. 1994]

**Validity:**

• ANOVAs performed indicated significant (P<.05) differences between SCI and able-bodied populations, which suggests that FST may be sensitive to various standing impairments.

[Triolo et al. 1994]

**Responsiveness:**

No values were reported for the responsiveness of the FST for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the FST for the SCI population.
Graded Redefined Assessment of Strength, Sensibility and Prehension (GRASSP)

- clinical impairment measure that incorporates three domains vital to upper limb function: sensation, strength, and prehension.
- multimodal test comprising 5 subtests for each upper limb: dorsal sensation, palmar sensation, strength, prehension ability and prehension performance.
- results in 5 numerical scores that provide a comprehensive profile of upper-limb function.

ICF Domain:

Body Function and Structures – Neuromusculoskeletal and Movement-Related Functions & Structures

Number of Items:

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

Instructions for Administration and Scoring:

Administration:

- Sensation: Key test locations (palmar and dorsal) that represent significant anatomical levels of sensory innervation and functionally important areas of the hand are tested using the Semmes Weinstein monofilament (SMW) mini-kit.
- Strength: traditional motor grading (Daniels and Worthington 1995) is performed for 10 muscles with strong representation at each anatomical neurological level; each muscle is tested with resistance through its full range and graded from 0-5.
- Prehension – divided into ability vs. performance; included to represent the influence of sensation and strength on goal-oriented upper limb tasks
  - ability test: involves 3 types of grasp tasks to ensure that the presence or absence of movement of the hand during the early stages post-injury is not missed. Graded by an assessor (0-4) using specific components of grasp acquisition outlined in the GRASSP manual.
  - performance test: assesses movement within a functional paradigm, and evaluates how the movement is performed. Tasks are scored 0-5.

Equipment:

- GRASSP kit (contains SMW minikit and standardized equipment ex. wooden blocks)
- manual muscle test equipment

Scoring:

- Scores for tasks in each section (sensation-dorsal, sensation-palmar, strength, prehension-ability, prehension-performance) are summed for each subscale score.
  - Dorsal sensation subscale score ranges from 0-12 (3 locations for dorsal side of each hand, scored from 0-4)
Palmar sensation subscale score ranges from 0-12 (3 locations for palmar side of each hand, scored from 0-4)

- Strength subscale score ranges from 0-50 (10 muscles graded 0-5)
- Prehension ability subscale score ranges from 0-12 (3 grasps graded 0-4)
- Prehension performance subscale score ranges from 0-30 (6 grasps graded 0-5)

- A total score is not calculated.

**Interpretability:**

**MCID:** not established

**SEM and MDC:**

SEM and MDC for GRASSP items for right and left hand (calculated from data in Kalsi-Ryan et al. 2012):

<table>
<thead>
<tr>
<th>GRASSP items:</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>Strength (0-50)</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Dorsal sensation (0-12)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Palmar sensation (0-12)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Prehension ability (0-12)</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Prehension performance (0-30)</td>
<td>2.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

- No cut-points or normative data have been established for the SCI population; however, published data is available (see the Study Details sheet of this tool).

**Languages:**

N/A

**Training Required:**

Reading the GRASSP manual is recommended.

**Availability:**

Purchase link is found here: [http://www.sci-grassp.org/Purchase.html](http://www.sci-grassp.org/Purchase.html).

The GRASSP Version 1.0 Kit retails for $850.00 CDN.

**Clinical Considerations:**

- Authors recommend that a partial GRASSP (sensibility, strength, tone and qualitative prehension) be administered prior to 3-4 weeks post-injury as it is unlikely that the patient will tolerate enough sitting (45 min) for the quantitative grasp portion of the test.

**Measurement Property Summary:**

- # of studies reporting psychometric properties: 3

**Reliability:**

- Both inter-rater reliability and test-retest reliability are excellent and significant for all GRASSP subtests:
Sensation right | 0.84 | 0.75-0.89 | 0.95 | 0.91-0.97
Sensation left  | 0.91 | 0.86-0.94 | 0.86 | 0.76-0.92
Strength right  | 0.95 | 0.93-0.97 | 0.98 | 0.98-0.99
Strength left   | 0.95 | 0.92-0.97 | 0.98 | 0.96-0.98
Prehension ability right | 0.95 | 0.92-0.97 | 0.98 | 0.96-0.99
Prehension ability left  | 0.95 | 0.92-0.97 | 0.98 | 0.97-0.99
Prehension performance right | 0.95 | 0.92-0.97 | 0.93 | 0.88-0.96
Prehension performance left  | 0.96 | 0.93-0.97 | 0.96 | 0.93-0.98

Validity:
- Correlation of the GRASSP subtest Sensation Total (R & L) is **adequate** with the Spinal Cord Independence Measure (SCIM) (0.57), and **excellent** with both the SCIM-self care subscale (0.74) and the Capabilities of Upper Extremity (CUE) (0.77).
- Correlation of the GRASSP subtest Strength Total (R & L) is **adequate** with the SCIM (0.59), and **excellent** with both the SCIM-self care subscale (0.74) and the CUE (0.76).
- Correlation of the GRASSP subtest Strength Total (R & L) is **excellent** with the SCIM (0.68), the SCIM-self care subscale (0.79) and the CUE (0.83).

Responsiveness:
No values were reported for the responsiveness of the GRASSP for the SCI population.

Floor/Ceiling effect:
No values were reported for the presence of floor/ceiling effects in the GRASSP for the SCI population.
Grasp and Release Test (GRT)

• designed to assess hand neuro-prosthesis in individuals with C5-C6 SCIs, but has also been used to assess hand function prior to and following tendon transfers in people with C6-7 level injuries.

• assesses the ability to pick up, move, and release six objects of varying sizes, weights and textures using a palmar or lateral grasp. Each object was chosen to represent one or more objects routinely manipulated for activities of daily living (ADL) that represented a range of difficulties.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

6

Instructions for Administration and Scoring:

Administration:

• Clinician-administered; standardized performance test.

• Specific instructions are provided for establishing the start position and for recording a successful completion of the task

• A pretrial practice test for each object is permitted and practice continues until a successful completion is achieved.

• This test takes approximately 20 minutes to administer.

Equipment:

• peg

• paperweight

• fork

• block

• can

• videotape

Scoring:

• Subjects are scored on their ability to successfully move each of the objects; the number of times the subject is able to move each object in 30 seconds is recorded.

• Each hand is tested and scored separately.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
Grasp and Release Test (GRT)

28.3 ACTIVITY

- A summed score is calculated by adding the item scores.
- If a subject fails to move an item, they score zero for that particular item.
- Single items may be used.
- Normative data has not been established for the SCI population.

Languages:

N/A.

Training Required:

None formally required.

Availability:

This test is a variant of earlier “pick and place” tests but objects, test structure and scoring methods are tailored to the tetraplegic population. This test consists of the manipulation of 6 objects, 3 with lateral prehension (peg, paperweight and fork) and 3 with palmar prehension (block, can and videotape).

Procedure:

Before the test begins, a pretest for each object is administered to familiarize the subject with the instructions for each test. The patients are given at least 30 seconds of practice with each object.

For all the objects, the sequences below are repeated as many times as possible in 30 seconds.

For the block and peg, the object was grasped in the starting area of the test board, lifted, and moved over a barrier and released (dropped) in the target area.

For the can, paperweight and videotape, the same procedure as above applies but the object had to be placed upright on the target area when released.

For the fork, the patient started with the hand at the lateral edge of the test board. They are then instructed to move their hand to the fork, grasp the handle and depress the piston past the indicator line. They then release the handle and place their hand back in the starting position.

Scoring:

Scored by mean # of successful completions and mean # of failures performed in 30 seconds, for each object over several trials (3-5 trials reported).

A summed completion score is calculated by adding the mean item completion scores. If a subject fails to move an item, they score zero for that particular item. If a subject moves the item N times, the score is N. Single item scores may be reported.

Patient Name: ___________________ Date: ___________________

For each of the following tasks, indicate whether there is successful completion of the task, and if yes, indicate the number of times the task was performed in 30 seconds.
Scored by mean # of successful completions and # of failures performed in 30 seconds, for each object. 3-5 trials should be completed.

Under each trial, indicate the # of completions (C) and failures (F).

<table>
<thead>
<tr>
<th>Hand: __________________________</th>
<th>Date: __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trials</strong></td>
<td><strong>Trials</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trials</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>C F C F C F C F C F C F C F C F</td>
<td>C F C F C F C F C F C F C F C F</td>
</tr>
<tr>
<td>Peg</td>
<td>Peg</td>
</tr>
<tr>
<td>Weight</td>
<td>Weight</td>
</tr>
<tr>
<td>Fork</td>
<td>Fork</td>
</tr>
<tr>
<td>Block</td>
<td>Block</td>
</tr>
<tr>
<td>Can</td>
<td>Can</td>
</tr>
<tr>
<td>Tape</td>
<td>Tape</td>
</tr>
<tr>
<td><strong>Total Score:_____________</strong></td>
<td><strong>Total Score:_____________</strong></td>
</tr>
</tbody>
</table>

**Clinical Considerations:**

- This is a standardized test of hand function that would be appropriate for a limited sub-sample of individuals with SCI.
- Completion of the tool may vary depending on the individual’s abilities. For example, subjects with paralysis of the finger and/or thumb flexor muscles are generally unable to hold the fork or paperweight between the thumb and index finger so floor effects are possible.
- Currently only assessed for use in young adults and adolescents.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2
Reliability:
- Test-retest reliability is **excellent** for all 6 items (ICC=0.87-1.00).
  [Wuolle et al. 1994, Mulcahey et al. 2004]

Validity:
- Correlations between the 12-month Functional Independence Measure (FIM) and the peg, block, paperweight and total number of GRT items were not statistically significant.
- Statistically significant and **adequate to excellent** correlations were found between the 12-month FIM and the fork item (Spearman’s ρ=0.624), the can item (Spearman’s ρ=0.700) and the videotape item (Spearman’s ρ=0.503).
  [Wuolle et al. 1994, Mulcahey et al. 2004]

Responsiveness:
No values were reported for the responsiveness of the GRT for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the GRT for the SCI population.
Jebsen Hand Function Test

• Developed to provide a standardized and objective evaluation of fine and gross motor hand function using simulated activities of daily living.

• Items to be performed on both the dominant and non-dominant hand.

ICF Domain:

Activity – Subcategory: Mobility.

Number of Items:

7

Instructions for Administration and Scoring:

Administration:

• clinician-administered; performance-based measure

• Weighted and non-weighted hand function is assessed through: writing; turning over 3 by 5 inch cards; picking up small common objects; simulated feeding; stacking checkers; picking up large objects; and picking up large heavy objects. Time to complete each task is recorded.

• Patients are required to perform all of the subtests with both the right and left hands, with the non-dominant hand tested first.

• Administration of this test takes approximately 45 minutes.

Equipment: (see Jebsen 1969 for details)

• Stopwatch, chair (18" seat height), desk/table (30" high), four sheets of unruled white paper, clipboard, sentences typed in all capital letters and centered on a 5x8" index card on a bookstand, 5 index cards (ruled on one side only), empty 1 pound coffee can, 2 paper clips, 2 regular sized bottle caps, 2 U.S. pennies, 5 kidney beans (~5/8" long), 1 regular teaspoon, wooden board (41 ½" long, 11 ¼" wide, ¾" thick), “C” clamp, plywood (20" long, 2" wide, ½" thick) glued to the board, 4 standard size (1 ¼” diameter) red wooden checkers, 5 No. 303 cans.

Scoring:

• record the time necessary to complete each subtest (rounded the nearest second).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

• Test results appear easy to interpret.

• Norms for general population according to age, sex and hand (dominant or non-dominant) are available with the instruction manual.

• Slow times reflect a less desirable performance.

• No normative or published data has been reported for the SCI population.
Languages:

English and Portuguese.

Training Required:

Training is not required.

Availability:

The Jebsen Hand Function Test was designed to provide a short, objective test of hand function for activities of daily living. It has 7 items and takes approximately 15-45 minutes to administer.

7 items include: writing, turning over 3-by-5 inch cards, picking up small common objects, simulated feeding, stacking checkers, picking up large light objects and picking up large heavy objects. The results are measured by timing the time taken to accomplish each task. The tests are always presented in the same order and are performed with the non-dominant hand first.

For a video of the Jebsen Hand function test being performed by 2 lab students, click here:
Items 1-3: http://www.youtube.com/watch?v=k4Am5NVVcK8
Items 4-7: http://www.youtube.com/watch?v=qFWQXcnIjgo&feature=relmfu

Item 1: Writing

The examiner has a small index card with the blank side facing the subject propped up so the subject can easily read it. The index card has a sentence of third-grade reading difficulty, with 24 letters. The subject is seated and given a pen and several sheets of white paper attached to a clipboard. The subject is instructed to begin copying the sentence from the index card onto the sheet when the examiner flips the index card and says “go”.

Record the time taken from “go” until the subject lifts their pen off the page after finishing the sentence.

Repeat with the dominant hand using a new sentence.

Verbal Instructions:

“Do you require glasses for reading? If so, put them on. Take this pen in your left hand and arrange everything so that it is comfortable for you to write with your left hand. On the other side of this card (indicate) is a sentence. When I turn the card over and say ‘Go’, write the sentence as quickly and as clearly as you can using your left hand. Write, do not print. Do you understand? Ready? Go.”

For the dominant hand – “All right, now repeat the same thing, only this time using your right hand. I’ve given you a different sentence. Are you ready? Go.”

Item 2: Card Turning

Place 5 index cards (3x5 in) in a horizontal row 2 in apart on a desk in front of the subject. Each card should be placed 5 inches from the front edge of the desk (indicate this with tape).
Record the time from “go” until the subject turns the last card over. The cards do not have to be in the same placement after turning.

*Repeat with the dominant hand.*

Verbal Instructions:
“Place your left hand on the table please. When I say “go”. Use your left hand to turn these cards over one at a time as quickly as you can, beginning with this one (indicate card to extreme right). You may turn them over in any way that you wish and they need not be in a neat pattern when you finish. Do you understand? Ready? Go.”

For the dominant hand – “Now the same thing with the right hand beginning with this one (indicate extreme left card). Ready? Go.”

**Item 3: Small Common Objects**
Place an empty 1-pound coffee can in front of the subject, 5 inches from the front edge of the desk. Next, place 2 United States pennies (closest to coffee can), 2 bottle caps with the inside facing up and 2 one-inch paper clips (farthest from coffee can) to the left, each of these items should be separated by 2 inches.
Record the time from “go” until the last item is placed inside the coffee can.

*Repeat with the dominant hand – with the layout as a mirror image of the non-dominant setup.*

Verbal instructions:
“Place your left hand on the table please. When I say “go”, use your left hand to pick up these objects one at a time and place them in the can as fast as you can beginning with this one (indicate paper clip on the extreme left). Do you understand? Ready? Go.”

For the dominant hand – “Now the same thing with the right hand beginning here (indicate paper clip now on the extreme right). Ready? Go.”

**Item 4: Simulated feeding**
Place 5 kidney beans and an empty coffee can on a board clamped to the desk in front of the subject, 5 inches from the front edge of the desk. The beans should be oriented to the left of center, parallel to and touching the upright of the board 2 inches apart, the coffee can should be in the center. Give the subject a teaspoon. Record the time from the word “go” until the last bean hits the bottom of the coffee can.

*Repeat with the dominant hand – placing the beans on the right side of the can if right hand, left side of the can if left hand.*

Verbal instructions:
“Take the teaspoon in your left hand please. When I say “go”, use your left hand to pick up these beans one at a time with the teaspoon and place them in this can as fast as you can beginning with this one (indicate bean on the extreme left). Do you understand? Ready? Go.”

For the dominant hand – “now the same thing with the right hand beginning here (indicate bean on extreme right). Ready? Go.”
Item 5: Checkers
Place 4 standard sized (1.25 inch diameter) wooden checkers in front of a board clamped to the desk in front of the subject, 5 inches from the front edge of the desk. The checkers should be placed 4 in a row, 2 on each side of the center. Record the time from the word “go” until the fourth checker makes contact with the third checker (subject is stacking the checkers one on top of another).

Repeat with the dominant hand.

Verbal instructions:
“Place your left hand on the table please. When I say “go”, use your left hand to stack these checkers on the board in front of you as fast as you can like this, one on top of the other (demonstrate). You may begin with any checker. Do you understand? Ready? Go.”

For the dominant hand – “Now the same thing with the right hand. Ready? Go.”

Item 6: Large Light Object
Place 5 empty cans in front of a board clamped to the desk, 5 inches from the front edge of the desk, in front of the subject. Space the cans 2 inches apart with the open end of the can facing down. The subject is to place each can onto the board in front of the cans. Record the time from the word “go” until the subject releases the fifth can.

Repeat with the dominant hand.

Verbal instructions:
“Place your left hand on the table please. When I say ‘Go’, use your left hand to stand these cans on the board in front of you like this (demonstrate). Begin with this one (indicate can on extreme left). Do you understand? Ready? Go.”

Dominant hand – “Now the same thing with the right hand beginning here (indicate extreme right can). Ready? Go.”

Item 7: Large Heavy Objects
Place 5 full (1 pound) cans in front of a board clamped to the desk in front of the subject, 5 inches from the front edge of the desk. Space the cans 2 inches apart with the open end of the can facing down. The subject is to place each can onto the board in front of the cans. Record the time from the word “go” until the subject releases the fifth can.

Repeat with the dominant hand.

Verbal instructions:
“Now do the same thing with these heavier cans. Place your left hand on the table. When I say “Go”, use your left hand to stand these cans on the board as fast as you can. Begin here (indicate can on extreme left). Do you understand? Ready? Go.”

For the dominant hand – “Now the same thing with your right hand beginning here (indicate can on far right). Ready? Go.”

Jebsen Hand Function Test Worksheet:
Patient Name: _____________________    Date: _____________________

The tests are performed with the non-dominant hand first.

The results are measured by timing the time taken to accomplish each task.

Writing: ____________ seconds

Card turning: ____________ seconds

Small common object: ____________ seconds

Simulated feeding: ____________ seconds

Checkers: ____________ seconds

Large light object: ____________ seconds

Large heavy object: ____________ seconds

Clinical Considerations:

• The JHFT only assesses the speed and not the quality of performance
• The JHFT represents one of the oldest standardized tests of hand function and used individuals with SCI during its initial development.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:
• Test-retest reliability for the items ranged from poor to excellent (ranged from r=0.60-0.99 (Pearson’s product-moment correlation)).
[Jebsen et al. 1969]

Validity:
• Correlation of the Jebsen Hand Function test is excellent with the overall Klein-Bell Scale score (Spearman’s ρ = 0.635) and Klein-Bell Scale–dressing subscale (Spearman’s ρ = 0.69), and adequate with Klein-Bell Scale-bathing/hygiene subscale (-0.57) and Klein-Bell Scale-Eating subscale (-0.45).
[Lynch & Bridle 1989]

Responsiveness:
No values have been reported for the responsiveness of the Jebsen Hand Function Test for the SCI population at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the Jebsen Hand Function Test for the SCI population at this time.
Modified Functional Reach Test (mFRT)

- The FRT was originally designed as a simple reach test designed to assess standing balance.
- This modified version is designed to assess sitting balance in individuals with SCI (i.e. modified FRT). Balance is defined as the ability to maintain control over upright posture during forward reach without stabilization.

ICF Domain:
Activity – subcategory: Mobility.

Number of Items:
1

Instructions for Administration and Scoring:

Administration:
- The individual is seated on a bench and the maximum distance forward they can reach is measured with the upper extremity flexed to 90 degrees. The anatomical landmark is the ulnar styloid process.
- No weight bearing is allowed through the non-reaching arm.
- The individual is allowed two practice trials and then the following three trials are recorded.
- Administration takes approximately 5 minutes.

Equipment:
- A meter stick/yardstick (attached horizontally to the wall)
- A seat (mat or bench approximately 61 cm in width)
- A backboard (at an angle of 80 degrees).

Scoring:
- The average of the three trials is reported in cm.

Interpretability:

MCID: not established
SEM & MDC:
SEM and MDC for mFRT for each group (calculated from Lynch et al. 1998):

<table>
<thead>
<tr>
<th>Group</th>
<th>SEM (cm)</th>
<th>MDC (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (C5-C6)</td>
<td>1.86</td>
<td>5.16</td>
</tr>
<tr>
<td>Group 2 (T1-T4)</td>
<td>1.67</td>
<td>4.62</td>
</tr>
<tr>
<td>Group 3 (T10-12)</td>
<td>1.48</td>
<td>4.11</td>
</tr>
</tbody>
</table>

- No normative data or cut-points have been established for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details page)

Languages:

- Performed with a leveled yardstick that has been mounted on the wall at the height of the patient's acromion level in the non-affected arm while sitting in a chair
- Hips, knees and ankles are positioned at 90 degree of flexion, with feet positioned flat on the floor

The initial reach is measured with the patient sitting against the back of the chair with the upper-extremity flexed to 90 degrees, measure was taken from the distal end of the third metacarpal along the yardstick

First trial in each direction is a practice trial and should not included in the final result. A 15 second rest break should be allowed between trials.

3 trials with different positions:
- Sitting with the unaffected side near the wall and leaning forward
- Sitting with the back to the wall and leaning right
- Sitting with the back to the wall leaning left

Instructions should include leaning as far as possible in each direction without rotation and without touching the wall

Once the individual leans, mark the position of the fifth finger along the yardstick

SCI population - ulnar styloid process was used as landmark since tetraplegic population may not be able to make a fist

Record the distance in centimeters covered in each direction

*If the patient is unable to raise the affected arm, the distance covered by the acromion during leaning is recorded

Training Required:

No formal training is required.

Clinical Considerations:

- The mFRT mimics a very functional activity that is required in daily living. It can distinguish between individuals who have abdominal and back extensors (i.e. high tetraplegia/high paraplegia versus low paraplegia) but not between individuals with high lesions.
- The mFRT has been developed specifically for individuals with SCI. As long as an individual has 90 degrees of shoulder flexion, he/she should be able to complete the test.
The mFRT requires an individual to have 90 degrees of shoulder flexion and it is therefore not suitable for individuals with limited range of motion or musculoskeletal deformity.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**
- Test-retest reliability is excellent for the mFRT (ICC=0.85-0.94). [Lynch et al. 1998]

**Validity:**
No values have been reported for the validity of the mFRT for the SCI population.

**Responsiveness:**
No values have been reported for the responsiveness of the mFRT for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the mFRT for the SCI population.
Pendulum Test (Wartenburg)

- introduced in the 1950s as a diagnostic tool of spasticity.
- originally a qualitative measure (clinician simply observed the leg swing), the use of electronic equipment to generate quantitative data was introduced in the 1980’s.

Brief introduction video to the pendulum test

ICF Domain:

Body Function – Subcategory: Neuromusculoskeletal & Movement-related Functions and Structures

Number of Items:

1 test, recommended to be repeated up to 4 times at 1 minute intervals.

Instructions for Administration and Scoring:

Administration:

- The patient sits on an examination table and the examiner holds the patient's foot with the knee fully extended (as straight as possible). The examiner drops the leg, and a computer records the motion and vibration.

Equipment:

- Typical equipment used is either electro-goniometers, uni-planar video or 3D motion analysis systems.

Scoring:

- Using computer data for number of oscillations and amplitude, values of the Relaxation index (R1 and R2) are calculated and compared to norms.

Interpretability:

MCID: not applicable
SEM: not applicable
MDC: not applicable

- Lower scores indicate more severe spasticity.
- No norms have been established for the SCI population.

Languages:

N/A

Training Required:

Knowledge of spasticity is recommended.

Availability:

This test is performed with the subject half-lying. The patient is instructed to relax his/her knee. The leg is then dropped from a near-full extension and the characteristics of the knee oscillation are evaluated. Specifically, the administrator of the test should observe the number of oscillation following the drop of the leg.
Patient name: _______________________

Trial Date: ______________________

Leg (circle): Left / Right # of oscillations: _______________________

Leg (circle): Left / Right # of oscillations: _______________________

Description of swing: ________________________________________

Clinical Considerations:

• The Wartenberg Pendulum Test is described as a measure of spastic hypertonia. It was proposed as a method of measuring the effects of therapeutic intervention on spasticity.

• Its usefulness and validity in any population suffering from spasms is debatable.

• Computer equipment is required. Although the test itself is quite simple, collecting quantitative information is more consuming.

• This test has not been validated in a SCI specific population and its validity in other populations is debated.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

• There were no significant differences between seven trials of the pendulum test performed at the end of manual muscle testing (P=.64).

• Inter-trial reliability is excellent (ICC=0.92).

[Smith et al. 2000]

Validity:

• Average manually applied velocities during the MMT were compared to muscle tone score from pendulum testing. Higher levels of muscle tone corresponded to lower applied velocities and vice versa, suggesting an inverse relationship between these two variables.

• Correlations between pendulum test score and average velocity were significant and excellent for two of the three therapists and non-significant and adequate for the third therapist (A: Pearson’s r=0.223, P=.32; B: Pearson’s r=0.657, P<.001; C: Pearson’s r=0.67, P<.001). Including all three data sets gave an average correlation of 0.638 and significance level of 0.001.

[Smith et al. 2000]

Responsiveness:

No values were reported for the responsiveness of the Pendulum test.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the Pendulum test for the SCI population.
Rivermead Mobility Index (RMI)

- originally developed to measure mobility for patients with acquired brain injury.
- evaluates patients' bed mobility, postural transfers, and walking ability.
- covers a range of activities, from turning over in bed to running.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

15-item scale: 14 questions and one direct observation

Instructions for Administration and Scoring:

Administration:

- Combined self-report and performance-based format.
- The RMI is quick to administer (approximately 3-5 minutes).

Equipment: None.

Scoring:

- Item 5 requires the patient to stand for 10 seconds without any aid; if the subject can stand for 10 seconds, a response of 'yes' (1) is indicated.
- The other questions require the patient to respond either yes (scored 1) or no (scored 0).
- Scores for the 15 items are summed.

Interpretability:

MCID: not established
SEM: not established for the SCI population, but for a chronic stroke sample (N=50, mean (SD) age: 60.9 (12.8) yrs, Taiwanese sample):
SEM=0.5
SRD = 2.2

MDC: not established

- The range of scores is between 0 (poor mobility) and 15 (good mobility).
- No information is available regarding norms or meaningful cut scores for SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet)

Languages:

English, Dutch, Chinese and Italian.

Training Required:
None.

**Availability:**

Can be found at: [http://www.medicaleducation.co.uk/resources/Rivmob.pdf](http://www.medicaleducation.co.uk/resources/Rivmob.pdf)

**Clinical Considerations:**

- The RMI is simple and quick to complete making it easy to perform in the home, institutional or office settings. There is minimal patient or clinician burden.

- The 14 interview questions should be fairly quick and easy to administer but the direct observation item requiring the patient to stand without aid may not be appropriate to individuals with an SCI. Additionally, since the RMI was originally developed to measure mobility for patients with acquired brain injury, self-report items in the measure may not be applicable to individuals with an SCI.

**Measurement Property Summary:**

| # of studies reporting psychometric properties: 2 |

**Reliability:**

No values were reported for the reliability of the RMI for the SCI population.

**Validity:**

- Correlation of the RMI is **excellent** with:
  - the Walking Index for Spinal Cord Injury (Spearman’s $\rho=0.67$)
  - the Spinal Cord Independence Measure (Spearman’s $\rho=0.75$)
  - the Functional Independence Measure (Spearman’s $\rho=0.9$)
  - the Barthel Index (Spearman’s $\rho=0.60$).

  [Morganti et al. 2005]

**Responsiveness:**

No values were reported for the responsiveness of the RMI for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the RMI for the SCI population.
Spinal Cord Injury Functional Ambulation Inventory (SCI-FAI)

- SCI-specific ambulation measure focusing on gait abnormalities.
- The gait parameters were developed by a panel of experts in SCI rehabilitation and consist of three components:
  1. Gait parameter (weight shift, step width, step rhythm, step height, foot contact, step length)
  2. Assistive devices use (degree of assistance provided by each of device - eg. cane, walker, parallel bars)
  3. Walking mobility (walking distance, speed, and walking frequency)

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

10

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; self-report and performance based measure.
- Clinicians provide scores for each of the gait parameter and assistive device use components.
- In the walking mobility component, subjects are asked about their walking frequency on a scale of 0 to 5 (0 = does not walk; 5 = regularly walks in community). The distance walked in two minutes is also measured. Walking can be videotaped for later evaluation.
- Administration time is very quick (approximately 5 minutes).

Equipment: None.

Scoring:

- The gait parameter component is scored out of 20, 10 points for each of the right and left sides.
- The assistive device component is scored out of 14 (7 points for each side), and assesses upper and lower extremities in addition to the left and right limbs.
- Scores within each component are summed. Component scores range from 0 to 20 in the gait parameter component, 0 to 14 in the assistive device component, and 0 to 5 in the walking mobility component.
- It is not meaningful to combine component scores into an overall total score.

Interpretability:

MCID: not established
SEM: 0.7 points (gait parameter subscale, Lam et al. 2008)
MDC: Smallest Real Difference (SRD) = 1.9 points (13%) (gait parameter subscale, Lam et al. 2008)
  - Higher score indicate better levels of function.
- No cut scores or norms have been established for the SCI population.
- Published data for the SCI population are available for comparison (see Interpretability section of the Study Details sheet).

**Languages:**

English.

**Training Required:**

None.

**Availability:**

The gait parameter component is scored out of 20, 10 points for each of the right and left sides. The assistive device component is scored out of 14 (7 points for each side), and assesses upper and lower extremities in addition to the left and right limbs. In the walking mobility component, subjects are asked about their walking frequency on a scale of 0 to 5 (0 = does not walk; 5 = regularly walks in community). The distance walked in two minutes is also measured. Walking can be videotaped for later evaluation.

