Monitoring patient status over time using common Neurological outcome measures

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Glossary of Terms

Concurrent validity Validity is established by comparing and new outcome instrument with a criterion measure, or gold standard, both of which are administered at the same time (Streiner and Norman 1995).
Content validity Content validity is defined as ‘the extent to which the content of the instrument appears logically to examine and comprehensively include the full scope of the characteristics or domains it is intended to measure’ (Bowling 1997).
Construct validity The assessment of construct validity is an ongoing process, involving the comparison of outcome instrument findings to other evidence (Beatie 2001, Bowling 1997). In general, construct validity is established through the development of hypotheses concerning the behaviour of the outcome instrument, in various situations and populations.
Face validity Face validity implies ‘whether on the face of it, the instrument appears to be assessing the desired qualities.’ (Streiner and Norman 1995).
Sensitivity to detect change over time Sensitivity can be defined as the ‘ability to detect change statistically, whether it is relevant (to the patient or clinician) or not.’ (Fortin et al 1995).
Test-retest reliability Test-retest reliability provides information about the extent to which the same results are gained on repeated use of the outcome instrument over time, when no change is expected (Beatie 2001, Simmons et al 1999).
Validity Validity provides evidence that an outcome instrument measures what it is supposed to measure (Andresen 2000, Bowling 1997).
References

Chapter 1: Introduction

Background

The Outcomes Calculator has been under development for since 1999, in a series of staged research strategies. Preliminary investigations comprised:

- Investigation of requirements of funding bodies regarding health outcomes derived from treatment by clinicians (Grimmer et al 2000, Grimmer and Milanese 2002)
- Literature review to assess evidence of validity, reliability, sensitivity to change and clinical utility of common measures of health outcome used by clinicians, as well as other measures of health outcome that may be useful for clinicians (Bialocerkowski et al 2002, Bialocerkowski et al 2003, Grimmer and Milanese 2002)
- Discussions with health Australian clinicians regarding the barriers and facilitators to regular use of health outcomes in clinical practice (Research Committee APA 1999, Grimmer et al 2000), and

The term ‘outcome’ incorporates the health gain and costs associated with treatment. For the management of many conditions, this involves an episode of care (a number of linked occasions of service). Currently the most common type of outcome information is on cost, or number of contacts with the patient. Our investigations highlighted that most clinicians collect no standard information from patients on health outcome, despite this being the most important information required by health funders. What information is collected is non-standardised, collected at variable time frames throughout the episode, and is usually handwritten in patient notes, which makes it inefficient and less than useful for clinical benchmarking. The need for a simple, efficient mechanism for collecting standard information routinely on patient progress was identified from our preliminary investigations. The Outcomes Calculator software was developed to address this need.

Aim of the Outcomes Calculator

The Outcomes Calculator aims to facilitate the use of standardised outcome measures in clinical practice to monitor change in patient status over time. Patients complete selected outcome measures prior to, or following treatment (without reference to the clinician) and the data can be entered into the Outcomes Calculator by administrative staff. This avoids the potential bias by the clinician and ensures that the patient’s view of their condition is recognised. The Outcome Calculator automatically computes the score for each outcome measure and uses available norms for comparison (for example: for joint range of motion). Summarising outcome in this way would assist in communicating patient progress, between clinicians, patients and funders.
Outcome measures

The outcome measures contained within the CAHE Outcomes Calculator Version 3 have been selected on their psychometric properties (validity, reliability, sensitivity to detect change over time and clinical utility for patient populations frequently treated with neurological problems). The outcome measures represent a range of aspects of functioning and/or disability (Grimmer and Milanese 2002), which are measured at the level of body functions/structure, the individual and society, as defined by the International Classification of Functioning (World Health Organization 2001). Table 1.1 provides a schematic overview of the International Classification of Functioning, whilst Figure 1.1 provides definitions regarding the components associated with functioning/disability.

The outcome measures contained in this revised Version 3 of the CAHE Outcomes Calculator are presented in Table 1.2. This table defines the level of measurement for each of the outcome measures (according to the World Health Organization’s (2001) International Classification of Functioning definitions).

Permission to use the outcome instruments in the calculator has been obtained from each of the developers. Contact details of the instrument developers are enclosed in this manual.

This manual also provides some ideas for use of patient details for determining the quality of treatment, using expected benchmarks, population norms, and clinical reasoning.

Table 1.1: An overview of the International Classification of Functioning: functioning and disability (World Health Organization 2001)

<table>
<thead>
<tr>
<th>Functioning and Disability</th>
<th>Components</th>
<th>Body Functions and structures</th>
<th>Body Functions</th>
<th>Body Structures</th>
<th>Activities and Participation</th>
<th>Life areas (tasks, actions)</th>
<th>Capacity executing tasks in a standard environment</th>
<th>Performance executing tasks in the current environment</th>
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<tbody>
<tr>
<td>Domains</td>
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<td>Body Functions</td>
<td>Body Structures</td>
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<td>Constructs</td>
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<td>Change in body functions (physiological)</td>
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<td>Change in body structures (anatomical)</td>
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<tr>
<td>Positive aspects</td>
<td></td>
<td></td>
<td>Functional and structural integrity</td>
<td></td>
<td></td>
<td>Activities Participation</td>
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<tr>
<td>Negative aspect</td>
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<td></td>
<td>Impairment</td>
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<td></td>
<td>Activity Limitation</td>
<td>Participation Restriction</td>
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</table>

In the context of health:

- **Body functions** are the physiological functions of body systems (including psychological functions).
- **Body structures** are anatomical parts of the body such as organs, limbs and their components.
- **Impairments** are problems in body function or structure such as a significant deviation or loss.
- **Activity** is the execution of a task or action by an individual.
- **Participation** is involvement in a life situation.
- **Activity limitations** are difficulties an individual may have in executing activities.
- **Participation restrictions** are problems an individual may experience in involvement in life situations.

Figure 1.1: Definitions of the components associated with functioning/disability (World Health Organization 2001)
### Table 1.2: Summary of outcome measures contained in the Outcomes Calculator

<table>
<thead>
<tr>
<th>Measurement construct</th>
<th>Outcome measure</th>
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<tr>
<td>Impairment:</td>
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<tr>
<td>Sensory Impairments</td>
<td>Nottingham Sensory Assessment Scale</td>
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<tr>
<td>Spasticity</td>
<td>Tardieu Scale</td>
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<td>Modified Ashworth Scale</td>
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<tr>
<td>Dysphagia</td>
<td>Functional Oral Intake Scale</td>
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<td>Balance Impairments</td>
<td>Step Test</td>
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<td>Functional Reach Test</td>
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<td>Berg Balance Scale</td>
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<td>Clinical Test of Sensory Interaction and Balance</td>
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<tr>
<td>Activity Limitation / Participation Restriction</td>
<td>Functional Independence Measure &amp; Functional Assessment Measure</td>
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<td></td>
<td>Frenchay Activities Index</td>
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<td></td>
<td>Goal Attainment Scale</td>
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<td></td>
<td>London Handicap Scale</td>
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<td></td>
<td>Chedoke Arm and Hand Inventory</td>
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<td>Nine Hole Peg Test</td>
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<td></td>
<td>Six-minute Walk Test</td>
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<td>High Level Mobility Assessment Tool</td>
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<td>Motor Assessment Scale</td>
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<td>Mobility Scale for Acute Stroke Patients</td>
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<td>Unified Parkinson’s Disease Rating Scale</td>
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<td>Traumatic Brain Injury- Supervision Rating Scale</td>
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<td>Resumption of Activities of Daily Living Scale</td>
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<td>Quality of Life Measures</td>
<td>Assessment of Quality of Life</td>
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<td>Reintegration to Normal Living Index</td>
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<td>Community Integration Measure</td>
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<td></td>
<td>Rand 36 Quality of Life Scale</td>
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<td>Psychological Responses to</td>
<td>Tampa Scale of Kinesiophobia</td>
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<td>Impairment/Activity Limitation/Participation Restriction</td>
<td>Centre for Epidemiologic Studies Depression Scale</td>
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<td></td>
<td>Kessler Psychological Distress Scale</td>
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</tbody>
</table>

### Table 1.3: Contact details of developers of selected outcome measures

CAHE has been given permission to use these outcome measures in its Outcomes Calculator by the developers.

<table>
<thead>
<tr>
<th>Nottingham Sensory Assessment Scale</th>
<th>Nadina Lincoln, BSc MSc PhD&lt;br&gt;Professor of Clinical Psychology&lt;br&gt;Institute of Work Health and Organisations&lt;br&gt;Phone +44(0) 1159515315&lt;br&gt;Phone +44(0) 1158466625&lt;br&gt;<a href="mailto:Nadina.lincoln@nottingham.ac.uk">Nadina.lincoln@nottingham.ac.uk</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tardieu Scale</td>
<td>Permission for use is not required since the instrument is available in the public domain.</td>
</tr>
<tr>
<td>Neurological Outcome Calculator</td>
<td>Contact Information</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------</td>
</tr>
</tbody>
</table>
| **Modified Ashworth Scale**     | Richard W. Bohannon, PT, EdD, NCS, FAHA  
|                                 | Professor, Department of Physical Therapy  
|                                 | School of Allied Health, University of Connecticut, 358 Mansfield Rd, U-2101, Storrs, CT 06250-2101 (USA)  
|                                 | Richard.bohannon@uconn.edu |
| **Functional Oral Intake Scale**| Michael Crary, PhD  
|                                 | Professor, Speech Language Pathology  
|                                 | University of Florida Health Science Center  
|                                 | Gainesville, FL 32611; Phone: (352) 273-6161  
|                                 | MCrary@phhp.ufl.edu |
| **Step Test**                   | Assistant Professor Keith Hill  
|                                 | Physiotherapist and Senior Researcher  
|                                 | National Aging Research Institute  
|                                 | k.hill@nari.unimelb.edu.au |
| **Functional Reach Test**       | Pamela Duncan, PhD  
|                                 | VA Rehabilitation Outcomes Research Center of Excellence (151B)  
|                                 | 1601 SW Archer Road  
|                                 | Gainesville, FL 32608  
|                                 | Telephone 1: (352) 376-1611/(352) 392-2631  
|                                 | Fax Number: (352) 392-9958  
|                                 | pwduncan@phhp.ufl.edu |
| **Berg Balance Scale**          | Katherine Berg, PhD  
|                                 | Associate Professor & Chair  
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|                                 | Phone: 416-978-0173  
|                                 | Fax: 416-946.8561  
|                                 | Katherine.berg@utoronto.ca |
| **Clinical Test of Sensory Interaction and Balance** | Anne Shumway-Cook  
|                                 | University of Washington  
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|                                 | 1959 NE Pacific Street  
|                                 | Box 356490  
|                                 | Seattle, WA 98195-6490  
|                                 | ashumway@u.washington.edu |
| **Functional Assessment Measure**| Jerry Wright  
|                                 | Santa Clara Valley Medical Center  
|                                 | 751 So. Bascom Ave., Box 70, San Jose, California 95128  
|                                 | Contact: (408) 295-9896 x16; FAX (408) 295-9913.  
|                                 | jerry.wright@hhs.sccgov.org |
| **Frenchay Activities Index**   | Department of General Practice,  
|                                 | University Medical Center Groningen  
|                                 | Groningen, Netherlands  
<p>|                                 | <a href="mailto:J.Schuling@med.umcg.nl">J.Schuling@med.umcg.nl</a> |</p>
<table>
<thead>
<tr>
<th>Neurological Test</th>
<th>Author/Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal Attainment Scale</strong></td>
<td>Thomas J. Kiresuk, PhD&lt;br&gt;Minneapolis Medical Research Foundation&lt;br&gt;914 S. 8th Street, Suite D-3&lt;br&gt;Minneapolis, Minnesota 55415&lt;br&gt;Telephone (612) 347-8754&lt;br&gt;<a href="mailto:thomas@kiresuk.com">thomas@kiresuk.com</a></td>
</tr>
<tr>
<td><strong>London Handicap Scale</strong></td>
<td>Harwood Rowan&lt;br&gt;Department of the Health Care of the Elderly&lt;br&gt;Queen's Medical Centre, Nottingham, UK&lt;br&gt;<a href="mailto:Rowan.Harwood@nuh.nhs.uk">Rowan.Harwood@nuh.nhs.uk</a></td>
</tr>
<tr>
<td><strong>Chedoke Arm and Hand Inventory</strong></td>
<td>Susan Barecca&lt;br&gt;Research Clinician&lt;br&gt;Holbrook 1, Chedoke Campus&lt;br&gt;Hamilton Health Sciences, Box 2000&lt;br&gt;Station A, Hamilton, Ontario L8N, 3Z5&lt;br&gt;Phone 905/521-2100 ext 73654 Fax: 905/521-7927&lt;br&gt;<a href="mailto:barreca@hhsc.ca">barreca@hhsc.ca</a></td>
</tr>
<tr>
<td><strong>Nine Hole Peg Test</strong></td>
<td>Virgil Mathiowetz, PhD, OTR/L, FAOTA&lt;br&gt;Office:&lt;br&gt;R505 Children’s Rehabilitation Center&lt;br&gt;426 Church Street SE&lt;br&gt;Minneapolis, MN 55455&lt;br&gt;Phone: 612 626-3759&lt;br&gt;Fax: 612 625-7192&lt;br&gt;<a href="mailto:Mathi003@umn.edu">Mathi003@umn.edu</a></td>
</tr>
<tr>
<td><strong>6Minute Walk Test</strong></td>
<td>Correspondence with Dr. Guyatt (Conducted a study using 6 minute walk test among patients with chronic heart and lung disease): ‘No permission is required for its use’&lt;br&gt;Dr. Gordon H. Guyatt&lt;br&gt;Dept. of Clinical Epidemiology&lt;br&gt;McMaster University Med. Ctr.&lt;br&gt;1200 Main Street&lt;br&gt;Hamilton, Ontario CANADA L8N 3Z5&lt;br&gt;<a href="mailto:guyatt@mcmaster.ca">guyatt@mcmaster.ca</a></td>
</tr>
<tr>
<td><strong>High Level Mobility Assessment Scale</strong></td>
<td>Gavin Williams, Ph.D.&lt;br&gt;Senior Physiotherapist, Epworth Rehabilitation&lt;br&gt;89 Bridge Rd&lt;br&gt;Richmond 3121&lt;br&gt;Victoria, Australia&lt;br&gt;Ph: 011 (613) 9426 8727&lt;br&gt;F: 011 (613) 9426 8734&lt;br&gt;<a href="mailto:gavin.williams@epworth.org.au">gavin.williams@epworth.org.au</a></td>
</tr>
<tr>
<td><strong>Motor Assessment Scale</strong></td>
<td>Roberta Shepherd&lt;br&gt;Honorary Professor, The Discipline of Physiotherapy&lt;br&gt;Faculty of Health Sciences&lt;br&gt;Cumberland Campus, East Street&lt;br&gt;Lidcombe, NSW 2141 Australia&lt;br&gt;<a href="mailto:R.Shepherd@usyd.edu.au">R.Shepherd@usyd.edu.au</a></td>
</tr>
<tr>
<td>Study/Scale</td>
<td>Author(s)</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mobility Scale for Acute Stroke Patients</td>
<td>Janine Simondson&lt;br&gt;Physiotherapy&lt;br&gt;Department, St Vincent's Hospital Melbourne&lt;br&gt;41 Victoria Parade, Melbourne, 3065, Australia.</td>
</tr>
</tbody>
</table>
| Reintegration to Normal Living Index            | Sharon Wood-Dauphinee PhD<br>Professor and Interim Director<br>School of Physical and Occupational Therapy<br>McGill University<br>Davis House<br>3654 Drummond Street, Room 20 Montreal, Quebec H3G 1Y5\[Sharon.wood.dauphinee@mcgill.ca] \[
<p>| Community Integration Measure                   | Mary Ann McColl, PhD&lt;br&gt;Associate Director, Research&lt;br&gt;Centre for Health Services and Policy Research&lt;br&gt;Queen's University&lt;br&gt;Kingston, ON Canada K7L 3N6&lt;br&gt;phone: 613-533-6319&lt;br&gt;fax: 613-533-6353 |
| RAND 36                                          | RAND hereby grants permission to use &quot;RAND 36-Item Short Form Health Survey&quot; in accordance with the following conditions, which shall be assumed by all to have been agreed to as a consequence of accepting and using this document:&lt;br&gt;Changes to the Health Survey may be made without the written permission of RAND. However, all such changes shall be clearly identified as having been made by the recipient.&lt;br&gt;1. The use of this Health Survey accepts full responsibility, and agrees to indemnify and hold RAND harmless, for the accuracy of any translations of the Health Survey into another language and for any errors, omissions, misinterpretations, or consequences thereof.&lt;br&gt;2. The user of this Health Survey accepts full responsibility, and agrees to indemnify and hold RAND harmless, for any consequences resulting from the use of the Health Survey.&lt;br&gt;3. The user of the 36-Item Health Survey will provide a credit line when printing and distributing this document acknowledging that it was developed at RAND as part of the Medical Outcomes Study.&lt;br&gt;No further written permission is needed for use of this Health Survey. |
| Unified Parkinson's Disease Rating Scale         | S Fahn&lt;br&gt;Department of Neurology&lt;br&gt;Columbia University College of Physicians Surgeons,&lt;br&gt;New York, New York 10032, USA&lt;br&gt;[<a href="mailto:fahn@neuro.columbia.edu">fahn@neuro.columbia.edu</a>] |
| Traumatic Brain Injury – Supervision Rating Scale| Corwin Boake, PhD,&lt;br&gt;The Institute for Rehabilitation Research&lt;br&gt;[<a href="mailto:Corwin.Boake@uth.tmc.edu">Corwin.Boake@uth.tmc.edu</a>] |
| Resumption of Activities of Daily Living Scale   | Renee Williams, PhD&lt;br&gt;Assistant Professor – School of Rehabilitation Science&lt;br&gt;McMaster University&lt;br&gt;Bldg. T-16, Room 128G&lt;br&gt;1280 Main St., W. Hamilton Ontario Canada L8S 4K1&lt;br&gt;[<a href="mailto:rwilliam@mcmaster.ca">rwilliam@mcmaster.ca</a>] |</p>
<table>
<thead>
<tr>
<th>Scale</th>
<th>Correspondence</th>
</tr>
</thead>
</table>
| Tampa Scale of Kinesiophobia             | Correspondence with Dr. Steve Wolby (Conducted research on the psychometric properties the English version of the TSK and proposed the TSK-11): ‘TSK was developed by Kori and colleagues in Tampa but didn’t publish much work on this. Permission to use TSK is not required.’ Steve Woby, PhD  
Research Fellow (joint post)  
Centre for Rehabilitation Science, University of Manchester Department of Physiotherapy, North Manchester General Hospital  
steve.woby@pat.nhs.uk |
| Center for Epidemiologic Studies Depression Scale | Correspondence with National Institute of Mental Health: ‘This scale is in the public domain and can be copied, revised, or reproduced as needed.’  
National Institute of Mental Health  
6001 Executive Boulevard  
Rockville, MD 20852  
Mailing Address:  
6001 Executive Boulevard  
Bethesda, MD 20892 |
| Kessler Psychological Distress Scale     | Ronald C. Kessler, PhD  
Harvard Medical School, Department of Health Care Policy  
180 Longwood Avenue  
Boston, MA 02115-5899  
Phone: 1 617-432-3587  
Fax: 1 617-432-3588  
kessler@hcp.med.harvard.edu |
Chapter 2: Impairment Measures

The Nottingham Sensory Assessment

Background

The Nottingham Sensory Assessment (NAS) was designed in 1991 to test tactile, kinesthetic sensation and stereognosis among patients with stroke. It includes test of light touch, pressure, pin prick and temperature. It also evaluates tactile localization, bilateral simultaneous touch, proprioception, 2-point discrimination and stereognosis.

Measurement

Client is assessed in sitting position and in a suitable state of undress (wearing ideally shorts and underwear). The procedure is demonstrated first before the client is blindfolded. The blindfold is removed regularly to prevent the patient from being disoriented. The test sensation is applied randomly to the different areas of the body, both right and left side. Client is asked to indicate if he/she feels the sensation.

Tactile sensations include all of the following:

a. Light touch – test is done by touching the skin lightly with a cotton wool ball
b. Pressure – index finger presses the skin just enough to deform it
c. Pinprick – tested with the use of a neurotip, maintaining even pressure
d. Temperature – 2 test tubes, with hot water and cold water respectively; each applied in a random manner
e. Tactile localization – tested only on areas which scored 2 in pressure; Pressure test is repeated but with the index finger coated with talcum powder to mark the spot. Client is then asked to point the exact spot that has been touched. Two centimeters of error are allowed.
f. Bilateral simultaneous touch – only on areas which scored 2 in pressure; Corresponding sites on one or both sides of the body are touched by the fingertips and the client is asked to indicate if both or one have been touched.

Kinesthetic sensations include all of the following:

Appreciation of movement, its direction and accurate joint position sense are being tested simultaneously. The limb on the affected side is supported and moved by the examiner in various directions but movement is only at one joint at a time. The client is asked to do the same movement on the unaffected limb. Before blindfolding, 3 practice movements are allowed. Upper limb is tested in sitting while the lower limb is tested in supine.

When testing for stereognosis, the object is placed on the client’s hand for a maximum of 30 seconds. Identification is by naming, description or pair-matching with an identical set. The affected side of the body is tested first.

For 2-point discrimination, the distances of the 2 points applied in the skin over the index finger tip and the thenar crease are measured.
Scoring

Tactile sensations, and stereognosis are both measured on a numerical scale 0, 1, 2 = absent, impaired, normal. For kinesthetic sensations, a scale of 0-3 is used, 0 = absent, 1 = appreciates the movement taking place, 2 = appreciates the movement and able to mirror the direction, 3 = mirrors the test movement to within 10° of the new position. For test sensations which were not assessed, a score of 9 is given. For 2-point discrimination, the distances between two points in the area being tested (index finger tip and thenar crease) are measured.

Total tactile sensations score for each part of the body is calculated by getting the sum of all scores obtained from all the test sensations, excluding those which were given a score of 9. Total kinesthetic sensations score is obtained by getting the sum of all scores for each joint assessed, also excluding all those which were given a score of 9. Scores for 2-point discrimination are the measured distances between 2 points in the skin.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The NAS should be completed on repeated occasions of testing, and the scores should be compared between testing in order to obtain an understanding of any change in sensation.

Interpretation

Change in status can be determined by getting the difference between the initial/previous and subsequent scores. An increase in the scores obtained from the different sensations tested can be interpreted as an improvement in sensation.

Validity, reliability and internal consistency

All of these tests for sensation, function, and stroke severity have been validated for use in elderly patients with stroke and have demonstrated good to excellent reliability (kappa>.6) in patients (studies included subjects with stroke over 60 years of age).

The Brazilian version of the NAS showed excellent internal consistency (0.86), acceptable inter- and intra-rater reliability for all items of the NSA, except temperature and good concurrent validity (Lima et al. 2010). It was found to be quick and easy to apply, and it can be used within clinical practice in neuro-rehabilitation outpatient clinics to assess sensory functions following stroke.

References

The Nottingham Sensory Assessment

This assessment has four components (listed 1-4 below)

1. **Tactile sensations**

Use the following response scale for each test on each body part

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>absent (fails to identify the test sensation on three occasions)</td>
</tr>
<tr>
<td>1</td>
<td>Impaired (identified the test sensation, but not on all three occasions in each body region)</td>
</tr>
<tr>
<td>2</td>
<td>Normal (correctly identifies the test on all three occasions)</td>
</tr>
<tr>
<td>9</td>
<td>Unable to test</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Light touch</th>
<th>Pressure</th>
<th>Pinprick</th>
<th>Temperature</th>
<th>Tactile localisation</th>
<th>Bilateral simultaneous touch</th>
<th>Total (exclude score=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trunk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ankle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. **Kinaesthetic sensations**

Use the following response scale for each chosen joint on affected and unaffected sides

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>absent</td>
</tr>
<tr>
<td>1</td>
<td>appreciation of movement taking place</td>
</tr>
<tr>
<td>2</td>
<td>direction of movement sense</td>
</tr>
<tr>
<td>3</td>
<td>joint position sense</td>
</tr>
<tr>
<td>9</td>
<td>unable to test</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chosen joint 1</th>
<th>Affected side</th>
<th>Unaffected side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chosen joint 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chosen joint 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (exclude score=9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Stereognosis

Use the following response scale for each item:

- 0: Absent (fails to identify the item on three occasions)
- 1: Impaired (identified the item, but not on all three occasions in each body region)
- 2: Normal (correctly identifies the item on all three occasions)
- 9: Unable to test

<table>
<thead>
<tr>
<th>Item list</th>
<th>Affected side</th>
<th>Unaffected side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (exclude score=9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Two point discrimination

- Index finger tip distance
- Thenar crease distance
Tardieu Scale

Background

The Tardieu Scale is a passive measure that evaluates spasticity. The scale accounts for the velocity-dependent nature of spasticity by passively stretching the muscles either at the speed of a limb falling under gravity or as fast as possible (greater than the speed of a limb falling under gravity) as these velocities elicit the stretch reflex.

Measurement and Recording

This test is done in the supine position, with head in midline, and is measured at 3 different velocities (V1, V2, V3).

V1 = as slow as possible (Slower than the natural drop of the limb segment under gravity)
V2 = speed of limb segment falling under gravity
V3 = as fast as possible (faster than the rate of the natural drop of the limb segment under gravity)

The responses are recorded at each velocity as "X/Y", with X being the 0-5 rating shown below, and Y being the degree of angle where the muscle reaction occurs. By moving the limb at different velocities, the response to stretch can be more easily gauged since the stretch reflex responds differently to velocity.

0 no resistance throughout the course of the passive movement
1 slight resistance throughout the course of the passive movement, no clear catch at a precise angle
2 clear catch at a precise angle, interrupting the passive movement, followed by release
3 Fatigable clonus (less than 10 seconds when maintaining the pressure) at the precise angle
4 Unfatigable clonus (more than 10 seconds when maintaining the pressure) at a precise angle
5 Joint is immovable

This scale has two components listed below

1. Quality of movement (X)

This is scored as
0 no resistance throughout the course of the passive movement
1 slight resistance throughout the course of the passive movement, with no clear catch at a precise angle
2 clear catch at a precise angle, interrupting the passive movement, followed by release
3 Fatigable clonus (<10 secs when maintaining pressure) occurring at a precise angle
4 Unfatigable clonus (>10 seconds when maintaining pressure) at a precise angle
5 Joint is immovable

<table>
<thead>
<tr>
<th>Muscle group list</th>
<th>Quality of movement</th>
<th>Muscle group list</th>
<th>Quality of movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Range of Movement

<table>
<thead>
<tr>
<th>Muscle group list</th>
<th>Movement</th>
<th>The degree of ANGLE at which the muscle reaction occurs – (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1 (PROM)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td></td>
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<td>5</td>
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<tr>
<td>6</td>
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<td>7</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e.g.

<table>
<thead>
<tr>
<th>Muscle group list</th>
<th>Movement</th>
<th>The degree of ANGLE at which the muscle reaction occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1 (PROM)</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Knee extension</td>
<td>-70 degrees</td>
</tr>
</tbody>
</table>

**Comparison and Interpretation**

The Tardieu Scale should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in spasticity.

The higher the score in the “X” scale, the greater the spasticity

**Validity, reliability and internal consistency**

Tardieu scale is a quantitative measure with content validity. ICC for inter-rater reliability ranged from 0.58-0.78 and for intra-rater reliability ranged from 0.55-0.97 (Morris 2002). Percentage exact agreement between Tardieu scale and a laboratory measure of spasticity (stretch-induced EMG activity) was 100% for elbow flexors and ankle plantarflexors (chance corrected agreement statistic kappa = 0.24). In the elbow flexors, there was strong and significant relationship between grade of muscle contraction and the fast stretch using the Tardieu scale and peak stretch-induced EMG activity (r=0.86, P=0.001). In addition there was a significant but moderate relationship between the Tardieu scale and the laboratory measure of spasticity in the ankle plantarflexors (r=0.62, P=0.01). Percentage exact agreement between Tardieu scale and a laboratory measure of contracture (maximum passive joint excursion) was 94% for elbow flexors and ankle plantarflexors (chance corrected agreement statistic kappa = 0.88).

In a study by Ada in 2006, the Tardieu scale was found to be a valid clinical measure for spasticity after stroke. Further study is however required to determine its clinical validity in other neurological cases.
Tardieu scale appears to be more valid clinical tool for the measurement of spasticity after stroke because it can differentiate spasticity from contracture (Patrick 2006).

A systematic review of all literature found related to Tardieu Scale revealed that the scale adheres more closely to the definition of spasticity. However, further studies should be undertaken to clarify the validity and reliability of the scale for a variety of muscle groups in adult neurological patients (Haugh 2006).

Gracies and colleagues (2010) conducted a study to measure the Tardieu Scale’s reliability in children with cerebral palsy (CP) when used by raters with and without experience. They found both parameters of the Tardieu Scale to have excellent intrarater and interrater reliability when assessed at the elbow and ankle joints of children with CP, with no difference noted between visual and goniometric measurements. Angle measurements were less reliable at the knee joints and training was associated with a highly significant improvement in reliability.

A study was conducted to compare the test–retest and inter-rater reliability of Tardieu Scale scores measured with inertial sensors and goniometry and it found that inertial sensors are reliable and accurate to use in Tardieu Scale measurements to quantify spasticity in the elbow flexors of hemiplegic stroke patients (Paulis et al. 2011).

The Modified Tardieu scale (MTS) was found to have insufficient intraclass correlation coefficients (ICC), Spearman’s correlation, and limits of agreement (LOA) for both inter- and interrater reliability for measuring spasticity in patients with profound intellectual and multiple disabilities (PIMD) (Waninge et al. 2011).

References


Modified Ashworth Scale

Background

The Ashworth Scale was developed in 1964 to evaluate spasticity by measuring the resistance in a joint following a rapid, passive stretch, using a scale of 0-4. The Modified Ashworth Scale (MAS) developed by Bohannon and Smith in 1987 has an additional level of measurement (1+) and redefines the lower levels of the scale in an attempt to increase the sensitivity of the original scale (0, 1, 1+, 2, 3, 4).

Scoring

As the software in the calculator would not accept a “+” sign, the scale was further modified into 0, 1, 2, 3, 4, 5 (with permission from the developer, Dr. R. Bohannon).

Resistance is scored as:

<table>
<thead>
<tr>
<th>Resistance score</th>
<th>Joint list</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no increase in muscle tone</td>
</tr>
<tr>
<td>1</td>
<td>slight increase in muscle tone, manifested by a catch and release, or by minimal resistance at the end of range of motion when the affected parts are moved in flexion or extension</td>
</tr>
<tr>
<td>2</td>
<td>slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the range of movement</td>
</tr>
<tr>
<td>3</td>
<td>more marked increase in muscle tone through most of the range of movement, but affected parts easily moved</td>
</tr>
<tr>
<td>4</td>
<td>considerable increase in muscle tone, passive movement difficult</td>
</tr>
<tr>
<td>5</td>
<td>affected parts rigid in flexion or extension</td>
</tr>
</tbody>
</table>

Recording

A separate recording sheet is provided to facilitate repeated measures over time.
Comparison and Interpretation

The MAS should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in spasticity.

The higher the score in the scale, the greater is the spasticity.

Validity, reliability and internal consistency

In children with CP, Fosang et al., found the inter-rater reliability of the Modified Ashworth scale to be poor, while Verschuren et al. found it to be acceptable. Verscheuren et al. likewise found the test-retest reliability acceptable, however, Fosang et al. found the test-retest reliability highly variable in children with CP, ranging from excellent to poor, depending on the rater. Damiano et al. found a poor correlation between the Ashworth Scale and stretch reflex activity (spasticity) when convergent cross-sectional validity was assessed.

The modified Ashworth Scale does not provide a valid measure of spasticity at lower grades but it may provide a measure of resistance to passive movement among patients with a first ever diagnosed stroke. (Pandyan et al, 2003)

The Modified Ashworth Scale yielded reliable measurements in the lower limb for a single examiner, and agreement was best on the grade of 0. The reliability between examiners was not good, which may bring into question the validity of measurements obtained with the scale. (Blackburn et al, 2002)

The MAS had sufficient test–retest and inter rater reliability and may be a good method for evaluating the quality of daily movements in persons with PIMD (Waninge et al. 2011).

References

Blackburn et al. Reliability of Measurements Obtained With the Modified Ashworth Scale in the Lower Extremities of People With Stroke. Phys Ther. Vol 82; No.1; jan 2002; 25-34.


Functional Oral Intake Scale

Background

The Functional Oral Intake Scale (FOIS) was developed to document the functional level of a client’s actual daily oral intake of food and liquid with consideration for modifications of either and the need for swallowing compensations.

Measurement and Scoring

The scale consists of 7 items, level 1-3 relate to varying degrees of non-oral feeding and level 4-7 relate to varying degrees of oral feeding without non-oral supplementation. The latter scale levels consider both diet modifications and patient compensations, but all levels focus on what the client consumes by mouth on a daily basis.

To score the functional oral intake using this scale, therapists may obtain information from medical charts, dietary journals and/or verified client reports. Verification of client reports may be obtained from family members or from a variety of sources for institutionalized clients.

Patients are rated on a scale of 1-7.
Level 1: Nothing by mouth
Level 2: Tube dependent with minimal attempts of food or liquid.
Level 3: Tube dependent with consistent oral intake of food or liquid.
Level 4: Total oral diet of a single consistency.
Level 5: Total oral diet with multiple consistencies, but requiring special preparation or compensations
Level 6: Total oral diet with multiple consistencies without special preparation, but with specific food limitations.
Level 7: Total oral diet with no restrictions.

Comparison and Interpretation

The functional oral intake of patients is assessed on repeated occasions using this scale in order to obtain an understanding of any change in the status of the client. An increase in the rating of clients can be interpreted as an improvement in the functional status of the client (oral intake of food and liquid).

Validity, reliability and internal consistency

Developmental literature indicates that the scale has a good inter-rater reliability and consensual validity. Inter-rater reliability was high, with perfect agreement on 85% of ratings. Kappa statistics ranged from .86 to .91. Consensual validity was high (.90). Criterion validity was high at onset and 1 month post-stroke. Significant associations were identified between the FOIS and stroke handicap scales. The FOIS was significantly associated with 2 physiologic measures of swallowing.

References
Balance Measures: Step Test

Background

The Step Test is a test of dynamic balance that consists of placing one foot forward on a 7.5 cm block and back on the floor. It is commonly used to assess balance in patients with stroke. This test includes a forward phase and a backward phase each comprising a bipedal and unipedal stance phase.

Scoring

Patient is asked to step on and off the block as many times as possible in 15 seconds. He/she is asked to place the whole foot onto the block and then return it fully to the ground. The total number of completed steps in 15 seconds is recorded for each side. If the patient overbalanced or needed steadying during the test, counting of steps stops. The completed number of steps prior to overbalancing is recorded.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The Step Test should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in balance.

Interpretation

<p>| Table 2.1: Normative values for Step test in age groups between 20-79 (Isles et al 2004) |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|</p>
<table>
<thead>
<tr>
<th>Age</th>
<th>20–29 (n=40)</th>
<th>30–39 (n=47)</th>
<th>40–49 (n=95)</th>
<th>50–59 (n=93)</th>
<th>60–69 (n=90)</th>
<th>70–79 (n=91)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step test (R) (Number of steps)</td>
<td>Mean±SE</td>
<td>20.72±0.48</td>
<td>20.17±0.45</td>
<td>18.77±0.33</td>
<td>17.13±0.33</td>
<td>15.59±0.33</td>
</tr>
<tr>
<td>Published</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>17.67 (73) Hill</td>
<td>17.67 (73) Hill</td>
</tr>
<tr>
<td>Normative value</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>16 (74) Hill</td>
<td>16 (74) Hill</td>
</tr>
<tr>
<td>(age)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.6 (65–86) Brauer</td>
<td>15.6 (65–86) Brauer</td>
</tr>
</tbody>
</table>

The score obtained may be compared against the normative values shown in the table.
Validity, reliability and internal consistency

ICC for test-retest reliability ranged from 0.90–0.94 with healthy elders & 0.88–0.97 for patients post-stroke. Correlation r value for Functional Reach test is 0.68-0.73, for gait velocity = 0.83 and for stride length = 0.82-0.83, with a p value of less than .001.

References


Functional Reach Test

Background

Functional Reach Test is a measure of balance and is the difference, in inches, between arm’s length and maximal forward reach, using a fixed base of support. This can be used to detect balance impairment, change in balance performance over time and in the design of modified environments for impaired older persons.

Measurement and Scoring

The test utilizes a 48-inch measuring device or "yardstick". With the feet at comfortable distance and yardstick at the level of humeral head, the arm closest to the wall is raised to 90 degrees of flexion and the position of the knuckle of the middle finger measured. Client is instructed to reach forward as far as possible without taking a step. The position of the knuckle is recorded at the point of furthest reach. The functional reach is the difference between the two measures. A practice trial is done prior to the actual test followed by 3 separate actual test measurements. The client’s final score is the average of the 3 measurements obtained.

Interpretation

<table>
<thead>
<tr>
<th>Age</th>
<th>Men (Mean ± SD in inches)</th>
<th>Women (Mean ± SD in inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-40</td>
<td>16.7 ± 1.9</td>
<td>14.6 ± 2.2</td>
</tr>
<tr>
<td>41-69</td>
<td>14.9 ± 2.2</td>
<td>13.8 ± 2.2</td>
</tr>
<tr>
<td>70-87</td>
<td>13.2 ± 1.6</td>
<td>10.5 ± 3.5</td>
</tr>
</tbody>
</table>

In the developmental literature, a reach of less than or equal to 6 inches predicted falls.