Patient Name: ____________________  Date: _______________________

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criterion</th>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Weight shift</td>
<td>Shifts weight to stance limb&lt;br&gt;Weight shift absent or only onto assistive device</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>B. Step width</td>
<td>Swing foot clears stance foot on limb advancement&lt;br&gt;Stance foot obstructs swing foot on limb advancement&lt;br&gt;Final foot placement does not obstruct swing limb&lt;br&gt;Final foot placement obstructs swing limb</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>C. Step rhythm</td>
<td><em>At heel strike of stance limb, the swing limb:</em>&lt;br&gt;Begins to advance in &lt;1 second or&lt;br&gt;Requires 1–3 seconds to begin advancing or&lt;br&gt;Requires &gt;3 seconds to begin advancing</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>D. Step height</td>
<td>Toe clears floor throughout swing phase or&lt;br&gt;Toe drags at initiation of swing phase only or&lt;br&gt;Toe drags throughout swing phase</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>E. Foot contact</td>
<td>Heel contacts floor before forefoot or&lt;br&gt;Forefoot or foot flat first contact with floor</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>F. Step length</td>
<td>Swing heel placed forward of stance toe or&lt;br&gt;Swing toe placed forward of stance toe or&lt;br&gt;Swing toe placed rearward of stance toe</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

*L and R denote left and right foot*
Sum for left foot: ______

Sum for right foot: ______

Parameter total (/20):_______

**Assistive Devices**

<table>
<thead>
<tr>
<th>Assistive Devices</th>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper extremity balance/weightbearing devices</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cane(s)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Quad cane(s), crutch(es) (forearm/axillary)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Walker</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Parallel bars</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lower extremity assistive devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ankle-foot orthosis</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Knee-ankle-foot orthosis</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Reciprocating gait orthosis</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Sum for left foot: ______

Sum for right foot: ______

Assistive devices total (/14):_______

**Temporal/Distance Measures**

<table>
<thead>
<tr>
<th>Walking mobility (typical walking practice as opposed to W/C use)</th>
<th>Walks ...</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly in community (rarely/never use W/C)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Regularly in home/occasionally in community</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Occasionally in home/rarely in community</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Rarely in home/never in community</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>For exercise only</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Does not walk</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Walking mobility score = ................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two-minute walk test (distance walked in 2 minutes)</td>
<td>Distance walked in 2 minutes = ...............</td>
<td></td>
</tr>
<tr>
<td>(metres / minute)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Walking mobility total (/5):_______

**Clinical Considerations:**

- The SCI-FAI can only be used among SCI patients who can ambulate independently, with or without the use of assistive devices.
- The SCI-FAI can be completed during regular check ups or during home visits. Individuals walk for a maximum of 2 minutes and can use whatever walking...
devices they require. The SCI-FAI is short in duration and scoring is straightforward for all items on the scale.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**
- Inter-rater reliability of the SCI-FAI is **excellent** for video-taped testing (ICC=0.800-0.840) and **adequate** for live testing (ICC=0.703).
- Intra-rater reliability across the 4 raters was **excellent** (ICC=0.850-0.956).

[Field-Fote et al. 2001]

**Validity:**
- There is an **adequate** correlation (r=0.58) between % change in gait score and change in Lower Extremity Motor Scores (LEMS).
- Correlation of SCI-FAI subscales (parameter, assistive devices and mobility) is **excellent** with the:
  - Berg Balance Scale (Spearman’s $\rho$=0.714-0.747)
  - 2 Minute Walk Test (Spearman’s $\rho$=0.688-0.805)
  - Walking Index of Spinal Cord Injury II (Spearman’s $\rho$=0.630-0.980)
  - 10 Meter Walk Test (Spearman’s $\rho$=0.756-0.788)
  - Timed Up and Go test (Spearman’s $\rho$=-0.724- -0.802).


**Responsiveness:**
- Subjects who participated in experimental walking rehabilitation intervention, showed a statistically significant increase (44.7%) in mean gait score following training.

[Field-Fote et al. 2001]

**Floor/ceiling effect:**
- Ceiling effect was present on 3 subscales (parameter, assistive devices and walking mobility) of the SCI-FAI; % of subjects reaching maximal score on the scale for each is as follows:
  - Parameter – 68.8%
  - Assistive Devices – 34.4%
  - Walking Mobility – 34.4%.

[Lemay & Nadeau 2010]
Sollerman Hand Function Test

- Designed to measure grips that are needed for certain ADLs such as eating, driving, personal hygiene, and writing.
- Includes subtests that represent common handgrips (volar, transverse volar, spherical volar and pinch positions - pulp, lateral, tripod, and the five finger) and activities (using a key; picking up coins from a flat surface; writing with a pen; using a phone; and pouring water from a jug).

**Brief introduction video to the Sollerman Hand Function Test**

**ICF Domain:**
Activity – Subcategory: Mobility.

**Number of Items:**
20

**Instructions for Administration and Scoring:**

**Administration:**
- Clinician-administered standardized performance test.
- A test box is placed in front of the patients who are required to start each subtask in a seated position (but they may stand to complete a task). Three subtasks are completed using the hands bilaterally while the rest are completed with each hand separately. The subtests are timed and the performance is observed.
  - Ex. Pick up key, put into Yale-lock and turn 90°.
- Administration time is usually 20-25 minutes.

**Equipment:**
- Yale-lock with bolts mounted on a vertical wall 30 cm above bottom level.
- Yale-key
- 4 coins of different size
- Two purses mounted on a wall (20 cm above bottom level) w/ zips of different size
- 2 wooden blocks (size 7.5 and 10 cm)
- Box (5cm edges)
- Iron weight (3 kg)
- 2 screws with nuts (1 with spring resistance, the other without resistance)
- Screwdriver with handle (2.5 cm diameter)
- 4 bolts of different size
- 4 nuts
- 2 jars (lid size 7.5 and 10cm diameter)
28.3 ACTIVITY

- 4 buttons with different button-hole sizes on pieces of cloth mounted on a plate.
- Plate
- Knife
- Fork
- Lump of Play-doh
- 2 TubiGrip stockings of different sizes
- Paper
- Pen
- Paper (A4 size)
- Envelope (C6 size)
- 2 paper clips of different size
- Telephone
- Empty water jug (1 litre) with handle

**Scoring:**

- Scoring takes into account the time taken, level of difficulty displayed, and the quality of performance using the correct pinch or grip position.
- Patients are then scored on a 5-point scale from 0 (task cannot be performed at all) to 4 (task is completed without any difficulty within the time frame (20 seconds) and with the prescribed hand-grip of normal quality).
- Scoring the test can be challenging as the assessor must be aware of multiple factors occurring simultaneously (passage of time, difficulty, correct positioning and quality of performance).
- Definitions for interpreting the scoring scheme are not inherently obvious.
- A total sum score (0-80) is created by adding up the scores from the different subtests.

**Interpretability:**

**MCID:** not established

**SEM:** not established for the SCI population, but for a sample of patients with burned hands (N=12 (21 hands), mean (SD) age: 45.1 (13.3) yrs, 7M/5F, mean (SD) time since injury: 13.3 (6.9) months):

SEM=2.6


**MDC:** not established for the SCI population, but for a sample of patients with burned hands (N=12 (21 hands), mean (SD) age: 45.1 (13.3) yrs, 7M/5F, mean (SD) time since injury: 13.3 (6.9) months):

MDC =6.7-6.9

- Higher scores reflect a better performance.
- Subjects with no hand function impairment typically score 80 with the dominant hand and 77-79 for the non-dominant hand.
- No meaningful cut points or norms have been established for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:
N/A

Training Required:
It can be used by clinicians who have little experience, though knowledge of hand function is an asset when scoring.

Availability:

Clinical Considerations:
- The Sollerman (unlike the Jebsen Hand Function Test) considers the quality and level of difficulty with the performance which are important components with respect to hand function.
- The test was designed with tetraplegic patients in mind and therefore reflects the needs of this group.

Measurement Property Summary:
# of studies reporting psychometric properties: 2

Reliability:
- Inter-rater reliability is excellent (r=0.98).
[Sollerman & Ejeskar 1995, Fattal 2004]

Validity:
- Correlation of the Sollerman Hand Function test is excellent with:
  - the International Classification for Surgery of the Hand in Tetraplegia (Pearson’s r=0.88)
  - the Motor Capacities Scale (Spearman’s ρ=0.959).
[Sollerman & Ejeskar 1995, Fattal 2004]

Responsiveness:
No values have been reported at this time for the responsiveness of the Sollerman hand Function Test.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the Sollerman Hand Function Test for the SCI population.
Tool for Assessing Mobility in Wheelchair-dependent Paraplegics

- Used to quantify the mobility of individuals with SCI who use a wheelchair.
- Assesses motor tasks such as: moving from lying to sitting; completing a horizontal transfer; completing a vertical transfer; pushing a wheelchair on flat ground; pushing a wheelchair up/down ramps; and negotiating curbs in a wheelchair.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

6

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; performance based assessment.
- For each task, subjects are scored on a six-point scale with 6 representing complete independence, and 1 representing total assistance. Patients must perform the tasks in the following order: Task 1) supine to long sitting; Task 2) horizontal transfer; Task 3) vertical transfer; Task 4) push on flat; Task 5) push on ramp; Task 6) negotiate curbs. For tasks 2 through 6, the patients are allowed three attempts with the best score recorded. If a task is not attempted, ‘not applicable’ is recorded.

Equipment:

- A 25 meter hallway
- Cones
- A 15 meter ramp
- Curbs 2.5 cm and 15 cm high

Scoring:

- The scores for each task are not meant to be added together to give an overall score. Rather, each task is given a score and interpretation is in relation to that specific task.
- For each task patients are scored on a six-point scale (takes into account assistance and performance time)

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Higher scores indicate greater independence.
- No norms or cut scores for the SCI population are available at this time.
Languages:

N/A.

Training Required:

No formal training required, but a trained physiotherapist should be administering this.

Availability:

Patients are assessed on their ability to perform six different tasks. For each task patients are scored on a six-point scale, with 6 representing the best score and 1 the worst. Patients must perform the tasks in the same order, as set out below. With tasks number 2 and 6, the patient may have three attempts with the best score recorded. The scores for each task were not designed to be added or combined in any way. If a test is not attempted, `not applicable should be recorded, not a score of 1. For the tasks where assistance is quantified the following definitions apply:

Total assistance. A situation where the patient provides less than 25% of the effort required to complete the task and the clinician provides the remaining effort.

Maximal assistance. A situation where the patient provides between 25% and 49% of the effort required to complete the task and the clinician provides the remaining effort.

Moderate assistance. A situation where the patient provides between 50% and 74% of the effort required to complete the task and the clinician provides the remaining effort.

Minimal assistance. A situation where the patient provides between 75% and 99% of the effort required to complete the task and the clinician provides the remaining effort.

Supervision. A situation where the patient provides 100% of the effort to complete the task and the clinician provides either verbal prompts or supervision. However, the clinician does not provide any physical assistance.

Independent. A situation where the patient provides 100% of the effort required to complete the task and the patient does not require any supervision or verbal prompts.

Task 1: Supine to long sitting
This task involves the patient moving from supine to long sitting on a wide plinth. The patient must not hold on to the side of the plinth or any external aids (eg trapeze). The patient completes the task with ....

1 = total assistance
2 = maximal assistance
3 = moderate assistance
4 = minimal assistance
5 = supervision
6 = independently

Task 2: Horizontal transfer
This task involves the patient transferring from their normal wheelchair to a plinth that is the same height as the top of their seat cushion. The front corner of the wheelchair must be 20 cm from the plinth. Subjects may use a slide board, but this will lower their score by one point.
The patient completes the transfer with …
1 = total assistance
2 = maximal assistance
3 = moderate assistance
4 = minimal assistance
5 = supervision
6 = independently

**Task 3: Vertical transfer**
This task involves the patient transferring from the floor back into their wheelchair. To complete the task independently the patient must be sitting on their cushion in their wheelchair. The wheelchair may be put on the plinth, if the patient does not wish to transfer onto the floor.

The patient completes the transfer with …
1 = total assistance
2 = maximal assistance
3 = moderate assistance
4 = minimal assistance
5 = supervision
6 = independently

**Task 4: Push on flat**
This task involves the patients pushing their wheelchair on level ground. Two marks (or objects e.g. witches hats) must be placed 25 m apart on level ground. The task requires the patient to push from one mark, around the second mark and back to the original mark. Timing starts and finishes when the front wheel moves past the first mark. One circuit is defined as pushing 50 metres, i.e. pushing from the first marker to the second marker and back to the first.

1 = patient cannot independently push 25 m (ie, 0.5 of a circuit) in less than 1 min.
2 = patient independently pushes 25 m (ie, 0.5 of a circuit) in less than 1 min, but cannot independently push 50 m in less than 1 min.
3 = patient independently pushes 50 m (ie, 1 circuit) in less than 1 min, but cannot independently push 200 m (ie, 4 circuits) in less than 4 min.
4 = patient independently pushes 200 m (ie, 4 circuits) in less than 4 min, but cannot independently push 200 m (ie, 4 circuits) in less than 3 min.
5 = patient independently pushes 200 m (ie, 4 circuits) in less than 3 min, but cannot independently push 200 m (ie, 4 circuits) in less than 1.5 min.
6 = patient independently pushes 200 m (ie, 4 circuits) in less than 1.5 min.

**Task 5: Push on ramp**
This task involves the patient pushing their wheelchair on a 1:12 ramp. Two marks (or objects, e.g. witches hats) must be placed on the ramp 15 metres apart. The task requires the patient to push from the bottom mark, up the ramp, around the second mark and back down to the original mark. Timing starts and finishes when the front wheel moves past the mark. One circuit is defined as pushing 30 metres, i.e., from the first marker, up to the second marker and back down to the first.

1 = patient cannot independently push up or down the ramp.
2 = patient independently pushes either up or down the ramp but not both.
3 = patient independently pushes up and down the ramp (ie, completes 1 circuit) but takes more than 2 min.
4 = patient independently pushes up and down the ramp (ie, completes 1 circuit) in less than 2 min, but not in less than 1 min.
5 = patient independently pushes up and down the ramp (ie, completes 1 circuit) in less than 1 min, but not in less than 15 s.
6 = patient independently pushes up and down the ramp (ie, completes 1 circuit) in less than 15 s.

**Task 6: Negotiate kerbs**
This task involves the patient pushing up kerbs in their wheelchair. A small kerb is defined as one that is approximately 2.5 cm high and a large kerb is defined as one that is 15 cm high. The task requires the patient to start below the kerb, push up the kerb and finish above the kerb.

1 = patient cannot independently push up a small kerb.
2 = patient independently pushes up a small kerb, but cannot achieve score 3.
3 = patient pushes up a large kerb with a pole and minimal assistance.
4 = patient pushes up a large kerb with minimal assistance.
5 = patient pushes up a large kerb with supervision.
6 = patient independently pushes up a large kerb.

**Scores:**
Task 1: 
Task 2: 
Task 3: 
Task 4: 
Task 5: 
Task 6: 

**Clinical Considerations:**
- The results of the assessment tool summarize the basic level of wheelchair mobility of patients in a manner that is readily understood by other professionals.
- The tool was designed specifically for individuals with paraplegia who use a manual wheelchair.

**Measurement Property Summary:**
# of studies reporting psychometric properties: 1

**Reliability:**
- Inter-rater reliability was measured by examining % agreement between 2 raters.
When the data from the six tasks were pooled, the two therapists’ scores were in perfect agreement 82% of the time, within one grade 17% of the time, within two grades 2% of the time and never differed by three or more grades. [Harvey et al. 1998]

**Validity:**
No values were reported for the validity of the Tool for assessing mobility in wheelchair-dependent paraplegics for the SCI population.

**Responsiveness:**
No values were reported for the responsiveness of the Tool for assessing mobility in wheelchair-dependent paraplegics for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the Tool for assessing mobility in wheelchair-dependent paraplegics for the SCI population.
Tetraplegia Hand Activity Questionnaire (THAQ)

- measure of arm and hand function in individuals with tetraplegia.
- consists of 9 subclasses:
  1) Self-care
  2) Dressing
  3) Continence
  4) Mobility
  5) Eating and drinking
  6) Work/admin/telecom
  7) Leisure
  8) Household
  9) Miscellaneous.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

153

Instructions for Administration and Scoring:

Administration:

- Self-report
- clinician asks individuals about level of difficulty, item importance and need for assistance.

Equipment: None.

Scoring:

- Items are scored based on 3 dimensions:
  1) Performance or Doing (0= without difficulty to 3=help from others);
  2) Use of an aid (0=never and 3=always);
  3) Importance of performing activity independently (0=not important to 2 very important).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Lower scores indicate a higher level of independence.
- No meaningful cut-points or norms have been established for the SCI population.

Languages:

English.

Training Required:

None.
Availability:
 Unable to locate the scale for use at this time.

Clinical Considerations:

• Test is specific to the tetraplegic population (items were identified by client population) so this test is likely to be acceptable to individuals with SCI.

• The test may not be useful when the individual is an in-patient as exposure to out of facility activities (i.e. community living, work, leisure) is required.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
 No values were reported for the reliability of the THAQ for the SCI population.

Validity:

• Experts were consulted to ensure content validity for the THAQ. The expert panel found activities relevant for evaluation in individuals with tetraplegia, not covered in other literature, to be used as THAQ items (69%), particularly within the domains leisure, work/administration/telecom, and continence, with 100%, 88% and 87% new items, respectively. [Land et al. 2004]

Responsiveness:
 No values were reported for the responsiveness of the THAQ for the SCI population.

Floor/ceiling effect:
 No values were reported for the presence of floor/ceiling effects in the THAQ for the SCI population.
**Timed Motor Test (TMT)**

- Assesses the capacity to perform ADL in children with SCI who use a manual wheelchair.
- Tasks include:
  1) donning a shirt
  2) donning sweat pants
  3) performance of even transfers
  4) performance of uneven transfers (4 inch height difference)
  5) wheelchair propulsion on even surfaces
  6) wheelchair performance up a ramp.

**ICF Domain:**

Activity – subcategory: Mobility.

**Number of Items:**

6

**Instructions for Administration and Scoring:**

**Administration:**

- Clinician-administered; performance-based measure.
- The individual completes each task 5 times, except for wheelchair skills which is only done 3 times. They are instructed to complete the task quickly but safely. If they are unsuccessful in completing the task, they can retry it and if they are not able to complete all 5 trials then no time is reported. If the individual requires more than 20 seconds to complete the task then it is considered “incomplete”.
- Administration time is usually **60-90 minutes** (time is required for instruction and rest times are given between trials).

**Equipment:**

- An adjustable mat (dimensions not specified)
- An 80 foot (24.3 m) corridor
- A 45 foot (13.72 m) ramp with an 8 degree angle.

**Scoring:**

- time (seconds) to complete each task is recorded.
- Based on the results of the reliability data it was decided to use the mean score of the fastest 3 trials for scoring each task.

**Interpretability:**

- **MCID:** not established
- **SEM:** not established
- **MDC:** not established
- More time required to complete each task indicates a lower capacity to perform ADL
• No norms or meaningful cut-points have been established for the SCI population.

Languages:
N/A.

Training Required:
No special training is required.

Availability:
Unable to locate the scale for use at this time; contact the author, Ross Chafetz, at rchafetz@shrinenet.org

Clinical Considerations:
• The TMT includes common ADL tasks for children with SCI.
• The objective scale (time in seconds) is useful to detect change.
• The client/clinician burden in completing the test is considerable

Measurement Property Summary:
# of studies reporting psychometric properties: 1

Reliability:
• Test-retest reliability of the TMT items ranges from poor to excellent (ICC=0.30 – donning pants to ICC=0.92 – wheelchair propulsion down the hall).
• For videotaped sessions, intra-rater reliability ranges from adequate to excellent (ICC=0.73 – 0.95) as does inter-rater reliability (ICC=0.71-0.95).
[Chafetz et al. 2004]

Validity:
• Groups with and without thoracolumbosacral orthoses have significantly different TMT scores for 5 of 6 items (all but ‘Propelling Up a Ramp’).
[Chafetz et al. 2004]

Responsiveness:
No values were reported for the responsiveness of the TMT for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the TMT for the SCI population.
**Timed Up and Go Test (TUG)**

- Timed walking test designed to measure gait performance and balance.
- Originally developed as a clinical measure of balance in elderly individuals.
- To date, the TUG has generally not been widely used in the SCI patient population.

**Brief introduction video for TUG**

**ICF Domain:**

Activity – subcategory: Mobility.

**Number of Items:**

N/A

**Instructions for Administration and Scoring:**

**Administration:**

- The individual is instructed to stand up from an arm chair, walk 3 meters, return to the chair and sit down at their preferred walking speed.

- **Instructions to the patient:** “When I say ‘go’ I want you to stand up and walk to the line, turn and then walk back to the chair and sit down again. Walk at your normal pace.”

**Equipment:**

- A chair
- A 3m walkway
- A cone or line to demarcate 3 meter boundary
- A stop watch.

**Scoring:**

Time for ‘Up and Go’ test: _________sec.

Unstable on turning? Y/N

Walking aid used? Y/N Type of aid: ______________

Note: the time recorded should be the time in seconds taken from the point the individual’s buttocks lifts off the seat to the time he/she sits down again.

**Interpretability:**

**MCID:** not established

**SEM** = 3.9 seconds (Lam et al. 2008)

**SRD** = 10.8 seconds (Lam et al. 2008)

- No cut-points or norms have been established for the SCI population
- Published data is available for comparison (see Interpretability section of the Study Details sheet).

**Languages:**

N/A.
Training Required:
No additional training required.

Availability:
The timed “Up and Go” test measures, in seconds, the time taken by an individual to stand up from a standard arm chair, walk a distance of 3 m, turn, walk back to the chair, and sit down. The subject wears their regular footwear and uses their customary walking aid (none, cane, walker). No physical assistance is given. They start with their back against the chair, their arms resting on the armrests, and their walking aid at hand. They are instructed that, on the word “go” they are to get up and walk at a comfortable and safe pace to a line on the floor 3 meters away, turn, return to the chair and sit down again. The subject walks through the test once before being timed in order to become familiar with the test. Either a stopwatch or a wristwatch with a second hand can be used to time the trial.

Equipment: standard arm chair (approximate seat height of 46 cm, arm height 65 cm)

Instructions to the patient
“When I say ‘go’ I want you to stand up and walk to the line, turn and then walk back to the chair and sit down again. Walk at your normal pace.”

Timed Up and Go Testing Form:
Patient name: _____________________________ Date: _____________________________
Time taken for ‘Up and Go’ test: _________ seconds.

Unstable on turning?

Walking aid used? Y / N Type of aid: ____________

Clinical Considerations:
- This test is used to discriminate balance and ambulatory function between patients and evaluate change over time in a single patient.
- The task is very functional and incorporates mobility, balance and lower extremity leg strength.
- The distance walked in the TUG is only 3 meters and so it is not a test of walking endurance.
- The test is simple and fairly easy to administer, however, it is not appropriate for many individuals with SCI.
- Some proponents have advocated for use of a mean time from 3 successive trials due to potential learning effect.

Measurement Property Summary:
# of studies reporting psychometric properties: 2

**Reliability:**
- Intra-rater reliability is **excellent** (Pearson’s r=0.979) and inter-rater reliability is **excellent** (Pearson’s r=0.973).
- Bland-Altman plot indicated that inter-rater reliability was better than intra-rater reliability and that repeatability of the test depends on patient’s walking performance.

[Van Hedel, Wirz & Dietz 2005]

**Validity:**
- Correlation of the Timed Up and Go test is **excellent** with the:
  - 10 Meter Walk Test (Spearman’s $\rho=-0.646$)
  - 6 Minute Walk Test (Spearman’s $\rho=0.88$)
  - Berg Balance Scale (Spearman’s $\rho=-0.815$)
  - WISCI II (Spearman’s $\rho=-0.76$ - -0.799)
  - SCI-Functional Ambulation Inventory- mobility subscale (Spearman’s $\rho=-0.724$).

[Van Hedel et al. 2005, Lemay & Nadeau 2010]

**Responsiveness:**
No values for the responsiveness of the TUG has been reported.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the TUG for the SCI population.
Van Lieshout Test Short Version (VLT-SV)

- Originally developed to assess basic functional modalities of the arm and hand in individuals cervical SCIs.
- Assesses positioning and stabilization of the arms, opening and closing of the functional hand, grasping and releasing of the hands, and manipulation of the thumbs and fingers.
- Tasks include:
  1) arch task
  2) forward reaching
  3) thumb opening
  4) finger opening
  5) grasp function of the thumb
  6) thumb strength
  7) finger strength
  8) pen grip
  9) opening a bottle
  10) lighting a match.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

10

Instructions for Administration and Scoring:

Administration:

- Clinician-administered standardized performance test.
- All tasks are performed while the patient is seated in their wheelchair for the “best hand” only.
- The VLT-SV is scored on a 6-point scale, where 0 = task was not possible, and 5 = highest level of accomplishment. Individual item scores take into account the:
  1) ability to complete the task;
  2) behavioral quality of performance (e.g./accuracy of task completion);
  3) independence in performing the task without using external support (e.g./assistance of the contra-lateral arm).
- Administration time is usually 25-35 minutes.

Equipment:

- Current published literature does not provide details about standardization of the test (e.g./ table heights, distance of reaching tasks, etc.)

Scoring:

- A total score may be calculated by summing the scores of all 10 items.

Interpretability:
MCID: not established  
SEM: not established  
MDC: not established  

- Total scores range from 0 to 50 with higher scores indicating greater functional ability.  
- No normative data or cut-points have been established for the SCI population  
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

**Languages:**  
English, German, Dutch.

The test's measurement properties have only been assessed for the Dutch version. English and German versions are available but the measurement properties have yet to be tested.

**Training Required:**

None, but should be administered by a skilled therapist.

**Availability:**

The total VLT-SV score is the mean of the item scores, ranging from 0 (worst arm/ hand function) up to 5 (best arm/ hand function). Administration time of the VLT-SV is 25–35 min.

**VLT-SV 1: arch task**  
Measure – Shoulder and elbow extension  
Task – perform a semicircular movement of the arm against gravity in the frontal plan by moving the hand along a vertical semicircular plastic tube

**VLT-SV 2: forward reaching**  
Measure – ability to reach forward  
Task – move a bottle across a table towards the body and back

**VLT-SV 3: thumb opening**  
Measure – wrist-related thumb opening  
Task – pick up and release cylindrical objects of different size using lateral pinch

**VLT-SV 4: finger opening**  
Measure – wrist-related finger opening  
Task – pick up and release a small and a large tin  
*Grasp and release*

**VLT-SV 5: grasp function of the thumb**  
Measure – grasp function of the thumb  
Task – pick up a coin in 10 different thumb positions

**VLT-SV 6: thumb strength**  
Measure – functional power of the grip using lateral pinch  
Task - pick up a jug containing water using the thumb, pour water into a glass, and put
the jug on the table

**VLT-SV 7: finger strength**
Measure – functional power of the grip of the fingers during maximal wrist extension
Task – pick up a jug containing water using the fingers, pour water into a glass, and put the jug on the table

*Manipulation using both thumb and fingers*

**VLT-SV 8: pen grip**
Measure – functional grip of the hand
Task – write own name and place signature on a piece of paper. Describe the grip used.

**VLT-SV 9: opening a bottle**
Measure – ability to perform a complex bilateral task
Task – open a bottle with a crown cork using an opener

**VLT-SV 10: lighting a match**
Measure – ability to perform a complex bilateral task
Task – pick up a matchbox, take out a match, secure the match, and light it

Patient Name: ________________________ Date: ______________________

Item scores (0-5):

1. _______
2. _______
3. _______
4. _______
5. _______
6. _______
7. _______
8. _______
9. _______
10. _______

**Total VLT-SV Score: ______________**

**Clinical Considerations:**

- The VLT-SV was developed with the cervical SCI population in mind, implying appropriate item selection / challenge. During administration of the test, the patient and clinician together identify the best way to complete the task.

**Measurement Property Summary - Van Lieshout Test – Short Version**

# of studies reporting psychometric properties: 2
Reliability:
- Internal consistency of the VLT-SV is excellent for both the left hand (Cronbach’s $\alpha=0.88$) and right hand (Cronbach’s $\alpha=0.94$).
- Inter-rater reliability is excellent for both the left hand (ICC=0.98) and right hand (ICC=0.99).
[Post et al. 2006]

Validity:
- Correlation between left and right hand VLT-SV score is adequate (Spearman’s $\rho=0.50$)
- Correlation between the Grasp and Release Test and VLT-SV is excellent for both left hand (Spearman’s $\rho=0.87$) and right hand (Spearman’s $\rho=0.90$).
[Post et al. 2006]

Responsiveness:
- There was a significant difference in VLT-SV scores across 3 measurement points (t1 = start of rehab, t2= 3 months after start of rehab, t3 = discharge).
[Spooren et al. 2006]

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the VLT-SV for the SCI population.
Walking Index for Spinal Cord Injury (WISCI) and WISCI II

- WISCI/WISCI II scale is a functional capacity scale, and was developed as a research tool in clinical trials to measure improvements in ambulation in persons with spinal cord injury.
- WISCI evaluates the amount of physical assistance, braces or devices required to walk at 10 meters.
- Participants are progressed systematically through a validated sequence of capacity levels, incorporating devices and personal assistance, to their maximum walking capacity.
- The WISCI II ranks levels according to the severity of underlying impairment rather than the need for physical assistance, walking aids or braces, etc.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; performance-based measure.
- The participant walks 10 meters (distance represents household ambulation).
- Determining the maximum WISCI II level requires that participants be progressed systematically through each level (for the levels, see below), as the self-selected level may be several levels lower than the maximal level.

Equipment:

- Equipment is typically available in the clinical setting: 5 meter parallel bars and mobility aids (e.g. braces, cane, walker).

Scoring:

- The clinician observes walking and rates the level which the person is considered safe.
- For WISCI I, a score from 1 to 19 is assigned. Level 1: “patient ambulates in parallel bars, with braces and physical assistance of two persons, less than 10 meters” to level 19: “patient ambulates with no devices, no braces and no physical assistance, 10 meters”.
- For WISCI II, a score from 0 to 20 is assigned. Level 0: “patient is unable to stand and/or participate in walking” to level 20: “ambulates with no devices, with brace and no assistance”.