Validity, reliability and internal consistency

Test-retest reliability (ICC=.81) and inter-rater reliability were demonstrated in a sample of 128 volunteers whose ages ranged from 21 to 87 years (Duncan 1990). Concurrent validity for balance and physical function was established by comparison with center-of-pressure excursion (Pearson r=.71) and various measures of physical performance (Spearman rho, r=.64–.71) in a sample of 45 community-dwelling older adults aged 66 to 104 years. (Weiner 1992)

The results of the study done by Light and Purser (1995) indicated that the measurement readings of carefully trained clinicians correlate well with videotaped analysis (ICC=0.86). This criterion-validity of FRT clinical observation suggests that it can be a useful tool for measuring balance.
Additional testing completed by Eagle et al. (1999) on a sample of elderly inpatients indicated the following: Sensitivity (ability to detect falls when they are present) = 76%; Specificity (ability to identify correctly the absence of falls) = 34%.

In a study by Linn et al. (2004), comparing the psychometric properties of different balance measures (timed up and go test, functional reach test, one-leg stand and Tinetti balance), it was found out that all four balance measures exhibited excellent test-retest reliability and discriminant validity but poor responsiveness to fall status.

References

Berg Balance Scale

Background

The Berg Balance Scale (BBS) is an objective performance-based measure of balance abilities. It has been used to identify and evaluate balance impairment in the elderly. It consists of 14 tasks in everyday life. The items test the client’s ability to maintain positions or movements of increasing difficulty by diminishing the base of support from sitting, standing to single leg stance. The ability to change position is also assessed. The test is simple, easy to administer and safe for the evaluation of elderly patients. It only requires a watch and a ruler as equipment and takes approximately 15 min to perform.

Scoring

The 14 items are scored on a 5-point ordinal scale (0=unable to perform, 4=independent) based on ability to complete the task and time for completion. The scores on the 14 items are combined for a total score, which can range from 0 to 56, with a higher score relating to better performance.

Interpretation

A score of less than 45 was shown to be predictive of risk for recurrent falls by a meta-analysis (N=110 older people) (Gillespie 2000) and predictive of a future fall in 113 older people (Berg 1992).

Validity, reliability and internal consistency

A Cronbach’s alpha of 0.96 was reported for the internal consistency of the developmental sample. Reliability studies have reported high intra and inter-rater reliability for the Berg Balance Scale (intraclass correlation coefficient [ICC] 0.98 for inter-rater reliability and 0.97-0.99 for intra-rater reliability). Noren et al, in a study of patients with rheumatoid arthritis, psoriatic arthritis, or other polyarthritis found an inter-rater reliability coefficient of 0.97.

Concurrent validity for the Berg Balance Scale as a measure of balance and mobility was determined by comparison with tests of postural sway (Pearson r=−.55), the Performance-Oriented Mobility Assessment balance subscale (Pearson r=−.91), and the Timed Up and Go Test (Pearson r=−.76).

Criterion Validity has been supported by moderate to high correlations with other clinical performance measures (Balance sub-scale of Tinetti, Barthel Mobility sub-scale, timed “Up and Go,” and gait speed), but low to moderate correlations with laboratory postural sway measures using center of pressure recordings. Riddle and Stratford pooled the data from 2 published articles by Shumway-Cook et al (22 fallers, 22 nonfallers) and Bogle Thorbahn and Newton (17 fallers, 49 nonfallers) to look at the validity of the test for predicting falls (using the cut-off point of 45). The analysis revealed a combined sensitivity of 64% and a specificity of 90%. Thus, the test appears to be better at identifying individuals who are not at risk for falling, than those at risk for falls. Riddle and Stratford encouraged the use of a lower cut-off point of 40 to improve clinical decision making regarding fall risk using likelihood ratios.

Sensitivity/responsiveness to change: Stevenson concluded with a group of patients post-stroke through minimal detectable change analysis that a ± 6 point difference on the Berg Balance Scale would be recommended to be 90% confident of genuine change. Further study is needed to look at responsiveness of this scale in intervention trials with older adults and patients with arthritis.

The consistent correlations found in the study by Qutubuddin et al (2005) support the clinical validity of the BBS in the Parkinson’s Disease population. The BBS proved to be reliable and to relate well with other
mobility measures, fear of falling, and muscle strength in persons with spinal cord injury however, it was unable to discriminate between people who did fall and people (Wirz, Muller & Bastiaenen 2010).

References

Noren Am, Bogren U, Bolin J, Stenstrom C. Balance assessment in patients with peripheral arthritis: applicability and reliability of some clinical assessments. Phys Ther Internatinal (200); 6(4); 193-204.
Shumway-Cook A, Baldwin M, Polissar NL, Gruber W. Predicting the probability for falls in community-dwelling older adults. Phys Ther.1997; 77:812–819
Berg Balance Scale

<table>
<thead>
<tr>
<th>Task</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sitting to standing</td>
<td></td>
</tr>
<tr>
<td>2. Standing unsupported</td>
<td></td>
</tr>
<tr>
<td>3. Sitting unsupported</td>
<td></td>
</tr>
<tr>
<td>4. Standing to sitting</td>
<td></td>
</tr>
<tr>
<td>5. Transfers</td>
<td></td>
</tr>
<tr>
<td>6. Standing with eyes closed</td>
<td></td>
</tr>
<tr>
<td>7. Standing with feet together</td>
<td></td>
</tr>
<tr>
<td>8. Reaching forward with an outstretched arm</td>
<td></td>
</tr>
<tr>
<td>9. Retrieving object from the floor</td>
<td></td>
</tr>
<tr>
<td>10. Turning to look behind</td>
<td></td>
</tr>
<tr>
<td>11. Turning 360 degrees</td>
<td></td>
</tr>
<tr>
<td>12. Placing alternate foot on stool</td>
<td></td>
</tr>
<tr>
<td>13. Standing with one foot in front of the other foot</td>
<td></td>
</tr>
<tr>
<td>14. Standing on one foot</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

General instructions
Please demonstrate each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for specific time. Progressively more points are deducted if the time or distance requirements are not met, if the subject's performance warrants supervision, or if the subject touches an external support or receives assistance from the examiner. Subjects should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing are a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5 and 10 inches (5, 12 and 25 cm). Chairs used during testing should be of reasonable height. Either a step or a stool (of average step height) may be used for item #12.

1. Sitting to standing
Instructions: Please stand up. Try not to use your hands for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or to stabilize ( ) 0 needs moderate or maximal assist to stand

2. Standing unsupported
Instructions: Please stand for two minutes without holding.
( ) 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 If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.
3. Sitting with back unsupported but feet supported on floor or on a stool
Instructions: Please sit with arms folded for 2 minutes.
( ) 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
Instructions: Please sit down.
( ) 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
Instructions: Arrange chairs(s) for a pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 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 cueing 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
Instructions: Please close your eyes and stand still for 10 seconds.
( ) 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
Instructions: Place your feet together and stand without holding.
( ) 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 feet together
( ) 0 needs help to attain position and unable to hold for 15 seconds

8. Reaching forward with outstretched arm while standing
Instructions: 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 finger reaches while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
( ) 4 can reach forward confidently >25 cm (10 inches)
( ) 3 can reach forward >12 cm safely (5 inches)
( ) 2 can reach forward >5 cm safely (2 inches)
( ) 1 reaches forward but needs supervision
( ) 0 loses balance while trying/requires external support
9. Pick up object from the floor from a standing position

Instructions: Pick up the shoe/slipper which is placed in front of your feet.

( ) 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 2-5cm (1-2 inches) from slipper and keeps balance independently
( ) 1 unable to pick up and needs supervision while trying
( ) 0 unable to try/needs assist to keep from losing balance or falling

10. Turning to look behind over left and right shoulders while standing

Instructions: Turn to look directly behind you over toward left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

( ) 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 assist to keep from losing balance or falling

11. Turn 360 degrees

Instructions: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only in 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cueing
( ) 0 needs assistance while turning

12. Placing alternate foot on step or stool while standing unsupported

Instructions: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps >20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete >2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

13. Standing unsupported one foot in front instructions: (demonstrate to subject)

Instructions: 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. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject’s normal stride width)

( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead of 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

Instructions: Stand on one leg as long as you can without holding.

( ) 4 able to lift leg independently and hold >10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold = or >3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently
( ) 0 unable to try or needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)
Clinical Test of Sensory Interaction and Balance

Background

The Clinical Test of Sensory Interaction and Balance (CTSIB) is a timed test that was developed for systematically testing the influence of visual, vestibular and somatosensory input on standing balance. It has been used clinically to assist in the evaluation and monitoring of persons with vestibular dysfunction. CTSIB has also been used to determine fall risk in older adults and with persons post-stroke, for persons with peripheral neuropathy, for persons with lower extremity amputation and with children.

The test consists of 6 conditions: Conditions 1, 2 & 3 involve standing on the floor with eyes open, eyes closed, and wearing a visual-conflict dome. Use of the conflict dome results in a discrepancy between vestibular input stimulated by postural sway and visual flow. Conditions 2 and 3 should examine different aspects of sensory organization of visual information that may require different postural adjustments. Conditions 4, 5 and 6 involve standing on foam and repeating the visual conditions described for conditions 1-3. For each condition, the length of time the subject can maintain standing and the amount of body sway that occurs are assessed.

Measurement

The feet of the patient are positioned 10 cm apart, with arms folded across the chest and the 6 sensory conditions are administered. The length of time the patient could maintain balance is recorded for each of the six conditions. Mean of the 3 trials are obtained to get the score for each of the condition. Any report by patients of nausea or dizziness should be recorded as well as movement strategies used to maintain stability.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Interpretation

Assessing sensory components require that patient maintains standing for 30 seconds under the six different conditions.

The CTSIB should be completed on repeated occasions of testing, and the length of time plus the quality of stance for each condition should be compared between testing in order to obtain an understanding of any change in the status of the patient.

Validity, reliability and internal consistency

Good test-retest reliability has been reported for the CTSIB in community-dwelling older adults (r=.75) and in healthy young subjects (r=.99). Inter-rater reliability of the CTSIB is high in healthy young subjects (r=.99).

The Sensory Organization Test (SOT) of computerized dynamic posturography moderately correlates with the CTSIB. The CTSIB had 90% sensitivity and 95% specificity using the SOT as the criterion standard. Sensitivity was similar at 87%, but specificity was only 60% in a group of persons participating in a vestibular physical therapy (PT) program when their CTSIB scores were compared with the SOT of computerized dynamic posturography.

DiFabio and Badke (1990) identified good retest reliability for the CTSIB in a small study of stroke patients, with kappa of 0.77.
References


<table>
<thead>
<tr>
<th>Test 1</th>
<th>Test 2</th>
<th>Test 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes open firm support base</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
<tr>
<td>Eyes closed firm support base</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
<tr>
<td>Visual conflict on firm support base</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
<tr>
<td>Eyes open standing on foam</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
<tr>
<td>Eyes closed standing on foam</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
<tr>
<td>Visual conflict standing on foam</td>
<td>xx seconds</td>
<td>xx seconds</td>
</tr>
</tbody>
</table>
Chapter 3: Activity/Mobility/Functional Status Measures

Global Scales

Functional Independence Measure & Functional Assessment Measure

Background

The Functional Independence Measure (FIM) is an 18-item scale typically used in rehabilitation inpatient programs to assess the extent of client’s physical disabilities and their ability to perform self-care activities. It was designed as a basic indicator of severity of disability to track a client’s progress from hospital entry through discharge and follow-up. It therefore provides data on the efficiency and effectiveness of rehabilitation. FIM was intended to assess areas of dysfunction in activities which commonly occur in individuals with any progressive, reversible or fixed neurologic, musculoskeletal and other disorders. The Functional Assessment Measure (FAM) consists of the FIM items plus 12 items that focus primarily on the cognitive and psychosocial elements of disability and is referred to as FIM+FAM. The 30-item FIM+FAM was developed as an expanded version of the FIM for use with brain-injured individuals. Items were developed by clinicians representing each of the disciplines in an inpatient rehabilitation program. The FIM+FAM was developed as an adjunct to the FIM to specifically address the major functional areas that are relatively less emphasized in the FIM.

The FIM is divided into 6 subscales (self-care, sphincter control, transfers, locomotion, communication & social cognition), whereas the FIM+FAM is divided into 7 subscales (self-care, sphincter control, transfers, locomotion, communication, psychosocial adjustment and cognitive functioning). There are 2 broader domains of the FIM+FAM, motor and cognitive/psychosocial. The motor domain includes items from self-care, sphincter control, transfers and locomotion subscales (with 16 items). The cognitive/psychosocial domain consists of 14 items from communication, psychosocial adjustment and cognitive functioning subscales.

Scoring

A patient is scored from a scale of 1-7, with 1 equating to total dependence and 7 means complete independence. The FIM score is calculated by getting the sum of all scores for the 18 items; FAM score is the sum of all 12 items. The FAM score is intended to be added to the FIM score.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The FIM+FAM should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in function.

Interpretation

The higher the FIM+FAM scores the more independent the client is. An increase in the score may indicate progress or improvement in the ability of the client to perform his activities of daily living.
Validity, reliability and internal consistency

Intraclass Correlation Coefficients (ICCs) were within the good to excellent range (ICC > .60) for 29 of 30 items of the FIM+FAM scale and for all subscales except psychosocial adjustment. Higher mean ICC values were obtained for motor domain items than for cognitive/psychosocial domain items (Donaghy S & Wass PJ, 1988).

The full FIM+FAM scale and two derived subscales have high internal reliability and the use of untransformed ratings should be adequate for most clinical and research purposes in comparable samples of patients with head injury (Hawley et al, 1999). However, results from a study involving 376 Canadian patients suggest that using the FAM as an adjunct to the FIM reduces test efficiency and adds minimal benefits (Linn et al, 1999).

Chumney and colleagues (2010) conducted a systematic review to evaluate the ability of the FIM to predict the functional outcome for civilian and veteran patients who had survived a stroke. They found that although limited, there is evidence that FIM scores can be used to accurately predict outcomes in patients post stroke across civilian and veteran populations.

References


Functional Independence Measure & Functional Assessment Measure

Scale
7  Complete Independence (Timely, safely)
6  Modified Independence (extra time, devices)
5  Supervision (cuing, coaching, prompting)
4  Minimal assist (performs 75% or more of task)
3  Moderate assist (performs 50-74% of task)
2  Maximal assist (performs 25-49% of task)
1  Total assist (performs >25 of task)

Self-care items
1. feeding
2. grooming
3. bathing
4. dressing upper body
5. dressing lower body
6. toileting
7. swallowing*

Sphincter control
1. bladder management
2. bowel management

Mobility items (type of transfer)
1. bed, chair, wheelchair
2. toilet
3. tub or shower
4. car transfer*

Locomotion
1. walking/wheelchair (circle)
2. stairs
3. community access*

Communication Items
1. comprehension - audio/visual (circle)
2. expression – verbal/nonverbal (circle)
3. reading*
4. writing*
5. speech intelligibility*

Psychosocial Adjustment
1. Social Interaction
2. Emotional status*
3. Adjustment to limitations*
4. Employability*

Cognitive Function
1. Problem solving
2. Memory
3. Orientation*
4. Attention*
5. Safety judgement*

*Functional Assessment Measure Items
Frenchay Activities Index

Background

The Frenchay Activities Index (FAI) measures activities that reflect a higher level of independence and social survival (Schuling, 1993). It was developed specifically to measure disability and handicap among stroke patients. The FAI consists of 15 items, each concerning an activity that requires decision making and organizing on the part of the client at home and outside the home.

Scoring

The instrument depends on the report of the client or the relatives. The FAI consists of single summary score obtained by getting the sum of all items, with a range of 15-60 points. Three subscale scores may also be obtained by calculating the sum of scores for each scale, domestic (items 1-5), leisure/work (items 7, 9, 11, 13, 15), outdoors (items 6, 8, 10, 12, 14).

Interpretation

Higher scores indicate better participation.

Validity, reliability and internal consistency

Inter-rater reliability: The 95% limits of agreement for the FAI totals were -9.9 to +8.4. The kappa statistic for 9 of the 15 items showed a good level of agreement between the two research interviews (0.64-0.80). The other six items showed fair or moderate strength of agreement (0.26-0.52). Three items showed significant differences between the two raters p < 0.05 (Wilcoxon's sign paired rank sum test). The mean difference between the total scores was -0.76 (95% confidence interval from -1.98 to 0.46). Spearman's rho correlation coefficient for FAI totals of rater B against A was r(59) = 0.93 (p < 0.001). (Piercy 2000)

Construct validity was supported by meaningful correlations between the Frenchay Activities Index and scores on the Barthel Index and Sickness Impact Profile. Convergent-Discriminant Validity of FAI as shown by Pearson's Correlation Coefficients (26 Weeks After Stroke) are as follows: (Schuling 1993).

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barthel Index</td>
<td>0.66</td>
</tr>
<tr>
<td>Home management</td>
<td>-0.73</td>
</tr>
<tr>
<td>Body care and movement</td>
<td>-0.70</td>
</tr>
<tr>
<td>Mobility</td>
<td>-0.68</td>
</tr>
<tr>
<td>Ambulation</td>
<td>-0.56</td>
</tr>
<tr>
<td>Recreation/pastimes</td>
<td>-0.47</td>
</tr>
<tr>
<td>Communication</td>
<td>-0.42</td>
</tr>
<tr>
<td>Eating</td>
<td>-0.42</td>
</tr>
<tr>
<td>Rest/sleep</td>
<td>-0.42</td>
</tr>
<tr>
<td>Social interaction</td>
<td>-0.39</td>
</tr>
<tr>
<td>Emotional behaviour</td>
<td>-0.15</td>
</tr>
<tr>
<td>Alertness behaviour</td>
<td>-0.14</td>
</tr>
</tbody>
</table>

The same study showed reliability of unweighted scores (range of Cronbach's alpha-coefficients, 0.78 to 0.87) was sufficient.

The FAI has good construct validity, particularly in middle-aged and elderly people, and is reliable according to a study made by Turnbull in 2000.

References
Frenchay Activities Index

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the last 3 months</td>
<td></td>
</tr>
<tr>
<td>1. Preparing main meals</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = &lt; 1 time per week</td>
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<tr>
<td></td>
<td>3 = 1-2 times per week</td>
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<tr>
<td></td>
<td>4 = most days</td>
</tr>
<tr>
<td>2. Washing up</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = &lt; 1 time per week</td>
</tr>
<tr>
<td></td>
<td>3 = 1-2 times per week</td>
</tr>
<tr>
<td></td>
<td>4 = most days</td>
</tr>
<tr>
<td>3. Washing Clothes</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
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<tr>
<td></td>
<td>3 = 3 - 12 times in 3 months</td>
</tr>
<tr>
<td></td>
<td>4 = &gt; 1 timer per week</td>
</tr>
<tr>
<td>4. Light housework</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
</tr>
<tr>
<td></td>
<td>3 = 3 - 12 times in 3 months</td>
</tr>
<tr>
<td></td>
<td>4 = &gt; 1 timer per week</td>
</tr>
<tr>
<td>5. Heavy housework</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
</tr>
<tr>
<td></td>
<td>3 = 3 - 12 times in 3 months</td>
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<tr>
<td></td>
<td>4 = &gt; 1 timer per week</td>
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<tr>
<td>6. Local Shopping</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
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<td></td>
<td>3 = 3 - 12 times in 3 months</td>
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<td></td>
<td>4 = &gt; 1 timer per week</td>
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<tr>
<td>7. Social outings</td>
<td>1 = never</td>
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<td>2 = 1-2 times in 3 months</td>
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<td>3 = 3 – 12 times in 3 months</td>
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<td></td>
<td>4 = &gt; 1 timer per week</td>
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<tr>
<td>8. Walking outside &gt; 15 minutes</td>
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<td></td>
<td>2 = 1-2 times in 3 months</td>
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<td></td>
<td>3 = 3 – 12 times in 3 months</td>
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<td></td>
<td>4 = &gt; 1 timer per week</td>
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<tr>
<td>9. Actively pursuing hobby</td>
<td>1 = never</td>
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<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
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<tr>
<td></td>
<td>3 = 3 – 12 times in 3 months</td>
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<td></td>
<td>4 = &gt; 1 timer per week</td>
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<tr>
<td>10. Driving car/bus travel</td>
<td>1 = never</td>
</tr>
<tr>
<td></td>
<td>2 = 1-2 times in 3 months</td>
</tr>
<tr>
<td></td>
<td>3 = 3 – 12 times in 3 months</td>
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<tr>
<td></td>
<td>4 = &gt; 1 time per week</td>
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<table>
<thead>
<tr>
<th>In the last 6 months</th>
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<tbody>
<tr>
<td>11. Outings/car rides</td>
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<td>12. Gardening</td>
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<tr>
<td></td>
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<tr>
<td>13. Household/car maintenance</td>
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<td>14. Reading books</td>
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<tr>
<td></td>
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<tr>
<td>15. Gainful work</td>
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Goal Attainment Scale

Background

The Goal Attainment Scale (GAS) is a criterion-referenced measure used to quantify achievement of specific goals of treatment, expressed as behavioral objectives.