Interpretability:

MCID: not established
SEM & MDC: (SEM, SRD values from Burns et al. 2011, MDC calculated from data in Burns et al. 2011)
For self-selected WISCI II level: SEM=0.283, SRD=0.785, MDC= 0.784
For self-selected WISCI II speed: SEM=0.091, SRD=0.254 m/s, MDC = 0.252
For max WISCI II level: SEM=0.215, SRD=0.597, 0.596
For max WISCI II speed: SEM=0.059, SRD=0.163 m/s, MDC=0.164

- No normative data or cut scores are available for the SCI population but the
  WISCI II is gaining popularity and comparisons can be made with existing
  studies.
- Published data for the SCI population is available for comparison (see
  Interpretability section of the Study Details sheet).

Languages:

N/A.

Training Required:

No formal training required. Knowledge of ambulation useful.

Availability:

Physical limitation for walking secondary to impairment is defined at the person level and
indicates the ability of a person to walk after spinal cord injury. The development of this
assessment index required a rank ordering along a dimension of impairment, from the
level of most severe impairment (1) to least severe impairment (19) for WISCI I and 1-20
for WISCI II, based on the use of devices, braces and physical assistance of one or
more persons.

The order of the levels suggests each successive level is a less impaired level than the
former. The ranking of severity is based on the severity of the impairment and not on
functional independence in the environment. The following definitions standardize the
terms used in each item:

Physical assistance:
‘Physical assistance of two persons’ is moderate to maximum assistance
‘Physical assistance of one person’ is minimal assistance.

Braces:
‘Braces’ means one or two braces, either short or long leg.
‘No braces’ means no braces on either leg.

Walker:
‘Walker’ is a conventional rigid walker without wheels.

Crutches:
‘Crutches’ can be Lofstrand (canadian) or axillary

Cane:
‘Cane’ is a conventional straight cane.

WISCI I:

Level Description
1 = Ambulates in parallel bars, with braces and physical assistance of two persons, less
than 10 meters.
2 = Ambulates in parallel bars, with braces and physical assistance of two persons, 10 meters.
3 = Ambulates in parallel bars, with braces and physical assistance of one person, 10 meters.
4 = Ambulates in parallel bars, no braces and physical assistance of one person, 10 meters.
5 = Ambulates in parallel bars, with braces and no physical assistance, 10 meters.
6 = Ambulates with walker, with braces and physical assistance of one person, 10 meters.
7 = Ambulates with two crutches, with braces and physical assistance of one person, 10 meters.
8 = Ambulates with walker, no braces and physical assistance of one person, 10 meters.
9 = Ambulates with walker, with braces and no physical assistance, 10 meters.
10 = Ambulates with one cane/crutch, with braces and physical assistance of one person, 10 meters.
11 = Ambulates with two crutches, no braces and physical assistance of one person, 10 meters.
12 = Ambulates with two crutches, with braces and no physical assistance, 10 meters.
13 = Ambulates with walker, no braces and no physical assistance, 10 meters.
14 = Ambulates with one cane/crutch, no braces and physical assistance of one person, 10 meters.
15 = Ambulates with one cane/crutch, with braces and no physical assistance, 10 meters.
16 = Ambulates with two crutches, no braces and no physical assistance, 10 meters.
17 = Ambulates with no devices, no braces and physical assistance of one person, 10 meters.
18 = Ambulates with one cane/crutch, no braces and no physical assistance, 10 meters.
19 = Ambulates with no devices, no braces and no physical assistance, 10 meters.

**WISCI Levels:**

<table>
<thead>
<tr>
<th>Level</th>
<th>Devices</th>
<th>Braces</th>
<th>Assistance</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Parallel bars</td>
<td>Braces</td>
<td>2 persons</td>
<td>Less than 10 meters</td>
</tr>
<tr>
<td>2</td>
<td>Parallel bars</td>
<td>Braces</td>
<td>2 persons</td>
<td>10 meters</td>
</tr>
<tr>
<td>3</td>
<td>Parallel bars</td>
<td>Braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>4</td>
<td>Parallel bars</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>5</td>
<td>Parallel bars</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>6</td>
<td>Walker</td>
<td>Braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>7</td>
<td>Two crutches</td>
<td>Braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>8</td>
<td>Walker</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>9</td>
<td>Walker</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>10</td>
<td>One cane/ crutch</td>
<td>Braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>11</td>
<td>Two crutches</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>12</td>
<td>Two crutches</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>13</td>
<td>Walker</td>
<td>No braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>14</td>
<td>One cane/ crutch</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>15</td>
<td>One cane/ crutch</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
</tbody>
</table>
### WISCI II:

**Level Description**

0 = Client is unable to stand and/or participate in assisted walking.

1 = Ambulates in parallel bars, with braces and physical assistance of two persons, less than 10 meters.

2 = Ambulates in parallel bars, with braces and physical assistance of two persons, 10 meters.

3 = Ambulates in parallel bars, with braces and physical assistance of one person, 10 meters.

4 = Ambulates in parallel bars, no braces and physical assistance of one person, 10 meters.

5 = Ambulates in parallel bars, with braces and no physical assistance, 10 meters.

6 = Ambulates with walker, with braces and physical assistance of one person, 10 meters.

7 = Ambulates with two crutches, with braces and physical assistance of one person, 10 meters.

8 = Ambulates with walker, no braces and physical assistance of one person, 10 meters.

9 = Ambulates with walker, with braces and no physical assistance, 10 meters.

10 = Ambulates with one cane/crutch, with braces and physical assistance of one person, 10 meters.

11 = Ambulates with two crutches, no braces and physical assistance of one person, 10 meters.

12 = Ambulates with two crutches, with braces and no physical assistance, 10 meters.

13 = Ambulates with walker, no braces and no physical assistance, 10 meters.

14 = Ambulates with one cane/crutch, no braces and physical assistance of one person, 10 meters.

15 = Ambulates with one cane/crutch, with braces and no physical assistance, 10 meters.

16 = Ambulates with two crutches, no braces and no physical assistance, 10 meters.

17 = Ambulates with no devices, no braces and physical assistance of one person, 10 meters.

18 = Ambulates with no devices, with braces and no physical assistance, 10 meters.

19 = Ambulates with one cane/crutch, no braces and no physical assistance, 10 meters.

### WISCI Levels:

<table>
<thead>
<tr>
<th>Level</th>
<th>Devices</th>
<th>Braces</th>
<th>Assistance</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>Braces</td>
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<td>Parallel bars</td>
<td>Braces</td>
<td>2 persons</td>
<td>10 meters</td>
</tr>
<tr>
<td>3</td>
<td>Parallel bars</td>
<td>Braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td></td>
<td>Activity Description</td>
<td>Braces/No braces</td>
<td>Person Count</td>
<td>Distance</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------</td>
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<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>4</td>
<td>Parallel bars</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>5</td>
<td>Parallel bars</td>
<td>Braces No assistance</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>6</td>
<td>Walker</td>
<td>Braces</td>
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<td>No braces</td>
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</tr>
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<td>Walker</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
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<td>10</td>
<td>One cane / crutch</td>
<td>Braces</td>
<td>1 person</td>
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</tr>
<tr>
<td>15</td>
<td>One cane / crutch</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>16</td>
<td>Two crutches</td>
<td>No braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>17</td>
<td>No devices</td>
<td>No braces</td>
<td>1 person</td>
<td>10 meters</td>
</tr>
<tr>
<td>18</td>
<td>No devices</td>
<td>Braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>19</td>
<td>One cane / crutch</td>
<td>No braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
<tr>
<td>20</td>
<td>No devices</td>
<td>No braces</td>
<td>No assistance</td>
<td>10 meters</td>
</tr>
</tbody>
</table>

**Clinical Considerations:**

- This scale is designed for individuals with an SCI who have the capacity to stand and walk.
- Minimal additional burden as the test falls into typical clinical practice parameters.
- A score is possible even if the individual cannot walk 10 m. However, because the furthest walk distance is 10m, it may not be suitable for individuals with minor impairments.
- It would be useful to incorporate the WISCI II into clinical practice and to evaluate new SCI therapies. Additional tests may be necessary to assess endurance (e.g. 6MWT) and/or walking speed (eg.10MWT), especially for individuals with greater walking capacity.

**Measurement Property Summary- WISCI**

# of studies reporting psychometric properties: 1

**Reliability:** (N=1) [Ditunno et al. 2000]
- Inter-rater reliability was tested by agreement between raters; 100% agreement was achieved across all 24 individual international participants and all eight teams.

**Validity:** (N=1) [Ditunno et al. 2000]
- Correlation of the WISCI I is excellent with the Functional Independence Measure (Spearman’s $\rho=0.765$).
Responsiveness:
No values were reported for the responsiveness of the WISCI I at this time.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the WISCI for the SCI population.

Measurement Property Summary—WISCI II

# of studies reporting psychometric properties: 10

Reliability:
• Test-retest reliability is excellent for self-selected (SS) WISCI II level (ICC=0.994) and walking speed (ICC=0.930), and maximum WISCI II level (ICC=0.995) and walking speed (ICC=0.971).
• Inter-rater reliability is excellent for SS WISCI II (ICC=1.00) and max WISCI II (ICC=0.98).

[ Morganti et al. 2005, Burns et al. 2011, Marino et al. 2010]

Validity:
• Correlation for the WISCI II is:
  o excellent with the Berg Balance Scale (Spearman’s ρ=0.82-0.92)
  o excellent with the Functional Independence Measure (Spearman’s ρ=0.70-0.77)
  o excellent with the Timed Up and Go (Spearman’s ρ=-0.799)
  o excellent with the Spinal Cord Independence Measure- Mobility subscale (Spearman’s ρ=0.81)
  o excellent with the Rivermead Mobility Index (Spearman’s ρ=0.67)
  o excellent with the Barthel Index (Spearman’s ρ=0.67)
  o poor to excellent with the 6-Minute Walk Test (Spearman’s ρ=0.28-0.76)
  o poor to excellent with the 10 Meter Walk Test (Spearman’s ρ=-0.21 - - 0.79)
  o poor to adequate with the Lower Extremity Motor Score (Spearman’s ρ=0.32-0.50)


Responsiveness:
• WISCI II differed between interval 1 and 2 (p=0.005), but not between 2 and 3 (p=0.18) or 3 and 4 (p=0.31) – (4 time intervals: 1) within first month; 2) after 3 months; 3) after 6 months; 4) after 12 months).

[Van Hedel, Wirz & Curt 2005, van Hedel et al. 2006]

Floor/ceiling effect:
• Ceiling effect detected in WISCI II; 44.8% of subjects reached maximal score.

[van Hedel et al. 2006, Ditunno et al. 2007, Lemay & Nadeau 2010]
Wheelchair Circuit (WC)

- assesses manual wheelchair mobility (i.e. skill and performance).
- Tasks cover 3 aspects of mobility:
  1) Tempo (tasks = figure-of-8 shape and sprint)
  2) Technical skill (tasks = crossing a doorstep, mounting a platform, and transferring)
  3) Physical capacity (tasks = wheelchair propulsion and ascending slopes).

ICF Domain:
Activity – subcategory: Mobility.

Number of Items:
9

Instructions for Administration and Scoring:

Administration:
- clinician-administered; performance-based measure
- consists of 9 standardized ADL tasks relating mainly to 3 aspects of mobility – tempo, technical skills and physical capacity.
- During each of the following tasks, performance time, distance or successful completion are recorded.
- There is a resting time of 2 minutes between each task.

Equipment:
- An adjustable mat
- Treadmill (with 3% and 6% grade)
- HR monitor
- Stopwatch
- 0.10 m platform on floor
- Wood doorstep height 0.4 m
- Open space
- 15 m corridor.

Scoring:
- Separate scores for ability (ordinal scale); performance time (seconds); and physical strain (formula using HR data) are calculated.

Interpretability:
MCID: not established
SEM & MDC:
SEM and MDC values (calculated from data in Kilkens et al. 2002) for performance time and peak heart rates during Wheelchair circuit tasks

<table>
<thead>
<tr>
<th>Performance Time: Task</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
</table>

Wheelchair Circuit (WC)
![Figure of 8 shape](image)

<table>
<thead>
<tr>
<th>Task</th>
<th>Time (s) 1</th>
<th>Time (s) 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure-of-8 shape</td>
<td>1.5</td>
<td>4.1</td>
</tr>
<tr>
<td>Crossing doorstep</td>
<td>2.2</td>
<td>6.1</td>
</tr>
<tr>
<td>Mounting platform</td>
<td>2.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Sprint</td>
<td>0.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Transfer</td>
<td>12.2</td>
<td>33.8</td>
</tr>
</tbody>
</table>

**Peak Heart Rate:**

<table>
<thead>
<tr>
<th>Task</th>
<th>Heart Rate (bpm) 1</th>
<th>Heart Rate (bpm) 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure-of-8 shape</td>
<td>6.8</td>
<td>18.9</td>
</tr>
<tr>
<td>Crossing doorstep</td>
<td>6.4</td>
<td>17.7</td>
</tr>
<tr>
<td>Mounting platform</td>
<td>7.7</td>
<td>21.3</td>
</tr>
<tr>
<td>Sprint</td>
<td>7.5</td>
<td>20.9</td>
</tr>
<tr>
<td>Walking</td>
<td>4.4</td>
<td>12.2</td>
</tr>
<tr>
<td>3% slope</td>
<td>9.1</td>
<td>25.3</td>
</tr>
<tr>
<td>6% slope</td>
<td>6.7</td>
<td>18.5</td>
</tr>
<tr>
<td>Wheelchair driving</td>
<td>6.9</td>
<td>19.2</td>
</tr>
<tr>
<td>Transfer</td>
<td>9.2</td>
<td>25.7</td>
</tr>
</tbody>
</table>

- No normative data is available for the SCI population
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

N/A

**Training Required:**

No training is mentioned by the authors, however experience in exercise testing is helpful.

**Availability:**

The wheelchair circuit test consists of 9 standardized ADL tests relating mainly to 3 aspects of mobility – tempo, technical skills and physical capacity.

During each of the following tasks, performance time, distance or successful completion are recorded. There is a resting time of 2 minutes between each task.

**Figure-of-8 shape**

Set up a course with 3 markers placed in a straight line, each 1.5 m apart.

Instruct the subject to start at the first marker, driving the wheelchair in a figure of 8 shape around the other 2 markers. Record the time from the moment the subjects start wheeling until the front wheels of the wheelchair pass the first marker again. (max time allowed = 1 min)

**Crossing a doorstep**

Set up a wooden doorstep (.04 m high, .15 m wide, 1.20 m long) in a doorway. Place a marker 1m in front of and 1m behind the doorstep.
Instruct the subject to start at the first marker and cross the doorstep and wheel until they passed the second marker. Record the time the subject took from passing the first marker to the second marker.

Note: subjects are allowed several attempts (max of 2 min).

**Mounting a platform**
Set up a wooden platform (.10m high, 1.20m wide, 1.20m long) against a wall. Place a marker 2m before the platform.

Instruct the subject to start at the marker and drive up the platform until all 4 wheels of the wheelchair are on the platform. Record the time taken to do this.

Note: Subjects are allowed several attempts within a maximum time of 2 minutes.

**Sprint**
Set up 2 markers on the floor, 15 m apart.

Instruct the subject to wheel from one marker to the other as fast as possible. Record the time taken to do this.

**Walking**
Set up 2 markers on the floor, 15 m apart.

If the subject is able to ambulate, instruct the subject to walk back and forth at a safe and comfortable pace between these 2 markers for 2 minutes and measure the distance ambulated. Subjects are allowed to use their normal walking aids. If they are unable to walk for 2 minutes, measure the distance they covered until they stopped.

**3% Slope**
*Equipment needed: treadmill*

Start the subject on the treadmill with the speed set at 0.56m/s. After 10 seconds, incline the treadmill to a slope of 3%. After the 3% inclination is reached, instruct subjects to keep driving for 10 seconds before returning the treadmill to 0% inclination, for the conclusion of the test.

Indicate whether the subject was successful in completion of this task.

**6% Slope**
*Equipment needed: treadmill*

Start the subject on the treadmill with the speed set at 0.56m/s. After 10 seconds, incline the treadmill to a slope of 6%. After the 6% inclination is reached, instruct subjects to keep driving for 10 seconds before returning the treadmill to 0% inclination, for the conclusion of the test.

Indicate whether the subject was successful in completion of this task.

**Wheelchair driving**
*Equipment needed:* treadmill

Instruct the subject to drive on a treadmill set at 0.83m/s for 5 minutes.

**Transfer**
Place a marker on the floor 1m from a table that is the same height as a wheelchair with a cushion.

Instruct the subject to start at the marker, drive to the table, and perform a transfer to the table. Record the time needed to complete the task (max. time of 5 min).

Note: Do not attempt this task if subject has a score of <3 on the FIM item transfer bed/chair/wheelchair.

Patient name: ________________________ Date: ______________________

Item 1 (figure-of-8): _______________ seconds

Item 2 (crossing a doorstep): _______________ seconds

Item 3 (mounting a platform): _______________ seconds

Item 4 (sprint): _______________ seconds

Item 5 (walking): _______________ metres

Item 6 (3% slope): successfully completed? Y / N

Item 7 (6% slope): successfully completed? Y / N

Item 8 (wheelchair driving): successfully completed? Y / N

Item 9 (transfer): _______________ seconds

**Clinical Considerations:**

- The performance time and physical strain are useful to monitor progress once the individual achieves a maximal score on the ability score or if they have not demonstrated any change over repeated administrations.
- The WC includes functional tasks developed specifically for the SCI population. However, the tasks are only relevant to manual wheelchair users. Some tasks may be too difficult / not suitable if individuals have medical complications or are older.
- The Wheelchair Circuit consists of 9 observational tasks on mobility; this may cause significant patient and clinician burden.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2
Reliability:
• Intra-rater reliability is **excellent** for the total WC (ICC=0.98), and **adequate to excellent** for both individual tasks (ICC=0.71-0.99) and for record peak heart rate during tasks (ICC=0.68-0.96).
• Inter-rater reliability is **excellent** for the total WC (ICC=0.97), individual tasks (ICC=0.76-0.98) and record peak heart rate during tasks (ICC=0.82-0.99).

[Kilkens et al. 2002]

Validity:
• Functional Independence Mobility (FIM) – mobility subscale score, peak power output and VO$_2$ peak are all significantly correlated to total ability score and performance time score.

[Kilkens et al. 2004]

Responsiveness:
• Standardized response mean between start of rehabilitation program and discharge is 0.6 for Ability score, 0.9 for Performance time score and 0.8 for Physical strain score.

[Kilkens et al. 2004]

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the WC for the SCI population.
Wheelchair Skills Test (WST)

- used to objectively evaluate manual wheelchair skills and safety.
- Existing wheelchair tests (Harvey et al. 1998) do not include the level of wheelchair skills required for daily functioning. The latest version of the WST is 4.2; prior versions include 1.0, 2.4, and 3.2.

ICF Domain:

Activity – subcategory: Mobility.

Number of Items:

50

Instructions for Administration and Scoring:

Administration:

- clinician-administered; performance-based measure
- The revised WST 2.4 includes 50 skills in 10 areas (brakes, armrests, footrests, rolling, turning, reaching, transfers, fold/open, obstacles, and wheelie).
- The individual is required to use a manual wheelchair
- 2 attempts, with a rest, are permitted to complete the task.

Equipment:

- A standardized wheelchair circuit or access to a variety of environmental obstacles, although test developers now advocate use of existing barriers in the natural environment (ex. ramps, curbs, potholes, etc.)

Scoring:

- Scoring is on a pass-fail basis (pass=2, pass with difficulty=1, fail=0, NP= not possible, TE=testing error) with an additional goal attainment score (GAS), for which the clinician indicates whether or not the skill is a reasonable goal for the individual case (N/G=not a goal).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- No cut-points or normative data have been established for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section in the Study Details sheet).

Languages:

N/A.

Training Required:

The clinician requires test familiarization and a spotter is mandatory.
Availability:

The WST manual, questions, and scoring form are available here: [http://www.wheelchairskillsprogram.ca/eng/](http://www.wheelchairskillsprogram.ca/eng/)

Clinical Considerations:

- The tasks cover a wide range of difficulty while remaining functional. It is a generic tool that can be used for several populations (e.g. SCI, amputees, stroke, musculoskeletal disorders, able-bodied) and it was developed using both inpatient and community dwelling samples.
- The Wheelchair Skills Test is developed for manual wheelchair users, therefore, it may not be appropriate for all individuals with SCI.
- The Wheelchair Skills Test may have significant clinician and patient burden as it has 50 items of mobility to test.

Measurement Property Summary:

# of studies reporting psychometric properties: 3

Reliability:

- Test-retest reliability for the WST is **adequate** (Spearman’s ρ=0.65).
- Intra-rater reliability is **excellent** (0.96), as is inter-rater reliability (Spearman’s ρ=0.95).
- Test-retest reliability is **excellent** for maximal velocity $V_{\text{max}}$ (ICC=0.94), spontaneous velocity $V_{\text{spont}}$ (ICC=0.84) and slalom time $S_{\text{time}}$ (ICC=0.88).
- Inter-rater reliability is **excellent** for $V_{\text{max}}$ (ICC=0.92), $V_{\text{spont}}$ (ICC=0.92) and $S_{\text{time}}$ (ICC=0.95).


Validity:

- Correlation of both the WST version 1 (Spearman’s ρ=0.40) and WST version 2 (Spearman’s ρ=0.54) is **adequate** with the Occupational Therapists Global Assessment-Visual Analog Scale (VAS).
- Correlation of the WST score is **excellent** with $V_{\text{max}}$ (Spearman’s ρ=0.72) and $S_{\text{time}}$ (Spearman’s ρ=-0.75) and **adequate** with $V_{\text{spont}}$ (Spearman’s ρ=0.57).
- WST total performance score is significantly correlated with wheeled distance per day (Pearson’s r=0.36) and age (Pearson’s r=-0.32).


Responsiveness:

No values have been reported for the responsiveness of the WST for the SCI population at this time.

Floor/ceiling effect:

No values were reported for the presence of floor/ceiling effects in the WST for the SCI population.
28.3.2 Self Care

Barthel Index (BI) & Modified Barthel Index (MBI)

- one of the oldest developed measures of basic activities of daily living
- originally developed to assess the severity of disability in personal care and mobility in stroke patients.
- consists of 10 domains:
  1) Bathing
  2) Grooming
  3) Feeding
  4) Dressing
  5) Toilet use
  6) Ascend/descend stairs
  7) Bowel management
  8) Bladder management
  9) Bed/wheelchair transfer
  10) Mobility (level surface)

ICF Domain:
Activity – subcategory: Self-Care.

Number of Items:
10

Instructions for Administration and Scoring:

Administration:
- Scores are obtained primarily from using direct observation
- Self-report, or proxy responses (from family/friends) have been reported.
- Scores based on performance in the past 48 hours are preferred.
- Administration takes:
  - 20-30 minutes to complete by direct observation
  - 2-10 minutes to complete for self-report or proxy

In the original version, each item is scored in three steps. **A modified Barthel Index (MBI) with a five-step scoring system, developed by Shah et al. was found to achieve a greater sensitivity and improved reliability compared with the original version. It has been tested in the SCI population by Kucukdevici et al. 2000 – measurement properties are described below.

Equipment: None.

Scoring:
- item scores are summed to give a total score ranging from 0 to 100 (0: fully dependent; 100: fully independent).

Interpretability:
MCID: not established for the SCI population, but for a stroke sample (n = 43; mean (SD) age = 55.4 (14.6) yrs; Taiwanese adults post-stroke mean (SD) of 7.04 (64.1) days):
BI MCID = 1.85 points
Reference: Hsieh et al. 2007, “Establishing the minimal clinically important difference of the Barthel Index in stroke patients” Neurorehabil Neural Repair 21(3): 233-238

SEM: not established for the SCI population, but for a stroke sample (n=56, Taiwanese adults post-stroke mean of 1197.1 days):
BI SEM=1.45 points
Reference: Hsieh et al. 2007, “Establishing the minimal clinically important difference of the Barthel Index in stroke patients” Neurorehabil Neural Repair 21(3): 233-238

MDC: not established for the SCI population, but for a stroke sample (n=56, Taiwanese adults post-stroke mean of 1197.1 days):
BI MDC = 4.02 points
Reference: Hsieh et al. 2007, “Establishing the minimal clinically important difference of the Barthel Index in stroke patients” Neurorehabil Neural Repair 21(3): 233-238

- Higher scores indicate a higher level of independence
- Scores reflect the nursing burden and social acceptability of the activity.
- Cut scores have been established for the stroke population and are not necessarily representative for the SCI population. Scores of 0-20 indicate total dependence; 21-60: severe dependence; 61-90: moderate dependence and 91-99: slight dependence.
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:
The 10 item English version has been assessed for the SCI population.

Training Required:
No training is required though clinical experience/practice is beneficial.

Availability:

From strokecenter.org:
The Barthel ADL Index: Guidelines
The index should be used as a record of what a patient does, not as a record of what a patient could do.
The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
The need for supervision renders the patient not independent.
A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. However direct testing is not needed.
Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
Middle categories imply that the patient supplies over 50 per cent of the effort.
Use of aids to be independent is allowed.
Barthel Index Worksheet:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Scoring description:</th>
<th>Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding</td>
<td>0 = unable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = needs help cutting, spreading butter, etc., or requires modified diet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = independent</td>
<td></td>
</tr>
<tr>
<td>Bathing</td>
<td>0 = dependent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = independent (or in shower)</td>
<td></td>
</tr>
<tr>
<td>Grooming</td>
<td>0 = needs help with personal care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = independent face/hair/teeth/shaving (implements provided)</td>
<td></td>
</tr>
<tr>
<td>Dressing</td>
<td>0 = dependent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = needs help but can do about half unaided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = independent (including buttons, zips, laces, etc.)</td>
<td></td>
</tr>
<tr>
<td>Bowels</td>
<td>0 = incontinent (or needs to be given enemas)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = occasional accident</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = continent</td>
<td></td>
</tr>
<tr>
<td>Bladder</td>
<td>0 = incontinent, or catheterized and unable to manage alone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = occasional accident</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = continent</td>
<td></td>
</tr>
<tr>
<td>Toilet use</td>
<td>0 = dependent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = needs some help, but can do something alone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = independent (on and off, dressing, wiping)</td>
<td></td>
</tr>
<tr>
<td>Transfers (Bed to chair and back)</td>
<td>0 = unable, no sitting balance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = major help (one or two people, physical) can sit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = minor help (verbal or physical)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 = independent</td>
<td></td>
</tr>
<tr>
<td>Mobility (on level surfaces)</td>
<td>0 = immobile or &lt;50 yards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = wheelchair independent, including corners, &gt;50 yards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = walks with help of one person (verbal or physical), &gt;50 yards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 = independent (but may use any aid; for example, stick), &gt;50 yards</td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td>0 = unable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 = needs help (verbal, physical, carrying aid)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = independent</td>
<td></td>
</tr>
</tbody>
</table>

Sum (0-100): __________

Clinical Considerations:

- The BI is one of the best-researched ADL tools and has been used with a number of patient populations. Use of adaptive aids is permitted with a score of ‘independent’.
- The BI covers very basic functional abilities and while a score of 100 suggests independence, assistance may still be required with other higher order tasks.
Barthel Index & Modified Barthel Index

such as cooking/cleaning and therefore other measures are needed to assess these areas.

- Though the test items are deemed important to society, they may not reflect activities that are of importance to individuals with SCI.
- There is minimum patient burden unless the entire test is scored by observation. Floor and ceiling effects makes the scale less useful for the SCI population.

Measurement Property Summary for the Barthel Index:

# of studies reporting psychometric properties: 2

Reliability:
No values were reported for the reliability of the Barthel Index for the SCI population.

Validity:
- Correlation of the Barthel Index is adequate with:
  - the Walking Index for Spinal Cord Injury (Spearman’s ρ=0.67)
  - the Rivermead Mobility Index (Spearman’s ρ=0.6)
  - the Spinal Cord Independence Measure (Spearman’s ρ=0.7)
  - the Functional Independence Measure (Spearman’s ρ=0.7).

[Morganti et al. 2005, Plantinga et al. 2006]

Responsiveness:
- Total score effect size (ES) for all participants = 0.98 (items: 0.38 to 1.16)

[O’Connor et al. 2004]

Floor/ceiling effect:
- Ceiling effects were detected at discharge for the Barthel Index score (24.1% of subjects had the highest score).

[O’Connor et al. 2004]

Measurement Property Summary for the Modified Barthel Index (MBI):

# of studies reporting psychometric properties: 1

Reliability:
- Internal consistency of the Modified BI is excellent at admission (Cronbach’s α=0.88) and discharge (Cronbach’s α=0.90).
- Inter-rater reliability for MBI items range from adequate to excellent (ICC= 0.50-0.78).
- Inter-rater reliability for the total MBI scale is adequate (ICC=0.77)

[Kucukdeveci et al. 2000]

Validity:
- Correlations between the MBI and ASIA (American Spinal Injury Association) motor scores were adequate at admission (r=0.55) and excellent at discharge (r=0.76).
- Correlations were weaker between the MBI and ASIA sensory scores; adequate at both admission (r=0.43) and discharge (r=0.51).

[Kucukdeveci et al. 2000]
Responsiveness:
No values were reported for the responsiveness of the Modified Barthel Index for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects for the Modified Barthel Index for the SCI population.
Frenchay Activities Index (FAI)

- assesses frequency of performing Instrumental Activities of Daily Living (IADL).
- includes items that reflect the patient’s behavior in the areas of domestic chores, leisure/work, and outdoor activities.
- A revised 13-item FAI has recently been assessed among SCI patients. The following summary therefore focuses on the revised FAI.

ICF Domain:

Activity – Subcategory: Self-Care.