Scoring and Recording

Problems are identified and goals are determined for those areas in which interventions will be given. It involves a 5-point scale where the expected outcome becomes the zero point on the scale. Then other relative levels of goal attainment are placed on the scale in reference to this expected outcome. Ratings of +1 and +2 refer to outcome better than expected post-intervention and much better than expected. -2 is the client’s baseline level, and -1 refers to improvement that is less than expected.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The GAS should be completed on repeated occasions of testing, and the scores should be compared between testings in order to determine progress of goal attainment.

Interpretation

Ratings that increase through time indicate attainment of goals.

Validity, reliability and internal consistency

The inter-rater reliability between pairs of raters at follow-up interviews was high (.87). The intra-class correlation for goal guides constructed by three independent goal setters was moderate (r=71). The mean scores of the three raters, when compared to a consensus goal score, attained an intra-class coefficient of 0.91. These findings suggest that goal-attainment scoring procedure is reliable.

King et al (1999) reported good reliability of the GSA (ICC=0.98) between multiple raters when school children with a variety of neurological diseases were assessed. Same results were reported by Brown et al (1998) when used among children and young adults with physical and cognitive disabilities assessed from video tapes.

GAS was shown to be responsive to change among patients with traumatic brain injury receiving outpatient occupational therapy (Trombly et al 2002)

Validity of the scale can be influenced by the expertise of the clinicians who set the goals and their objectivity in the subsequent assessments of patients.

The interrater reliability of GAS used under optimal conditions was good (0.82), particularly for scales constructed by the children’s own therapists (Steenbeek et al. 2010).
References

Brown DA, Effgen SK, Palisano RJ (1998) Performance following ability-focused physical therapy intervention in individuals with severely limited physical and cognitive abilities. Phys Ther 78(9); 934-950.

Goal Attainment Scale

Each goal attainment is rated as
-2 baseline
-1 less than expected level of goal attainment
0 expected goal attainment
+1 criterion-referenced goal that partially exceeds target goal expectations
+2 criterion-referenced goal that completely exceeds target goal expectations

<table>
<thead>
<tr>
<th>Goal description</th>
<th>date</th>
<th>date</th>
<th>date</th>
<th>date</th>
<th>date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
London Handicap Scale

Background

The London Handicap Scale is a 6-item instrument that measures health status in clients with chronic, multiple, or progressive diseases, including evaluation of interventions deployed in their treatment, including rehabilitation. The scale generates a profile of handicaps on six different dimensions (mobility, physical independence, occupation, social integration, orientation, and economic self-sufficiency) and an overall handicap severity score. Each dimension has six levels, arranged in order of increasing disadvantage.

Measurement and Scoring

Each degree of handicap along a 6-point interval was assigned a scale weight. The score is the sum of all 6 utility values plus 0.456.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Finding</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Finding</td>
<td>Value</td>
</tr>
<tr>
<td>Mobility</td>
<td>no disadvantage</td>
<td>0.071</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.036</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.072</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.108</td>
</tr>
<tr>
<td>Physical Independence</td>
<td>no disadvantage</td>
<td>0.102</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>-0.021</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.053</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.057</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.061</td>
</tr>
<tr>
<td>Occupation</td>
<td>no disadvantage</td>
<td>0.099</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.024</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.035</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.060</td>
</tr>
<tr>
<td>Social Integration</td>
<td>no disadvantage</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.029</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.041</td>
</tr>
<tr>
<td>Orientation</td>
<td>no disadvantage</td>
<td>0.109</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>-0.038</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.051</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.063</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.075</td>
</tr>
<tr>
<td>Economic Self-sufficiency</td>
<td>no disadvantage</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>minimal disadvantage</td>
<td>0.067</td>
</tr>
<tr>
<td></td>
<td>mild disadvantage</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>moderate disadvantage</td>
<td>-0.023</td>
</tr>
<tr>
<td></td>
<td>severe disadvantage</td>
<td>-0.067</td>
</tr>
<tr>
<td></td>
<td>most severe disadvantage</td>
<td>-0.111</td>
</tr>
</tbody>
</table>
The sum of all "no disadvantage" values is 0.544 which when added to 0.456 gives 1.00. The sum of all "most severe disadvantage" values is -0.456 which when added to 0.456 gives 0.00.

**Recording**

A separate recording sheet is provided to facilitate repeated measures over time.

**Comparison**

The LHS questionnaire should be completed on repeated occasions of testing, and the scores compared in order to obtain an understanding of any change in status.

**Interpretation**

The minimum scale value is 0 and the maximum scale value is 1.0. The scale value corresponds to residual function with 1.00 indicating normal function and 0.00 indicating total disability.

**Validity, reliability and internal consistency**

Developmental literature showed Pearson's correlation coefficient between predicted and measured values to be 0.98 and Kendall's coefficient of concordance (tau) at 1.00.

Validity of the instrument on various cases, such as stroke (Harwood, 1994), arthritis (Harwood, 1996), multiple sclerosis (Thompson, 1999), and elderly care (Harwood, 1998) was demonstrated by several studies.

A study by Westergren and Hagell (2006) provided support for the reliability and validity of the LHS instrument for use among neurologically ill patients in Sweden.

The London Handicap Scale is a valid and reliable scale for use in stroke in Turkey (Kutlay et al. 2011). Its unweighted raw scores and weighted scores are equivalent and ordinal, but a linear transformation is possible through Rasch analysis.

**References**


## London Handicap Scale

### Mobility

**Getting around**

Think about how you get from one place to another, using any help, aids, means of transport that you normally have available.

**DOES YOUR HEALTH STOP YOU FROM GETTING AROUND**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOT AT ALL</strong></td>
<td>You go everywhere you want to, no matter how far away.</td>
</tr>
<tr>
<td><strong>VERY SLIGHTLY</strong></td>
<td>You go most places you want, but not all.</td>
</tr>
<tr>
<td><strong>QUITE A LOT</strong></td>
<td>You get out of the house but not far way from it.</td>
</tr>
<tr>
<td><strong>VERY MUCH</strong></td>
<td>You don’t go outside but you can move around from room to room indoors.</td>
</tr>
<tr>
<td><strong>ALMOST COMPLETELY</strong></td>
<td>You are confined to a single room but you can move around in it</td>
</tr>
<tr>
<td><strong>COMPLETELY</strong></td>
<td>You are confined to a bed or a chair. There is no-one to move you.</td>
</tr>
</tbody>
</table>

### Physical Independence

**Looking After Yourself**

Think about things like housework, shopping, looking after money, laundry, getting dressed, washing, shaving, and using the toilet.

**DOES YOUR HEALTH STOP YOU LOOKING AFTER YOURSELF**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOT AT ALL</strong></td>
<td>You do everything to look after yourself.</td>
</tr>
<tr>
<td><strong>VERY SLIGHTLY</strong></td>
<td>You need a little help now and again.</td>
</tr>
<tr>
<td><strong>QUITE A LOT</strong></td>
<td>You need help with some tasks (such as heavy housework or shopping), but no more than once a day.</td>
</tr>
<tr>
<td><strong>VERY MUCH</strong></td>
<td>You do some things for yourself, but you need help more than once a day. You can be left alone safely for a few hours.</td>
</tr>
<tr>
<td><strong>ALMOST COMPLETELY</strong></td>
<td>You need help to be available all the time. You cannot be left alone safely</td>
</tr>
<tr>
<td><strong>COMPLETELY</strong></td>
<td>You need help with everything. You need constant attention, day and night.</td>
</tr>
</tbody>
</table>
### Occupation

**Work and Leisure**

Think about things like work (paid or not), housework, gardening, sports, hobbies, going out with friends, travelling, reading, looking after children, watching television and going on holiday.

**Does your health limit your work and leisure?**

- [ ] **Not at all**
- [ ] **Very slightly**
- [ ] **Quite a lot**
- [ ] **Very much**
- [ ] **Almost completely**
- [ ] **Completely**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>You do everything you want to do.</td>
</tr>
<tr>
<td>Very slightly</td>
<td>You do almost all the things you want to do.</td>
</tr>
<tr>
<td>Quite a lot</td>
<td>You find something to do almost all the time, but you cannot do some things for as long as you would like.</td>
</tr>
<tr>
<td>Very much</td>
<td>You are unable to do a lot of things but you can find something to do most of the time.</td>
</tr>
<tr>
<td>Almost completely</td>
<td>You are unable to do most things, but you can find something to do some of the time.</td>
</tr>
<tr>
<td>Completely</td>
<td>You sit all day doing nothing. You cannot keep yourself busy or take part in any activities.</td>
</tr>
</tbody>
</table>

### Social Integration

**Getting on with people**

Think about family, friends, and the people you might meet during normal day.

**Does your health stop you getting on with people?**

- [ ] **Not at all**
- [ ] **Very slightly**
- [ ] **Quite a lot**
- [ ] **Very much**
- [ ] **Almost completely**
- [ ] **Completely**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>You get on well with people, see everyone you want to see, and meet new people.</td>
</tr>
<tr>
<td>Very slightly</td>
<td>You get on well with people but your social life is slightly limited.</td>
</tr>
<tr>
<td>Quite a lot</td>
<td>You are fine with people you know well but you feel uncomfortable with strangers.</td>
</tr>
<tr>
<td>Very much</td>
<td>You get on well with people but you have few friends and little contact with neighbours. Dealing with strangers is very hard.</td>
</tr>
<tr>
<td>Almost completely</td>
<td>Apart from people who look after you, you see no one. You have no friends and no visitors.</td>
</tr>
<tr>
<td>Completely</td>
<td>You don’t get on with anyone, not even people who look after you.</td>
</tr>
</tbody>
</table>
### Orientation

**Awareness of Your Surroundings**

Think about taking in and understanding the world about you, and finding your way around it. **DOES YOUR HEALTH STOP YOU UNDERSTANDING THE WORLD AROUND YOU**

Please tick one box only:

- [ ] NOT AT ALL
- [ ] VERY SLIGHTLY
- [ ] QUITE A LOT
- [ ] VERY MUCH
- [ ] ALMOST COMPLETELY
- [ ] COMPLETELY

You fully understand the world around you. You see, hear and think clearly and your memory is good.

You have problems with hearing, speaking, seeing or your memory, but these does not stop you from doing most things.

You have problems with hearing, speaking, seeing or your memory which make life difficult a lot of the time. But, you understand what's going on. You have (he/she has) great difficulty understanding what's going on.

He/she is unable to tell where he/she is and what day it is. He/she cannot look.

He/she is unconscious, completely unaware of anything going on around him/her.

### Self-sufficiency

**Affording the Things you need**

Think about whether health problems have led to any extra expenses, or have caused you to earn less than you would if you were healthy. **ARE YOU ABLE TO AFFORD THE THINGS YOU NEED**

Please tick one box only:

- [ ] NOT AT ALL
- [ ] VERY SLIGHTLY
- [ ] QUITE A LOT
- [ ] VERY MUCH
- [ ] ALMOST COMPLETELY
- [ ] COMPLETELY

You can afford anything you need. You have easily enough money to buy modern labour saving devices, and anything you may need because of ill health.

You have just about enough money. It is fairly easy to cope with expenses caused by ill health.

You are less well off than other people like you; however, with sacrifices you can get by without help.

You only have enough money for your basic needs. You are dependent on state benefits for any extra expenses you have because of ill health.

You are dependent on state benefits, or money from other people or charities. You cannot afford things you need.

You have no money at all and no state benefits. You are totally dependent on charity for your most basic needs.
Upper Limb Scales

Chedoke Arm and Hand Activity Inventory

Background

The Chedoke Arm and Hand Activity Inventory (CAHAI) was designed to measure the performance of bilateral hand tasks as they relate to functional ability in individuals with stroke. It consists of 13 real-life functional tasks that reflect (1) the domains deemed important by survivors of stroke; (2) bilateral activities; (3) non-gender-specific items; (4) the full range of normative movements, pinches, and grasps; and (5) the various stages of motor recovery post-stroke.

Scoring

There are 13 items and each item is given a score from 1 to 7, with 1 being dependent or unable to perform the task and 7 being independent. Scoring is based on the percentage of contribution to each task by the paretic hand/arm. For example, a score of 7 is given if the patient is able to hold the jar with his non-paretic hand and open the lid using the paretic hand. A score of 3 means that patient is able to use the paretic hand to stabilize and manipulate but requires hand over guidance (50-74% contribution of the paretic hand). The total score can be calculated by summing the responses.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The CAHAI should be completed on repeated occasions of testing, and the scores compared in order to obtain an understanding of any change in the upper limb function.

Validity, reliability and internal consistency

High internal consistency (Cronbach \( \alpha = 0.98 \)) and an excellent inter-rater reliability were established with an ICC of 0.98 (95% confidence interval [CI], 0.96–0.99). The minimal detectable change score was 6.3 CAHAI points. Convergent and discriminant cross-sectional validity were established for the CAHAI in the same study (Barreca, 2005). Construct validity (0.81-0.93), face and content validity have likewise been reported.

A qualitative study to explore the clinical utility of the CAHAI when used by occupational therapists in stroke rehabilitation was conducted. It found that the clinical application of the CAHAI may be influenced by occupational therapy values, differences in training procedures, and organizational barriers (Gustafsson, Turpin & Dorman 2010). Training and strategies to address these issues may be beneficial. Another study aimed to explore both therapists’ and clients’ views on the clinical utility of CAHAI-9 within 14 days of stroke found that CAHAI-9 shows promise as an upper limb ability assessment for such clients within this time frame (Rowland et al. 2011).

References


Harris JE & Eng, JJ. Individuals with the Dominant Hand Affected following Stroke Demonstrate Less Impairment than those with the Non-Dominant Hand Affected. Neurorehabil Neural Repair 2006; 20:380-389.

Chedoke Arm and Hand Activity Inventory

Activity Scale

1. Total Assist (weak U/L <25%)
2. Maximal Assist (weak U/L=25-49%)
3. Moderate Assist (weak U/L=50-74%)
4. Maximal Assist (weak U/L>75%)
5. Supervision
6. Modified Independence (device)
7. Complete Independence (timely, safely)

<table>
<thead>
<tr>
<th>Activity</th>
<th>U/L Score</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open jar of coffee</td>
<td>holds jar</td>
<td>holds lid</td>
</tr>
<tr>
<td>Calls 911</td>
<td>holds receiver</td>
<td>dials phone</td>
</tr>
<tr>
<td>Draw a line with a ruler</td>
<td>holds ruler</td>
<td>holds pen</td>
</tr>
<tr>
<td>Puts toothpaste on toothbrush</td>
<td>holds toothpaste</td>
<td>holds toothbrush</td>
</tr>
<tr>
<td>Cut medium consistency putty</td>
<td>holds knife</td>
<td>holds fork</td>
</tr>
<tr>
<td>Pour a glass of water</td>
<td>holds glass</td>
<td>holds pitcher</td>
</tr>
<tr>
<td>Wring out washcloth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean a pair of eyeglasses</td>
<td>holds glasses</td>
<td>wipe lenses</td>
</tr>
<tr>
<td>Zip up the zipper</td>
<td>holds the zipper</td>
<td>holds the zipper pull</td>
</tr>
<tr>
<td>Do up five buttons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry back with towel</td>
<td>reaches for towel</td>
<td>grasps towel end</td>
</tr>
<tr>
<td>Place container on table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carry bag up the stairs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: _____/91
Nine-Hole Peg Test

Background

The Nine-Hole Peg (NHP) Test is a simple, timed test of fine motor coordination, involving placing dowels (9 mm in diameter and 32 mm long) in 9 holes. It measures finger dexterity among patients with physical disabilities. The test administration is brief involving only the time it takes to place and remove all 9 pegs in a 5-inch square board.

Measurement

The test consists of a square board with nine holes spaced 3.2 cm apart measured center to center, with a depth of 1.3 cm. The 9 wooden pegs are 0.64 cm in diameter and 3.2 cm in length. The container for the pegs is constructed from 0.7 cm plywood. The pegboard is centered in front of the subject, with the pegs placed in the container next to the board on the same side as the hand being tested. Dominant hand is tested first, followed by the non-dominant hand.

It is a time-monitored test where pegs are picked up from the container one by one, put into the holes and then returned to the container as quickly as possible. A stopwatch is started by the examiner as soon as the client touched the first peg and stopped when the last peg hit the container. If a peg is dropped, the examiner retrieves the peg or replaces it with a spare into the container. Patients are scored on the amount of time it takes to place and remove all 9 pegs. Two scores are collected, one for each hand.