Number of Items:

13

Instructions for Administration and Scoring:

Administration:

- Self-administered or interview format using a 2 and 3 point ordinal scale.
- Administration usually takes between 5-15 minutes.

Equipment: None.

Scoring:

- According to Hsieh et al. (2007), the revised FAI includes 13 items (two items in the original FAI, reading books and walking outside or going outside did not fit the Rasch model and were therefore taken out).
- 4 items (washing up, washing clothes, driving a car/bus travel, and gainful work) are scored on a 2 point scale, and the remaining 9 items are scored on a 3-point scale. The response categories are 0 = never, 1= occasionally or more, and 2 = most days.
- The total item summary score ranges from 0 to 22.

Interpretability:

MCID: not established
SEM:
Standard Error (SE) of the items (Hsieh et al. 2007):

<table>
<thead>
<tr>
<th>Items:</th>
<th>SE Logit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Washing up</td>
<td>0.17</td>
</tr>
<tr>
<td>2. Preparing main meals</td>
<td>0.13</td>
</tr>
<tr>
<td>3. Washing clothes</td>
<td>0.17</td>
</tr>
<tr>
<td>4. Driving car/bus travel</td>
<td>0.17</td>
</tr>
<tr>
<td>5. Light housework</td>
<td>0.11</td>
</tr>
<tr>
<td>6. Heavy housework</td>
<td>0.12</td>
</tr>
<tr>
<td>7. Local shopping</td>
<td>0.11</td>
</tr>
<tr>
<td>8. Social occasions</td>
<td>0.13</td>
</tr>
<tr>
<td>9. Actively pursuing</td>
<td>0.12</td>
</tr>
</tbody>
</table>
### Frenchay Activities Index (FAI)

<table>
<thead>
<tr>
<th>Hobby</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Gainful work</td>
<td>0.16</td>
</tr>
<tr>
<td>11. Travel outings/car rides</td>
<td>0.15</td>
</tr>
<tr>
<td>12. Gardening</td>
<td>0.15</td>
</tr>
<tr>
<td>13. Household/car maintenance</td>
<td>0.15</td>
</tr>
</tbody>
</table>

**MDC:** not established

- Higher scores indicate greater frequency of doing IADL.
- The raw scores of the 13-item FAI can be transformed to interval scores thereby enabling clinicians and researchers to quantify and monitor IADL function in SCI patients.
- No cut-points or normative data for the SCI population have been established.
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

English, Dutch, and Chinese.

**Training Required:**

Relevant clinical experience is beneficial but not necessary.

**Availability:**

Can be found at: [http://www.rehabmeasures.org/PDF%20Library/Frenchay%20Activities%20Index.pdf](http://www.rehabmeasures.org/PDF%20Library/Frenchay%20Activities%20Index.pdf)

**Clinical Considerations:**

- The FAI does not assess whether patients can perform or how well they perform IADL.
- The 13 item revised FAI was developed specifically for use with SCI patients.
- The revised 13-item scale is brief, quick to complete, and reflects the everyday activities of daily living.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Rasch analysis reliability coefficient was reported to be 0.78. [Hsieh et al. 2007]

**Validity:**

- The Frenchay Activities Index was validated as a unidimensional construct through revision of the scale after Rasch analysis. [Hsieh et al. 2007]
Responsiveness:
No values were reported for the responsiveness of the FAI for the SCI population.

Floor/ceiling effect:
• The FAI exhibited a slight floor effect (9.9% of participants scored the lowest possible score) and no ceiling effect.
[Hsieh et al. 2007]
Functional Independence Measure (FIM)

- often considered the gold standard for assessing basic activities of daily living (ex. self care).
- consists of two subscales, motor and socio-cognitive.

ICF Domain:

Activity – Subcategory: Self-Care

Number of Items:

18

Instructions for Administration and Scoring:

Administration:

- clinician-administered; completed by observation of performance.
- The motor subscale includes 13 items: eating, grooming bathing, dressing upper extremity, dressing lower extremity, bowel management, bladder management, transfers to bed, chair or wheelchair, transfer to tub, toilet and shower, walking or wheelchair propulsion and stair climbing.
- The socio-cognitive subscale includes 5 items: comprehension, expression, social interaction, problem solving and memory.
- administration is typically conducted by interdisciplinary team members
- Administration usually takes approximately 45 minutes, though short and phone versions also exist and may take more/less time to administer.

Equipment: Items that the patient uses to carry out activities of daily living.

Scoring:

- Each item is scored on a 7 point ordinal scale ranging from 1 (total dependence) to a score of 7 (total independence).
- The scoring considers the use of adaptive equipment and/or the extent of personal assistance or supervision required to complete the task. If assistive equipment (ex. raised toilet seat) is used, the individual cannot achieve a score of 7 on the item.
- FIM motor, cognitive and/or total scores can be derived by summing items.
- Total FIM scores range from 18 (totally dependent) to 126 (totally independent); motor scores range from 13 (total dependence) to 91 (total independence); and cognitive scores range from 5 (total dependence) to 35 (total independence).

Interpretability:

MCID: not established for the SCI population, but for an acute stroke sample, MCID = 22 points (for FIM Total score), 17 points (for FIM-Motor subscale) and 3 points (for FIM-Cognitive subscale). [Beninato et al. 2006, “Determination of the minimal clinically important difference in the FIM instrument in patients with stroke”, n=113]
**SEM**: not established  
**MDC**: not established

- Higher scores reflect fewer care hours required upon discharge.
- No normative data for the SCI population has been established.
- Published data for the SCI population is available for comparison for the FIM (see Interpretability section of the respective Study Details sheets).

**Languages:**

English, German, Italian, Spanish, Swedish, Finnish, Portuguese, Afrikaans, Turkish and French.

**Training Required:**

Certification for FIM administration is required.

**Availability:**

Can be purchased through [http://www.udsmr.org/WebModules/FIM/Fim_About.aspx](http://www.udsmr.org/WebModules/FIM/Fim_About.aspx)

**Clinical Considerations:**

- Though it is the best researched measure of basic function, it may not be sensitive to the subtle important changes in function for SCI individuals.
- The FIM is not SCI specific. It has limitations in sensitivity to component abilities within tasks for people with SCI. There is a ceiling effect with the socio-cognitive subscale for individuals with and it does not measure the social, psychological, or vocational impact of disability experienced by those living with SCI.
- Punitive scoring for individuals who use assistive technology occurs although these individuals may be independent
- Typically requires individuals from a number of different backgrounds (nurse, physical therapy, occupational therapy) to complete

**Measurement Property Summary:**

# of studies reporting psychometric properties: 27

**Reliability:**

- Overall reliability is **excellent** for the total FIM (ICC=0.96), the FIM motor scale (ICC=0.90-0.96) and the FIM cognitive scale (ICC=0.91-0.98).
- Test-retest reliability of the FIM is **excellent** (ICC=0.89).  

**Validity:**

- Correlation of the FIM is **excellent** with the:
  - Quadriplegia Index of Function (Spearman’s $\rho = 0.97$)
  - Quadriplegia Index of Function – Modified (Spearman’s $\rho = 0.93$)
  - Upper Extremity Motor Score (Spearman’s $\rho = 0.84$)
  - Rivermead Mobility Index (Spearman’s $\rho = 0.9$)
  - Barthel Index (Spearman’s $\rho = 0.7$)
- Spinal Cord Independence Measure (Spearman’s $\rho = 0.8$)
  - Walking Index for Spinal Cord Injury (Spearman’s $\rho = 0.70-0.77$)
  - Berg Balance Scale (Spearman’s $\rho = 0.72-0.77$)
  - American Spinal Injury Association (ASIA) motor score (Spearman’s $\rho = 0.91$)

- Correlation of the FIM is **adequate** with the:
  - ASIA light touch (Spearman’s $\rho = 0.58$)
  - ASIA pinprick (Spearman’s $\rho = 0.55$)
  - 50-Foot Walking Speed Test (Spearman’s $\rho = 0.57$).


**Responsiveness:**
- Significant improvements in FIM score were detected between admission and discharge FIM scores (effect size for total FIM = 1.36).


**Floor/ceiling effect:**
- Ceiling effects were reported on FIM-cognition items.
- For bed transfer, toilet transfer and bath transfer, a ceiling effect was detected in the paraplegia group and a floor effect was detected in the tetraplegic group.

[Davidoff 1990, Middleton et al. 2006, Hall et al. 1999]
Functional Independence Measure Self-Report (FIM-SR)

- assesses burden of care and functional impairment.
- this version of the FIM is completed by the patient.
- contains 6 subscales:
  1) Self-care
  2) Sphincter control
  3) Mobility
  4) Locomotion
  5) Communication
  6) Social cognition.

ICF Domain:

Activity – Subcategory: Self-Care.

Number of Items:

18

Instructions for Administration and Scoring:

Administration:

- Self-report
- was developed for administration by telephone interview.

Equipment: None.

Scoring:

- The 18 items are rated on a 1 – 7 scale where 1 = total assistance is needed and 7 = complete independence.
- The scoring considers the use of adaptive equipment and/or the extent of personal assistance or supervision required to complete the task. If assistive equipment (ex. raised toilet seat) is used, the individual cannot achieve a score of 7 on the item.
- The scores can be reported as FIM Motor scores, FIM Cognitive scores or FIM Total summed scores.
- Total FIM scores range from 18 (totally dependent) to 126 (totally independent); motor scores range from 13 (total dependence) to 91 (total independence); and cognitive scores range from 5 (total dependence) to 35 (total independence).

Interpretability:

MCID: not established
SEM & MDC:
SEM and MDC for total FIM-SR and subscales (calculated from data in Masedo et al. 2005):

<table>
<thead>
<tr>
<th>Variable</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-care</td>
<td>4.03</td>
<td>11.2</td>
</tr>
<tr>
<td>Sphincter</td>
<td>1.45</td>
<td>4.02</td>
</tr>
</tbody>
</table>
### 28.3 ACTIVITY

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pre-Treatment Score</th>
<th>Post-Treatment Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>2.51</td>
<td>6.96</td>
</tr>
<tr>
<td>Locomotion</td>
<td>1.59</td>
<td>4.41</td>
</tr>
<tr>
<td>Communication</td>
<td>0.49</td>
<td>1.35</td>
</tr>
<tr>
<td>Social cognition</td>
<td>0.74</td>
<td>2.04</td>
</tr>
<tr>
<td>Motor</td>
<td>7.67</td>
<td>21.2</td>
</tr>
<tr>
<td>Cognitive</td>
<td>0.93</td>
<td>2.56</td>
</tr>
<tr>
<td>Total</td>
<td>8.05</td>
<td>22.30</td>
</tr>
</tbody>
</table>

- Total FIM-SR scores range from 18 (total dependence) to 126 (total independence).
- The higher the FIM score, the fewer care hours required upon discharge.
- No normative data has been established for the SCI population.
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet)

**Languages:**

English

**Training Required:**

Health care professionals scoring the FIM–SR are required to complete training and testing protocol (contact information is available at: [http://www.udsmr.org/WebModules/International/int_About.aspx](http://www.udsmr.org/WebModules/International/int_About.aspx))

**Availability:**

Must be purchased from the UDSMR website above.

**Clinical Considerations:**

- The instrument reports the patient perspective on their level of independence and in general, is well known as the internationally accepted, global tool to measure functional independence.
- The FIM-SR has less clinician and client burden than the original FIM which requires observation of performance.
- Most items on the FIM-SR generalize to all populations, however modified versions of the FIM exist to accommodate the needs of individuals with SCI. The motor scale adequately discriminated subjects with different injury levels

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency of the total FIM-SR is excellent for both pre-treatment (Cronbach’s $\alpha=0.95$) and post-treatment (Cronbach's $\alpha=0.94$)
- Internal consistency for the FIM-SR items range from poor to excellent for pre-treatment (Cronbach’s $\alpha=0.14-0.98$) and post-treatment (Cronbach’s $\alpha=0.20-0.98$).
- Test-retest reliability is excellent for total FIM-SR ($r=0.89$)
• Test-retest reliability ranges from adequate to excellent for individual FIM-SR items (r=0.54-0.91).

[Masedo 2005]

Validity:
• Correlation of the FIM-SR is adequate with the CHART physical subscale (r=0.49), and poor with the CHART Total score (r=0.26) and the CHART mobility subscale (r=0.30).

[Masedo 2005]

Responsiveness:
No values were reported for the responsiveness of the FIM-SR for the SCI population.

Floor/ceiling effect:
• Ceiling effects were detected in both the FIM-SR cognitive subscale (88% subjects reported max score) and the FIM-SR communication and social cognition subscale (76% subjects reported max score).

[Masedo 2005]
**Klein-Bell Activities of Daily Living Scale (K-B Scale)**

- generic instrument that can be used with persons with or without disability.
- developed to measure basic activities of daily living (ADL) independence in both adults and children.
  
  Items are divided into 6 sub-dimensions:
  1) Mobility
  2) Emergency Communication
  3) Dressing
  4) Elimination
  5) Bathing/Hygiene
  6) Eating.
- The majority of items measure ADLs and others measure body function (bladder/bowel emptying and incontinence, chewing/swallowing food and liquids, verbalizing telephone messages).

**ICF Domain:**

Activity – Subcategory: Self-Care.

**Number of Items:**

170

**Instructions for Administration and Scoring:**

**Administration:**

- clinician-administered
- measures patient performance
- Administration of the scale takes from 1-3 hours.

**Equipment:** items typically used in basic activities of daily living (ex. toilet, bed, etc.)

**Scoring:**

- Task weights of 1, 2, or 3 are assigned to each task.
- In developing the weights, four factors were considered, including: importance to health, difficulty for non-disabled persons, time required to perform the task, and the burden of care-giving.
- Items are summed (each task is multiplied by its weight)
- Overall independence scores range from 0 to 313 (0%-100%).

**Interpretability:**

**MCID:** not established
**SEM:** not established
**MDC:** not established
- Higher scores indicate greater independence.
- No normative data has been established for the SCI population at this time.
28.3 ACTIVITY

Languages:

English

Training required:

None formally required.

Availability:

Unable to locate the scale for use.

Clinical Considerations:

• The K-B Scale divides each activity into its essential components to get a measure of basic ADL. This is advantageous over other known ADL scales as it makes it possible to detect problematic items within activities and thus helps to better identify rehabilitation treatment.
• The authors suggest using the scale as a method to generate discussion about goals they wish to achieve.
• The scale was not designed specifically for SCI subjects; therefore, items included in the scale may not be important for SCI populations.

Measurement Property Summary:

# of studies reporting psychometric properties: 2

Reliability:
No values were reported for the reliability of the Klein-Bell Scale for the SCI population.

Validity:
• Correlation of the Klein-Bell scale is excellent with:
  o the Jebsen-Taylor total score (Spearman’s $\rho=-0.635$)
  o the Jebsen-Taylor Test- dressing subscale (Spearman’s $\rho=-0.69$),
• and adequate with:
  o the Jebsen Taylor Test – Bathing/Hygiene subscale (Spearman’s $\rho=-0.57$)
  o the Jebsen Taylor Test – Eating subscale (Spearman’s $\rho=-0.45$).
[Lynch & Bridle 1989, Dahlgren et al. 2007]

Responsiveness:
No values were reported for the responsiveness of the Klein-Bell Scale for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the K-B Scale for the SCI population.

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K-B Scale
Lawton Instrumental Activities of Daily Living Scale (IADL)

- Developed to assess the complex activities of daily living (ADLs) for older adults living in the community. It assesses a person’s ability to perform tasks such as using a telephone, doing laundry, and handling finances.
- Each ability measured by the scale relies on either cognitive or physical function, though all require some degree of both.

**ICF Domain:**
Activity – subcategory: Self-Care.

**Number of Items:**
8

**Instructions for Administration and Scoring:**

**Administration:**
- can be administered using self-report or by interview.
- The patient or a family member or caregiver may provide answers.
- Responses to each of the eight items in the scale will vary ranging from independence in performing the activity to not performing the activity at all.
- **Approximately 10 minutes** is required for administration.

**Equipment:** None.

**Scoring:**
- Responses range from 0 ‘unable or partially able’ to 1 ‘able’.
- Individual items are summed to give a total score.

**Interpretability:**
- **MCID:** not established
- **SEM:** not established
- **MDC:** not established
- Item responses are summed to derive a scale score with higher scores indicating great independence.
- No normative data has been established for the SCI population
- Published data is available to compare results for individuals with SCI (see interpretability section of Study Details sheet).

**Languages:**
- English.

**Training Required:**
- No special training required.

**Availability:**
Freely available online (https://www.abramsoncenter.org/pri/documents/IADL.pdf)

Clinical Considerations:

- The IADL is an easy to administer and provides various response options for each item enabling flexibility when scoring. It measures more complex (instrumental) levels of functioning than other ADL instruments. The IADL scale is therefore likely to be more sensitive in detecting earlier, less severe dysfunction.
- The content of IADL measures often reflects specific cultural concerns. For example, British measures frequently include the ability to make a cup of tea. There is also potential for gender bias as the scale may overemphasize tasks customarily performed by women and thus overestimate dependency in men.
- Only one study, with findings of weak construct validity, has been performed to test the IADL psychometric properties among an SCI population.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
No values have been reported at this time for the reliability of the IADL for the SCI population.

Validity:
- Correlation of the IADL is:
  - adequate with the Quality of Well-Being Scale (Pearson’s r=-0.454)
  - adequate with the Short Form-36 Physical subscales summary (Pearson’s r=-0.357)
  - adequate with the Short Form-12 Mental subscale summary (Pearson’s r=-0.370)
  - poor with the Short Form-36 Mental subscales summary (Pearson’s r=-0.262)
  - poor with the Short Form-12 Physical subscales summary (Pearson’s r=-0.272).
  
[Andresen et al. 1999]

Responsiveness:
No values were reported for the responsiveness of the IADL for the SCI population.

Floor/ceiling effect:
- A slight floor effect detected (13.5% of participants had lowest score).

[Andresen et al. 1999]


Physical Activity Scale for Individuals with Physical Disabilities (PASIPD)

- modified disability version of the 10 item Physical Activity Scale for the Elderly (PASE)
- captures information about leisure, household, and work related physical activity over the preceding 7 days.
- developed targeting individuals with visual/auditory and locomotor/SCI disabilities.
- solicits information about the frequency (number of days a week) and duration (daily hours) of current participation. The specific activity performed in each of these areas is also captured.
- assesses 5 distinct dimensions of physical activity: home repair, lawn and garden work, housework, vigorous sport and recreation, moderate sport and recreation, and occupation and transportation.

ICF Domain:

Activity – subcategory: Self-Care.

Number of Items:

13

Instructions for Administration and Scoring:

Administration:

- Survey administered by mail, telephone, or in person.
- Individuals respond to 2 ordinally ranked responses. Frequency responses range from 1 (never) to 4 (often) while duration responses range from 1 (less than 1) hour to 4 (greater than 4 hours).
- Time for administration is approximately 15 minutes.

Equipment:

- Equipment that subjects use in their everyday physical activities.

Scoring:

- The average hours per day for each item is multiplied by a metabolic equivalent (MET) value associated with the intensity of the activity and summing over items 2 through 13.
- Scores range from 0 (no activity) to >100 METS hr/day (very high).
- There is some variation on scoring.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
• No cut-points or normative data have been established for the SCI population
• Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet)

**Languages:**

English and Dutch.

**Training Required:**

None required.

**Availability:**

This scale has 13 items; items 2-13 are scored.
PASIPD score = sum of (item multiplier x average hours per day) over items 2–13

**Scoring: PASIPD (Item multipliers)**

1. Not scored
2. 2.5
3. 3.0
4. 4.0
5. 8.0
6. 5.5
7. 1.5
8. 4.0
9. 4.0
10. 4.0
11 4.0
12. 1.5
13. 2.5

**PASIPD Worksheet:**

<table>
<thead>
<tr>
<th>Item: Leisure Time Activity:</th>
<th>Score</th>
<th>Score x Item multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. During the past 7 days how often did you engage in stationary activities such as reading, watching TV, computer games, or doing handcrafts?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never (Go to question #2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seldom (1–2d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes (3–4d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often (5–7d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What were these activities?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>On average, how many hours per day did you spend in these stationary activities?</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Patient Name: ___________________________ Date: ___________________________
### 28.3 Activity

<table>
<thead>
<tr>
<th>Question</th>
<th>1. Less than 1hr</th>
<th>2. 1 but less than 2hr</th>
<th>3. 2–4hr</th>
<th>4. More than 4hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the past 7 days, how often did you walk, wheel, push outside your home other than specifically for exercise. For example, getting to work or class, walking the dog shopping, or other errands?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Often (5–7d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>On average, how many hours per day did you spend wheeling or pushing outside your home?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During the past 7 days, how often did you engage in light sport or recreational activities such as bowling, golf with a cart, hunting or fishing, darts, billiards or pool, therapeutic exercise (physical or occupational therapy, stretching, use of a standing frame) or other similar activities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Often (5–7d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>What were these activities?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>On average, how many hour per day did you spend in these light sport or recreational activities?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
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<tr>
<td>4. More than 4hr</td>
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<tr>
<td>During the past 7 days, how often did you engage in moderate sport and recreational activities such as doubles tennis, softball, golf without a cart, ballroom dancing, wheeling or pushing for pleasure or other similar activities?</td>
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<tr>
<td>1. Never (Go to question #5)</td>
<td></td>
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<tr>
<td>2. Seldom (1–2d)</td>
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<tr>
<td>3. Sometimes (3–4d)</td>
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<tr>
<td>4. Often (5–7d)</td>
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<tr>
<td><strong>What were these activities?</strong></td>
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<tr>
<td><strong>On average, how many hours per day did you spend in these moderate sport and recreational activities?</strong></td>
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<tr>
<td>1. Less than 1hr</td>
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<tr>
<td>2. 1 but less than 2hr</td>
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<tr>
<td>3. 2–4hr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
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</tr>
</tbody>
</table>
5. During the past 7 days, how often did you engage in *strenuous sport and recreational* activities such as jogging, wheelchair racing (training), off-road pushing, swimming, aerobic dance, arm cranking, cycling (hand or leg), singles tennis, rugby, basketball, walking with crutches and braces, or other similar activities?

1. Never (Go to question #6)
2. Seldom (1–2d)
3. Sometimes (3–4d)
4. Often (5–7d) What were these activities?

On average, how many hours per day did you spend in these *strenuous sport or recreational* activities?

1. Less than 1hr
2. 1 but less than 2hr
3. 2–4hr
4. More than 4hr

6. During the past 7 days, how often did you do any exercise specifically to increase muscle strength and endurance such as lifting weights, push-ups, pull-ups, dips, or wheelchair push-ups, etc?

1. Never (Go to question #7)
2. Seldom (1–2d)
3. Sometimes (3–4d)
4. Often (5–7d) What were these activities?

On average, how many hours per day did you spend in these exercises to increase muscle strength and endurance?

1. Less than 1hr
2. 1 but less than 2hr
3. 2–4hr
4. More than 4hr

### Household Activity

7. During the past 7 days, how often have you done any *light housework*, such as dusting, sweeping floors or washing dishes?

1. Never (Go to question #8)
2. Seldom (1–2d)
3. Sometimes (3–4d)
4. Often (5–7d)

On average, how many hours per day did you spend doing *light housework*?

1. Less than 1hr
2. 1 but less than 2hr
3. 2–4hr
4. More than 4hr

8. During the past 7 days, how often have you done any *heavy housework or chores* such as vacuuming, scrubbing floors, washing windows, or walls, etc?

1. Never (Go to question #9)
2. Seldom (1–2d)
### 28.3 ACTIVITY

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Sometimes (3–4d)</td>
<td>4. Often (5–7d)</td>
</tr>
<tr>
<td>On average, how many hours per day did you spend doing</td>
<td></td>
</tr>
<tr>
<td><strong>heavy housework or chores?</strong></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2hr</td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
</tr>
<tr>
<td>9. During the past 7 days, how often you done <strong>home repairs</strong> like</td>
<td></td>
</tr>
<tr>
<td>carpentry, painting, furniture refinishing, electrical work, etc?</td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #10)</td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
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<tr>
<td>4. Often (5–7d)</td>
<td></td>
</tr>
<tr>
<td>On average, how many hours per day did you spend doing</td>
<td></td>
</tr>
<tr>
<td><strong>home repairs?</strong></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2hr</td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
</tr>
<tr>
<td>10. During the past 7 days how often have you done **lawn work or yard</td>
<td></td>
</tr>
<tr>
<td>care including mowing, leaf or snow removal, tree or bush trimming, or</td>
<td></td>
</tr>
<tr>
<td>wood chopping, etc?</td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #11)</td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
</tr>
<tr>
<td>4. Often (5–7d)</td>
<td></td>
</tr>
<tr>
<td>On average, how many hours per day did you spend doing</td>
<td></td>
</tr>
<tr>
<td><strong>lawn work?</strong></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2hr</td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
</tr>
<tr>
<td>11. During the past 7 days, how often have you done <strong>outdoor gardening</strong></td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #12)</td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
</tr>
<tr>
<td>4. Often (5–7d)</td>
<td></td>
</tr>
<tr>
<td>On average, how many hours per day did you spend doing</td>
<td></td>
</tr>
<tr>
<td><strong>outdoor gardening?</strong></td>
<td></td>
</tr>
<tr>
<td>1. Less than 1hr</td>
<td></td>
</tr>
<tr>
<td>2. 1 but less than 2 hr</td>
<td></td>
</tr>
<tr>
<td>3. 2–4hr</td>
<td></td>
</tr>
<tr>
<td>4. More than 4hr</td>
<td></td>
</tr>
<tr>
<td>12. During the past 7 days, how often did you <strong>care for another person,</strong> such as children, a dependent spouse, or another adult?</td>
<td></td>
</tr>
<tr>
<td>1. Never (Go to question #13)</td>
<td></td>
</tr>
<tr>
<td>2. Seldom (1–2d)</td>
<td></td>
</tr>
<tr>
<td>3. Sometimes (3–4d)</td>
<td></td>
</tr>
</tbody>
</table>
4. **Often (5–7d)**
   On average, how many hours per day did you spend *caring for another person*?
   1. Less than 1hr
   2. 1 but less than 2hr
   3. 2–4hr
   4. More than 4hr

**Work-related Activity**

13. **During the past 7 days, how often did you *work for pay or as a volunteer*?** (Exclude work that mainly involved sitting with slight arm movement such as light office work, computer work, light assembly line work, driving bus or van, etc.)
   1. Never (Go to END)
   2. Seldom (1–2d)
   3. Sometimes (3–4d)
   4. Often (5–7d)
   On average, how many hours per day did you spend *working for pay or as a volunteer*?
   1. Less than 1hr
   2. 1 but less than 4hr
   3. 5 but less than 8hr
   4. 8hr or more

**PASIPD Score** (Sum of items x item multiplier): __________

**Clinical Considerations:**

- The PASIPD has the potential to provide in-depth information about the degree of activity in the form of Metabolic Equivalents (METS hr/day) and or descriptive information about various activities individuals are performing as well as the frequency and duration of this activity.
- The items of the test were developed with disabled populations in mind.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 2

**Reliability:**

- Internal consistency of factors obtained from principal component analysis and varimax orthogonal rotations was **poor** (Cronbach’s $\alpha=0.37-0.65$).
  [Washburn et al. 2002]

**Validity:**

- PASIPD constructs were assessed through factor analysis and differentiation between groups (age, physical activity level, and self-rated health status)
- **Poor to excellent** correlations (all significant) were found between survey items and total PASIPD score (Pearson’s $r=0.20-0.67$).
28.3 ACTIVITY

- **Poor** and non-significant correlations were found between activity monitor duration and PASIPD duration (Spearman’s $\rho=0.31$), and activity monitor duration and PASIPD intensity (Spearman’s $\rho=0.28$).
- The PASIPD was found to differentiate significantly in score between groups by age, physical activity level and self-rated health status. [Washburn et al. 2002, Van Den Berg-Emons et al. 2011]

**Responsiveness:**
No values were reported for the responsiveness of the PASIPD for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the PASIPD for the SCI population.
Quadriplegia Index of Function (QIF)

- Developed in 1980 to provide a functional assessment that would be useful in documenting the small but clinically significant gains made by quadriplegics throughout in-patient rehabilitation.

- Assesses 10 ADLs:
  1) transfers
  2) grooming
  3) bathing
  4) feeding
  5) dressing
  6) wheelchair mobility
  7) bed activities
  8) bowel program
  9) bladder program
  10) understanding of personal care.
  These represent functional performance activities.

- The final area is a questionnaire - designed to assess the client’s understanding of skin care, nutrition, equipment medications and infections.

ICF Domain:
Activity – subcategory: Self-Care.

Number of Items:
37

Instructions for Administration and Scoring:

Administration:

- Clinician-administered; interview format.
- Scores are provided to give credit for being able to complete a portion of the task rather than the entire task.
- Administration takes less than 30 minutes when the assessor is familiar with the measure.

Equipment: None.

Scoring:

- The functional performance categories are scored on a 5 point scale from 0 (dependent) to 4 (independent).
- Each category of functional performance is calculated according to weighted scores - Functional performance categories: \( \frac{1}{180} \); Understanding of personal care: \( \frac{1}{20} \);
- Total score of 200 can be divided by 2 to yield a score out of 100.

Interpretability:

MCID: not established
SEM: not established
**MDC:** not established

- Higher scores indicate greater independence in key activities of daily living.
- No cut scores or normative data have been established for the SCI population.
- However, published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

**Languages:**

English.

**Training Required:**

None formally required.

**Availability:**

Contact Dr. Glen E Gresham at Erie County Medical Centre.

**Clinical Considerations:**

- The QIF was designed for individuals with tetraplegia due to SCI.

**Measurement Property Summary:**

- # of studies reporting psychometric properties: 2

**Reliability:**

- Inter-rater reliability ranges from **adequate to excellent** ($r=0.55-0.95$).
  
  [Gresham et al. 1986]

**Validity:**

- Correlation of the QIF is **excellent** with the:
  
  - Functional Independence Measure (Spearman’s $\rho=0.97$)
  - American Spinal Injury Association (ASIA) – Motor subscale (Spearman’s $\rho=0.91$)
  - ASIA – light touch (Spearman’s $\rho=0.64$)
  - ASIA – pinprick (Spearman’s $\rho=0.65$).
  