<table>
<thead>
<tr>
<th></th>
<th>Dominant hand</th>
<th>Non-dominant hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice test</td>
<td>Time to finish (in seconds)</td>
<td>Time to finish (in seconds)</td>
</tr>
<tr>
<td>Actual test</td>
<td>Time to finish (in seconds)</td>
<td>Time to finish (in seconds)</td>
</tr>
</tbody>
</table>

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The NHP Test should be completed on repeated occasions of testing, and the time to finish should be compared between testings in order to obtain an understanding of any change in performance.
### Interpretation

**Table 3.2: Normative Values (time in seconds) for Males and Females on the Nine Hole Peg Test**

<table>
<thead>
<tr>
<th>Age</th>
<th>Hand</th>
<th>Male</th>
<th></th>
<th></th>
<th>Female</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Low</td>
<td>High</td>
<td>Mean</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>20-24</td>
<td>R</td>
<td>16.1</td>
<td>13</td>
<td>22</td>
<td>15.8</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>16.8</td>
<td>13</td>
<td>23</td>
<td>17.2</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>25-29</td>
<td>R</td>
<td>16.7</td>
<td>14</td>
<td>21</td>
<td>15.8</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>17.7</td>
<td>15</td>
<td>21</td>
<td>17.2</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>30-34</td>
<td>R</td>
<td>17.7</td>
<td>14</td>
<td>24</td>
<td>16.3</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>18.7</td>
<td>14</td>
<td>24</td>
<td>17.8</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>35-39</td>
<td>R</td>
<td>17.9</td>
<td>15</td>
<td>26</td>
<td>16.4</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>19.4</td>
<td>14</td>
<td>28</td>
<td>17.3</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>40-44</td>
<td>R</td>
<td>17.7</td>
<td>14</td>
<td>22</td>
<td>16.8</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>18.9</td>
<td>16</td>
<td>24</td>
<td>18.6</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>45-49</td>
<td>R</td>
<td>18.8</td>
<td>15</td>
<td>24</td>
<td>17.3</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>20.4</td>
<td>15</td>
<td>27</td>
<td>18.4</td>
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<td>50-54</td>
<td>R</td>
<td>19.2</td>
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<td>22</td>
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<td>L</td>
<td>20.7</td>
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<td>27</td>
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<td>16</td>
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<td>60-64</td>
<td>R</td>
<td>20.3</td>
<td>15</td>
<td>25</td>
<td>18.4</td>
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<td>L</td>
<td>21.0</td>
<td>18</td>
<td>27</td>
<td>20.6</td>
<td>17</td>
<td>25</td>
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<tr>
<td>65-69</td>
<td>R</td>
<td>20.7</td>
<td>15</td>
<td>29</td>
<td>19.5</td>
<td>16</td>
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</tr>
<tr>
<td></td>
<td>L</td>
<td>22.9</td>
<td>18</td>
<td>30</td>
<td>21.4</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>70-74</td>
<td>R</td>
<td>22.0</td>
<td>17</td>
<td>30</td>
<td>20.2</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>23.8</td>
<td>16</td>
<td>33</td>
<td>22.0</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>75+</td>
<td>R</td>
<td>22.9</td>
<td>17</td>
<td>35</td>
<td>21.5</td>
<td>17</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>26.4</td>
<td>19</td>
<td>37</td>
<td>24.6</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>All Subjects</td>
<td>R</td>
<td>19.0</td>
<td>13</td>
<td>35</td>
<td>17.9</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>20.6</td>
<td>13</td>
<td>37</td>
<td>19.6</td>
<td>14</td>
<td>35</td>
</tr>
</tbody>
</table>
Validity, reliability and internal consistency

Moderately high test-retest reliability (rs = .81 and .79) and high interrater agreement (rs > .99) were obtained. Correlations of -0.80 and -0.74 between the scores on the Nine hole Peg Test and Purdue Pegboard Test at all tested ages indicated adequate concurrent validity of the measures and a significant difference in test scores between regular and special education groups provided further evidence of construct validity.

In a study by Pascal-Moussellard (2006), the 9HPT was a valid quantitative and objective outcome measurement tool in cervical myelopathy treatment. In a study made among patients with Charcot Marie tooth Disease, reliability of the 9HPT was good if performance was within 2 minutes (ICC=0.99, CR=4.3 s, CV=3.9%).

References

Mobility Scales

Six-minute Walk Test

Background

The Six-Minute Walk Test (6MWT) is used as a measure of exercise tolerance and endurance for community dwelling older adults. It has been used to describe and monitor an individual's endurance level, as a one-time measure of functional status as well as a predictor of morbidity and mortality. The self-paced Six-Minute Walk Test is dependent on an individual's ability to ambulate.

Measurement

The 6MWT should be performed indoors, along a flat, straight, enclosed corridor with a hard surface which is seldom traveled. If the weather is comfortable, the test may be done outdoors. The walking course must be 30m in length. A 100-foot halfway is required. The length of the corridor should be marked every 3m. The turnaround points should be marked with a cone. A starting line, which marks the beginning and end of the 60m lap, should be marked on the floor using brightly colored tape. Clients should use their usual assistive devices during the test.

Client should rest in the chair for 10 minutes before the test starts. The client is asked to walk as far as possible for 6 minutes, going back and forth the hallway. Client is allowed to slow down, stop or rest as necessary but should resume walking as soon as he/she is able. Client is not allowed to talk to anybody during the test. The primary measurement is the distance covered by the client (meters). Mungall and Hainsworth recommended completion of the Six-Minute Walk Test three times, with the third test distance recorded for the most accurate representation of the individual's fitness level.

The test should be stopped immediately if any one of these symptoms appears: chest pain, intolerable dyspnea, leg cramps, staggering, diaphoresis, pale or ashen appearance.

Comparison

The 6MWT should be administered on repeated occasions of testing, and the distances covered should be compared between testings in order to obtain an understanding of any change in the endurance/fitness.

Interpretation

Increase in the distance covered indicates improvement in endurance.
Validity, reliability and internal consistency

One-week test-retest reliability (Pearson r=.95) of data obtained with the test was determined in a sample of 86 older adults without significant disease (e.g. some subjects had chronic conditions such as arthritis and hypertension, but the subjects had no life-threatening or disabling conditions such as cardiac dysfunction or cerebrovascular accident). Validity was demonstrated by comparing the measurements obtained from the Six-Minute Walk Test with those obtained from cycle ergometer exercise testing (Spearman rho, r=.58) and with functional classification (Spearman rho, r=.50–.60). The distance covered during the Six-Minute Walk Test was different for inactive older individuals living in retirement homes (mean distance covered=274.6 m [901 ft]) compared with active older individuals attending community centers (mean distance covered=496.5 m [1,629 ft]), thus demonstrating known-groups validity.

In a study by Hamilton (2000) among cardiac patients at Phase II/III, the 6-minute walk test was linearly related to maximum METs (r=0.687, p<.001), supporting the validity of the test. A strong test-retest reliability was demonstrated with intra-class correlation of 0.97.

References

High Level Mobility Assessment Tool

Background

The High Level Mobility Assessment Tool was developed as a unidimensional measure of motor performance rather than a general measure of functional mobility. It is appropriate for assessing people with high-level balance and mobility problems. The minimal mobility requirement for testing is independent walking over 20m without gait aids. Orthoses are permitted.

Scoring

The HiMAT consists of 13 items that are measured using either a stopwatch or tape-measure. Clients are instructed to perform at their maximum safe speed except for the bounding and stair items. A 20-meter walkway is marked by cones/markers at the start, 5m, 15m and at the end (20m mark). The middle 10m (from the 5m to the 15m markers) is used for recording client performances. Each client should have a practice trial for each item before testing.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>The middle 10m of a 20m trial is timed.</td>
</tr>
<tr>
<td>Walk backward</td>
<td>As for walking</td>
</tr>
<tr>
<td>Walk on toes</td>
<td>As for walking; Any heel contact during the middle 10m is recorded as a fail</td>
</tr>
<tr>
<td>Walk over obstacle</td>
<td>As for walking; A house brick is placed across the walk way at midpoint.</td>
</tr>
<tr>
<td></td>
<td>Clients must step over the brick without contacting it. A fail is recorded</td>
</tr>
<tr>
<td></td>
<td>if patient step around the brick or make contact with the brick.</td>
</tr>
<tr>
<td>Run</td>
<td>The middle 10m of a 20m trial is timed. A fail is recorded if client fail to</td>
</tr>
<tr>
<td></td>
<td>have a consistent flight phase during the trial.</td>
</tr>
<tr>
<td>Skipping</td>
<td>The middle 10m of a 20m trial is timed. A fail is recorded if client fail to</td>
</tr>
<tr>
<td></td>
<td>have a consistent flight phase during the trial.</td>
</tr>
<tr>
<td>Hop forward</td>
<td>Client stands on their more affected leg and hop forward. The time to hop 10m</td>
</tr>
<tr>
<td></td>
<td>is recorded.</td>
</tr>
<tr>
<td>Bound (affected)</td>
<td>A bound is a jump from one leg to the other with a flight phase. Client</td>
</tr>
<tr>
<td></td>
<td>stands behind a line on their less affected leg, hands on hips and jumps</td>
</tr>
<tr>
<td></td>
<td>forward landing on their more affected leg. Each bound is measured</td>
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<tr>
<td></td>
<td>from the line to the hell of the landing leg. The average of three trials is</td>
</tr>
<tr>
<td></td>
<td>recorded.</td>
</tr>
<tr>
<td>Bound (less affected)</td>
<td>Client stands behind a line on their more affected leg, hands on hips and</td>
</tr>
<tr>
<td></td>
<td>jumps forward landing on their less affected leg. The average of three trials</td>
</tr>
<tr>
<td></td>
<td>is recorded.</td>
</tr>
<tr>
<td>Up Stairs</td>
<td>Client is asked to walk up a flight of 14 stairs as they normally would and</td>
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<tr>
<td></td>
<td>at their normal speed. The trial is recorded form when the patient starts</td>
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<tr>
<td></td>
<td>until both feet are at the top. Client who uses a rail or a non-reciprocal</td>
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<tr>
<td></td>
<td>pattern are scored on Up Stairs Dependent. Client who ascends the stairs</td>
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<tr>
<td></td>
<td>reciprocally without a rail is scored on an Upstairs Independent and get an</td>
</tr>
<tr>
<td></td>
<td>additional 5 points in the last column of the upstairs dependent.</td>
</tr>
<tr>
<td>Down Stairs</td>
<td>As for Up stairs</td>
</tr>
</tbody>
</table>

The HiMAT total score is the sum of scores obtained on all the items successfully attempted by each client. Each item is rated on a 5-point scale from 0-4, except the two dependent ‘Stair’ items, which are rated on a 6-point scale from 0-5. The maximum score for the HiMAT is 54.
Each client has their scores recorded on the scoring sheet as the testing proceeds. If a client fails an item, they score a ‘0’ for that item. Performances are written in the performance column, and then the corresponding score is assigned in the adjoining column. For example, if a client scores 6.1 seconds for ‘Walking’, the second column is circled (5.4-6.7) indicating the client’s score for ‘Walking’ is a ‘2’.

The ‘Bound’ items are scored separately, designated ‘affected’ and ‘less-affected’ rather than left and right. ‘Bound – affected’ means the patient attempts a bound pushing off their less affected leg and landing on their more affected leg.

‘Up stairs’ and ‘Down stairs’ are scored separately. For each item, clients are scored according to how they attempted the stairs. If a client uses a handrail or is unable to ascend the stairs reciprocally, they are scored as ‘dependent’. Their time is recorded on the score sheet and they are scored only on the ‘Up stairs – dependent’ item. If a client successfully ascends the stairs reciprocally without use of a handrail, they are scored on the ‘Up stairs - independent’ item AND get an additional 5 points scored on the ‘Up stairs – dependent’ item. The same scoring procedure is followed for ‘Down stairs’.

Once testing is completed, scores in each column are summed. When all the columns are summed, the column scores are added to determine the total HiMAT score.

Score sheet:

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>sec</td>
<td>X</td>
</tr>
<tr>
<td>Walk backward</td>
<td>sec</td>
<td>&gt;13.3</td>
</tr>
<tr>
<td>Walk on toes</td>
<td>sec</td>
<td>&gt;8.9</td>
</tr>
<tr>
<td>Walk over obstacle</td>
<td>sec</td>
<td>&gt;7.1</td>
</tr>
<tr>
<td>Run</td>
<td>sec</td>
<td>&gt;2.7</td>
</tr>
<tr>
<td>Skip</td>
<td>sec</td>
<td>&gt;4.0</td>
</tr>
<tr>
<td>Hop Forward (affected)</td>
<td>sec</td>
<td>&gt;7.0</td>
</tr>
<tr>
<td>Bound (affected)</td>
<td>cm</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Bound (less affected)</td>
<td>cm</td>
<td>&lt;82</td>
</tr>
<tr>
<td>Up Stairs Dependent (rail OR not reciprocal: if not, score 5 and rate below)</td>
<td>sec</td>
<td>&gt;22.8</td>
</tr>
<tr>
<td>Up Stairs Independent (NO rail AND reciprocal: if not, score 0 and rate above)</td>
<td>sec</td>
<td>&gt;9.1</td>
</tr>
<tr>
<td>Down Stairs Dependent (rail or NOT reciprocal: if not, score 5 and rate below)</td>
<td>sec</td>
<td>&gt;24.3</td>
</tr>
<tr>
<td>Down Stairs Independent (NO rail and reciprocal: if not, score 0 and rate above)</td>
<td>sec</td>
<td>&gt;8.4</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL HiMAT SCORE:</td>
<td></td>
<td>/54</td>
</tr>
</tbody>
</table>
Please notify Gavin Williams at gavin@neuro-solutions.net or gavin.williams@epworth.org.au so that the use of the HiMAT can be tracked.

**Recording**

A separate recording sheet is provided to facilitate repeated measures over time.

**Comparison**

The HiMAT should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in motor performance.

**Interpretation**

Higher scores indicate better mobility performance.

**Validity, reliability and internal consistency**

Williams et al examined the concurrent validity and responsiveness of HiMAT in patients following traumatic brain injury. The correlation between the HiMAT and motor FIM was moderate ($r=.53$, $P<.001$), largely because of a ceiling effect in the motor FIM. The correlation between the HiMAT and gross function RMA was strong ($r=.87$, $P<.001$), yet the gross function RMA was also susceptible to a ceiling effect, with 51.5% of subjects achieving the maximum score. The HiMAT was more responsive than the motor FIM and the gross function RMA on all indices.

HiMAT was found to have very high interrater (intraclass correlation coefficient [ICC]=.99) and retest reliability (ICC=.99). Internal consistency was also very high (Cronbach alpha=.97).

**References**


Williams, Garcia P.; Greenwood, Kenneth M.; Robertson, Val J.; Goldie, Patricia A.; Morris, Meg E. HiMAT Interrater reliability, retest reliability, and internal consistency 2006. Physical Therapy, Vol. 86, No. 3, pp. 395-400

Motor Assessment Scale

Background

The Motor Assessment Scale was designed to assess the ability of stroke patients to perform functional tasks rather than isolated patterns of movement or synergies. This was based on the principles of Motor Relearning Programme.

Scoring

Each item has individual provocation tests, scored incrementally in response categories from 0-6. If a client cannot progress past level 4 (say) then there is no need to test levels 5 or 6. Items 1 to 8 are recorded according to the client’s responses to specific instructions. General Tonus, item 9, is scored from continuous observations and handling throughout the assessment. Instructions should be repeated and demonstrations given to client if necessary.

All items are to be performed independently by the client unless otherwise stated. “Stand-by help” means that the physical therapist stands by and may steady the client but must not actively assist.

Criteria

1. Supine to Side Lying onto Intact Side

   1. Pulls himself into side lying. (Starting position must be supine lying, both knees flexed. Patient pulls himself into side lying with intact arm, moves affected leg with intact leg.)
   2. Moves leg across actively and the lower half of the body follows. (Starting position as above. Arm is left behind.)
   3. Arm is lifted across body with other arm. Leg is moved actively and body follows in a block. (Starting position as above.)
   4. Moves arm across body actively and the rest of the body follows in a block. (Starting position as above.)
   5. Moves arm and leg and rolls to side but overbalances. (Starting position as above. Shoulder protracts and arm flexes forward.)
   6. Rolls to side in 3 seconds. (Starting position as above. Must not use hands.)

2. Supine to Sitting over Side of Bed

   1. Side lying, lifts head sideways but cannot sit up. (Patients assisted to side lying.)
   2. Side lying to sitting over side of bed. (Therapist assists patient with movement. Patient controls head position throughout.)
   3. Side lying to sitting over side of bed, (Therapist gives stand-by help [see General Rules for Administering the MAS] by assisting legs over side of bed.)
   4. Side lying to sitting over side of bed. (With no stand-by help.)
   5. Supine to sitting over side of bed. (With no stand-by help.)
   6. Supine to sitting over side of bed within 10 seconds. (With no stand-by help.)
3. Balanced Sitting

1. Sits only with support. (Therapist should assist patient into sitting.)
2. Sits unsupported for 10 seconds. (Without holding on, knees and feet together, feet can be supported on floor.)
3. Sits unsupported with weight well forward and evenly distributed. (Weight should be well forward at the hips, head and thoracic spine extended, weight evenly distributed on both sides.)
4. Sits unsupported, turns head and trunk to look behind. (Feet supported and together on floor. Do not allow legs to abduct or feet to move. Have hands resting on thighs, do not allow hands to move onto plinth.)
5. Sits unsupported, reaches forward to touch floor, and returns to starting position. (Feet supported on floor. Do not allow patient to hold on. Do not allow legs and feet to move, support affected arm if necessary. Hand must touch floor at least 10 cm [4 in] in front of feet.)
6. Sits on stool unsupported, reaches sideways to touch floor, and returns to starting position. (Feet supported on floor. Do not allow patient to hold on. Do not allow legs and feet to move, support affected arm if necessary. Patient must reach sideways not forward.)

4. Sitting to Standing

1. Gets to standing with help from therapist. (Any method.)
2. Gets to standing with stand-by help. (Weight unevenly distributed, uses hands for support.)
3. Gets to standing. (Do not allow uneven weight distribution or help from hands.)
4. Gets to standing and stands for 5 seconds with hips and knees extended. (Do not allow uneven weight distribution.)
5. Sitting to standing to sitting with no stand-by help. (Do not allow uneven weight distribution. Full extension of hips and knees.)
6. Sitting to standing to sitting with no stand-by help three times in 10 seconds. (Do not allow uneven weight distribution.)

5. Walking

1. Stands on affected leg and steps forward with other leg. (Weight-bearing hip must be extended. Therapist may give stand-by help.)
2. Walks with stand-by help from one person.
3. Walks 3 m (10 ft) alone or uses any aid but no stand-by help.
4. Walks 5 m (16 ft) with no aid in 15 seconds.
5. Walks 10 m (33 ft) with no aid, turns around, picks up a small sandbag from floor, and walks back in 25 seconds. (May use either hand.)
6. Walks up and down four steps with or without an aid but without holding on to the rail three times in 35 seconds.
6. Upper-Arm Function

1. Lying, protract shoulder girdle with arm in elevation. (Therapist places arm in position and supports it with elbow in extension.)
2. Lying, hold extended arm in elevation for 2 seconds. (Physical therapist should place arm in position and patient must maintain position with some external rotation. Elbow must be held within 200 of full extension.)
3. Flexion and extension of elbow to tale palm to forehead with arms as in 2. (Therapist may assist supination of forearm.)
4. Sitting, hold extended arm in forward flexion at 90 degrees to body for 2 seconds. (Therapist should place arm in position and patient must maintain position with some external rotation and elbow extension. Do not allow excess shoulder elevation.)
5. Sitting, patient lifts arm to above position, holds it there for 10 seconds, and then lowers it. (Patient must maintain position with some external rotation. Do not allow pronation.)
6. Standing, hand against wall. Maintain arm position while turning body toward wall. (Have arm abducted to 900 with palm flat against the wall.)

7. Hand Movements

1. Sitting, extension of wrist. (Therapist should have patient sitting at a table with forearm resting on the table. Therapist places cylindrical object in palm of patient’s hand. Patient is asked to lift object off the table by extending the wrist. Do not allow elbow flexion.)
2. Sitting, radial deviation of wrist. (Therapist should place forearm in midpronation-supination, i.e., resting on ulnar side, thumb in line with forearm and wrist in extension, fingers around a cylindrical object. Patient is asked to lift hand off table. Do not allow elbow flexion or probation.)
3. Sitting, elbow into side, probation and supination. (Elbow unsupported and at a right angle. Three-quarter range is acceptable.)
4. Reach forward, pick up large ball of 14 cm (5 in) diameter with both hands and put it down. (Ball should be on table so far in front of patient that he has to extend arms fully to reach it. Shoulders must be protracted, elbows extended, wrist neutral or extended. Palms should be kept in contact with the ball.)
5. Pick up a polystyrene cup from table and put it on table across other side of body. (Do not allow alteration in shape of cup).
6. Continuous opposition of thumb and each finder more than 14 times in 10 seconds. (Each finger in turn taps the thumb, starting with the index fingers. Do not allow thumb to slide from one finger to the other, or to go backwards.)
8. Advanced Hand Activities

1. Picking up the top of a pen and putting it down again. (Patient stretches arm forward, picks up pen top, releases it on table close to body.)
2. Picking up one jellybean from a cup and placing it in another cup. (Teacup contains eight jellybeans. Both cups must be at arms’ length. Left hand takes jellybean from cup on right and releases it in cup on left.)
3. Drawing horizontal lines to stop at a vertical liner 10 times in 20 seconds. (At least five lines must touch and stop at the vertical line.)
4. Holding a pencil, making rapid consecutive dots on a sheet of paper. (Patient must do at least 2 dots a second for 5 seconds. Patient picks pencil up and positions it without assistance. Patient must hold pen as for writing. Patient must make a dot not a stroke.)
5. Taking a dessert spoon of liquid to the mouth. (Do not allow head to lower towards spoon. Do not allow liquid to spill.)
6. Holding a comb and combing hair at back of head.

9. General Tonus

1. Flaccid, limp, no resistance when body parts are handled.
2. Some response felt as body parts are moved.
4. Consistently normal response.
5. Hypertonic 50 percent of the time.
6. Hypertonic at all times.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The MAS should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in functional performance.
### MOVEMENT SCORING SHEET

<table>
<thead>
<tr>
<th>Date</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supine To Side Lying</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Supine To Sitting Over Side Of Bed</td>
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<tr>
<td>3. Balanced Sitting</td>
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<tr>
<td>4. Sitting To Standing</td>
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<td>5. Walking</td>
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<tr>
<td>6. Upper-Arm Function</td>
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<td>7. Hand Movements</td>
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<td>8. Advanced Hand Activities</td>
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<tr>
<td>9. General Tonus</td>
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</tr>
</tbody>
</table>

**Interpretation**

Higher scores indicate better functional performance.

**Validity, reliability and internal consistency**

The MAS reliability was tested among stroke patients and was found to be highly reliable with an average interrater correlation of .95 and an average test-retest correlation of .98. (Carr 1985)

The high correlations obtained between the total scores on the MAS and the Fugl-Meyer Assessment ($r = .88$) and between specific item scores (except sitting balance) ($r = .28$ to .92) provide support for the concurrent validity of the MAS. Interrater reliability coefficients for the total MAS score and individual items on the MAS (except tone) were also high and significant. (Poole JL, 1988)

Interrater reliability $r=0.89-0.99$; 78%-95% agreement & $r=0.91-0.99$ and Intrrater reliability ($r=0.81-1.0$) of the MAS was established by Dean et al 1992 and Murphy et al 2003.

Malouin et al in 1994 compared the Fugl Meyer Sensorimotor Assessment and MAS and revealed the following results: Spearman correlation coefficient for total FMA and total MAS scores $= 0.96$

Correlations ranged from $0.65-0.93$
References


Mobility Scale for Acute Stroke Patients

Background

The Mobility Scale for Acute Stroke (MSAS) patients was developed in response to the perceived lack of suitable measures that can discriminate between the lower levels of physical ability found in acute stroke patients. It consists of 6 activities assessed using a 6-point scale. It is based on the amount of assistance and independence on performing selected mobility tasks.

Scoring

There are 6 items and each item is given a score from 1 to 6, where 1 means patient is unable to do the activity or does not make any contribution to the activity and 6 meaning activity is unassisted and was performed safe. For the activities 1, 2 and 4, the patient is asked to perform the activities 3 times and the best of 3 attempts is recorded. For the activities 3, 5 and 6, the overall assistance provided for the duration of activity is recorded. Score is the sum of all ratings for each item.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The MSAS should be completed on repeated occasions of testing, and the scores compared in order to obtain an understanding of any change in the ability to perform mobility tasks.

Interpretation

Higher scores indicate better mobility performance.

Validity, reliability and internal consistency

The MSAS appears to have an acceptable level of intra-rater and inter-rater reliability (Simmonds, 1996) and good validity in predicting length of stay post stroke (Brock et al 1997).

The MSAS was found to have a high level of concurrent validity (r>0.80) when the total score was correlated with the Motor Assessment Scale (MAS), Functional Ambulation Classification system (FAC), Functional Independence Measure (FIM), and Barthel Index(BI). A high level of association was found between the non-bed mobility items (sit to stand, stand and walk) of the MSAS and the mobility items (toileting, transfers, walk and stairs) of the FIM and BI. There was a weaker association between the MSAS items and the ADL items of the BI and FIM.

References

Mobility Scale for Acute Stroke Patients

Activities

1. Bridging from supine, buttocks clear of bed, return to supine
2. Sitting from supine, legs over the side of the body, let the patient choose the side, return to supine
3. Balanced sitting for 3 minutes maximum base of support, defined as thighs in contact with the couch, flexor aspect of knees in contact with the edge of the couch, legs at right angles to thighs, feet supported on a stool/floor at right angles to the legs. The bed height may be adjusted to achieve the correct position; a footstool may be used when the patient’s feet do not reach the floor.
4. Sit to vertical stand from a chair (height 43 cm) with no arm rest
5. Balanced standing for 1 minute (to be performed from the chair), only assess standing, not sit to stand
6. Gait, assessed indoors on level surface, along a measured walkway of 10m, with or without a gait aid

Rating Scale

1. Unable to do the activity, patient makes no contribution to the activity or is unable to complete the activity
2. Maximum assistance of 1 or 2 people patient makes minimal contribution to the activity
3. Moderate assistance of 1 person, hands on assistance for most of the activity. The patient is able to perform a part of the activity independently.
4. Minimal assistance, hands on for part of the activity
5. Supervised (verbal input, no hands on assistance, physiotherapist prepared to give assistance).
6. Unassisted and safe, no verbal input
Chapter 4: Quality of Life Measures

Assessment of Quality of Life

Background
The Assessment of Quality of Life (AQoL) was designed to measure health-related quality of life (HRQoL) and to be the descriptive system for a multi-attribute utility (MAU) instrument used in economic evaluation. It has 5 dimensions – illness, independent living, social relationships, physical senses and psychological well-being.

Scoring
The AQoL is a self-administered tool where patients are asked to rate their health related quality of life on a 4-point scale (A-D). The answers are coded as follows:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

The questionnaires should be recorded as follows:

1 is equal to "0"
2 is equal to "1"
3 is equal to "2"
4 is equal to "3"

This coding will produce scores for each scale ranging from 0-9, where 0 indicates normal or good and 9 the worst possible in the dimension scale of interest.

Scores can be summed into a single AoQL Score, which will range from 0-45, with 0 being the normal and 45 the worst possible AoQL score.

Recording
A separate recording sheet is provided to facilitate repeated measures over time.

Comparison
The AQoL should be completed on repeated occasions of testing, and the scores compared in order to obtain an understanding of any change in the health related quality of life.

Interpretation
The higher the numerical score, the poorer the respondent’s health-related quality of life (HRQoL).

NOTE: AQoL is not intended to measure individual utility but like all summative program evaluation, measures population outcome. It is appropriately used for assessing the overall impact of a health program and not the benefit obtained by any given individual from that program.

Validity, reliability and internal consistency
The AQoL has good internal consistency (α=0.87) and test-retest reliability (r=0.80) (Hawthrone et al, 1999). The questionnaire also appears to be a valid and sensitive measure of health related quality of life after stroke (Sturm et al, 2002). The same study showed internal consistency at (α=0.81) and comparative fit index of 0.90.

The AQoL-6D descriptive system has been shown to have good psychometric properties (Richardson et al. 2012). The instrument has achieved construct validity and provides a sensitive description of Health related Quality of Life (HRQoL). This means that it may be used with confidence for measuring health related quality of life and that it is a suitable basis for modelling utilities for inclusion in the economic evaluation of health programs.

References
Assessment of Quality of Life

Instructions: Please circle the alternative the best describes you during the last week.

**Illness**
1. Concerning my use of prescribed medicines:
   A. I do not or rarely use any medicines at all.
   B. I use one or two medicinal drugs regularly.
   C. I need to use three or four medicinal drugs regularly.
   D. I use five or more medicinal drugs regularly.

2. To what extent do I rely on medicines or a medical aid? 
   *(NOT glasses or a hearing aid.)* *(For example: walking frame, wheelchair, prosthesis etc.)*
   A. I do not use any medicines and/or medical aids.
   B. I occasionally use medicines and/or medical aids.
   C. I regularly use medicines and/or medical aids.
   D. I have to constantly take medicines or use a medical aid.

3. Do I need regular medical treatment from a doctor or other health professional?
   A. I do not need regular medical treatment.
   B. Although I have some regular medical treatment, I am not dependent on this.
   C. I am dependent on having regular medical treatment.
   D. My life is dependent upon regular medical treatment.

**Independent Living**
4. Do I need any help looking after myself?
   A. I need no help at all.
   B. Occasionally I need some help with personal care tasks.
   C. I need help with the more difficult personal care tasks.
   D. I need daily help with most or all personal care tasks.

5. When doing household tasks: *(For example, preparing food, gardening, using the video recorder, radio, telephone or washing the car)*
   A. I need no help at all.
   B. Occasionally I need some help with household tasks.
   C. I need help with the more difficult household tasks.
   D. I need daily help with most or all household tasks.

6. Thinking about how easily I can get around my home and community:
   A. I get around my home and community by myself without any difficulty.
   B. I find it difficult to get around my home and community by myself.
   C. I cannot get around the community by myself, but I can get around my home with some difficulty.
   D. I cannot get around either the community or my home by myself.
Social relationships
7. Because of my health, my relationships (For example: with my friends, partner or parents) generally:
   A. Are very close and warm.
   B. Are sometimes close and warm.
   C. Are seldom close and warm.
   D. I have no close and warm relationships.

8. Thinking about my relationship with other people:
   A. I have plenty of friends, and am never lonely.
   B. Although I have friends, I am occasionally lonely.
   C. I have some friends, but am often lonely for company.
   D. I am socially isolated and feel lonely.

9. Thinking about my health and my relationship with my family:
   A. My role in the family is unaffected by my health.
   B. There are some parts of my family role I cannot carry out.
   C. There are many parts of my family role I cannot carry out.
   D. I cannot carry out any part of my family role.

Physical senses
10. Thinking about my vision, including when using my classes or contact lenses if needed:
    A. I see normally.
    B. I have some difficulty focusing on things, I do not see them sharply. For example: small print, a newspaper, or seeing objects in the distance.
    C. I have a lot of difficulty seeing things. My vision is blurred. For example: I can see just enough to get by with.
    D. I only see general shapers, or am blind. For example: I need a guide to move around.

11. Thinking about my hearing, including using my hearing aid if needed:
    A. I hear normally.
    B. I have some difficulty in hearing or I do not hear clearly. For example: I ask people to speak up, or turn up the TV or radio volume.
    C. I have difficulty hearing things clearly. For example: I usually do not take part in conversations because I cannot hear what is said.
    D. I hear very little indeed. For example: I cannot fully understand loud voices speaking directly to me.

12. When I communicate with others: (For example: by talking, listening, writing or signing)
    A. I have no trouble speaking to them or understanding what they are saying.
    B. I have some difficulty being understood by people who do not know me. I have trouble understanding what others are saying to me.
    C. I am only understood by people who know me well. I have great trouble understanding what others are saying to me.
    D. I cannot adequately communicate with others.
Psychological well-being

13. If I think about how I sleep:
   A. I am able to sleep without difficulty most of the time.
   B. My sleep is interrupted some of the time, but I am usually able to go back to sleep without difficulty.
   C. My sleep is interrupted most nights, but I am usually able to go back to sleep without difficulty.
   D. I sleep in short bursts only. I am awake most of the night.

14. Thinking about how I generally feel:
   A. I do not feel anxious, worried or depressed.
   B. I am slightly anxious, worried or depressed.
   C. I feel moderately anxious, worried or depressed.
   D. I am extremely anxious, worried or depressed.

15. How much pain or discomfort do I experience?
   A. None at all.
   B. I have moderate pain.
   C. I suffer from severe pain.
   D. I suffer unbearable pain.
Reintegration to Normal Living Index

Background

The Reintegration to Normal Living (RNL) Index was developed to assess how individuals return to normal living patterns following incapacitating diseases or injury. The RNL Index is made up of 11 declarative statements (i.e. I move around my community as I feel necessary), including the following domains: indoor, community and distance mobility, self care, daily activity (work and school) recreational and social activities, general coping skills, family role(s), personal relationships, and presentation of self to others. There are 2 sub scales: Daily Activity (mobility, participation in work, school, social and recreational activities) and Perception of Self (comfort with relationships and coping skills).

Scoring

Each statement is accompanied by a visual analogue scale (0-10). The scale is anchored by the statements, “does not describe my situation” and fully describes my situation. The total score, which is obtained by summing the individual scores for each statement, has a possible range from 11 to 110. For ease of interpretation, the total score is proportionally converted to 100.

Total score = \text{SUM} (points for all 11 items)
Adjusted score = (total score) / 110 \times 100
• minimum adjusted score: 0
• maximum adjusted score: 100

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The RNL should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in status.

Interpretation

Higher scores denote better reintegration but some investigators have reversed the scoring to reflect amount of disability.

Validity, reliability and internal consistency

Internal consistency: The RNL Index has good internal consistency (alphas for patient sample=0.90; for significant others= 0.92; for health professionals=0.95. Corrected item to total correlations ranged from 0.39-0.75 for patients, 0.61-0.87 for significant others and from 0.70-0.90 for health professionals; alphas for community living elderly sample= 0.76-0.90).

Inter-Rater: The RNL Index has shown acceptable interrater reliability (Significant other to patient correlations, r =0.62 and 0.69; health professional to patient correlations, r= 0.39 and 0.43). Problems in RNL domains were more likely reported by proxy than patients in both face-to face and telephone interviews (Komer-Bitensky, 1994). At admission to a treatment program, patients and proxies scores did not differ significantly; at discharge and follow-up they differed significantly (U=0, p<0.001).
Test-Retest: Test-retest reliability of RNL was also demonstrated (Community dwelling elderly $r=0.83$. By age group: 75-79 $r=0.82$; 80-84 $r=0.93$; 85+ $r=0.76$. Adults with traumatic brain injury: for patients $r=0.12$; for significant others $r=0.79$).

Validity Estimates:

Convergent: In those with mild traumatic brain damage, a significant association was found with discharge disposition in the post hospital phase (Friedland, 2001). Among lower limb amputees, the RNL and its Daily Activities subscale correlated in the expected direction and moderately with the most of the items in the subscale related to physical performance of the Prosthetic Profile of the Amputee Questionnaire. It failed to correlate significantly with items related to use of the prosthesis. Significant Pearson’s correlations ranged from 0.36 to 0.56. (Gauthier-Gagnon et al, 1994) In those with long standing spinal cord injury, the multiple regression analysis of the RNL reported significant coefficients with the FIM (0.34), the Yale Scale Score (0.99), the CES-D (0.87), living conditions (9.02), relationships (7.39), sexual life (6.96) and age (0.27) (Daverat et al, 1995). When used with people with rheumatoid arthritis, scores on the RNL were significantly correlated with disease duration, number of affected joints, the FIM, the Lee Index (pain, fatigue and stiffness) and the American Rheumatism Association Classification. Correlations ranged from 0.31-0.83 (Calmels et al, 1994). When examined in community dwelling individuals with a disability, RNL scores were related to the Canadian Occupational Performance Measure (multiple regression model) and to the Satisfaction with Performance Scaled Questionnaire ($r=0.72$) (McCull et al, 2000). In patients with cancer, RNL scores were marginally related to work status and disease status but were not related to family status, living arrangements or the presence of problems in living during the first year after the diagnosis and treatment for cancer. Further, they were significantly associated with the Quality of Life (QL) Index ($r=0.68$) and a measure of psychological well-being ($r$ ranged from 0.32-0.41).

Known groups: When people with stroke were divided by levels of impairment (mild-moderate-severe according to Adam’s Scale), by presence or absence of depression (Zung scale), by levels of physical disability (independent-moderately dependent-dependent-FIM) and by levels of cognitive disability (independent- moderately dependent-dependent-FIM) at 3months and one year post stroke, RNL scores for these ‘known groups’ demonstrated expected gradients and were significantly different as analysed by ANOVAs. The differences between categories in these analyses ranged from 12-62% (Clarke et al, 1999).

When people with traumatic brain injury were divided by baseline severity scores into mild, moderate and severe categories, mean RNL scores by group were not significantly different at a mean of 4.4 years post injury (Dawson et al, 2000). However, when people with mild traumatic brain injury were divided according to definite post traumatic stress, possible post traumatic stress, and no post traumatic stress RNL scores were significantly different across the groups (Friedland et al, 2001).

The RNL failed to significantly differentiate those with paraplegia and those with tetraplegia (mean scores = 81.8(14.5) and 78.4(14.5) in a long term follow-up (Daverat et al, 1995).

The RNL Index is a valid and reliable ($\alpha=0.87$) measure of community participation for persons with chronic SCI of traumatic cause (Hitzig et al. 2012). A study examining the validity and reliability of a modified Reintegration to Normal Living Index (mRNL Index) with a sample of community-dwelling adults with mixed diagnoses found that modifications to the phrasing, rating scale and subscales improved the validity of the original RNL Index for a mixed rehabilitation, community-dwelling population (Miller, Clemson & Lannin 2011). The same study found the mRNL Index demonstrated acceptable internal consistency Cronbach’s $\alpha=0.80$, as did the Daily Functioning subscale (Cronbach’s $\alpha=0.80$) and Personal Integration subscale.
(Cronbach’s \( \alpha = 0.82 \)). Test-retest reliability was also acceptable (intraclass correlation coefficient = 0.83, \( p = 0.0001 \)). The Reintegration to Normal Living Index is a reliable (Cronbach’s \( \alpha = 0.92 \); ICC = 0.87) and valid tool for assessing satisfaction with community reintegration among Chinese people with chronic stroke (Pang et al. 2011).

References


Tooth LR, McKenna KT, Smith M, o’Rourke PK. Reliability of scores between stroke patients and significant other on RNL Index. Disability and Rehabilitation 25(9): 433-440.


Reintegration to Normal Living Index

1) I move around my living quarters as I feel necessary.
2) I move around my community as I feel necessary.
3) I am able to take trips out of town as I feel are necessary.
4) I am comfortable with how my self-care needs (dressing feeding toileting bathing) are met.
5) I spend most of my days occupied in work activity that is necessary or important to me.
6) I am able to participate in recreational activities (hobbies crafts sports reading television games computers etc.) as I want to.
7) I participate in social activities with family, friends and/or business acquaintances as is necessary or desirable to me.
8) I assume a role in my family which meets my needs and those of other family members.
9) In general I am comfortable with my personal relationships.
10) In general I am comfortable with myself when I am in the company of others.
11) I feel that I can deal with life events as they happen.