  [Gresham et al. 1986, Yavuz et al. 1998]

**Responsiveness:**

- QIF is sensitive in documenting functional improvements in quadriplegics – average improvements detected by QIF was 46%, while Barthel Index detected 20%.
  
  [Gresham et al. 1986]

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the QIF for the SCI population.
Quadriplegia Index of Function Short Form (QIF-SF)

- Comprised of 3 of the 10 domains originally included in the QIF.
- Includes the categories of grooming, bathing and feeding.
- This version of the QIF includes the categories that relate directly to the upper extremity motor score assessment of ASIA.

ICF Domain:

Activity – subcategory: Self-Care.

Number of Items:

14

Instructions for Administration and Scoring:

Administration:

- clinician-administered; interview format
- administration time is approximately 10 minutes
- The functional performance categories are scored 0-4 in order of increasing independence.

Equipment: None

Scoring:

- Each category of functional performance is calculated according to weighted scores

Interpretability:

MCID: not established for the SCI population
SEM: not established for the SCI population
MDC: not established for the SCI population

- Scores are provided to give credit for being able to complete a portion of the task rather than the entire task.
- The scores represent functional performance in activities rather than performance in component parts.

Languages:

N/A

Training Required:

No formal training required.

Availability:

Can be found in the following article:

• Designed specifically for SCI population.
• ASIA motor scores are strongly correlated to performance improvement on QIF scores
• It is not a comprehensive measure of upper extremity function or predictor of independence in ADLs upon discharge.
• The QIF reflects small gains in function

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

• Inter-correlations of items within the same category for each domain:
  o Grooming: $\rho=0.65-0.70$
  o Bathing: $\rho=0.67-0.93$
  o Feeding: $\rho=0.44-0.88$

Marino et al. 1993

Validity:

• Correlation of the modified QIF and its subscales with the Functional Independence Measure (FIM) subscales and the Upper Extremity Motor Score (UEMS) subscales measuring the constructs were excellent
  o QIF-modified and FIM: $\rho=0.93$
    ▪ Subscale – Grooming: $\rho=0.94$
    ▪ Subscale – Bathing: $\rho=0.92$
    ▪ Subscale – Feeding: $\rho=0.75$
  o QIF-modified and UEMS: $\rho=0.91$
    ▪ Subscale – Grooming: $\rho=0.90$
    ▪ Subscale – Bathing: $\rho=0.84$
    ▪ Subscale – Feeding: $\rho=0.90$

• Feeding ability was assessed by the QIF significantly better than by the FIM (P<.01)

Marino et al. 1993

Responsiveness:

No data on responsiveness was available for the QIF-modified.
Self Care Assessment Tool (SCAT)

- Developed by experienced clinicians to assess cognitive and self care skills required by individuals with an SCI below C7 to perform self-care. Cognitive and functional skills are measured in eight self-care areas: bathing/grooming; nutritional management; medications; mobility/transfer/safety; skin management; bladder management; and bowel management.
- The items in the SCAT consider the use of physical assistance as well as assistive devices. The scale for each item is yes/no/not applicable.

ICF Domain:
Activity – Subcategory: Self-Care

Number of Items:
81 (41 cognitive and 40 functional)

Instructions for Administration and Scoring:

Administration:
- interviewer-administered test.

Equipment: None.

Scoring:
- A cognitive and a functional subscale score can be calculated as well as an overall score, although no details are provided on how to calculate the scores.

Interpretability:

<table>
<thead>
<tr>
<th>MCID: not established</th>
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<tbody>
<tr>
<td>SEM: not established</td>
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<td>MDC: not established</td>
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</tbody>
</table>

- No standardized norms are available and no results were reported so it is difficult to make any comparisons.

Languages:
English.

Training Required:
None formally required.

Availability:
For a copy, contact the authors of the original article (McFarland et al. 1992).

Clinical Considerations:

- The SCAT was developed specifically for the SCI patient population whereas many other self-care measures have been developed for a broad range of health conditions.
- The tool has been used in both the rehabilitation and community setting.
- However, the SCAT does not appear to be widely used in research.
Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
- Test-retest reliability is excellent for the SCAT-Functional subscale ($r=0.80-0.86$), and adequate to excellent for the SCAT-Cognitive subscale ($r=0.47-0.80$) and SCAT total ($r=0.45-0.69$).
- Inter-rater reliability is excellent for the SCAT-Cognitive subscale ($r=0.69-0.93$), SCAT-Functional subscale ($r=0.80-0.92$), and the SCAT-Total ($r=0.74-0.93$).
[McFarland et al. 1992]

Validity:
- Content for all areas of the scale (over 90% agreement) validated by clinical nurse specialists.
- Predictive value at 6 months following discharge was $R^2=0.61$ for SCAT-Cognitive, $R^2=0.82$ for SCAT-Functional and $R^2=0.90$ for SCAT Total.
[McFarland et al. 1992]

Responsiveness:
No values were reported for the responsiveness of the SCAT for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCAT for the SCI population.
Self Reported Functional Measure (SRFM)

- Developed to provide clinically useful information pertinent to the different levels of the disablement process.
- Suitable for people with SCI and was designed to correspond closely in wording, format, and scoring to the Functional Independence Measure (FIM). While the FIM provides seven levels of measurement of 13 motor functions (basic activities of daily living (ADL)) and measurements of cognitive and communication functions, the SRFM has four-level response categories to 13 items of basic ADL and 5 items of instrumental ADL. (The cognitive and communications domains were excluded due to difficulties with accurate self-report of these items.)
- Covers personal functioning such as moving around indoors and personal hygiene.
- Scores of the SRFM can indicate the amount of assistance (burden of care) an individual requires. This may be useful when monitoring treatment efficacy after rehabilitation or when the individual has returned to the community.

ICF Domain:

Activity – Subcategory: Self-Care

Number of Items:

13

Instructions for Administration and Scoring:

Administration:

- self-report or interview; can be administered either in person or by mail.

Equipment: None.

Scoring:

- The 4-point scale is as follows: 4 = no extra time or help, 3 = extra time or special tool, 2 = some help, and 1 = total help or never do.
- Questions are asked based on an average day and the individual’s usual way of doing the activity.
- Total scores (13-52) are derived by summing the scores from each question.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Lower scores indicate greater need for assistance.
- No cut scores or normative values for the SCI population have been established
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

English.

Training Required:
No specialized administration learning is required.

**Availability:**


**Clinical Considerations:**

- The SRFM is comprehensible to persons with a fourth grade reading level.
- This scale has been adapted specifically for the SCI population from the FIM.

**Measurement Property Summary:**

- # of studies reporting psychometric properties: 1

**Reliability:**

No values were reported for the reliability of the SRFM for the SCI population.

**Validity:**

- There were statistically significant correlations (P<.001) between SRFM score and the number of affected limbs, the amount of movement, and the amount of motor dysfunction.
- The relationship between motor impairment and SRFM score was statistically significant on self reported visual, sensory, or memory impairment.

[Hoenig *et al.* 1999]

**Responsiveness:**

No values were reported for the reliability of the SRFM for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the SRFM for the SCI population.
Skin Management Needs Assessment Checklist (SMNAC)

- Skin management scale extracted from the Needs Assessment Checklist.
- Developed to be a post discharge measure to assess client knowledge and ability to perform skin checks, pressure relief and prevention of skin breakdown.
- Based on the individual's perception of his/her ability to independently perform skin management activities.
- Provides SCI specific information related to skin management needs. Its score may be used to identify the problems for individuals living in the community to establish priorities and goal setting or to inform community health care professionals about a clients’ ability to manage skin management activities.

ICF Domain:

Activity – Subcategory: Self-Care

Number of Items:

12

Instructions for Administration and Scoring:

Administration:

- self-report
- requires individuals to demonstrate or, for an individual with a high lesion, instruct their personal care attendant to perform the activities.
- Each item on the SMNAC receives a score ranging from 0-3 (0-complete dependence; 1-mostly dependent; 2-moderately dependent; 3-complete independence) or N/A (not applicable, representing no rehabilitation need or goal to be identified).

Equipment: None.

Scoring:

- The items are summed to generate a total score ranging from 0-36. The value reported is a proportion (client score/36) x 100%.

Interpretability:

MCID: not established

SEM & MDC:

SMNAC score SEM and MDC (calculated from data obtained from Berry & Kennedy 2003):

<table>
<thead>
<tr>
<th>Subscale</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin management</td>
<td>3.27</td>
<td>9.05</td>
</tr>
</tbody>
</table>

- Higher scores reflect greater independence.
- No risk specific scores or normative data for the SCI population is available at this time.
- Published data for the SCI population is available for comparison (see Interpretability section for the Study Details sheet).

Languages:

English.
Training Required:
None, however, experience with wound care may enhance tool use.

Availability:

Clinical Considerations:
- There is minimal patient burden however some embarrassment addressing items may be evident.

Measurement Property Summary:
# of studies reporting psychometric properties: 3

Reliability:
- Internal consistency of the SMNAC is excellent (Cronbach’s α=0.851)
- Test-retest reliability is excellent (ICC=0.899).
[Berry et al. 2004, Gelis et al. 2011]

Validity:
- The SMNAC score did not differ statistically between sex.
- Negative and poor correlations between age and skin management were found in incomplete tetraplegia group (r=-0.22), complete paraplegia group (r=-0.22) and incomplete paraplegia group (r=-0.27).
[Berry et al. 2004]

Responsiveness:
- A significant difference in SMNAC score between the 2 test days (mean days apart: 103±66) using paired-sample t-test (t=-24.38) was found.
[Berry et al. 2004]

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SMNAC for the SCI population.
Spinal Cord Injury Lifestyle Scale (SCILS)

- Measures the frequency of health-related behaviour performance in individuals with SCI.
- Designed to enable examination of the effectiveness of clinical and educational efforts for health maintenance and prevention of secondary impairments.
- Items were developed from a review of the literature on secondary impairments related to SCI. In addition, expert clinicians (physician assistants, nurses and physiotherapists) generated items describing health related behaviours. Each item describes different health behaviours.
- The 5 subscales include:
  1) Cardiovascular
  2) Genitourinary
  3) Neuromuscular
  4) Skin
  5) Psychosocial.

ICF Domain:

Activity – Subcategory: Self-Care.

Number of Items:

25

Instructions for Administration and Scoring:

Administration:

- Self-report
- Administration time is usually 5-10 minutes.

Equipment: None.

Scoring:

- A score is generated for each subscale by totaling scores of each item in the subscale.
- The frequency with which each behaviour has been performed over the past 3 months is rated using an ordinal scale where 4-'almost always', 3-'frequently', 2-'sometimes', 1-'rarely' and 0-'never'.
- One item (genitourinary) is reverse scored.
- A total score ranging from 0-100 is calculated by summing the 5 subscale scores.
- Sub-scale scores may be used to identify/address specific areas of concern.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Higher total scores are intended to indicate better performance of behaviours which promote health in individuals with SCI.
- The scores could be used for each sub-scale or as a tool for general overall health.
- There are no norms or reported cut scores for the SCI population.
Published data for the SCI population is available for comparison (see Interpretability section in the Study Details sheet).

**Languages:**

English.

**Training Required:**

None formally required.

**Availability:**

Scoring:

A total score is comprised of the sum of the five scale scores. Higher scores on the SCILS are indicative of higher performance of behaviors that promote health in persons with SCI.

**Rating System:**

4 = almost always
3 = frequently
2 = sometimes
1 = rarely
0 = never

* One item (genitourinary #3) is reverse scored

<table>
<thead>
<tr>
<th>Item</th>
<th>Score (0-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular:</strong></td>
<td></td>
</tr>
<tr>
<td>1. I avoid smoking cigarettes.</td>
<td></td>
</tr>
<tr>
<td>2. I limit the amount of fat and cholesterol in my diet (for example, I limit red meats, dairy products).</td>
<td></td>
</tr>
<tr>
<td>3. I am aware of and try to reduce my risk for heart disease.</td>
<td></td>
</tr>
<tr>
<td>4. I monitor my blood pressure on a regular basis.</td>
<td></td>
</tr>
<tr>
<td><strong>Genitourinary:</strong></td>
<td></td>
</tr>
<tr>
<td>1. I use an intermittent catheterization program and stick to the recommended schedule.</td>
<td></td>
</tr>
<tr>
<td>2. I change my catheters as often as I have been directed to.</td>
<td></td>
</tr>
<tr>
<td>3. I have episodes of bladder incontinence.* (item is reverse-scored)</td>
<td></td>
</tr>
<tr>
<td>4. I use a rectal suppository as part of my regular bowel program.</td>
<td></td>
</tr>
<tr>
<td><strong>Neuromusculoskeletal:</strong></td>
<td></td>
</tr>
<tr>
<td>1. I do range of motion exercises daily to keep my joints flexible.</td>
<td></td>
</tr>
<tr>
<td>2. I do exercises that enhance my muscle strength (for example, weight training) at least 3 times a week.</td>
<td></td>
</tr>
<tr>
<td>3. My muscle strengthening exercises are monitored by a therapist at least once a year.</td>
<td></td>
</tr>
<tr>
<td>4. I allow my shoulder joints to rest when I am having pain from overusing them.</td>
<td></td>
</tr>
</tbody>
</table>
### 28.3 ACTIVITY

<table>
<thead>
<tr>
<th></th>
<th>SCI Lifestyles Scale (SCILS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>I do activities which put weight on the bones in my legs to help increase bone density about 3 times a week (for example, use standing frame).</td>
</tr>
<tr>
<td>6.</td>
<td>I pay attention to the position my body is in when I am in my wheelchair.</td>
</tr>
<tr>
<td>7.</td>
<td>I pay attention to the position my body is in when I am sleeping.</td>
</tr>
<tr>
<td>8.</td>
<td>If I noticed the beginning of a contracture (a joint that is ‘freezing up’), I would know exactly what to do.</td>
</tr>
</tbody>
</table>

#### Skin:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I check my skin to look for any areas of redness or breakdown.</td>
</tr>
<tr>
<td>2.</td>
<td>I do some type of pressure relief every 30 minutes any time I am in my chair or driving.</td>
</tr>
<tr>
<td>3.</td>
<td>I am careful not to bump my legs, feet, or buttocks when doing transfers.</td>
</tr>
<tr>
<td>4.</td>
<td>I wear something on my feet when I am out of bed (for example, shoes or foam boots).</td>
</tr>
<tr>
<td>5.</td>
<td>I am careful when handling hot liquids by not carrying them in my lap.</td>
</tr>
<tr>
<td>6.</td>
<td>I am aware of the condition of my wheelchair cushion.</td>
</tr>
<tr>
<td>7.</td>
<td>I am aware of the condition and repair needs of my wheelchair.</td>
</tr>
</tbody>
</table>

#### Psychosocial:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am able to get around in my house (my house is wheelchair accessible).</td>
</tr>
<tr>
<td>2.</td>
<td>I am with or talk to other people at least once a day.</td>
</tr>
</tbody>
</table>

Total score: ___________

### Clinical Considerations:

- Although the authors identified a comprehensive list of secondary conditions, only some of these impairments have been included in the tool. For example, some of the missed items include autonomic dysreflexia, deep vein thrombosis, pressure relief in bed, and adjustment to disability.
- Individuals with SCI participated in item elimination during tool development therefore the included items should resonate with the population.

### Measurement Property Summary:

- # of studies reporting psychometric properties: 1

#### Reliability:

- Internal consistency is excellent for the total SCILS (Cronbach’s $\alpha=0.81$) and poor to excellent for the SCILS subscales (Cronbach’s $\alpha=0.31$-0.86).

[Pruitt et al. 1998]

#### Validity:
SCI Lifestyles Scale (SCILS)

28.3 ACTIVITY

- SCILS was tested against instruments measuring constructs other than that of the SCILS; correlations of the SCILS are poor and non-significant for the following instruments as expected:
  - Functional Independence Measure (Pearson’s $r=-0.06$)
  - Brief Symptom Inventory (Pearson’s $r=-0.16$–0.13)
  - Impact of Event Scale (Pearson’s $r=-0.16$)
  - Beck Depression Inventory (Pearson’s $r=-0.17$).

- SCILS was tested against instruments measuring the same construct as that of the SCILS; correlations of the SCILS were adequate with:
  - Self-assessment of overall health behavior (Pearson’s $r=0.51$) ($P<0.005$)
  - Physician assistant’s assessment of overall health behavior (Pearson’s $r=0.41$) ($P<0.005$)

and poor with:
  - Physical therapist’s assessment of overall health behavior (Pearson’s $r=0.30$) (non-significant)
  - Nurse’s assessment of overall health behavior (Pearson’s $r=-0.18$).

[Pruitt et al. 1998]

Responsiveness:
No values were reported for the responsiveness of the SCILS for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SCILS for the SCI population.
Spinal Cord Independence Measure (SCIM) & SCIM II & SCIM III

- Disability scale developed to specifically address the ability of SCI patients to perform basic activities of daily living independently.

- Three versions of the SCIM (I-III) have been consecutively developed and assess three areas:
  1) self-care (feeding, grooming, bathing, and dressing)
  2) respiration and sphincter management
  3) mobility (bed and transfers and indoor/outdoor)

  The item scores are weighted related to the assumed clinical relevance.

ICF Domain:

Activity – Subcategory: Self-Care.

Number of Items:

19

Instructions for Administration and Scoring:

Administration:

- clinician-administered; a clinician scores the items based on the activities the patient is performing during the regular daily activities or as the patient reports in an interview.

- Administration time is usually 30-45 minutes.

Equipment: None.

Scoring:

- Scores are derived by adding up the items producing a total score (0 to 100) and/or subscale scores (self care: 0-20; respiration and sphincter management: 0-40; mobility 0-40).

- Item response categories vary from item to item; ranging from 0-2 to 0-15.

Interpretability:

MCID: not established for SCIM I, II or III
SEM: not established for SCIM I, II or III
MDC: not established for SCIM I, II or III

- Higher scores reflect higher levels of independence.

- No cut points or norms have been established for the SCI population.

- Published data is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

English and Turkish.

Training Required:

None, but reading the manual is recommended.
**Availability:**
For SCIM III, see [http://www.rehabmeasures.org/Lists/RehabMeasures/Attachments/967/SCIM.pdf](http://www.rehabmeasures.org/Lists/RehabMeasures/Attachments/967/SCIM.pdf)

SCIM I is shown below:

<table>
<thead>
<tr>
<th>Patient Name: ___________________</th>
<th>Date: ___________________</th>
</tr>
</thead>
</table>

**Self-care**

1. Feeding:
   - 0 = needs parenteral, gastrostomy or fully assisted oral feeding
   - 1 = eats cut food using several adaptive devices for hand and dishes
   - 2 = eats cut food using only one adaptive device for hand; unable to hold cup
   - 3 = eats cut food with one adaptive device; holds cup
   - 4 = eats cut food without adaptive devices; needs a little assistance (e.g., to open containers)
   - 5 = independent in all tasks without any adaptive device

2. Bathing (soaping, manipulating water tap, washing)
   - 0 = requires total assistance
   - 1 = soaps only small part of body with or without adaptive devices
   - 2 = soaps with adaptive devices; cannot reach distant parts of body or cannot operate a tap
   - 3 = soaps without adaptive devices; needs a little assistance to reach distant parts of body
   - 4 = washes independently with adaptive devices or in specific environmental setting
   - 5 = washes independently without adaptive devices

3. Dressing (preparing clothes, dressing upper and lower body, undressing)
   - 0 = requires total assistance
   - 1 = dresses upper body partially (e.g. without buttoning) in a special setting (e.g. back support)
   - 2 = independent in dressing and undressing upper body. Needs much assistance for lower body.
   - 3 = requires little assistance in dressing upper or lower body
   - 4 = dresses and undresses independently, but requires adaptive devices and/or special setting
   - 5 = dresses and undresses independently, without adaptive devices

4. Grooming (washing hands and face, brushing teeth, combing hair, shaving, applying makeup)
   - 0 = requires total assistance
   - 1 = performs only one task (e.g. washing hands and face)
   - 2 = performs some tasks using adaptive devices; needs help to put on/take off devices
   - 3 = performs some tasks using adaptive devices, puts on/takes off devices independently
   - 4 = performs all tasks with adaptive devices or most tasks without devices
   - 5 = independent in all tasks without adaptive devices
Respiration and Sphincter Management

5. Respiration
   0 = requires assisted ventilation
   2 = requires tracheal tube and partially assisted ventilation
   4 = breathes independently but requires much assistance in tracheal tube management
   6 = breathes independently and requires little assistance in tracheal tube management
   8 = breathes without tracheal tube, but sometimes requires mechanical assistance for breathing
   10 = breathes independently without any device

6. Sphincter management – Bladder
   0 = indwelling catheter
   5 = assisted intermittent catheterization or no catheterization, residual urine volume > 100 cc
   10 = intermittent self-catheterization
   15 = no catheterization required, residual urine volume < 100 cc

7. Sphincter management – Bowel
   0 = irregularity, improper timing or very low frequency (less than once in 3 days) of bowel movements
   5 = regular bowel movements, with proper timing, but with assistance (e.g. for applying suppository)
   10 = regular bowel movements, with proper timing, without assistance

8. Use of toilet (perineal hygiene, clothes adjustment before/after, use of napkins or diapers)
   0 = requires total assistance
   1 = undresses lower body, needs assistance in all the remaining tasks
   2 = undresses lower body and partially cleans self (after); needs assistance in adjusting clothes and/or diapers
   3 = undresses and cleans self (after); needs assistance in adjusting clothes and/or diapers
   4 = independent in all tasks but needs adaptive devices or special setting (e.g. grab-bars)
   5 = independent without adaptive devices or special setting

Mobility (room and toilet)

9. Mobility in bed and action to prevent pressure sores
   0 = requires total assistance
   1 = partial mobility (turns in bed to one side only)
   2 = turns to both sides in bed but does not fully release pressure
   3 = releases pressure when lying only
   4 = turns in bed and sits up without assistance
   5 = independent in bed mobility; performs push-ups in sitting position without full body elevation
   6 = performs push-ups in sitting position
10. Transfers: bed-wheelchair (locking wheelchair, lifting footrests, removing and adjusting arm rests, transferring, lifting feet)
   - 0 = requires total assistance
   - 1 = needs partial assistance and/or supervision
   - 2 = independent

11. Transfers: wheelchair-toilet-tub (if uses toilet wheelchair – transfers to and from; if uses regular wheelchair – locking wheelchair, lifting footrests, removing and adjusting arm rests, transferring, lifting feet)
   - 0 = requires total assistance
   - 1 = needs partial assistance and/or supervision, or adaptive device (e.g. grab-bars)
   - 2 = independent

**Mobility (indoors and outdoors)**

12. Mobility indoors (short distances)
   - 0 = requires total assistance
   - 1 = needs electric wheelchair or partial assistance to operate manual wheelchair
   - 2 = moves independently in manual wheelchair
   - 3 = walks with a walking frame
   - 4 = walks with crutches
   - 5 = walks with two canes
   - 6 = walks with one cane
   - 7 = needs leg orthosis only
   - 8 = walks without aids

13. Mobility for moderate distances (10-100 meters)
   - 0 = requires total assistance
   - 1 = needs electric wheelchair or partial assistance to operate manual wheelchair
   - 2 = moves independently in manual wheelchair
   - 3 = walks with a walking frame
   - 4 = walks with crutches
   - 5 = walks with two canes
   - 6 = walks with one cane
   - 7 = needs leg orthosis only
   - 8 = walks without aids

14. Mobility outdoors (more than 100 meters)
   - 0 = requires total assistance
   - 1 = needs electric wheelchair or partial assistance to operate manual wheelchair
   - 2 = moves independently in manual wheelchair
   - 3 = walks with a walking frame
   - 4 = walks with crutches
   - 5 = walks with two canes
   - 6 = walks with one cane
   - 7 = needs leg orthosis only
   - 8 = walks without aids

15. Stair management
   - 0 = unable to climb or descend stairs
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1 = climbs 1 or 2 steps only, in a training setup
2 = climbs and descends at least 3 steps with support or supervision of another person
3 = climb and descends at least 3 steps with support of handrail and/or crutch and/or cane
4 = climbs and descends at least 3 steps without any support or supervision

16. Transfers: wheelchair-car (approaching car, locking wheelchair, removing arm and foot rests, transferring to and from car, bringing wheelchair into and out of car)
   0 = requires total assistance
   1 = needs partial assistance and/or supervision, and/or adaptive devices
   2 = independent without adaptive devices

Self-care subscale score (0-20): __________________
Respiration and sphincter management subscale score (0-40):

Mobility subscale score (0-40): __________________
Total Score: __________________

Clinical Considerations:
• The SCIM is quickly becoming one of the most frequently used research tools within the SCI population and has high clinical relevance for the rehabilitation for individuals with either traumatic/non-traumatic and complete/incomplete SCI.
• Ceiling and floor effects (especially floor) may be an issue for individuals at either who have very high or low level lesions.
• Minimal staff/patient burden is required as the variables collected are important to patient care, reflect basic areas of patient concern, and are routinely collected as a component of standard practice.

Measurement Property Summary- SCIM

# of studies reporting psychometric properties: 3
Reliability: (N=1) [Catz et al. 1997]
• Total inter-rater agreement on the various individual SCIM items ranged from 72-99%
• Total agreement was higher than 85% (Kappa coefficients ranged between 0.66-0.98).

• Correlation of the SCIM is excellent with the:
  o Functional Independence Measure (Spearman’s ρ=0.80)
  o Walking Index for Spinal Cord Injury (Spearman’s ρ=0.97)
  o Rivermead Mobility Index (Spearman’s ρ=0.75)
  o Barthel Index (Spearman’s ρ=0.70).

Responsiveness: (N=1) [Catz et al. 1997]
• The SCIM was found to be more sensitive than the FIM to changes in function in individuals with SCI. The SCIM detected all functional changes detected by the FIM, and more.
Floor/ceiling effect:  
No values were reported for the presence of floor/ceiling effects in the 4FTPSMW for the SCI population.

Measurement Property Summary – SCIM II
# of studies reporting psychometric properties: 7

Reliability:
• Inter-rater reliability was excellent for the SCIM subscales (r=0.797-0.82), and the total SCIM (r=0.903-0.99).
• Correlation between interviewer and observation scores were adequate to excellent (r=0.69-0.96).
[Catz et al. 2001, Itzkovich et al. 2003]

Validity:
• Correlation of the SCIM II was excellent with the:
  o Berg Balance Scale (Spearman’s ρ=0.89)
  o Walking Index of Spinal Cord Injury (Spearman’s ρ=0.81)
  o 10-Meter Walk Test (Spearman’s ρ=0.89)
  o Falls Efficacy Scale (FES-I) (Spearman’s ρ=-0.78).

Responsiveness:
• In ASIA A subjects, the SRM values were higher for the SCIM II items compared with the walking capacity tests.
• The greatest improvements in mobility occurred within the first month, but predominantly between 1 and 3 months.
• Between 6 and 12 months, only minimal changes were observed.
• There were similar observations in the ASIA B subjects, although these subjects showed more improvement between 6 and 12 months compared with ASIA A subjects.
• In ASIA C subjects, the internal responsiveness values were largest between 1 and 3 months. Good internal responsiveness was also observed within the first month and between 3 and 6 months.

Floor/ceiling effect:
• The median SCIM II score for mobility indoors and mobility over moderate distances reached a ceiling effect at 3 months for complete paraplegia and 6 months for complete quadriplegia.
[Wirth et al. 2008]

Measurement Property Summary – SCIM III
# of studies reporting psychometric properties: 7

Reliability:
• Internal consistency of the SCIM III is excellent (Cronbach’s α=0.77-0.91).
• Inter-rater reliability is excellent for SCIM total (ICC=0.956), as well as all SCIM subscales: self-care (ICC=0.941), respiration/sphincter (ICC=0.844), mobility in the room (ICC=0.961) and mobility indoors/outdoors (ICC=0.945).


Validity:
• Correlation of the SCIM III is excellent with the Functional Independence Measure (Pearson’s r=0.779-0.91).


Responsiveness:
• The ability to identify a 1-point change (admission to discharge) within the 4 areas of SCIM-III in comparison with the total FIM™ score were compared using the McNemar test. SCIM-III detected more numerous changes than FIM™ in 3 of the 4 areas; self-care, respiration and sphincter management, and mobility indoors and outdoors, but not mobility in the room and toilet. The differences between the 2 scales’ responsiveness to changes are not statistically significant.


Floor/ceiling effect:
• Ceiling effects were observed in 3 items: Feeding & grooming, Respiration, Bed mobility
• Floor effects were observed in 11 items: Feeding & grooming, Bathing upper & lower body, Dressing upper body, Dressing lower body, Use of toilet, Bed mobility, Transfer Bed-wheelchair, Transfer wheelchair-toilet-tub, Stair management, Transfer wheelchair-car, and Transfer Wheel-chair ground.

 Activity References

Mobility References

4FTPSMW:

6MWT:

10MWT:
Lemay JF and Nadeau S. Standing balance assessment in ASIA D paraplegic and


BBS:


Box and Block Test:


Mathiowetz V, Federman S, Wiemer D. Box and Block test of manual dexterity: norms

**COVS:**

**CUE:**

**FST:**

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

**GRT:**
**28.3 ACTIVITY**

**Jebsen:**


**mFRT:**

**Pendulum Test:**

**RMI:**


**SCI-FAI:**


**Sollerman:**


**Tools for assessing mobility in wheelchair-dependent paraplegics:**

**THAQ:**

**TMT:**

**TUG:**


**VLT-SV:**


**WISCI I & WISCI II:**


WC:


WST:

Kirby RL, Swuste J, Dupuis DJ, MacLeod DA, Monroe R. The Wheelchair Skills Test: a

**Self Care References**

**Barthel:**
O’Connor RJ, Cano SJ, Thompson AJ, Hobart JC. Exploring rating scale responsiveness: Does the total score reflect the sum of its parts?. Neurology, 2004; 62: 1842-44.

**FAI:**

**FIM:**


Segal ME, Ditunno JF, Staas WE. Interinstitutional agreement of individual functional independence measure (FIM) items measured at two sites on one sample of SCI patients. Paraplegia, 1993; 31: 622-631.


**FIM-SR:**


**Lawton ADL (IADL):**


**PASIPD:**

**QIF:**
Gresham GE, Labi ML, Dittmar SS, Hicks JT, Joyce SZ, Stehlik MA. The Quadriplegia Index of Function (QIF): sensitivity and reliability demonstrated in a study of thirty quadriplegic patients. Paraplegia 1986;24:38-44

**QIF-SF:**

**SCAT:**

**SRFM:**

**SMNAC:**
Keith RA, Lipsey MW. The role of theory in rehabilitation assessment, treatment and


**SCILS:**

**SCIM:**
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SCIM II:
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validly and responsively assessed in subjects with a spinal cord injury.
van Hedel HJA for the EMSCI Study Group. Gait speed in relation to categories of
Wirth B, van Hedel HJA, Kometer B, Dietz V, Curt A. Changes in activity after a
complete spinal cord injury as measured by the Spinal Cord Independence
Wirz M, Muller R, Bastiaenen C. Falls in Persons With Spinal Cord Injury: Validity and
DOI: 10.1177/1545968309341059

SCIM III:
Ackerman P, Morrison SA, McDowel S, Vazquez L. Using the Spinal Cord
Independence Measure III to measure functional recovery in a post-acute spinal
Anderson KD, Acuff ME, Arp BG, Backus D, Chun S, Fisher K, Fjerstad JE, Graves DE,
Greenwald K, Groah SL, Harkema SJ, Horton III JA, Huang M-N, Jennings M,
Kelley KS, Kessler SM, Kirshblum S, Koltenuk S, Linke M, Ljungberg I, Nagy J,
Nicolini L, Roach MJ, Salles S, Scelza WM, Read MS, Reeves RK, Scott MD,
Tansey KE, Theis JL, Tolfo CZ, Whitney M, Williams CD, Winter CM, Zanca JM.
United States (US) multi-center study to assess the validity and reliability of the
Bluvhshtein V, Front L, Itzkovich M, Aidinoff E, Gelernter I, Hart J, Biering-Sorensen F,
Weeks C, Laramee MT, Craven C, Hitzig SL, Glaser E, Zeilig G, Aito S,
Scivoletto G, Mecci M, Chadwick RJ, El Masry WS, Osman A, Glass CA, Silva P,
Son BM, Gardner BP, Savic G, Bergstrom EM, Catz A. SCIM III is reliable and
valid in a separate analysis for traumatic spinal cord lesions. Spinal Cord, 2011;
49:292-296.
Catz A, Itzkovich M, Tesio L, Biering-Sorensen F, Weeks C, Laramee MT, Craven BC,
RJ, El Masry WS, Osman A, Glass CA, Silva P, Soni BM, Gardner BP, Savic G,
Bergstrom EM, Bluvhshtein V, Ronen J. A multicenter international study on the
Spinal Cord Independence Measure, version III: Rasch psychometric validation.
Cord Independence Measure, Version III: Applicability to the UK spinal cord
Itzkovich M, Gelernter I, Biering-Sorensen F, Weeks C, Laramee MT, Craven BC,
RJ, El Masry WS, Osman A, Glass CA, Silva P, Soni BM, Gardner BP, Savic G,
Bergstrom EM, Bluvhshtein V, Ronen J, Catz A. The Spinal Cord Independence
Measure (SCIM) version III: Reliability and validity in a multi-center international
Development and validation of the Italian version of the Spinal Cord
28.4 Participation

Conceptualization and Definition of Participation:

There has been tremendous progress in understanding how individuals resume participating in life activities following a health condition. In 2001, when International Classification of Functioning, Disability and Health (ICF) (Gray & Hendershot 2000) replaced the International Classification of Impairments, Disability and Handicap (ICIDH) there was a change from concept handicap to participation. Participation is defined in the ICF as involvement in a life situation and participation restriction is defined as problems an individual may experience while involved in life situations (World Health Organization 2001). This is a significant shift because handicap focused on the disadvantages for an individual in life roles considered normal (i.e. based on age, sex, and social and cultural factors), which was also referred to as a societal perspective. It is important to note that the World Health Organization’s ICIDH and ICF models are just one way to conceptualize measuring life roles/activities. Other disciplines have proposed measuring similar concepts but have used alternate terms, which are conceptually quite similar, and include: social health; social adjustment; social or community re-integration; independent living; instrumental activities of daily living; and quality of life (Dijkers et al. 2000).

Since the concept of measuring involvement in life situations is very broad, there will likely never be consensus, as to what life dimensions should be included and what construct should be addressed (Dijkers et al. 2000). In the ICF, activity and participation domains are listed together and the user of the model decides which ones to consider activity versus participation. Jette et al. (2003) analyzed items based on the ICF concepts activity and participation and demonstrated that they are distinct concepts, with the former assessing basic tasks (e.g. the ability to climb stairs) and the latter assessing more complex life tasks (e.g. preparing meals). It has been recommended that in future revisions of the ICF that these two concepts are better defined (Dijkers et al. 2000; Whiteneck 2006).

The perspective of how to assess participation has also evolved over time. Measures of handicap primarily captured observable information, such as the frequency which an individual performed roles (e.g. hours of paid work) and in this review are called measures assessing objective participation. However, measures of objective participation do not capture the individual’s perspective about the impact of the health condition and the problems they experience when carrying out everyday activities or fulfilling social roles. As a result, developers incorporated the perspective of participation as perceived by the individual which has been termed subjective or person-perceived participation (i.e. cognitive, emotional and motivational aspects of participation) (Noreau et al. 2005). Although the ICF model does not explicitly include a subjective dimension, the replacement of the term handicap with the term participation and the inclusion of a broader range of life roles provide the opportunity to capture subjective information. In this review, the term objective participation will be used to describe handicap and the term subjective participation will describe person perceived participation.

Recommendations:

For the purpose of this review, the measures included in this section had questions related to most ICF dimensions of participation, particularly, interpersonal
relations/interactions/relationships, major life areas (e.g. education, employment), and/or community/social/civic life. All of the measures have been tested, to varying degrees on individuals with SCI.

The measurement of participation has been termed the most meaningful outcome of rehabilitation (Cicerone 2004); however, it is probably also the most challenging to measure since there are many things that contribute to a person’s level of participation. It is important not to select an outcome measure just because it is commonly used, but rather consider whether it provides information about the outcome of interest (Backman 2005). In this review consideration was given to the domains (i.e. content) which is frequently determined from the conceptual model, the perspective (i.e. objective versus subjective participation) of a particular measure, the psychometric properties as well as logistical issues (e.g. number of questions, patient burden etc.).

The measures included in this review were based on various conceptual models. Some of the measures have been developed based on the ICIDH model (i.e. CHART) or the ICF model (IPAQ). Other measures have used other models such as the Disability Creation Process model (Life-H). The RNL and the PARA-SCI did not use a specific model, but were developed based on the concepts re-integration and physical activity, respectively. All of the measures included multiple domains (i.e. are generic) with the exception of the PARA-SCI, which just focused on physical activity. The domains included vary depending on how participation was defined. Most measures (except PARA-SCI) included some items on self-care, mobility, family/social relations and work/education a few measures included details on items such as parenting, attending religious services or conducting economic transactions. The content and the measurement properties of the participation measures are designed to be used in the community setting.

The participation perspective varies among the measures. Some measures primarily assess objective participation (CHART, PARA-SCI) while other assess subjective participation (IPAQ, Life-H, RNL). Objective participation measures such as the CHART are primarily useful for research purposes to describe from a societal point of view, how individuals with SCI differ from other patient populations and healthy controls. The CHART is probably the most widely used participation measure for individuals with SCI. However, information provided in the CHART does not include the individual’s perspective and so information about how the person performs the tasks as well as what tasks are important to them is not captured, which is a significant limitation. In contrast, the subjective measures of participation (IPAQ, Life-H, RNL) offer tremendous potential to clinicians and researchers working in the area of SCI.

Most of the participation measures have established some aspects of reliability and validity. The IPAQ is a relatively new measures and so not much has been published specifically on individuals with SCI. To date, very little has been published on responsiveness for any of the measures, with the exception of the IPAQ. In Canada, data using the RNL in individuals with SCI will become available since it is part of the NRS, although little work has been done to establish its psychometric properties in this population. Finally, measures as the LIFE-H include information on satisfaction with participation and clinicians and researchers can use this information to identify areas or target interventions to those life activities that are most important to the individual.

Conclusion
Participation measures, particularly ones that measure subjective participation, provide important information for individuals working in the field of rehabilitation since they assess how the individual is doing in the community, which some would argue is the ultimate rehabilitation outcome. Future work establishing the psychometric properties of participation instruments will be essential to ensure the measures are reliable, valid and responsive for assessing participation in individuals with SCI thereby enabling clinicians and researchers to select appropriate measures.

The outcome measures reviewed under this category include:

**28.4 Participation**

- Assessment of Life Habits Scale (LIFE-H)
- Community Integration Questionnaire (CIQ)
- Craig Handicap Assessment and Reporting Technique (CHART)
- Impact on Participation and Autonomy Questionnaire (IPAQ)
- Physical Activity Recall Assessment for People with Spinal Cord Injury (PARA-SCI)
- Reintegration to Normal Living (RNL)

**Participation References**
Assessment of Life Habits Scale (LIFE-H)

- developed to assess life habits and handicap situations, which are concepts related to social participation. Life habits are defined as “those habits that ensure the survival and development of a person in society throughout his or her life” and they include activities ranging from ADL’s to social roles. A handicap situation is “a disruption in the accomplishment of a person’s life habits, taking into account age, sex and socio-cultural identity, resulting from impairments, disabilities or environmental factors”.

- The LIFE-H includes 12 categories:
  1) nutrition
  2) fitness
  3) personal care
  4) communication
  5) housing
  6) mobility
  7) responsibilities
  8) interpersonal relationships
  9) community life
  10) education
  11) employment
  12) recreation.

ICF Domain:
Participation.

Number of Items:

Long form - 242 items; short form - 77 items. The long form can be used as a whole or as sub-sections and the short form is a general measure of handicap.

Instructions for Administration and Scoring:

Administration:

- Self or clinician-administered.
- The response categories consider the level of difficulty (5 point ordinal scale) and the type of assistance (4 point ordinal scale) required to do each life habit.
- Satisfaction for each item is reported using a 5-point scale (1=very dissatisfied to 5=very satisfied).
- The long form requires 40 to 120 minutes to complete (depending on which sections are used) and the short form takes between 30 to 60 minutes.

Equipment: None.

Scoring:

- The level of difficulty and the types of assistance are combined and weighted to derive an accomplishment score: \((\Sigma \text{Scores} \times 10)/(\text{number of applicable life habits} \times 9)\).
- Total scores for each life habit category range from 0-10.
Interpretability:

**MCID:** not established

**SEM & MDC:** not established for the SCI population, but for an older population with disabilities (n=40, mean (SD) age: 76.5 (8.6), 11M/29F):

<table>
<thead>
<tr>
<th>LIFE-H categories</th>
<th>SEM:</th>
<th>MDC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal care</td>
<td>0.47</td>
<td>1.30</td>
</tr>
<tr>
<td>Nutrition</td>
<td>0.70</td>
<td>1.93</td>
</tr>
<tr>
<td>Housing</td>
<td>0.56</td>
<td>1.56</td>
</tr>
<tr>
<td>Mobility</td>
<td>1.03</td>
<td>2.85</td>
</tr>
<tr>
<td>Communication</td>
<td>0.55</td>
<td>1.52</td>
</tr>
<tr>
<td>Fitness</td>
<td>1.34</td>
<td>3.71</td>
</tr>
<tr>
<td>Daily activities subscore</td>
<td>0.24</td>
<td>0.67</td>
</tr>
<tr>
<td>Responsibility</td>
<td>0.40</td>
<td>1.10</td>
</tr>
<tr>
<td>Community life</td>
<td>0.78</td>
<td>2.17</td>
</tr>
<tr>
<td>Recreation</td>
<td>2.15</td>
<td>5.95</td>
</tr>
<tr>
<td>Interpersonal relationships</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Social roles subscore</td>
<td>0.49</td>
<td>1.36</td>
</tr>
<tr>
<td>Total score</td>
<td>0.25</td>
<td>0.68</td>
</tr>
</tbody>
</table>


- There are no published norms established for the SCI population at this time
- Data from various SCI studies can provide some basis for comparison (see references and Interpretability section in Study Details sheet).

Languages:

French, English and Dutch.

**Training Required:**

No special training is required to administer or score the LIFE-H.

**Availability:**


**Clinical Considerations:**

- The LIFE-H is a conceptually strong tool that incorporates the interaction of the individual and their environment, and thus, overlaps with the ICF. Participation is based on the individual’s perspective of performance rather than describing it from a societal perspective.
Input was obtained from rehabilitation experts and individuals with SCI (children and adults) so this items on this measure should be acceptable to individuals with SCI.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

- Test-retest reliability is:
  - excellent for the LIFE-H Short Form for adults (ICC=0.83)
  - adequate for the LIFE-H Short form for children (ICC=0.67)
  - adequate for the LIFE-H total for adults (ICC=0.74)
  - adequate for the LIFE-H total for children (ICC=0.73).
  
  [Fougeyrollas et al. 1998, Dumont et al. 2003]

**Validity:**

- Correlation of the LIFE-H is:
  - excellent with the CHART-Physical Independence subscale (Spearman’s \( \rho = 0.89 \))
  - adequate with the CHART-Occupation subscale (Spearman’s \( \rho = 0.36 \))
  - adequate with the CHART-Mobility subscale (Spearman’s \( \rho = 0.33 \))
  - poor with the CHART-Social integration subscale (Spearman’s \( \rho = 0.14 \)).
  
  [Fougeyrollas et al. 1998, Noreau et al. 1998, Dumont et al. 2003]

**Responsiveness:**

No values were reported for the responsiveness of the LIFE-H for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the LIFE-H for the SCI population.
Community Integration Questionnaire (CIQ)

- originally designed as a measurement of community integration for individuals with traumatic brain injury (Willer et al, 1994).
- Has three subscales:
  1) Home Integration (e.g. Who does the grocery shopping at home? Who does the normal everyday housework?)
  2) Social Integration (e.g. Who looks after your personal finances?)
  3) Productive Activities (e.g. Do you work/volunteer? How often?).
- Scores for these domains are generated based on the frequency of engaging in roles and activities, and responses are weighted according to level of independence in performing roles and activities. The CIQ has recently been validated for use with SCI populations (Gontkovsky et al. 2009).

ICF Domain:

Participation.

Number of Items:

15

Instructions for Administration and Scoring:

Administration:

- self-report measure that can be completed via a computer, on the phone, by mail, or in person.
- may be completed in less than 15 minutes.

Equipment: None.

Scoring:

- Subscales (Home Integration, Social Integration and Productivity) are summed to yield a total score for community integration ranging from 0-29, with higher scores indicating a greater degree of community integration.
- Most items are scored on a 3 point scale from 0-2, 1 item is scored from 0-4 and 1 item is scored from 0-5. Further instructions are available at the How-to page of this tool.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Higher scores indicate higher levels of community integration (Willer et al, 1994).
- Individual domain scores of the CIQ allow the clinician to determine where individuals are succeeding or struggling in re-integration after injury.
- No normative data for the SCI population have been established
- Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

Appears to only be available in English.
Training Required:

No training is required to administer or score the CIQ.

Availability:

The original scale and scoring guide is available from Barry Willer of State University of New York. A copy of the CIQ can be found in Willer et al. 1994 and online at http://tbims.org/combi/ciq/ciqrat.html.

Clinical Considerations:

• originally developed due to recognition that community integration is a priority during rehabilitation.
• developed by 14 experts to look at integration after a traumatic brain injury.
• Scores on the CIQ indicate the level of community integration. Low scores would suggest a need for strategies to help with community integration.
• Additional evaluations are warranted to assess the subjective aspects of community integration, such as a person’s desire to engage in activities and how satisfied a person is with the activities they are engaged in.
• The three domains of the CIQ parallel the Craig Handicap Assessment Reporting Technique – Short Form (CHART-SF), a common measure of community integration in the SCI population. If the individual is unable to answer the questions, a person close to the individual can complete the questionnaire on his/her behalf.
• Respondent burden is minimal especially given the several ways to complete the questionnaire.
• has been validated for use in the chronic spinal cord injured population.
• Administration and scoring are done via established standardized procedures.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:
There have been no reported values for the reliability of the CIQ.

Validity:
• Correlation of the CIQ is excellent with the Craig Handicap Assessment and Reporting Technique (CHART)- Short Form total score (Pearson’s r=0.79).
• The greatest degree of association was found between the Social Integration subscales of each of the CIQ and CHART measures (Pearson’s r=0.77).

[Gotinkovsky et al. 2009]

Responsiveness:
There have been no reported values for the responsiveness of the CIQ.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the CIQ for the SCI population.
Craig Handicap Assessment and Reporting Technique (CHART)

- designed to measure the level of handicap in a community setting. Basically, CHART collects information on the degree to which the respondent fulfills the roles typically expected from people without disabilities.

- The CHART assesses ability in 6 domains:
  A) Physical independence – the individual’s ability to sustain a customarily effective independent existence
  B) Cognitive independence - the individual’s ability to sustain a customary level of independence without need of assistance
  C) Mobility – the individual’s ability to move about effectively in his/her surroundings
  D) Occupation – the individual’s ability to occupy time in the manner customary to that person’s sex, age and culture.
  E) Social integration – the individual’s ability to participate in and maintain customary social relationships
  F) Economic self-sufficiency – the individual’s ability to sustain customary socio-economic activity and independence

- A short form (CHART-SF) has been developed; it has the same domains as the CHART.

ICF Domain:

Participation

Number of Items:

32 (short form = 19 questions)

Instructions for Administration and Scoring:

Administration:

- patient-reported

- The questions can be answered in a quantifiable, behavioral terms (e.g.: hours of physical assistance, how much time is someone with you to assist you, how many relatives do you visit, etc.).

- The scale takes up to 30 minutes for the CHART and up to 15 min for the CHART-SF.

Equipment: None.

Scoring:

- For each CHART dimension, a scoring procedure allows a score from 0 to 100 points, the latter being the maximum attainable corresponding to a role fulfillment equivalent to that of most individuals without disabilities.

- For more detailed scoring instructions, refer to the CHART manual (see “Availability”).

Interpretability:
MCID: not established

SEM:
CHART SEM and MDC calculated from Tozato et al. 2005:

<table>
<thead>
<tr>
<th>Domain:</th>
<th>SEM (calculated from data in this article):</th>
<th>MDC (calculated from data in this article):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical independence</td>
<td>8.2</td>
<td>22.8</td>
</tr>
<tr>
<td>Mobility</td>
<td>5.2</td>
<td>14.4</td>
</tr>
<tr>
<td>Occupation</td>
<td>14.8</td>
<td>41.1</td>
</tr>
<tr>
<td>Social Integration</td>
<td>11.6</td>
<td>32.1</td>
</tr>
<tr>
<td>Economy</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CHART-J total score:</td>
<td>40.7</td>
<td>112.9</td>
</tr>
</tbody>
</table>

MDC: CHART MDC = 53.3 between Time 1 (6 weeks post-discharge from inpatient rehabilitation) and Time 2 (1 year post-discharge) – De Wolf et al. 2010

- No normative data or cut-points have been established for the SCI population
- Published data for the SCI population are available for comparison for both the CHART and CHART-SF (see the Interpretability section of the Study Details sheet).
- Total scores can be a misleading assessment of handicap, thus the use of subscales is recommended.

Languages:
English, Spanish, Japanese, Chinese, Korean and Italian.

Training Required:

Availability:
Freely available at http://tbims.org/combi/chart/

Clinical Considerations:
- The CHART is widely used, particularly in the U.S. National Spinal Cord Injury Database. However, questions on cognitive independence might be seen as irrelevant in SCI population.
- The economic self-sufficiency domain is based on US financial values and may not be applicable in other countries.

Measurement Property Summary for the CHART:
# of studies reporting psychometric properties: 7

Reliability:
• Test re-test reliability is **excellent** \((r=0.93)\) for the total score and ranges from **adequate to excellent** for the domains (low: \(r=0.53\) for Physical Independence – high: \(r=1.00\) for Economic Self-sufficiency).

• Proxy values are **excellent or adequate** for all domains except cognitive independence \((\text{ICC}=0.34, \text{‘poor’ rating})\).


**Validity:**

• CHART domains and total score are able to differentiate groups based on:
  - level of handicap
  - gender
  - age
  - time since injury

• Domains social integration and economic self-sufficiency did not differentiate groups based on injury factors.

• Correlations between the CHART total score ranges from **excellent** for the SPRS \((r=0.72)\) to **adequate** for the CIM \((r=0.47)\)

• Associations with measures of subjective quality of life are **moderate to excellent**.

• Significant sensitivity to change was reported \((P=.002)\) of 408.2±50.1 for Time 1, 431.6±57.4 for Time 2.


**Responsiveness:**

No values were reported for the responsiveness of the CHART for the SCI population.

**Floor/ceiling effect:**

• No floor effects reported for CHART total or for any of the CHART domains.

• Ceiling effects were reported only for the Social integration and Cognitive Independence subscales.

[De Wolf et al. 2010]

**Measurement Property Summary for the CHART-SF:**

No papers have been found reporting on the psychometric properties of the CHART-SF for the SCI population; one paper (Gontkovsky et al. 2009) provides mean CHART-SF domain scores for comparison (See Study Details sheet – Interpretability section)
Impact on Participation and Autonomy Questionnaire (IPAQ)

- self-administered questionnaire developed using the ICF model of human functioning and disability.
- Developed using input from experienced clinicians and individuals attending an out-patient rehabilitation unit (e.g. stroke, SCI, rheumatoid arthritis, and neuromuscular conditions)
- assesses autonomy and participation as perceived by the individual.
- measures two different aspects of participation: perceived participation and the experience of problems for each aspect of participation.

The participation domains include:
1) autonomy outdoors (e.g. visiting friends, leisure time)
2) autonomy indoors (e.g. self-care)
3) family role (e.g. housework)
4) social relations
5) paid work and education.

ICF Domain:

Participation.

Number of Items:

39

Instructions for Administration and Scoring:

Administration:

- completed by self-report or by interviewer.
- The perceived participation scale consists of 31 items which are assessed using a 5 point rating scale (1=very good and 5=very poor) and the problem scale contains 8 items which are assessed using a 3 point rating scale (0=no problem and 2=severe problem).
- Administration requires approximately 20 minutes.

Equipment: None.

Scoring:

- A participation score (range: 30-155) and a problem score (0-16) are produced by summing items in each scale.

Interpretability:

MCID: not established
SEM: [Noonan et al. 2010a]
Autonomy Indoors: 0.25
Family Role: 0.30
Autonomy Outdoors: 0.42
Social life and relationships: 0.28
Work and Education: 0.35
MDC: [Noonan et al. 2010a]
Autonomy Indoors: 0.70
Family Role: 0.83
Autonomy Outdoors: 1.18
Social life and relationships: 0.76
Work and Education: 0.96
- Higher scores in participation domain = lower participation
- Higher scores in problem experience domain = more problem
- No normative data has been established for the SCI population
- Published data is available to compare results for individuals with SCI (see interpretability section of Study Details sheet).

Languages:

English only.

Training Required:

None.

Availability:

Response options per item:
1 = very good
2 = good
3 = fair
4 = poor
5 = very poor.

Response options for problem experience:
0 = no problems
1 = minor problems
2 = severe problems

2 scores are used for the IPAQ; a Participation domains score (comprised of the summation of item scores from the domains: Autonomy Indoors, Family Role, Autonomy Outdoors, Social Relations, Paid work and education) and a Problem Experience score (comprised of the summation of the items within the problem experience section).

<table>
<thead>
<tr>
<th>Autonomy indoors (n= 7)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the context of illness or disability . . .</td>
<td></td>
</tr>
<tr>
<td>1. My chances of getting around in my house <em>where</em> I want to are</td>
<td>___</td>
</tr>
<tr>
<td>2. My chances of getting around in my house <em>when</em> I want to are</td>
<td>___</td>
</tr>
<tr>
<td>3. My chances of washing, bathing or showering, and dressing, <em>the way</em> I wish, either by myself or with help are</td>
<td>___</td>
</tr>
<tr>
<td>4. My chances of having a bath and dressing <em>when</em> I want to, either by myself or with help are</td>
<td>___</td>
</tr>
<tr>
<td>5. My chances of getting up and going to bed <em>when</em> I want to are</td>
<td>___</td>
</tr>
<tr>
<td>6. My chances of going to the toilet <em>when</em> I need to are</td>
<td>___</td>
</tr>
<tr>
<td>7. My chances of eating and drinking <em>when</em> I want to are</td>
<td>___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family role (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the context of illness or disability . . .</td>
</tr>
</tbody>
</table>

Patient Name: ______________________ Date: ______________________
### 28.4 PARTICIPATION

<table>
<thead>
<tr>
<th>Participation domains total score: ____________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My chances of contributing to looking after my home <em>the way</em> I want to are ___</td>
</tr>
<tr>
<td>2. My chances of getting minor housework jobs done, either by myself or by someone else <em>the way</em> I want them done are ___</td>
</tr>
<tr>
<td>3. My chances of getting major housework jobs done, either by myself or by others, <em>the way</em> I want them done are ___</td>
</tr>
<tr>
<td>4. My chances of getting housework done, either by myself or by others, <em>when</em> I want them done are ___</td>
</tr>
<tr>
<td>5. My chances of getting minor repairs and maintenance work done in my house, either by myself or by others, <em>the way</em> I want them done are ___</td>
</tr>
<tr>
<td>6. My chances of fulfilling my role at home as I would like are ___</td>
</tr>
<tr>
<td>7. My chances of spending my own money as I wish are ___</td>
</tr>
</tbody>
</table>

**Autonomy outdoors (n=5)**

<table>
<thead>
<tr>
<th>In the context of illness or disability . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My chances of visiting relatives and friends <em>when</em> I want to are ___</td>
</tr>
<tr>
<td>2. My chances of going on the sort of trips and holidays I want to go on are ___</td>
</tr>
<tr>
<td>3. My chances of seeing people as often as I want are ___</td>
</tr>
<tr>
<td>4. My chances of living life <em>the way</em> I want are ___</td>
</tr>
<tr>
<td>5. My chances of spending <em>leisure time</em> <em>the way</em> I want to are ___</td>
</tr>
</tbody>
</table>

**Social relations (n=6)**

<table>
<thead>
<tr>
<th>In the context of illness or disability . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My chances of talking to people close to me <em>on equal terms</em> are ___</td>
</tr>
<tr>
<td>2. The quality of my relationship with people who are close to me is ___</td>
</tr>
<tr>
<td>3. The respect I receive from people who are close to me is ___</td>
</tr>
<tr>
<td>4. My chances of having an intimate relationship are ___</td>
</tr>
<tr>
<td>5. My relationships with acquaintances are ___</td>
</tr>
<tr>
<td>6. The respect I receive from acquaintances is ___</td>
</tr>
</tbody>
</table>

**Paid work and education (n=6)**

<table>
<thead>
<tr>
<th>In the context of illness or disability . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My chances of doing the paid work I want to do are ___</td>
</tr>
<tr>
<td>2. My chances of doing my job <em>the way</em> I want to are ___</td>
</tr>
<tr>
<td>3. My contacts with the people I work with are ___</td>
</tr>
<tr>
<td>4. My chances of maintaining or changing my working role <em>as</em> I would wish are ___</td>
</tr>
<tr>
<td>5. My chances of getting a different job are ___</td>
</tr>
<tr>
<td>6. My chances of getting the training or education I want are ___</td>
</tr>
</tbody>
</table>
28.4 PARTICIPATION

<table>
<thead>
<tr>
<th>Items addressing problem experience (n=8)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. With regard to your mobility, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>2. With regard to your self-care, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>3. With regard to your family role, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>4. With regard to controlling your finances, does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>5. With regard to your leisure time, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>6. With regard to your relationships, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>7. With regard to paid work, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
<tr>
<td>8. With regard to your education, to what extent does your health or disability cause problems?</td>
<td></td>
</tr>
</tbody>
</table>

Problem experience score: _______________________

Clinical Considerations:

- items should be acceptable and relevant to individuals with SCI as the IPAQ was developed using input from experienced clinicians and individuals attending an out-patient rehabilitation unit

Measurement Property Summary:

# of studies reporting psychometric properties: 6

Reliability:

- Internal consistency is **excellent** for all the IPAQ subscales:
  - Social relationships (Cronbach’s $\alpha=0.86-0.90$)
  - Autonomy Indoors (Cronbach’s $\alpha=0.84-0.94$)
  - Family Role (Cronbach’s $\alpha=0.84-0.95$)
  - Autonomy outdoors (Cronbach’s $\alpha=0.81-0.95$)
  - Work and Education (Cronbach’s $\alpha=0.86-0.96$).
- Test-retest reliability is **excellent** for all IPAQ subscales:
  - Social relationships (ICC=0.83-0.94)
  - Autonomy Indoors (ICC=0.87-0.95)
  - Family Role (ICC=0.83-0.97)
  - Autonomy outdoors (ICC=0.91-0.97)
  - Work and Education (ICC=0.91).

[Cardol et al. 1999, Cardol et al. 2001, Sibley et al. 2006]

Validity:

- Correlations between IPAQ subscales (Autonomy indoors, Family role and Autonomy outdoors) and the Short Form -36 Physical Domain are **adequate** (Pearson’s $r=-0.43- -0.51$).

Responsiveness:
- The Standard Response Mean (SRM) of the IPAQ Participation Domains are as follows:
  - Autonomy Indoors (0.4)
  - Family Role (0.8)
  - Autonomy Outdoors (1.2)
  - Social Relations (0.1)
  - Work and Education (1.3).