Where:
- Wheelchairs or other adaptive aids may be used.
Scoring is based on distance along a 10 cm visual analogue scale (VAS).

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No reintegration</td>
<td>0</td>
</tr>
<tr>
<td>Complete reintegration</td>
<td>10</td>
</tr>
</tbody>
</table>
Community Integration Measure

Background

The Community Integration Measure (CIM) is a 10-item client-centered measure of community integration that uses the words of the participants themselves, and makes no assumptions about the relative importance of particular activities or relationships. It requires basic literacy level and can be easily administered in 3-5 minutes.

Scoring

Clients are asked to indicate whether or not they agree to the statements, using a 5 point scale with 1 = “always disagree” and 5 = “always agree.” The single summary score is the unweighted sum of the 10 items, ranging from 10-50.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The CIM should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in status.

Interpretation

Higher scores indicate better community integration.

Validity, reliability and internal consistency

Internal consistency reliability using Cronbach alpha is 0.87. Content validity was assured by the development procedure, correspondence with the theoretical model, and the direct use of consumer language. Discriminant validity was supported by the CIM’s ability to differentiate between sub-samples. Construct validity was supported by correlations with the Interpersonal Support Evaluation List. (McColl et al, 2001)

CIM items produced standardized alphas ranging from 0.72 to 0.83. Significant positive correlations were found among the CIM and both the CIQ-R (Community Integration Questionnaire Revised) and SWLS (Satisfaction with Life Scale), with the CIM performing better with the SWLS than did the CIQ-R. The CIM discriminated between subject samples as well as by living arrangement.

The CIQ adjusted for people with aphasia was found to be a feasible instrument with good internal consistency for the CIQ total (standardized Cronbach α=0.75), excellent test-retest reliability (intraclass correlation coefficient=0.96), moderate correlations with the Barthel Index, the COOP-WONCA, and the Life Satisfaction Questionnaire with regard to construct validity and it showed significant relations were found with regard to age and aphasia severity (Dalemans et al. 2010). The CIM was found to be a valid and reliable measure of community integration for persons with histories of TBI of up to 15 years (Griffen, Hamks & Meachen 2010).
References


Community Integration Measure

For each of the following statements, please indicate whether you agree or disagree:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel like part of this community, I feel like I belong.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I know my way around this community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I know the rules in this community and I can fit in with them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I feel that I am accepted in this community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I can be independent in this community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I like where I’m living now.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. There are people I feel close to in this community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I know a number of people in this community well enough to say hello and have them say hello back.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. There are things that I can do in this community for fun in my free time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I have something to do in this community during that main part of my day that is useful and productive.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RAND-36

Background
The RAND-36 is a widely used health-related quality of life survey instrument which contains eight dimensions of health, namely, physical functioning, social functioning, role limitations (physical problem), role limitations (emotional problem), mental health, vitality, pain and general health perception.

RAND is comprised of 36 items selected from a larger pool of items used in the RAND Medical outcomes study. It assesses eight health concepts with multi-item scales (35 items): physical functioning (10 items), role limitations caused by physical health problems (4 items), role limitations caused by emotional problems (3 items), social functioning (2 items), emotional wellbeing (5 items), energy/fatigue (4 items), pain (2 items), and general health perceptions (5 items). An additional single item assesses change in perceived health during the last 12 months.

Scoring
Scoring of RAND involves transforming every item linearly to a 0-100 possible range (per cent of total possible score) and then averaging all items in the same scale together. Below is a scale that can be used to convert scores.

<table>
<thead>
<tr>
<th>Item Numbers</th>
<th>Original Response</th>
<th>Recorded Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 20, 22, 34, 36</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Numbers</th>
<th>Original Response</th>
<th>Recorded Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Numbers</th>
<th>Original Response</th>
<th>Recorded Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>13, 14, 15, 16, 17, 18, 19</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item Numbers</th>
<th>Original Response</th>
<th>Recorded Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>21, 23, 26, 27, 30</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>
### Averaging Items to Form 8 Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Number of Items</th>
<th>After recording scores from the above table, average the following items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning</td>
<td>10</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Role limitations due to physical health</td>
<td>4</td>
<td>13, 14, 15, 16</td>
</tr>
<tr>
<td>Role limitations due to emotional problems</td>
<td>3</td>
<td>17, 18, 19</td>
</tr>
<tr>
<td>Energy/ fatigue</td>
<td>4</td>
<td>23, 27, 29, 31</td>
</tr>
<tr>
<td>Emotional well being</td>
<td>5</td>
<td>24, 25, 26, 28, 30</td>
</tr>
<tr>
<td>Social functioning</td>
<td>2</td>
<td>20, 32</td>
</tr>
<tr>
<td>Pain</td>
<td>2</td>
<td>21, 22</td>
</tr>
<tr>
<td>General health</td>
<td>5</td>
<td>1, 33, 34, 35, 36</td>
</tr>
</tbody>
</table>

For example, to measure the patient's energy/fatigue level, scores from questions 23, 27, 29, and 31 are added. If a patient circled 4 on 23, 3 on 27, 3 on 29 and left 31 blank, scores are converted using the first table above. An answer of 4 to Q23 is scored as 40, 3 to Q27 is scored as 60, and 3 to Q29 is scored as 40. Q31 is omitted. The score for this block is 40+60+40 = 140 which is then divided by 3 (3 answered questions) to get a total of 46.7. Since a score of 100 represents high energy with no fatigue, the lower score of 46.7% suggests the patient is experiencing a loss of energy and is experiencing some fatigue. All 8 categories are scored in the same way.

**Note:** One item was added measuring health change during the last 12 months. This item was not included in one of the dimensions.

**Interpretation**

Higher score indicates higher level of functioning.
Validity, Reliability and Sensitivity

VanderZee et al (1996) examined the psychometric properties of RAND 36 and found the internal consistency of the questionnaire to be high. Alpha values ranged from 0.71-0.93. The convergent and discriminant validity of the RAND-36 was largely supported by data. All the correlations between the corresponding scales of the RAND 36-Item Health Survey and corresponding scales from different instruments are significantly positive. Furthermore, on the whole, correlations between corresponding scales are higher than correlations between non-corresponding scales.

In a more recent study by Moore et al (2001), psychometric properties both of the total RAND-36 and of its subscales, such as uni-dimensionality, differential item functioning, homogeneity and reliabilities were examined. Data were collected from Dutch population with different chronic illnesses such as multiple sclerosis, rheumatism or COPD. All subscales of the RAND-36 appeared to be uni-dimensional. For the subscales ‘mental health’ and ‘general health perceptions’ some minor indications of DIF for the different chronic illnesses were found. Reliabilities of almost all subscales in all subpopulations were higher than 0.80, while the homogeneities of almost all subscales in all subpopulations were higher than 0.50, indicating ‘strong uni-dimensional, hierarchical scales’.

References

Chapter 5: Parkinson’s Disease

Unified Parkinson’s Disease Rating Scale

Background

The United Parkinson’s Disease Rating Scale (UPDRS) is the standard tool for measuring parkinsonian signs and symptoms in practice and clinical research. It consists of 3 domains: (1) mentation, behavior and mood, (2) activities of daily living based on historical information and (3) motor functions based on clinical examination.

Scoring

Points are assigned to each item based on patient response and physical examination. The range is from 0 (no disability) to 199 (total disability). Most of the items are scored on a 5-point scale (0-4), with very few items answerable by either 0 or 1. For the following items, more than one score is given

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Face, lips and chin</td>
</tr>
<tr>
<td>20</td>
<td>Hands (Right and Left)</td>
</tr>
<tr>
<td>21</td>
<td>Feet (Right and Left)</td>
</tr>
<tr>
<td>20</td>
<td>Right and Left</td>
</tr>
<tr>
<td>21</td>
<td>Neck</td>
</tr>
<tr>
<td>21</td>
<td>Upper extremity (Right and Left)</td>
</tr>
<tr>
<td>21</td>
<td>Lower extremity (Right and Left)</td>
</tr>
<tr>
<td>22</td>
<td>Right and Left</td>
</tr>
<tr>
<td>23</td>
<td>Right and Left</td>
</tr>
<tr>
<td>24</td>
<td>Right and Left</td>
</tr>
</tbody>
</table>

Scores for each of the domains can be calculated by getting the sum of all items.

<table>
<thead>
<tr>
<th>Main Sections</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Mentation, Behavior and Mood (Items 1-4)</td>
<td>16</td>
</tr>
<tr>
<td>B. Activities of Daily Living (Items 5-17)</td>
<td>52</td>
</tr>
<tr>
<td>C. Motor Functions (Items18-31)</td>
<td>108</td>
</tr>
<tr>
<td>Total (Items 1-31)</td>
<td>176</td>
</tr>
</tbody>
</table>

Complications of Therapy

<table>
<thead>
<tr>
<th>Main Sections</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dyskinesia (Items 32-35)</td>
<td>13</td>
</tr>
<tr>
<td>2. Clinical Fluctuations (Items 36-39)</td>
<td>7</td>
</tr>
<tr>
<td>3. Other complications (Items 40-42)</td>
<td>3</td>
</tr>
</tbody>
</table>

Main sections plus the complications of therapy 199
Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The UPDRS should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in status.

Interpretation

Change in status can be determined by getting the difference between the initial/previous and subsequent scores. An increase in the scores obtained can be interpreted as a decline in the functional ability of the patient.

Validity, reliability and internal consistency

Several studies have investigated the structure and psychometric properties of the UPDRS. These studies have shown that the UPDRS has high internal consistency (Stebbins & Goetz, 1998) (Martine-Martine et al, 1994). Inter-rater reliability has been demonstrated using ratings of videotapes of patients (Fahn & Elton, 1997) as well as face-to-face ratings (Richards et al, 1994). The test-retest reliability of the motor section has been studied in elderly patients with parkinsonian signs (but not necessarily PD) (Bennett et al, 1997).

The ICCs for the UPDRS scores were as follows: total score, 0.92; mental, 0.74; ADL, 0.85; motor, 0.90. ICCs for derived symptom-based scales ranged from 0.69-0.88. Reliability of specific items was generally lower than for summary scales. Reliability was slightly better in patients for whom the testing interval was within 14 days. Based on conventional standards, the UPDRS scores were found to have excellent test-retest reliability in this sample of patients with early PD rated by academic movement disorder specialists.

While test–retest and interrater reliability has not been established, research studies have demonstrated good criterion, convergent, and discriminant validities of the UPDRS-apathy Item (Clarke et al. 2011).

References


United Parkinson’s Disease Rating Scale

A. MENTATION, BEHAVIOR AND MOOD

1. Intellectual Impairment
   0 = None.
   1 = Mild. Consistent forgetfulness with partial recollection of events and no other difficulties.
   2 = Moderate memory loss, with disorientation and moderate difficulty handling complex problems. Mild but definite impairment of function at home with need of occasional prompting.
   3 = Severe memory loss with disorientation for time and often to place. Severe impairment in handling problems.
   4 = Severe memory loss with orientation preserved to person only. Unable to make judgements or solve problems. Requires much help with personal care. Cannot be left alone at all.

2. Thought Disorder (Due to dementia or drug intoxication)
   0 = None.
   1 = Vivid dreaming.
   2 = "Benign" hallucinations with insight retained.
   3 = Occasional to frequent hallucinations or delusions; without insight; could interfere with daily activities.
   4 = Persistent hallucinations, delusions, or florid psychosis. Not able to care for self.

3. Depression
   1 = Periods of sadness or guilt greater than normal, never sustained for days or weeks.
   2 = Sustained depression (1 week or more).
   3 = Sustained depression with vegetative symptoms (insomnia, anorexia, weight loss, loss of interest).
   4 = Sustained depression with vegetative symptoms and suicidal thoughts or intent.

4. Motivation/Initiative
   0 = Normal.
   1 = Less assertive than usual; more passive.
   2 = Loss of initiative or disinterest in elective (nonroutine) activities.
   3 = Loss of initiative or disinterest in day to day (routine) activities.
   4 = Withdrawn, complete loss of motivation.

ACTIVITIES OF DAILY LIVING (for both "on" and "off")

5. Speech
   0 = Normal.
   1 = Mildly affected. No difficulty being understood.
   2 = Moderately affected. Sometimes asked to repeat statements.
   3 = Severely affected. Frequently asked to repeat statements.
   4 = Unintelligible most of the time.

6. Salivation
   0 = Normal.
   1 = Slight but definite excess of saliva in mouth; may have nighttime drooling.
   2 = Moderately excessive saliva; may have minimal drooling.
   3 = Marked excess of saliva with some drooling.
   4 = Marked drooling, requires constant tissue or handkerchief.
7. **Swallowing**
   0 = Normal.
   1 = Rare choking.
   2 = Occasional choking.
   3 = Requires soft food.
   4 = Requires NG tube or gastrotomy feeding.

8. **Handwriting**
   0 = Normal.
   1 = Slightly slow or small.
   2 = Moderately slow or small; all words are legible.
   3 = Severely affected; not all words are legible.
   4 = The majority of words are not legible.

9. **Cutting food and handling utensils**
   0 = Normal.
   1 = Somewhat slow and clumsy, but no help needed.
   2 = Can cut most foods, although clumsy and slow; some help needed.
   3 = Food must be cut by someone, but can still feed slowly.
   4 = Needs to be fed.

10. **Dressing**
    0 = Normal.
    1 = Somewhat slow, but no help needed.
    2 = Occasional assistance with buttoning, getting arms in sleeves.
    3 = Considerable help required, but can do some things alone.
    4 = Helpless.

11. **Hygiene**
    0 = Normal.
    1 = Somewhat slow, but no help needed.
    2 = Needs help to shower or bathe; or very slow in hygienic care.
    3 = Requires assistance for washing, brushing teeth, combing hair, going to bathroom.
    4 = Foley catheter or other mechanical aids.

12. **Turning in bed and adjusting bed clothes**
    0 = Normal.
    1 = Somewhat slow and clumsy, but no help needed.
    2 = Can turn alone or adjust sheets, but with great difficulty.
    3 = Can initiate, but not turn or adjust sheets alone.
    4 = Helpless.

13. **Falling (unrelated to freezing)**
    0 = None.
    1 = Rare falling.
    2 = Occasionally falls, less than once per day.
    3 = Falls an average of once daily.
    4 = Falls more than once daily.
14. Freezing when walking
0 = None.
1 = Rare freezing when walking; may have starthesitation.
2 = Occasional freezing when walking.
3 = Frequent freezing. Occasionally falls from freezing.
4 = Frequent falls from freezing.

15. Walking
0 = Normal.
1 = Mild difficulty. May not swing arms or may tend to drag leg.
2 = Moderate difficulty, but requires little or no assistance.
3 = Severe disturbance of walking, requiring assistance.
4 = Cannot walk at all, even with assistance.

16. Tremor (Symptomatic complaint of tremor in any part of body.)
0 = Absent.
1 = Slight and infrequently present.
2 = Moderate; bothersome to patient.
3 = Severe; interferes with many activities.
4 = Marked; interferes with most activities.

17. Sensory complaints related to parkinsonism
0 = None.
1 = Occasionally has numbness, tingling, or mild aching.
2 = Frequently has numbness, tingling, or aching; not distressing.
3 = Frequent painful sensations.
4 = Excruciating pain.

MOTOR EXAMINATION

18. Speech
0 = Normal.
1 = Slight loss of expression, diction and/or volume.
2 = Monotone, slurred but understandable; moderately impaired.
3 = Marked impairment, difficult to understand.
4 = Unintelligible.

19. Facial Expression
0 = Normal.
1 = Minimal hypomimia, could be normal "Poker Face".
2 = Slight but definitely abnormal diminution of facial expression
3 = Moderate hypomimia; lips parted some of the time.
4 = Masked or fixed facies with severe or complete loss of facial expression; lips parted 1/4 inch or more.

20. Tremor at rest (head, upper and lower extremities)
0 = Absent.
1 = Slight and infrequently present.
2 = Mild in amplitude and persistent. Or moderate in amplitude, but only intermittently present.
3 = Moderate in amplitude and present most of the time.
4 = Marked in amplitude and present most of the time.
21. Action or Postural Tremor of hands  
0 = Absent.  
1 = Slight; present with action.  
2 = Moderate in amplitude, present with action.  
3 = Moderate in amplitude with posture holding as well as action.  
4 = Marked in amplitude; interferes with feeding.

22. Rigidity (Judged on passive movement of major joints with patient relaxed in sitting position. Cogwheeling to be ignored.)  
0 = Absent.  
1 = Slight or detectable only when activated by mirror or other movements.  
2 = Mild to moderate.  
3 = Marked, but full range of motion easily achieved.  
4 = Severe, range of motion achieved with difficulty.

23. Finger Taps (Patient taps thumb with index finger in rapid succession.)  
0 = Normal.  
1 = Mild slowing and/or reduction in amplitude.  
2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.  
3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.  
4 = Can barely perform the task.

24. Hand Movements (Patient opens and closes hands in rapid succession.)  
0 = Normal.  
1 = Mild slowing and/or reduction in amplitude.  
2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.  
3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.  
4 = Can barely perform the task.

25. Rapid Alternating Movements of Hands (Pronation-supination movements of hands, vertically and horizontally, with as large an amplitude as possible, both hands simultaneously.)  
0 = Normal.  
1 = Mild slowing and/or reduction in amplitude.  
2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.  
3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.  
4 = Can barely perform the task.

26. Leg Agility (Patient taps heel on the ground in rapid succession picking up entire leg. Amplitude should be at least 3 inches.)  
0 = Normal.  
1 = Mild slowing and/or reduction in amplitude.  
2 = Moderately impaired. Definite and early fatiguing. May have occasional arrests in movement.  
3 = Severely impaired. Frequent hesitation in initiating movements or arrests in ongoing movement.  
4 = Can barely perform the task.
27. Arising from Chair (Patient attempts to rise from a straightbacked chair, with arms folded across chest.)
0 = Normal.
1 = Slow; or may need more than one attempt.
2 = Pushes self up from arms of seat.
3 = Tends to fall back and may have to try more than one time, but can get up without help.
4 = Unable to arise without help.

28. Posture
0 = Normal erect.
1 = Not quite erect, slightly stooped posture; could be normal for older person.
2 = Moderately stooped posture, definitely abnormal; can be slightly leaning to one side.
3 = Severely stooped posture with kyphosis; can be moderately leaning to one side.
4 = Marked flexion with extreme abnormality of posture.

29. Gait
0 = Normal.
1 = Walks slowly, may shuffle with short steps, but no festination (hastening steps) or propulsion.
2 = Walks with difficulty, but requires little or no assistance; may have some festination, short steps, or propulsion.
3 = Severe disturbance of gait, requiring assistance.
4 = Cannot walk at all, even with assistance.

30. Postural Stability (Response to sudden, strong posterior displacement produced by pull on shoulders while patient erect with eyes open and feet slightly apart. Patient is prepared.)
0 = Normal.
1 = Retropulsion, but recovers unaided.
2 = Absence of postural response; would fall if not caught by examiner.
3 = Very unstable, tends to lose balance spontaneously.
4 = Unable to stand without assistance.