[Cardol et al. 2002]

Floor/ceiling effect:
- There are significant ceiling effects (>20% have best possible score) in all the IPAQ subscales.

[Lund et al. 2007]
Physical Activity Recall Assessment for People with Spinal Cord Injury (PARA-SCI)

- designed to capture information on the type, frequency, duration and intensity of physical activity carried out by people with SCI using a wheelchair as their primary mode of mobility. Individuals are asked about their activity over the previous 3 days, starting with the prior day. Activity is broken down into 8 periods:
  1. Morning routine (subdivided into transferring, bowel and bladder management, bathing, personal hygiene, dressing)
  2. Breakfast
  3. Morning
  4. Lunch
  5. Afternoon
  6. Dinner
  7. Evening
  8. Evening Routine (subdivided into transferring, bowel and bladder management, bathing, personal hygiene, dressing)

ICF Domain:

Participation

Number of Items:

N/A

Instructions for Administration and Scoring:

Administration:

- Data are reported as an average number of minutes of activity per day (mild, moderate, heavy, total) for the two dimensions (Leisure-time physical activity or lifestyle activity) and a cumulative index.

- On average, the interview can be completed within **20-30 minutes**.

Interview protocol: An interview format was developed to capture activities performed over the last 3 days which are divided into 8 periods from morning routine to evening routine. The 2 routine periods are subdivided to capture activity related to daily living (transfer, bowel and bladder management, dressing, etc.). The interviewer asks the respondent about general activities performed during each period. The number of minutes spent on each specific activity is recorded and the activity is coded into 2 dimensions: Leisure-time physical activity or lifestyle activity.

Intensity Classification system: This system was developed from empirical data collected during maximal exercise testing (VO$_{2\text{max}}$ and 1RM muscle workload for chest press and bicep curl). From a list of adjectives, participants of the experiment identified words that described how they felt during exercise. Based on their responses, definitions were created for mild, moderate and heavy intensity exercise.

Equipment:

- equipment patients use in their everyday physical activities.

Scoring:
28.4 PARTICIPATION

- Average daily LTPA and lifestyle activity scores are calculated by averaging the number of minutes of mild, moderate, and heavy activity reported for these activity categories across the three recalled days.

- Average daily cumulative physical activity is calculated by averaging the sum of LTPA and leisure activity across the three recalled days.

- As well, for each activity category (i.e., LTPA, lifestyle, cumulative), separate scores are calculated for mild, moderate, and heavy intensity levels.

**Interpretability:**

**MCID:** not established

**SEM:**

SEM and MDC (both calculated from data in Martin-Ginis et al. 2005):

<table>
<thead>
<tr>
<th>PARA-SCI measure and Intensity Level</th>
<th>SEM (min)</th>
<th>MDC (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative - Total</td>
<td>64.7</td>
<td>179.4</td>
</tr>
<tr>
<td>Cumulative - Mild</td>
<td>63.5</td>
<td>176.1</td>
</tr>
<tr>
<td>Cumulative - Moderate</td>
<td>36.3</td>
<td>100.6</td>
</tr>
<tr>
<td>Cumulative - Heavy</td>
<td>13.6</td>
<td>37.8</td>
</tr>
<tr>
<td>Leisure Time Activity - Total</td>
<td>31.7</td>
<td>87.9</td>
</tr>
<tr>
<td>Leisure Time Activity - Mild</td>
<td>15.3</td>
<td>42.3</td>
</tr>
<tr>
<td>Leisure Time Activity - Moderate</td>
<td>24.8</td>
<td>68.7</td>
</tr>
<tr>
<td>Leisure Time Activity - Heavy</td>
<td>8.5</td>
<td>23.5</td>
</tr>
<tr>
<td>Lifestyle Activity - Total</td>
<td>65.0</td>
<td>180.1</td>
</tr>
<tr>
<td>Lifestyle Activity - Mild</td>
<td>54.3</td>
<td>150.6</td>
</tr>
<tr>
<td>Lifestyle Activity - Moderate</td>
<td>29.5</td>
<td>81.7</td>
</tr>
<tr>
<td>Lifestyle Activity - Heavy</td>
<td>9.8</td>
<td>27.2</td>
</tr>
</tbody>
</table>

**MDC:** see above

- No cut-points or normative data have been established for the SCI population

- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet)

**Languages:**

N/A

**Training Required:**

None

**Availability:**


**Clinical Considerations:**
• PARA-SCI is a promising instrument that provides information on the intensity-based type of physical activities. It has to be used more extensively before a final assessment is completed.

• This assessment was specifically developed for the SCI population. It provides a quantitative measure of physical activity (including the intensity of exercise), taking into account ADLs – which are often physically taxing for individuals with SCI.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

• Test-retest reliability is **adequate to excellent** for the PARA-SCI measures of physical activity:
  - Cumulative activity (ICC=0.70-0.85)
  - Leisure time physical activity (LTPA) (ICC=0.6-0.8)
  - Lifestyle activity (ICC=0.68-0.84)

  [Martin-Ginis et al. 2005]

**Validity:**

• **Excellent** correlations were found between indirect calorimetry measurement and PARA-SCI cumulative activity levels - moderate (Pearson’s r=0.63), heavy (Pearson’s r=0.88), total (Pearson’s r=0.79).

• All correlations between the PARA-SCI and the Leisure Time Physical Activity Questionnaire – SCI measures of leisure time physical activity were positive and statistically significant.


**Responsiveness:**

No values were reported for the responsiveness of the PARA-SCI for the SCI population at this time.

**Floor/ceiling effect:**

• Minimum between-subject variability may have caused floor effects in heavy intensity lifestyle activity for reliability scores.

  [Martin-Ginis et al. 2005]
Reintegration to Normal Living (RNL)

• self-report questionnaire that assesses an individual’s satisfaction with performance in life activities.
• assesses mobility, self-care, daily activity, recreational activity, and family roles
• developed based on interviews with clinicians, patients and their significant others.

ICF Domain:

Participation.

Number of Items:

11

Instructions for Administration and Scoring:

Administration:

• self-report or interviewer.
• contains 11 items.
• There are 3 alternate scoring systems: 1) a 10-point visual analogue scale, 2) a 3-point scale, and 3) a 4-point scale. We focus on the first scoring system here since it is most commonly used. Each item is scored using a 10 cm visual analogue scale anchored with phrases (0=no reintegration and 10=complete reintegration).
• Wheelchairs or other assistive/adaptive aids may be used when considering how to answer the questions.
• Administration time is approximately 10 minutes.

Equipment: None.

Scoring:

• Both the total score = sum (points all 11 items) and the adjusted score = (total score)/110 * 100 can be calculated.
• A minimum adjusted score is 0 and a maximum adjusted score is 100.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
• No cut-points have been established for the SCI population.
• Published data for the SCI population is available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English and French.
28.4 PARTICIPATION

Training Required:
None.

Availability:

There are 11 items in the Reintegration to Normal Living Index. Each of these items is accompanied by a visual analog scale (VAS) anchored by phrases reflecting whether the statement describes the situation of the patient. It allows the patients to determine the extent to which the statement in question applies to their specific situation. Each VAS is scored out of 10 points: 1 = minimal reintegration, 10 = complete reintegration.

Scoring:
Both the total score = sum (points all 11 items) and the adjusted score = (total score)/110 * 100 can be calculated. A minimum adjusted score is 0 and a maximum adjusted score is 100.

Patient Name: _________________________  Date: __________

<table>
<thead>
<tr>
<th>RNL items</th>
<th>Score (0-10):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I move around my living quarters as I feel is necessary. (Wheelchairs, other equipment or resources may be used.)</td>
<td></td>
</tr>
<tr>
<td>2. I move around my community as I feel is necessary. (Wheelchairs, other equipment or resources may be used.)</td>
<td></td>
</tr>
<tr>
<td>3. I am able to take trips out of town as I feel are necessary. (Wheelchairs, other equipment or resources may be used.)</td>
<td></td>
</tr>
<tr>
<td>4. I am comfortable with how my self-care needs (dressing, feeding, toileting, bathing) are met. (Adaptive equipment, supervision and/or assistance may be used.)</td>
<td></td>
</tr>
<tr>
<td>5. I spend most of my days occupied in a work activity that is necessary or important to me. (Work activity could be paid employment, housework, volunteer work, school, etc. Adaptive equipment, supervision and/or assistance may be used.)</td>
<td></td>
</tr>
<tr>
<td>6. I am able to participate in recreational activities (hobbies, crafts, sports, reading, television, games, computers, etc.) as I want to. (Adaptive equipment, supervision and/or assistance may be used.)</td>
<td></td>
</tr>
<tr>
<td>7. I participate in social activities with family, friends, and/or business acquaintances as is necessary or desirable to me. (Adaptive equipment, supervision and/or assistance may be used.)</td>
<td></td>
</tr>
<tr>
<td>8. I assume a role in my family which meets my needs and those of other family members. (Family means people with whom you live and/or relatives with whom you don’t live but see on a regular basis. Adaptive equipment, supervision and/or assistance may be used.)</td>
<td></td>
</tr>
</tbody>
</table>
## 28.4 PARTICIPATION

<table>
<thead>
<tr>
<th>Q.</th>
<th>Statement</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>In general, I am comfortable with my personal relationships.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>In general, I am comfortable with myself when I am in the company of others.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>I feel that I can deal with life events as they happen.</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score:** _______________

**Adjusted Score:** _______________

### Clinical Considerations:

- Although the RNL is commonly used as part of the national reporting system for individuals with SCI, there has been very little research conducted on the psychometric properties for this patient population.

### Measurement Property Summary:

| # of studies reporting psychometric properties: 3 |

#### Reliability:

- Internal consistency of the RNL Index is **excellent** (Cronbach’s $\alpha=0.87$).
- Total item correlations ranged from 0.37-0.67.
  
  [Hitzig et al. 2012]

#### Validity:

- Correlation of the RNL Index is:
  
  - **excellent** with the Quality of Life Index (Pearson’s $r=-0.654$)
  - **adequate** with the Functional Independence Measure (Pearson’s $r=-0.348$)
  - **adequate** with the Rosenberg Self-Esteem Scale (Pearson’s $r=-0.483$)
  - **poor** with the American Spinal Injury Association (ASIA) – motor score (Pearson’s $r=-0.196$).


#### Responsiveness:

- No values have been reported for the responsiveness of the RNL Index for the SCI population at this time.

#### Floor/ceiling effect:

- No values were reported for the presence of floor/ceiling effects in the RNL for the SCI population.
Participation References

LIFE-H:

CIQ:

CHART:
IPaq:

Para-Sci:

RNL:
28.5 Quality of Life

Conceptualization and definition of QOL

Although the term “goodness of life” (Baker & Intagliata 1982) seems appropriate to express the overall concept of quality of life (QOL), its apparent simplicity hides a multidimensional concept that is among the most difficult one to define and to translate into a functioning and operating reality. Nonetheless, 2 main conceptualizations of QOL are well-accepted: (1) the subjective approach whose focal point is the person’s emotional or cognitive assessment of the congruence between his/her life expectations and achievement, usually associated with life satisfaction or well-being and (2) the objective approach, based on one’s characteristics that can be objectively measured by an external appraiser or outsider (Dijkers 2003). The latter includes the concept of Health-related Quality of Life (HRQOL) that focuses mostly on physical and mental health, social and role achievements, and thus it is more oriented toward functional performance than is subjective QOL (Wood-Dauphinee et al. 2002).

As the HRQOL tends to address dimensions that influence subjective QOL (health status, functioning), Post et al. proposed a superordinate construct of QOL that includes both HRQOL and well-being which was operationalized from the International Classification Functioning, Disability and Health (ICF) (Post et al. 1999; WHO 2001; Post & Noreau 2005). This approach is quite useful for the rehabilitation community as it permits to integrate most of the dimensions that might be measured to cover the construct of QOL in the field of disability and rehabilitation.

Thus QOL tools are either investigator-determined enabling statistical comparisons between an experimental and control group or they are more individualized allowing the participating subject to weigh the value (importance) of any individual field in the self-assessment of their own QOL.

Measurement issues

On an operational basis, Dijkers (2003) nicely summarized that QOL measures focus on three dimensions: 1) the person’s achievements (performance) or 2) expectations, or 3) the reaction to the congruence between his/her life expectations and achievements. The HRQOL measures mainly (but not exclusively) focus on achievement as the subjective QOL measures address the reaction (or satisfaction) regarding the achievements.

The current review focuses on a number of HRQOL and subjective measures that were previously reported in the field of SCI for which psychometric testing has been published and assessed as adequate or excellent. Most of the measures are not disability-specific, meaning that they have not been specifically developed for the context of people with disability in general or specifically for individuals with SCI. As such, psychometric properties are usually stronger with general population or groups having conditions other than SCI.

Recommendations (HRQOL)

Three generic instruments addressing the concept of HRQOL are recommended despite some limitations: The short version of the World Health Organization Quality of Life Assessment (WHOQOL-BREF), the Sickness Impact Profile (SIP-68), and the MOS 36-Item Short-Form Health Survey (SF-36) or its shorter form (SF-12). The WHOQOL
QUALITY OF LIFE (BREF) is a promising instrument with a strong conceptualization but its psychometric testing in SCI is limited. Despite their wide use, SIP-68 and SF-36 should be used with caution as limitations were previously reported (Andresen & Meyers 2000; Post & Noreau 2005). For example, the SF-36 physical functioning scale has been found inappropriate in individuals with mobility impairments because several items refer to climbing or walking. Post et al. (1996) found the SIP68 valid for use in persons with SCI but had to develop a recoding procedure to deal with several questions about walking difficulties that are not applicable to persons who cannot walk. Moreover, to answer the questions ‘in the context of health’ can be problematic as some persons with SCI will distinguish health from disability. People perceive themselves as healthy, defining SCI and its consequences as a disability, and not as a disease.

A utility measure (Quality of Well-being) has been reviewed but little work has been done to establish its psychometric properties in individuals with SCI. Moreover, the usefulness of the concept (utility) in the field of rehabilitation might be limited in regards of clinical purposes. Finally, the Qualiveen a SCI specific measure of urinary related QOL has been reviewed. Despite excellent psychometric properties its scope is limited.

Recommendations (subjective QOL)

Four different instruments focusing on life satisfaction have been included in the current review: The Satisfaction with Life Scale (SWLS), the Life Satisfaction Questionnaire (LISAT-11), The Quality of Life Index (QLI) and the Quality of Life for Adults with Physical Disabilities (QOLP-PD) With some pros and cons, they addresses the life satisfaction as a whole, or with a few questions focusing on general life dimensions or with a more-in depth assessment of importance and satisfaction regarding life domains. SWLS is quite brief, mostly useful in research setting but does not bring about information that can be assessed as useful for clinical interventions. At the opposite, QLI and QOLP-PD can inform a lot on some areas of life dissatisfaction but they might be seen as lengthy in some setting. QOLP-PD is a promising instrument with a good conceptualization but it is at an early stage of development with a few psychometric characteristics already tested. The LISAT-11 might be seen a good compromise for research and clinical purposes as it contains items (life dimensions) that are relevant to SCI. Some data has already been published in the field (Post et al. 1998; Schönherr et al. 2005; Kennedy et al. 2006) and it has previously been recommended by an expert committee on QOL (Wood-Dauphinee et al. 2002). Its main limitation remains the lack of psychometric information relative to the field of SCI.

Conclusion

In the process of selecting tools to assess QOL, one should consider the purposefulness, usefulness and psychometric properties of measures. For example, generic and global outcomes measures might be useful for comparison across populations but might not bring about information for needs related to community interventions. At the opposite, more specific or detailed measures might be seen as too lengthy for some research or survey settings or as having complex scoring procedures. In many situations, the choice might be driven by a ‘trade-off’ between a measure that fully meets one’s needs and another one that will limit the respondent’s burden. But in all cases, a careful evaluation of the psychometric characteristics is mandatory before making the final choice.
The outcome measures reviewed under this category include:

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  Incontinence Quality of Life Questionnaire (I-QOL) ............................................................. 334
  Life Satisfaction Questionnaire (LISAT-9 & LISAT-11) ...................................................... 337
  Quality of Life Index (QLI, Ferran & Powers) ...................................................................... 340
  Quality of Life Profile for Adults with Physical Disabilities (QOLP-PD) ......................... 342
  Quality of Well Being ........................................................................................................... 344
  Qualiveen ............................................................................................................................ 347
  Satisfaction with Life Scale (SWLS, Deiner Scale) .............................................................. 349
  Short Form 36 (SF-36) ........................................................................................................ 352
  Sickness Impact Profile 68 (SIP-68) .................................................................................. 356
  World Health Organization Quality of Life Questionnaire (WHOQOL-Bref) ..................... 358

Quality of Life References ..................................................................................................... 361
Incontinence Quality of Life Questionnaire (I-QOL)

- measures the effect of urinary incontinence on quality of life.
- The I-QOL is divided into 3 subscales:
  1) avoidance and limiting behavior (ALB)
  2) psychosocial impact (PSI)
  3) social embarrassment (SE).

ICF Domain:

Quality of Life.

Number of Items:

22

Instructions for Administration and Scoring:

Administration:

- self-report questionnaire.
- Subjects use a 5-point response scale with values ranging from 1 (extremely) to 5 (not at all).

Equipment: None.

Scoring:

- A mean score for each subscale is calculated (averaging the scores for the items in each subscale) as well as a total score for all 22 items (sum of all subscale scores).
- The scores are then transformed to a ‘Scale score’ ranging from 0-100 points for ease of interpretation: Scale score = (sum of the items – lowest possible score)/possible raw score range X 100.

Interpretability:

MCID: MID is approximately 4 points when defined as that corresponding to a small effect size (0.2 SD at baseline) and approximately 11 points when defined as corresponding to a medium effect size (0.5 SD at baseline).
SEM: ranged from 8-11 points.
MDC: not established
- For all items, higher scores indicate less impact of urinary tract infections on quality of life.
- No normative data has been established for the SCI population.

Languages:

The instrument has been translated into more than 20 European, Asian, North and South American, and African languages.

Training Required:

None, but reading the user manual is recommended.

Availability:
The I-QoL can be found in the original article (Schurch et al; 2007); however no information was found on how to access the user manual. The IQOL is copyrighted and can be purchased at [http://depts.washington.edu/seaqol/IQOL](http://depts.washington.edu/seaqol/IQOL).

**Clinical Considerations:**

- The I-QOL is a highly used and widely recommended scale. Among other populations, the scale has been shown to be reliable, valid, and responsive to change. No ceiling effects have been reported and it is suitable for both men and women.
- The scale was originally developed for the general population; subsequently, some items are not applicable for individuals with SCI.
- The questionnaire is easy to understand and poses little respondent burden. However, the assessment cannot be completed by proxy.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency is **excellent** for the I-QOL total score (Cronbach’s α=0.93) as well as the 3 subscales (Cronbach’s α=0.79-0.89).
  
  [Schurch et al. 2007]

**Validity:**

- Correlations between SF-36 and I-QOL scores at the end of the study (week 24) were substantial for most SF-36 domains and tended to be stronger and more likely to be significant than those at screening.
- Correlations between SF-36 and I-QOL scores at week 24 were adequate and strongest for mental health (Pearson’s r =.45-.59), social functioning (Pearson’s r= .43-.54), and vitality (Pearson’s r =.36-.54)

  [Schurch et al. 2007]

**Responsiveness:**

No values were reported for the responsiveness of the I-QOL for the SCI population.

**Floor/ceiling effect:**

- There were no ceiling effects for I-QOL total and subscales, and a small floor effect for the Social Embarrassment domain (8.9% subjects had lowest score).

  [Schurch et al. 2007]
Life Satisfaction Questionnaire (LISAT-9 & LISAT-11)

- originally developed as a checklist rather than a measure of life satisfaction (Fugl-Maeyer et al. 1991).
- target important life domains: vocational, financial and leisure situations, contacts with friends, sexual life, self-care management, family life, partner relationships; physical and psychological health were added (Melin et al. 2003).

ICF Domain:

Quality of Life.

Number of Items:

LISAT-9: 9 items; LISAT-11: 11 items. The LISAT-11 has 2 extra items asking about the level of satisfaction of the individual's physical health and psychological health.

Instructions for Administration and Scoring:

Administration:

- Each item is scored on a 6-point scale from 1 (very dissatisfied) to 6 (very satisfied).
- Administration of either test takes approximately 5 minutes.

Equipment: None.

Scoring:

- Item scores can be summed and an average score is produced.
- It seems more appropriate to use mean domain scores rather than a total score in order to keep the information on each domain available for clinical interventions.

Interpretability:

MCID: not established
SEM:
Standard error of item location (SE) and MDC of LISAT-9 (calculated from data in Geyh et al. 2010):

<table>
<thead>
<tr>
<th>Variable</th>
<th>SE</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life as a whole</td>
<td>0.07</td>
<td>0.19</td>
</tr>
<tr>
<td>Self care</td>
<td>0.05</td>
<td>0.14</td>
</tr>
<tr>
<td>Vocational situation</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Financial situation</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Leisure situation</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Sexual life</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Partner relations</td>
<td>0.07</td>
<td>0.19</td>
</tr>
<tr>
<td>Family Life</td>
<td>0.06</td>
<td>0.17</td>
</tr>
<tr>
<td>Contact w/ friends</td>
<td>0.07</td>
<td>0.19</td>
</tr>
</tbody>
</table>

MDC: see above

- No cut-points or normative data have been published for the SCI population.
- Published data for the SCI population is available for comparison (see Interpretability section of Study Details sheet)
Languages:
Available in 8 languages

Training Required:
None.

Availability:
6-point rating scale for both the LISAT-9 and LISAT-11:
1 = very dissatisfying  4 = rather satisfying  
2 = dissatisfying  5 = satisfying  
3 = rather dissatisfying  6 = very satisfying

How satisfactory are these different aspects of your life? Indicate the number which best suits your situation.

For the LISAT-9:

Score: (1-6)
Life as a whole is ________
My ability to manage my self-care (dressing, hygiene, transfers, etc.) is ________
My leisure situation is ________
My vocational situation is ________
My financial situation is ________
My sexual life is ________
My partnership relation is ________
My family life is ________
My contacts with friends and acquaintances are ________
Sum: ________

For the LISAT-11:

Score: (1-6)
Life as a whole is ________
My vocational situation is ________
My financial situation is ________
My leisure situation is ________
My contacts with friends and acquaintances are ________
My sexual life is ________
My ability to manage my self-care (dressing, hygiene, transfers, etc.) is ________
My family life is have no family ________
My partnership relation is have no steady partner relationship ________
My physical health is ________
My psychological health is ________
---------------------------------------------------------------------------------------------------------------------
Sum: ________

Clinical Considerations:

• The LISAT provides meaningful information on quality of life for clinical and research purposes in the field of SCI. To date, it has been used in several studies involving a SCI population.
Measurement Property Summary for the LISAT-9:

# of studies reporting psychometric properties: 2

Reliability:
- Internal consistency is **adequate** for the LISAT-9 total score (Cronbach’s $\alpha=0.75$).
- Item-to-total correlations for the 9 questions ranged from 0.21 to 0.64. [Post et al. 2012]

Validity:
- Correlation of the LISAT-9 is **adequate** for the Short Form-36 – mental health subscale (Spearman’s $\rho=0.52$) and the Sickness Impact Profile – Social dimension (Spearman’s $\rho=-0.45$).
- As expected, correlation of the LISAT-9 is **poor** for the Functional Independence Measure – Motor subscale (Spearman’s $\rho=0.29$).
- Correlation of the LISAT-9 is **excellent** for the Satisfaction with Life Scale (Spearman’s $\rho=0.60$). [Post et al. 2012]

Responsiveness:
No values were reported for the responsiveness of the LISAT-9 for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the LISAT-9 for the SCI population.

No articles examining the measurement properties of the LISAT-11 were found.
Quality of Life Index (QLI, Ferran & Powers)

- designed to measure subjective quality of life in terms of satisfaction within different life domains.
- originates from Flanagan’s perception of life satisfaction (Flanagan JC, 1982, “Measurement of quality of life: current state of the art”), which holds that two aspects, importance and satisfaction, must be addressed when measuring QOL. Importance ratings are used to weight the satisfaction responses, such that scores reflect the respondents’ satisfaction with the aspects of life they value. Items that are rated as more important have a greater impact on scores than those of lesser importance.
- comprised of 4 domains:
  1. health and functioning
  2. psychological/spiritual
  3. social and economic
  4. family.

ICF Domain:
Quality of Life.

Number of Items:
SCI version (37 items)

Instructions for Administration and Scoring:

Administration:
- can be administered in an interview or by client self-report.
- The scales (satisfaction and importance) are on a 6-point Likert scale, ranging from 1, very dissatisfied (very unimportant), to 6, very satisfied (very important).
- Five scores are generated (i.e. total and 4 domains) on a 0 - 30 scale.
- Administration time is **approximately 10 minutes**.

Equipment: None.

Scoring:
- Scoring instructions are available on the instrument website ([http://www.uic.edu/orgs/qli/questionaires/questionnairehome.htm](http://www.uic.edu/orgs/qli/questionnaires/questionnairehome.htm)).

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Scores represent the satisfaction with different aspects of life; a higher score in one of the 4 domains indicates a higher satisfaction with that particular aspect of life.
• No normative data have been established for the SCI population
• Published data for the SCI population are available for comparison (see Interpretability section of the Study Details sheet).

Languages:
The spinal cord injury version is available in English, Lithuanian and French. For other versions (arthritis, cancer, cardiac, etc.), many languages (over 10) are available.

Training Required:
None.

Availability:
Located at: http://www.uic.edu/orgs/qli/questionnaires/questionnairehome.htm

Clinical Considerations:
• Psychometric properties for SCI populations remain to be established, particularly with respect to test-retest reliability.

Measurement Property Summary:
# of studies reporting psychometric properties: 2

Reliability:
No values were reported for the reliability of the QLI for the SCI population.

Validity:
• Correlation of the QLI is excellent for the Reintegration to Normal Living Scale (Pearson’s r=-0.654) and the Rosenberg Self-Esteem Scale (Pearson’s r=0.609). [May & Warren 2001, May & Warren 2002]

Responsiveness:
No values were reported for the responsiveness of the QLI for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the QLI for the SCI population.
Quality of Life Profile for Adults with Physical Disabilities (QOLP-PD)

- designed to offer a new approach to measuring QOL that is grounded in and congruent with the perspective and experience of people with disabilities.

- based on the Centre for Health Promotion (CHP) QOL model that views QOL as arising out of the ongoing relationship between the person and his/her environment. It is comprised of three domains:
  1) Being
  2) Belonging
  3) Becoming.

ICF Domain:

Quality of Life.

Number of Items:

102

Instructions for Administration and Scoring:

Administration:

- Can be interview-administered or self-reported.

- The items in the 3 domains are grouped into 9 sub-scores. All items are rated on a 5-point scale for satisfaction and importance – ranging from 1 (not at all satisfied/important) to 5 (extremely satisfied/important).

Equipment: None.

Scoring:

- Overall scores are made more comprehensible by subtracting 3, leading to a range of scores from negative 10 (not at all satisfied/extremely important issues) to positive 10 (extremely satisfied/extremely important issues).

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- No normative data have been established for the SCI population

- Published data for the SCI population are available for comparison (see the Interpretability section of the Study Details sheet).

Languages:

English

Training Required:

None.

Availability:

Contact the author for a copy: Rebecca Renwick – r.renwick@utoronto.ca
Clinical Considerations:
- This tool is a lengthy instrument that likely takes considerable time to administer.

Measurement Property Summary:
# of studies reporting psychometric properties: 1

Reliability:
- Internal consistency is **excellent** for the QOLP-PD total score (Cronbach’s $\alpha=0.98$) and the QOLP-PD domains: Being (Cronbach’s $\alpha=0.95$), Belonging (Cronbach’s $\alpha=0.95$) and Becoming (Cronbach’s $\alpha=0.97$).

  [Renwick et al. 2003]

Validity:
- Correlations between the adjusted QOLP-PD total score and QOLP-PD subscale are **excellent** (ranging from Pearson’s $r=0.63$ – Physical Being to Pearson’s $r=0.88$ – Growth Becoming).

  [Renwick et al. 2003]

Responsiveness:
No values were reported for the responsiveness of the QOLP-PD for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the QOLP-PD for the SCI population.
Quality of Well Being Scale (QWB)

- preference measure that was designed to measure health related quality of life.
- developed based on theory from the General Health Policy Model which incorporates the concepts of mortality, morbidity, the preference of an individual for a certain health state and the duration in that particular health state.
- administered by interview
- combines 4 scales:
  1) Mobility
  2) Physical Activity
  3) Social Activity
  4) Symptom/problem complexes
- The QWB self-administered (QWB-SA) version combines three scales:
  1) Mobility
  2) Physical Activity
  3) Social Activity
  with a measure of symptoms/problems. This version contains slightly different content and the recall period was decreased from six days to three days to reduce recall bias.

ICF Domain:

Quality of Life

Number of Items:

71

Instructions for Administration and Scoring:

Administration:

- The original version of the QWB was designed to be interviewer administered.
- The QWB-SA is designed to be self-administered.
- The QWB-SA is reported to be easier to complete compared to the original QWB measure. It takes approximately 10 minutes to complete.

Equipment: None.

Scoring:

- The QWB-SA score is calculated by subtracting the combination of the maximum weighted symptom/problem item and the weights associated with mobility, social activity and physical function from a “perfect” score of 1.0.
- An overall utility score is calculated between 0.0 and 1.0; where 0.0 represents death and 1.0 represent perfect health.

Interpretability:

MCID: not established for either QWB or QWB-SA for the SCI population, but for a sample of PTSD patients (n=200, age range: 18-65 yrs, participants in cognitive behavioral therapy and pharmacotherapy with sertraline)
MCID (anchor-based) for QWB-SA was estimated to range from 0.03 to 0.05. 
MCID (distribution-based) for QWB-SA was estimated to range from 0.02 to 0.05.

Reference: Le et al. 2013. “Minimal clinically important differences for the EQ-5D and 
QWB-SA in Post-traumatic Stress Disorder (PTSD): results from a Doubly Randomized 

**SEM:** not established for either QWB or QWB-SA

**MDC:** not established for either QWB or QWB-SA

- The QWB and QWB-SA provides an overall utility value which represents the 
  preference an individual places on their specific health state, scored between 0.0 
  and 1.0.
- Some normative data on the general population are provided in pg 22-24 of the 
- No normative data or cut points have been reported for the SCI population
- Published data on the SCI population is available for comparison (see 
  Interpretability section of the Study Details sheet).

**Languages:**

The QWB-SA is available in various languages (though none are specified).

**Training Required:**

None for the QWB-SA, while training is required for the interview-based QWB.

**Availability:**

Can be found at: [https://hoap.ucsd.edu/qwb-info/](https://hoap.ucsd.edu/qwb-info/)

**Clinical Considerations:**

- The QWB-SA is a preference-based measure that has been used in individuals 
  with SCI. It can provide information on health related quality of life and produces 
  a utility value which can be used to calculate quality adjusted life years required 
  for economic analyses.
- It is not recommended to complete the QWB-SA by proxy.
- 82% acceptability has been reported for the QWB, with the mean (SD) time taken 
  to complete the test being 10.5 (3.2) min.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

No values were reported for the reliability of the QWB for the SCI population.

**Validity:**

- QWB is significantly (P<.05) correlated to 6 of 8 Short-Form 36 subscales (all 
  except Role Emotion and Mental Health).
• QWB is significantly correlated to 4 of 8 Behavioural Risk Factor Surveillance System items (Poor physical health days, pain limited activity days, good days and days worried tense anxious).
[Andresen et al. 1999]

**Responsiveness:**
No values were reported for the responsiveness of the QWB for the SCI population at this time.

**Floor/ceiling effect:**
• The QWB showed no signs of floor or ceiling effects.
[Andresen et al. 1999]
Qualiveen Scale

- developed as a condition-specific quality of life measure for individuals with SCI who have urinary disorders that could be used in international multi-centre trials.
- developed by a multi-disciplinary group of experts and the questions were derived based on the literature and individuals with SCI.
- Contains 4 domains:
  1) Limitations / Inconvenience (items 1-9)
  2) Constraints / Restrictions (items 10-17)
  3) Fears (items 18-25)
  4) Feelings / Impact on Daily Life (items 26-30)

ICF Domain:

Quality of Life

Number of Items:

30

Instructions for Administration and Scoring:

Administration:

- can be administered by interviewer or be self-administered.
- The questionnaire is based on a 5 point Likert scale.
- Administration time is under 30 minutes.

Equipment: None.

Scoring:

- Each domain score is calculated as an average of the scores for the domain items.
- An overall (averaged) score can also be calculated.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Each of the four scales are scored from 0 - 100, where lower scores indicate a better quality of life (i.e. no limitations, fears, constraints, or negative feelings) and higher scores indicate a poorer quality of life.
- Data is only provided from one study, so no normative data exists for the SCI population.
- Reference scores for different gender, age and type of lesion are available from the Qualiveen manual on 400 individuals with SCI (see the Interpretability section of the Study Details page).

Languages:
English, French, Dutch, German, Turkish and Italian.

Training Required:

None.

Availability:

Copyrighted, the Qualiveen Short Form can be ordered and previewed here: http://www.mapi-trust.org/services/questionnairelicensing/catalog-questionnaires/293-sf-qualiveen-

Information for the Qualiveen-30 can be found here: http://www.proqolid.org/instruments/qualiveen_30_items_ qualiveen_30?fromSearch=yes &text=yes

Clinical Considerations:

• The Qualiveen was developed specifically for individuals with SCI and was developed with input from individuals with SCI.

Measurement Property Summary:

# of studies reporting psychometric properties: 1

Reliability:

• Internal consistency is excellent for the total Qualiveen scale (Cronbach’s α=0.80) as well as for all the Qualiveen subscales (Cronbach’s α=0.81-0.85).
• Test-retest reliability is excellent for the 4 Qualiveen subscales (ICC=0.85-0.92).
[Costa et al. 2001]

Validity:

• As expected, correlations of Qualiveen subscales to overall Qualiveen are positive and:
  o adequate to excellent for Qualiveen-Limitations (Pearson’s r=0.52-0.65)
  o adequate to excellent for Qualiveen-Constraints (Pearson’s r=0.43-0.66)
  o adequate to excellent for Qualiveen-Fears (Pearson’s r=0.39-0.60)
  o adequate to excellent for Qualiveen-Feelings (Pearson’s r=0.50-0.77).
• Correlations between items in each domain and non-corresponding domains are poor to excellent for Qualiveen-Limitations (Pearson’s r=0.29-0.64), and poor to adequate for Qualiveen-Constraints (Pearson’s r=0.18-0.59), Qualiveen-Fears (Pearson’s r=0.12-0.40) and Qualiveen-Feelings (Pearson’s r=0.28-0.57).
[Costa et al. 2001]

Responsiveness:

No values were reported for the responsiveness of the Qualiveen scale for the SCI population at this time.

Floor/ceiling effect:

• Floor and ceiling effects were minimal for the Qualiveen scale.
[Costa et al. 2001]
Satisfaction with Life Scale (SWLS, Deiner Scale)

- designed to address the concept of life satisfaction as a whole rather than to assess satisfaction with sub-dimensions of life (Diener et al. 1985).
- Conceptually, the SWLS measures the ‘discrepancy or balance’ between one’s life achievements and expectations.

ICF Domain:
Quality of Life.

Number of Items:
5

Instructions for Administration and Scoring:

Administration:
- Participants respond to the items of the SWLS on a 7-point Likert scale, ranging from strongly disagree (1) to strongly agree (7).
- Administration time is usually under 5 minutes.

Equipment: None.

Scoring:
- A global score (5 – 35) is computed by summing the scores of each question.
- No reports have been presented wherein the scores of a single question were used.

Interpretability:

MCID: not established

SEM:
Standard error of item location for the SWLS items: (Geyh et al. 2010)

<table>
<thead>
<tr>
<th>Item</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWLS 1</td>
<td>0.05</td>
</tr>
<tr>
<td>SWLS 2</td>
<td>0.05</td>
</tr>
<tr>
<td>SWLS 3</td>
<td>0.05</td>
</tr>
<tr>
<td>SWLS 4</td>
<td>0.06</td>
</tr>
<tr>
<td>SWLS 5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

SEM for total SWLS (calculated from data in Dijkers et al. 1999): 4.67

MDC:
MDC for total SWLS (calculated from data in Dijkers et al. 1999): 12.95
- Scores represent a global perspective of life satisfaction.
- Norms/profiles are not available for the SCI population
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:
It is available in multiple foreign languages.

Training Required:
None

**Availability:**

| Patient Name: ______________________ | Date: _______________

Directions:
Below are five statements with which you may agree or disagree.
Using the 1-7 scale below, indicate your agreement with each item by placing the appropriate number in the line preceding that item. Please be open and honest in your responding.
1 = Strongly Disagree
2 = Disagree
3 = Slightly Disagree
4 = Neither Agree or Disagree
5 = Slightly Agree
6 = Agree
7 = Strongly Agree

1. In most ways my life is close to my ideal.  ______
2. The conditions of my life are excellent.  ______
3. I am satisfied with life.  ______
4. So far I have gotten the important things I want in life.  ______
5. If I could live my life over, I would change almost nothing.  ______

Total score: ______

**Clinical Considerations:**

- The SWLS is generic, in that it holds no bias due to particular disability (e.g. SCI). It has adequate psychometric properties across various populations and scores can be compared between these populations.
- One item on the questionnaire "if I could live my life over, I would change nothing" is potentially sensitive.

**Measurement Property Summary:**

| # of studies reporting psychometric properties: 7 |

**Reliability:**
- Internal consistency of the SWLS is excellent (Cronbach’s $\alpha=0.83-0.92$).
- Test-retest reliability for the total SWLS is adequate ($r=0.65$) and for the individual items is poor to adequate ($r=0.39-0.60$).


**Validity:**
- Correlation of the SWLS is excellent with the:
28.5 QUALITY OF LIFE

- Assistive Technology Device Predisposition Assessment (Spearman’s $\rho=0.89$)
- Brief Symptom Inventory (Spearman’s $\rho=-0.64$)
- Life Satisfaction Questionnaire (LISAT-9-11) (Spearman’s $\rho=0.60$),

  - Correlation of the SWLS is **adequate** with the:
    - Older Adult Health and Mood Questionnaire (Spearman’s $\rho=-0.538$)
    - Patient Health Questionnaire-9 (Spearman’s $\rho=-0.477$).


**Responsiveness:**
No values reported for the responsiveness of the SWLS for the SCI population.

**Floor/ceiling effect:**
No values were reported for the presence of floor/ceiling effects in the SWLS for the SCI population.
Short Form 36 (SF-36)

- generic health status measure that was introduced in 1992 and has been translated into various languages and is used world-wide.
- designed to be applied to all health conditions and assess health concepts which represent basic human values and were relevant to a person’s functional status and well-being.
- contains 36 questions covering eight domains:
  1) Physical functioning
  2) Role limitations due to physical health problems
  3) Bodily pain
  4) General health
  5) Vitality
  6) Social functioning
  7) Role limitations due to emotional problems
  8) Mental health

The responses are based on a Likert scale. Both standard (4 week) and acute (1 week) recall versions are used. Version 2 of the SF-36 was released in 1996 and some modifications were made to the format, the wording of the questions and to the response options.

ICF Domain:
Quality of Life.

Number of Items:
36

Instructions for Administration and Scoring:

Administration:
- administered by interviewer or self-administered.

Equipment: None.

Scoring:
- The manual (which must be purchased) has a scoring algorithm to transform item scores to a 0-100 scoring system.
- Norm based scoring, where the mean score for the general population is 50 with a standard deviation of 10, is also used (scoring algorithm in manual).
- The SF-36 can also be scored using two summary scores, a physical and a mental component score, which are norm based.

Interpretability:

MCID: not established for the SCI population, but for a sample of patients with osteoarthritis of the lower extremities (n=142, mean age: 65.1 yrs, 70.5% female, 61.5% had knee osteoarthritis, 35.2% used NSAIDS or analgesics):

<table>
<thead>
<tr>
<th>SF-36 subscales</th>
<th>MCID for worsening</th>
<th>MCID for improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodily pain</td>
<td>7.2</td>
<td>7.8</td>
</tr>
</tbody>
</table>
28.5 QUALITY OF LIFE

<table>
<thead>
<tr>
<th>Physical function</th>
<th>5.3</th>
<th>3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical component summary</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>


**SEM:**
SF-36 score SEM and MDC (calculated from data in Lin et al. 2007):

<table>
<thead>
<tr>
<th>SF-36 Subscales:</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>21.4</td>
<td>59.4</td>
</tr>
<tr>
<td>Role physical</td>
<td>14.7</td>
<td>40.8</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>7.4</td>
<td>20.6</td>
</tr>
<tr>
<td>General health</td>
<td>7.9</td>
<td>21.8</td>
</tr>
<tr>
<td>Vitality</td>
<td>4.6</td>
<td>12.7</td>
</tr>
<tr>
<td>Social functioning</td>
<td>5.9</td>
<td>16.3</td>
</tr>
<tr>
<td>Role emotional</td>
<td>4.1</td>
<td>11.3</td>
</tr>
<tr>
<td>Mental health</td>
<td>7.4</td>
<td>20.6</td>
</tr>
</tbody>
</table>

**MDC:** see above
- There is published data and norms available for some health conditions as well as for the general population (Canada and United States).
- Higher scores indicate higher levels of health.
- Further research is needed on using the SF-36 for individuals with SCI to understand how they are answering the questions to ensure the data is valid.
- Normative data for the SCI population have not been reported at this time
- Published data on the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

**Languages:**
The SF-36 has been translated into over 50 languages.

**Training Required:**
None.

**Availability:**
Permission to use the tools must be obtained from Quality Metric at www.qualitymetric.com. There is a cost to buy the manuals as well as to use the tools (depending on how they will be used).

**Clinical Considerations:**
- The SF-36 is the most widely used health survey and has been used in SCI. It has been used extensively to discriminate, evaluate and predict outcomes in various health conditions, but more work is required to study the validity of the questions and the proposed modifications to the questions for SCI patient population.

28-353
Short Form 36 (SF-36)
• The questions related to walking and climbing stairs are seen to be insensitive to individuals with a complete SCI.

Measurement Property Summary:

# of studies reporting psychometric properties: 11

Reliability:

• Internal consistency ranges from **adequate to excellent** for total SF-36 (Cronbach’s $\alpha=0.82$) and subscales:
  - Physical Functioning (Cronbach’s $\alpha=0.91$-0.98)
  - Role Physical (Cronbach’s $\alpha=0.94$)
  - Bodily Pain (Cronbach’s $\alpha=0.79$)
  - General Health (Cronbach’s $\alpha=0.79$-0.82)
  - Vitality (Cronbach’s $\alpha=0.76$)
  - Social Functioning (Cronbach’s $\alpha=0.72$)
  - Role Emotional (Cronbach’s $\alpha=0.89$)
  - Mental Health (Cronbach’s $\alpha=0.78$)
• Inter-rater and intra-rater reliability ranges from **adequate to excellent** for the SF-36 subscales: (Inter-rater ICC, intra-rater ICC)
  - Physical Functioning (0.67, 0.71)
  - Role Physical (0.90, 0.89)
  - Bodily Pain (0.70, 0.87)
  - General Health (0.41, 0.87)
  - Vitality (0.86, 0.93)
  - Social Functioning (0.52, 0.93)
  - Role Emotional (0.98, 0.99)
  - Mental Health (0.57, 0.77)


Validity:

• Correlation of the SF-36 mental summary is **excellent** with Behavioural Risk Factor Surveillance System items (Pearson’s $r=-0.650$ to -0.761), **poor** with the Quality of WellBeing (Pearson’s $r=0.116$), and **poor** with the Instrumental Activities of Daily Living (Pearson’s $r=0.262$).
• Correlation of the SF-36 physical summary is **adequate** with the Behavioural Risk Factor Surveillance System items (Pearson’s $r=-0.458$ to -0.489), the Quality of WellBeing (Pearson’s $r=0.417$) and the Instrumental Activities of Daily Living (Pearson’s $r=-0.357$)
• The ability of the SF-36 to discriminate among subgroups with respect to age, education, marital status, employment, time since injury, level of injury, and self-care ability was tested using the Mann-Whitney U-test.
• The domains of the SF-36 had significant discriminant validity between employment and self-care ability; the discriminant ability differed with other characteristics. Overall, the SF-36 domains significantly discriminated between subgroups in terms of 2-4 characteristics.

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Responsiveness:
- Significantly lower scores for individuals with SCI than the nondisabled group were reported on the Physical Functioning, Bodily Pain and Role-Physical domains.
- However, all Vitality subscale items showed significant positive differential functioning for people with SCI when controlling for total physical health scores. [Lin 2007, Bonne-Lee et al. 2008, Horner-Johnson et al. 2010]

Floor/ceiling effect:
- Floor effects and ceiling effects reported for the SF-36.
- 3 subscales (role physical, social functioning, role emotion) exhibited ceiling effects between 22.5 and 75.3%.
- 2 subscales (physical functioning and role physical) exhibited floor effects 24.2% and 36.3%, respectively. [King & Roberts 2002, Van Leeuwen et al. 2012, Andresen et al. 1999, Lin 2007, Bonne-Lee et al. 2008]
Sickness Impact Profile 68 (SIP-68)

- generic health status measure.
- measures physical, mental and social aspects of health-related functioning in 6 subscales:
  1) Somatic autonomy (score: 0-17)
  2) Mobility control (score: 0-12)
  3) Mobility range (score: 0-11)
  4) Social behavior (score: 0-12)
  5) Emotional stability (score: 0-6)
  6) Psychological autonomy/communication (score: 1-10)
- contains statements regarding behavior “sickness impact” and the individual is asked to respond by checking items that describe their health status.

ICF Domain:
Quality of Life

Number of Items:
68

Instructions for Administration and Scoring:

Administration:
- can be administered by the interviewer or the client (self-report).
- All items are scored dichotomously (no=0, yes=1).
- Administration time is usually 15-20 minutes.

Equipment: None.

Scoring:
- The items reported as “yes” are used to calculate the scores.
- The questions regarding walking are not relevant to wheelchair-dependent individuals and a scoring modification is proposed in such cases – for a “yes” response to the item “I cannot walk at all”, all 7 items related to walking are scored positively.

Interpretability:

MCID: not established
SEM: not established
MDC: not established
- Higher scores indicate more health-related behavioral problems (i.e. worse health state).
- The SIP-68 can be reported as an overall total score, three dimension scores (physical, psychological and social) or six sub-scale scores.
- No normative data have been established for the SCI population.
• There is published data available for the SCI population for comparison (see the Interpretability section of the Study Details sheet).

Languages:
The full SIP (136 items) has been translated into several languages so far, including Spanish.

Training Required:
None.

Availability:
The full SIP (136 items) is available for purchase at: [http://www.mapi-trust.org/services/questionnairelicensing/catalog-questionnaires/296-sip](http://www.mapi-trust.org/services/questionnairelicensing/catalog-questionnaires/296-sip)

Note: for individual clinical practice and non-funded academic research, use of the SIP is free.

Clinical Considerations:
• The SIP 68 is a commonly used health status measure and it is possible to compare results with various patient populations, including those with SCI. However, the evidence on the psychometric properties of the SIP 68 for a SCI population is limited and more research is needed to assess reliability and responsiveness.

• The response options (applies or does not apply to my situation) may cause deceptive figures in the SCI population because all items related to difficulties with walking will be scored negatively, causing a lower score indicating greater health-related status.

Measurement Property Summary:
# of studies reporting psychometric properties: 3

Reliability:
• Internal consistency is excellent for the SIP-68 (Cronbach’s $\alpha=0.88$-0.92). [Post et al. 2001, Post et al. 1996]

Validity:
• Correlation of the SIP-68 is excellent with the Barthel Index ($r=0.74$) and adequate with the Life Satisfaction Questionnaire ($r=-0.52$). [Post et al. 2001, Post et al. 1996, Post et al. 1998]

Responsiveness:
No values were reported for the responsiveness of the SIP-68 for the SCI population.

Floor/ceiling effect:
No values were reported for the presence of floor/ceiling effects in the SIP68 for the SCI population.
World Health Organization Quality of Life Questionnaire (WHOQOL-Bref)

- conceptually fits with the WHO definition of QOL. Substantial effort has been put forth to properly operationalize the sub-concepts (various aspects of life) included in the instrument.

- grouped into 4 domains of QOL:
  1. Physical health (raw score range: 7-35)
  2. Psychological health (raw score range: 6-30)
  3. Social relationships (raw score range: 3-15)
  4. Environment (raw score range: 8-40)

and 2 items that measure overall QOL and general health.

ICF Domain:
Quality of Life

Number of Items:
24

Instructions for Administration and Scoring:

Administration:
- self-report questionnaire
- Participants express how much they have experienced the items in the preceding 2 weeks on a 5-point Likert scale ranging from 1 (not at all) to 5 (completely).
- Administration time is usually 10-15 minutes.

Equipment: None.

Scoring:
- All domain scores are reported between 4 and 20 (mean scores for each multiplied by 4); for the scoring algorithm, see the User Manual (http://www.who.int/mental_health/publications/whoqol/en/index.html)

Interpretability:

MCID: not established
SEM:
SEM and MDC for the WHOQOL-Bref domains (calculated from data in Lin et al. 2007):

<table>
<thead>
<tr>
<th>Domain</th>
<th>SEM</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Health</td>
<td>7.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Physical health</td>
<td>5.2</td>
<td>14.4</td>
</tr>
<tr>
<td>Psychological</td>
<td>2.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Social relationships</td>
<td>6.4</td>
<td>17.9</td>
</tr>
<tr>
<td>Environment</td>
<td>5.1</td>
<td>14.1</td>
</tr>
</tbody>
</table>

MDC: see above
• Scores represent one’s personal experience and satisfaction regarding various aspects of life.

• Norms are available for different groups; however, cut-points and norms have not been established for the SCI population.

• Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:

English, Chinese, Czech, Farsi, Indonesian, Polish, Russian and Thai.

Training Required:

None.

Availability:

Can be found at WHO website: http://www.who.int/substance_abuse/research_tools/whoqolbref/en/

Clinical Considerations:

• WHOQOL-BREF can provide data for both research and clinical purposes. Although it is a relatively brief instrument, its structure allows one to acquire specific information covering many aspects of life.

• This scale was not developed for individuals with SCI, therefore, it is possible that there are some questions in the scale that are not relevant.

• The WHOQOL(Bref) is short and easy to administer.

Measurement Property Summary:

# of studies reporting psychometric properties: 5

Reliability:

• Intra-rater reliability is excellent for the total WHOQOL-Bref and its subscales (ICC range: 0.84-0.93).

• Inter-rater reliability is adequate to excellent for the total WHOQOL-Bref and its subscales (ICC range: 0.56-0.95)


Validity:

• Correlation of the WHOQOL-Bref subscales with the Satisfaction with Well-Being Index is adequate to excellent (Psychological – Pearson’s r=0.75, Physical – Pearson’s r=0.63, Family/social – Pearson’s r=0.45, Financial/environment – Pearson’s r=0.59).

• Correlation of WHOQOL-Bref subscales with the Chinese version of Quebec User Evaluation with Assistive Technology is adequate (Psychological – Pearson’s r=0.344, Physical – Pearson’s r=0.508, Family/social – Pearson’s r=0.460, Financial/environment – Pearson’s r=0.567).


Responsiveness:
• Stratified random sample by current employment status of 30 subjects, selected from those who had been employed before the SCI, were interviewed for a second time to recall their health related QoL at the time of the injury.

• **Effect Sizes:**
  - Overall QOL and general health domain: 1.01
  - Physical Health Domain: 1.83
  - Psychological Health Domain: 0.78
  - Social Relationship Domain: 1.16
  - Environment Domain: 0.78

  [Lin et al. 2007]

**Floor/ceiling effect:**

• No floor or ceiling effects were reported.

  [Jang 2004, Lin et al. 2007]
**Quality of Life References**

**Incontinence Quality of Life Questionnaire:**

**LISAT-9, LISAT-11:**

**QLI:**

**QOLP-PD:**
287.

Quality of Well Being:

Qualiveen:

SWLS:

SF-36:


**SIP 68:**


**WHOQOL-Bref:**


Chapin MH, Miller SM, Ferrin JM, Chan F, Rubin SE. Psychometric validation of a subjective well-being measure for people with spinal cord injury. Disability and


28.6 Environment

Disability is no longer understood as a feature of the individual, but rather as the outcome of an interaction of the person with a health condition and the environmental factors. The environment consists of the physical, social and attitudinal circumstances in which people live and conduct their lives. Environmental factors are external to the individual and can have a positive or negative influence on a person's participation as a member of society, on performance of activities, or on a person's body function or structure. Facilitators are features of the environment that have a positive effect on disability while barriers are features of the environment that have a negative effect on disability.

There are very few measurement tools designed to evaluate the environment and its effect on an individual’s life. The physical environment is the most commonly assessed aspect that is evaluated. In this section we feature two environmentally oriented tools that have been validated with individuals with SCI.

The outcome measures reviewed under this category include:

28.6 Environment ................................................................................................................................. 365
  Assistive Technology Device Predisposition Assessment (ATD-PA)........................................ 365
  Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0)........... 368

Environment References ..................................................................................................................... 370
Assistive Technology Device Predisposition Assessment (ATD-PA)

- examines consumer’s subjective satisfaction with achievements in a variety of functional areas. Consumers are asked to characterize aspects of functioning, temperament, lifestyle, and views of a particular assistive device.

ICF Domain:

Environment

Number of Items:

63 (divided into 2 domains)

Instructions for Administration and Scoring:

Administration:

- patient-reported but can be applied through interview techniques.
- Domain one contains 53 items. It is designed to be administered per individual across several time points. It is divided into four sections. Section A (items 1-9) asks respondents to rate their current capabilities in nine functional areas according to a five-point scale (1=poor to 5=excellent). All items in Sections B and C comprise the QOL subset. Each item is rated on a five-point scale (Section B: 1=not satisfied; 5=very satisfied; Section C: 1=strongly disagree; 5=strongly agree). Section D contains 33 statements about temperament and psychosocial support. Patients check those which apply to them.
- Domain two is designed to be administered for each assistive technology device used across several time points. It consists of 10 items related to the expected benefit from a device. Patients rate each item on a five-point scale how based on how much the statement applies to them (1=does not apply to me; 5=definitely applies to me).
- In some spinal cord injury research publications, only domain two is used.

Equipment required: None but the patient’s assistive device.

Scoring: No information is provided on scoring.

Interpretability:

MCID: not established
SEM: not established
MDC: not established

- Scores from the quality of life section provide information regarding the consumer’s subjective quality of life.
- Higher scores are indicative of better quality of life.
- No meaningful cut-points or normative data have been established for the SCI population.
- Published data is available for comparison for ATD-PA B & C for the SCI population (see the Interpretability section of the Study Details sheet).

Languages:
English, French and Italian.

**Training Required:**

Training manual available.

**Availability:**

Can be purchased from the publisher’s website: 
http://www.matchingpersonandtechnology.com/orderform.html

**Clinical Considerations:**

- The ATD-PA encourages consumer participation in the process of developing and setting goals and helps the consumer to better understand her or his own needs and interests. It is useful when a consumer has a complicated case and is a good tool for assessing a client’s ‘story’ with assistive technology.

- Together with functional data, the ATD-PA has the potential to contribute to the formulation of consumer-directed needs and goals for rehabilitation. For persons with new spinal cord injury who indicate a predisposition to poor assistive technology use, the ATD-PA can be a measure to identify obstacles to AT use early on in the course of rehabilitation.

- The ATD-PA has been shown to be a reliable measure and to have adequate content and criterion-related validity in the SCI population.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 1

**Reliability:**

- Internal consistency of the ATD-PA was reported to be **excellent** (Cronbach’s $\alpha=0.80$).
  
  [Scherer & Cushman 2001]

**Validity:**

- Correlation of the ATD-PA Quality of Life subscale was **excellent** with:
  - the Brief Symptom Inventory (Spearman’s $\rho=-0.71$)
  - the Satisfaction with Life Scale (Spearman’s $\rho=0.89$).
  
  [Scherer & Cushman 2001]

**Responsiveness:**

No values were reported for responsiveness of the ATD-PA for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the ATD-PA for the SCI population.
Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0)

- designed to evaluate a person’s satisfaction with a wide range of assistive technology (AT).
- current version of the scale covers two dimensions:
  1. satisfaction with the device
  2. satisfaction with the service from the vendor/manufacturer.
- Items in the satisfaction with the device domain include dimensions, weight, adjustments, safety, durability, simplicity of use, comfort and effectiveness.
- The satisfaction with the service from the vendor/manufacturer domain includes service delivery, repairs and service of the device, professionalism of service, and follow-up service.

ICF Domain:
Environmental Factors

Number of Items:
12

Instructions for Administration and Scoring:

Administration:
- self-administration or interview format.
- Response categories range from 1 (not satisfied at all) to 5 (very satisfied).
- Administration time is approximately 10-15 minutes.

Equipment: None.

Scoring:
- The QUEST yields three scores: Device, Services, and a total QUEST, calculated by summing and then averaging valid responses to assigned items.

Interpretability:

<table>
<thead>
<tr>
<th>MCID</th>
<th>not established</th>
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<tbody>
<tr>
<td>SEM</td>
<td>not established</td>
</tr>
<tr>
<td>MDC</td>
<td>not established</td>
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</tbody>
</table>

- No information on important cut points or responsiveness (sensitivity to change) is available for the SCI population.
- Published data for the SCI population is available for comparison (see Interpretability section of the Study Details sheet).

Languages:
English, French, Chinese, Taiwanese, Dutch, Portuguese, Norwegian and Japanese.

Training Required:
None.

**Availability:**

Must be purchased from [http://www.abledata.com/abledata.cfm?pageid=113583&top=0&productid=189455&trail=0](http://www.abledata.com/abledata.cfm?pageid=113583&top=0&productid=189455&trail=0)

**Clinical Considerations:**

- The tool is both simple to use and simple to score.
- Reliability and validity studies for SCI have only been conducted with the Chinese version of the QUEST. In the self-administered format, the QUEST demands minimal skills to circle or mark the responses on the rating scale and to write comments. When the interview format is used, some interactive optional material is provided, including a list of 12 satisfaction items printed in large font and an enlarged rating scale displaying the 5-point degrees of satisfaction.

**Measurement Property Summary:**

# of studies reporting psychometric properties: 3

**Reliability:**

- Internal consistency is **excellent** for the:
  - QUEST (Cronbach’s $\alpha=0.82$)
  - Devices subscale of QUEST (Cronbach’s $\alpha=0.84$)
  - Services subscale of QUEST (Cronbach’s $\alpha=0.85$)

[Chan and Chan 2006]

**Validity:**

- Correlation for the QUEST Device subscale is **adequate** with the WHO Quality Of Life-Bref (HK version) ($r=0.412$), and the WHOQOL-Bref subscales: Physical ($r=0.508$), Psychological ($r=0.344$), Social Relationship ($r=0.460$) and Environment ($r=0.567$).
- Correlation for the QUEST Services subscale is **poor** with the WHO Quality Of Life-Bref (HK version) ($r=0.120$) and WHOQOL Psychological ($r=0.023$) and Social Relationship ($r=0.242$) subscales; and **adequate** with the WHOQOL-Bref Physical ($r=0.307$) and Environment ($r=0.333$) subscales.

[Chan and Chan 2006, Chan and Chan 2007]

**Responsiveness:**

No values were reported for responsiveness of the QUEST for the SCI population.

**Floor/ceiling effect:**

No values were reported for the presence of floor/ceiling effects in the QUEST for the SCI population.
Environment References

**ATD-PA:**

**QUEST:**