31. Body Bradykinesia and Hypokinesia (Combining slowness, hesitancy, decreased armswing, small amplitude, and poverty of movement in general.)
0 = None.
1 = Minimal slowness, giving movement a deliberate character; could be normal for some persons. Possibly reduced amplitude.
2 = Mild degree of slowness and poverty of movement which is definitely abnormal. Alternatively, some reduced amplitude.
3 = Moderate slowness, poverty or small amplitude of movement.
4 = Marked slowness, poverty or small amplitude of movement.

COMPLICATIONS OF THERAPY (In the past week)
i. DYSKINESIAS
32. Duration: What proportion of the waking day are dyskinesias present? (Historical information.)
0 = None
1 = 1-25% of day.
2 = 26-50% of day.
3 = 51-75% of day.
4 = 76-100% of day.
33. Disability: How disabling are the dyskinesias? (Historical information; may be modified by office examination.)
0 = Not disabling.
1 = Mildly disabling.
2 = Moderately disabling.
3 = Severely disabling.
4 = Completely disabled.

34. Painful Dyskinesias: How painful are the dyskinesias?
0 = No painful dyskinesias.
1 = Slight.
2 = Moderate.
3 = Severe.
4 = Marked.

35. Presence of Early Morning Dystonia (Historical information.)
0 = No
1 = Yes

ii. CLINICAL FLUCTUATIONS

36. Are "off" periods predictable?
0 = No
1 = Yes

37. Are "off" periods unpredictable?
0 = No
1 = Yes

38. Do "off" periods come on suddenly, within a few seconds?
0 = No
1 = Yes

39. What proportion of the waking day is the patient "off" on average?
0 = None
1 = 1-25% of day.
2 = 26-50% of day.
3 = 51-75% of day.
4 = 76-100% of day.

iii. OTHER COMPLICATIONS

40. Does the patient have anorexia, nausea, or vomiting?
0 = No
1 = Yes

41. Any sleep disturbances, such as insomnia or hypersomnolence?
0 = No
1 = Yes

42. Does the patient have symptomatic orthostasis?
(Record the patient's blood pressure, height and weight on the scoring form)
0 = No
1 = Yes
Chapter 6: Traumatic Brain Injury

Supervision Rating Scale

Background

The Supervision Rating Scale measures the level of supervision that a patient/subject receives from caregivers. The SRS rates level of supervision on a 13-point ordinal scale that can optionally be grouped into five ranked categories (Independent, Overnight Supervision, Part-Time Supervision, Full-Time Indirect Supervision, and Full-Time Direct Supervision).

Scoring

Scoring is a one step procedure in which the clinician assigns the rating that is closest to the client's level. The rating is derived from information acquired through interviews with the client and an informant who has directly observed the level of supervision received by the client. Ratings are based on the level of supervision received, not on how much supervision a subject is judged or predicted to need.

Comparison and Interpretation

Level of supervision should be evaluated on repeated occasions to determine any change in status, with a lower score indicating greater level of independence.

Validity, reliability and internal consistency

SRS Ratings showed consistent relationships with type of living arrangement and with independence in self-care and instrumental ADL. SRS ratings were also strongly associated with ratings on the DRS (Disability rating Scale) and GOS (Glasgow Outcome Scale). Inter-rater reliability of the SRS was evaluated on a sample of 19 patients and found to be satisfactory (intraclass correlation=.86, weighted kappa=.64).

The original SRS has levels that are not useful in measuring individuals with brain injury after one year of injury. Collapsing the SRS to 5 levels may improve its utility. (Wright et al, 2006)

References

Supervision Rating Scale

Instructions: Circle the rating that is closest to the amount of supervision that the patient actually receives.

"Supervision" means that someone is responsible for being with the patient.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1      | **Level 1: INDEPENDENT**  
The patient lives alone or independently. Other persons can live with the patient, but they cannot take responsibility for supervision (for example, a child or elderly person). |
| 2      | The patient is unsupervised overnight. The patient lives with one or more persons who could be responsible for supervision (for example, a spouse or roommate), but they are all sometimes absent overnight. |
| 3      | **Level 2: OVERNIGHT SUPERVISION**  
The patient is only supervised overnight. One or more supervising persons are always present overnight but they are all sometimes absent for the rest of the day. |
| 4      | **Level 3: PART-TIME SUPERVISION**  
The patient is supervised overnight and part-time during waking hours, but is allowed on independent outings. One or more supervising persons are always present overnight and are also present during part of waking hours every day. However, the patient is sometimes allowed to leave the residence without being accompanied by someone who is responsible for supervision. |
| 5      | The patient is supervised overnight and part-time during waking hours, but is unsupervised during working hours. Supervising persons are all sometimes absent for enough time for them to work full-time outside the home. |
| 6      | The patient is supervised overnight and during most waking hours. Supervising persons are all sometimes absent for periods longer than one hour, but less than the time needed to hold a full-time job away from home. |
| 7      | The patient is supervised overnight and during almost all waking hours. Supervising persons are all sometimes absent for periods shorter than one hour. |
| 8      | **Level 4: FULL-TIME INDIRECT SUPERVISION**  
The patient is under full-time indirect supervision. At least one supervising person is always present, but the supervising person does not check on the patient more than once every 30 minutes. |
| 9      | Same as #8 plus requires overnight safety precautions (for example, a deadbolt on outside door). |
| 10     | **Level 5: FULL-TIME DIRECT SUPERVISION**  
The patient is under full-time direct supervision. At least one supervising person is always present and the supervising person checks on the patient more than once every thirty minutes. |
| 11     | The patient lives in a setting in which the exits are physically controlled by others (for example, a locked ward). |
| 12     | Same as #11 plus a supervising person is designated to provide full-time line-of-sight supervision (for example, an escape watch or suicide watch). |
| 13     | The patient is in physical restraints. |
Chapter 7: Generic Functional Measures

Resumption of Activities of Daily Living Scale

Background

The Resumption of Activities of Daily Living (RADL) Scale assesses the extent of recovery from the time of injury to the initiation of treatment, and concurrent with the course of treatment, using the individual's customary level of functioning as benchmark (Williams, 1998).

Measurement and Scoring

The scale consists of 12 items, with scores ranging from 0-100 (0%=not at all, 100%=complete resumption). The total RADL score can be calculated by summing the responses and dividing by the number of items answered. At least 9 out of the 12 items should be answered in order to calculate a total score.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The RADL should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in the recovery pattern.

Interpretation

No cut-off scores are provided, although higher scores indicate higher likelihood for resuming activities of daily living.

To determine change in status over time, the clinician may compare the subsequent assessment score with the initial or previous score (initial total score – subsequent total score). A minimal change of 16 points (from the maximum of 100 points) represents a clinically important difference.

Validity, reliability and internal consistency

The RADL developmental literature has strong evidence of psychometric properties, with high internal consistency and test-retest reliability as assessed by high ICC values (0.8) and moderate Pearson r-values (0.4). It also appears to be responsive to change over a 3-week period in a rehabilitation clinic.

References


Resumption of Activities of Daily Living Scale

Since your injury, to what extent have you resumed your usual activities in each of the following areas? If you do not do an activity, put N/A (non-applicable) beside the scale. As you rate each activity, think of how you are today. Circle the number on the scale for each question.

1. **Sleeping patterns**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

2. **Sexual activity**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

3. **Self-care** (e.g. washing, dressing)
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

4. **Light household chores** (e.g. doing dishes, making beds, preparing meals)
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

5. **Heavy household chores** (e.g. yardwork, cleaning windows, doing laundry)
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

6. **Shopping**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

7. **Socialising with friends and family inside your home**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

8. **Socialising with friends and family outside your home**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

9. **Travelling (in cars, buses, etc) for less than 30 minutes**
   - 0% for Not at all
   - 10% to 100% for Moderate resumption

10. **Travelling (in cars, buses, etc) for longer than 1 hour**
    - 0% for Not at all
    - 10% to 100% for Moderate resumption

11. **Engaging in your usual recreational activities**
    - 0% for Not at all
    - 10% to 100% for Moderate resumption

12. **Engaging in your usual paid employment**
    - 0% for Not at all
    - 10% to 100% for Moderate resumption
Chapter 8: Psychological Response Measures

Tampa Scale of Kinesiophobia

Background

The Tampa Scale Kinesiophobia-11 (TSK-11) uses 11 out of the 17 items from the original version of the Tampa Scale of Kinesiophobia. TSK checklist was developed as a measure of fear of movement/re-injury in persistent pain. The scale is based on the model of fear avoidance, fear of work-related activities, fear of movement/re-injury. This instrument requires an average literacy level.

Measurement and Scoring

Client rates each item on a 4-point Likert scale, with scoring options ranging from 1= strongly disagree to 4= strongly agree. The score can be calculated as the sum of the responses to the 11 items. The TSK-11 produces a total score ranging from 0 to 44.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The TSK-11 should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in the experience.

Interpretation

A high value in the TSK-11 signifies a high degree of kinesiophobia, indicating greater fear for physical movement and activity.

To determine change in status over time, the clinician may compare the subsequent assessment score with the initial or previous score (initial total score – subsequent total score). Initial research by the instrument developers suggests that a reduction of at least 4 points in the total score represents a clinically significant reduction in the patient’s fear of movement/re-injury. This has been shown to have 66% sensitivity and 67% specificity, when using the instrument as an outcome measure.

Validity, reliability and internal consistency

The TSK-11 version may be used with confidence of validity, as intra-instrument Pearson r correlations were >0.7. The scale has good internal consistency (Cronbach’s α=0.79), test-retest reliability (ICC=0.81), and responsiveness (SRM=-1.11). The TSK_11 has been translated into a number of languages and the psychometric properties have been tested in translation.

A study compared commonly used fear avoidance questionnaires in patients with chronic low back pain and found that the Tampa scale for Kinesiophobia had similar test retest reliability and validity to the Fear-Avoidance Beliefs Questionnaire (FABQ), Fear of Pain Questionnaire (FPQ), and the Pain Catastrophizing Scale. The test-retest ICC coefficients for these questionnaires ranged from 0.90 to 0.96 (George, Valencia & Beneciuk 2010). TSK-11 was found to be appropriate for use in patients with shoulder pain (Mintken et
Test-retest reliability intraclass correlation coefficient (ICC) was substantial for the TSK-11 however it correlated significantly only with SPADI (Shoulder Pain and Disability Index) pain scores not disability scores. The TSK-11 scales were found to demonstrated acceptable levels of internal consistency, as well as evidence of discriminant, concurrent criterion-related, and incremental validity. Somatic focus uniquely predicted perceived disability while activity avoidance uniquely predicted actual physical performance, controlling for pain severity (Tkachuk & Harris 2012). The 2-factor structure of the TSK-11 was found to be a brief, reliable, and valid measure of fear of movement/ (re)injury for chronic pain patients. It is recommended for use in future research and in clinical settings. A study found the Dutch version of the TSK to have good reliability and validity and the results provide a basis for use of the 12-item version for routine assessment of fear of movement in Temporomandibular joint disorder (TMD) patients, and for future clinical studies, for example, to the role of fear of movement in TMD-treatment success (Visscher et al. 2010).

References


### Tampa Scale of Kinesiophobia

_This is a list of phrases that other patients have used to express how they view their condition. Please circle the number that best describes how you feel about each statement._

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Somewhat disagree</th>
<th>Somewhat agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I'm afraid that I might injure myself if I exercise.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>If I were to try to overcome it, my pain would increase.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>My body is telling me I have something dangerously wrong.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>People aren't taking my medical condition seriously enough.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>My accident has put my body at risk for the rest of my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Pain always means I have injured my body.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>I wouldn't have this much pain if there weren't something potentially dangerous going on in my body.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>Pain lets me know when to stop exercising so that I don't injure myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>I can't do all the things normal people do because it's too easy for me to get injured.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>No one should have to exercise when he/she is in pain.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Centre for Epidemiologic Studies - Depression Scale

Background

The CES-D is a 20-item measure of anxiety, depression and depressed mood symptoms. It has been translated into a number of other languages and validated in many of them. There are shorter forms of this instrument, all of which have been developed to measure current depressive symptoms in the general population (CESD-10 (10 item), Revised Form (8 item), Iowa Form (11 item) and Boston Form (10 item). The long form of the instrument is the best researched and the one reported in this compendium.

Measurement and Scoring

Scoring of all questions, except items 4, 8, 12 and 16 are as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>rarely or none of the time (&lt;1day)</td>
</tr>
<tr>
<td>1</td>
<td>some or little of the time (1-2 days)</td>
</tr>
<tr>
<td>2</td>
<td>occasionally or moderate amount of the time (3-4 days)</td>
</tr>
<tr>
<td>3</td>
<td>most or all of the time (5-7 days)</td>
</tr>
</tbody>
</table>

For questions 4, 8, 12 and 16 the scoring is reversed, with “most or all of the time” as 0, “rarely or none of the time as 3, etc. The score can be calculated as the sum of the responses to the 20 items. Higher scores indicate greater depressive symptoms.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The CES-D should be completed on repeated occasions of testing, and the scores should be compared between testings in order to obtain an understanding of any change in the mood.

Interpretation

In the general population a cut-off score of 16 is used for diagnosing depression. This cut-point may lead to overdiagnosis in persistent pain patients, because typical neurovegetative symptoms of depression (e.g. sleep disorder) are often associated with patients’ pain problems. For persistent pain patients, cut-off scores of 19 (Turk & Okifuji 1994) and 27 (Geisser, Roth & Robinson 1997) have been suggested. A higher cut-off is less likely to lead to overdiagnosis (that is, has greater specificity) but is less sensitive.

Validity, reliability and internal consistency

The CES-D has demonstrated significant responsiveness to change and differentiated between different groups of pain sufferers with p values < 0.05 from ANOVA modeling. This instrument has been compared well with Beck Depression Inventory (BDI) psychologists’ assessment and the Multidimensional Personality Questionnaire (MPQ) for convergent and divergent validity.
Among cancer patients (Hann et al. 1999), the CES-D was found to have good internal consistency, with alpha coefficients > 0.85 for both groups of women with and without cancer, as well as adequate test-retest reliability in both groups. Construct validity was demonstrated in two ways, via comparisons between the groups and by comparing the CES-D with measures of fatigue, anxiety, and global mental health functioning. The CES-D was established as a valid and reliable measure of depressive symptomatology in this sample of breast cancer patients.

A study examined the psychometric qualities of the CES-D in Jordanian women and found that Cronbach’s α =0.90 and validity testing using independent samples t-test provided evidence of discriminant validity for the 20-item and the 16-item CES-D (Al-Modallal 2010). They indicated that depression status can be easily identified by clinicians. Another study found this instrument to be useful for the assessment of depressive symptoms or for the screening depressive disorders in the context of epidemiological studies targeting French patients and community men and women with a background similar to those from the present study (Morin et al. 2011).

References


### Centre for Epidemiologic Studies-Depression Scale

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

<table>
<thead>
<tr>
<th>During the Past Week</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 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>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. I did not feel like eating; my appetite was poor.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</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>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. I felt I was just as good as other people.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. I had trouble keeping my mind on what I was doing.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. I felt depressed.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. I felt that everything I did was an effort.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. I felt hopeful about the future.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. I thought my life had been a failure.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. I felt fearful.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. My sleep was restless.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12. I was happy.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13. I talked less than usual.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>15. People were unfriendly.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>16. I enjoyed life.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>17. I had crying spells.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>18. I felt sad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>19. I felt that people dislike me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>20. I could not get “going.”</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Kessler Psychological Distress Scale

Background

The Kessler Psychological Distress Scale (K10) is a widely reported two-domain, 10-item measure of non-specific psychological distress, primarily intended as a measure of mood, anxiety and depression. The wording is appropriate for use with moderately literate individuals.

Measurement and Scoring

The 10-item scale has 5 response categories, from 1 (None of the time) to 5 (All of the time). The score can be calculated as the sum of the responses to the 10 items.

Recording

A separate recording sheet is provided to facilitate repeated measures over time.

Comparison

The K10 should be completed on repeated occasions of testing, and the scores should be compared between testing in order to obtain an understanding of any change in the mood.

Interpretation

The following cut-off scores have been used to estimate the prevalence of levels of psychological distress in an Australian population health survey.

Table 4.2: Interpretation of K-10 scores

<table>
<thead>
<tr>
<th>K10 score</th>
<th>Likelihood of having a mental disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>10–19</td>
<td>Likely to be well</td>
</tr>
<tr>
<td>20–24</td>
<td>Likely to have a mild mental disorder</td>
</tr>
<tr>
<td>25–29</td>
<td>Likely to have a moderate mental disorder</td>
</tr>
<tr>
<td>30–50</td>
<td>Likely to have a severe mental disorder</td>
</tr>
</tbody>
</table>

Scores usually decline with effective treatment. Patients whose scores remain above 24 after treatment should be reviewed and specialist referral considered.

Validity, reliability and internal consistency

The developmental literature reports a significant area under the ROC curve (0.89) related to its sensitivity and specificity, high Cronbach’s alpha in all tests (>0.9) and high intra-rater reliability (Pearson r >0.75).

A study confirms the good psychometric characteristics of Kessler’s psychological distress scale when administered to patients admitted to French emergency department for alcohol consumption–related disorders (Arnaud et al. 2010). Another study set out to validate the Dutch version of the K10 as well as an extended version (EK10) in screening for depressive and anxiety disorders in primary care. It reported that
the Dutch version of the K10 is appropriate for screening depressive disorders in primary care, while the EK10 is preferred in screening for both depressive and anxiety disorders (Donker et al. 2010).

References


The following questions ask about how you have been feeling over the **past 30 days**. For each question, mark the circle under the option that best describes the amount of time you felt that way.

<table>
<thead>
<tr>
<th>Question</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. During the last 30 days, about how often did you feel tired out for no good reason?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2. During the last 30 days, about how often did you feel nervous?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3. During the last 30 days, about how often did you feel so nervous that nothing could calm you down?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4. During the last 30 days, about how often did you feel hopeless?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. During the last 30 days, about how often did you feel restless or fidgety?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6. During the last 30 days, about how often did you feel so restless you could not sit still?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7. During the last 30 days, about how often did you feel depressed?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8. During the last 30 days, about how often did you feel that everything was an effort?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9. During the last 30 days, about how often did you feel so sad that nothing could cheer you up?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>10. During the last 30 days, about how often did you feel worthless?</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Chapter 9: Troubleshooting: using calculator data to assist in treatment decisions, quality improvement and casenote review

The data provided by the CAHE Outcomes Calculator allows clinicians to review patient progress throughout, and after completion of, an episode of care. It allows practitioners to consider actual response to treatment, compared with expected response. Expected response may come from an in-house review of clinical outcomes for specific conditions over a cohort of patients treated in the practice, or it could come from peer-developed benchmarks (what do other practices do?), or from the research literature (algorithms of outcome from clinical guidelines for instance).

Take as an example of reflection on outcomes throughout an episode of care, the findings from repeated administration of the Oswestry Disability Index, used to measure outcome for a patient with low back pain.

Figure 9.1: Example of one patient’s progress throughout an episode of care using the CAHE outcomes calculator

This patient received five treatments for low back pain in an episode of care. The patient’s initial Oswestry score was high, indicating that he/she rated problems in most domains of the instrument. Improvement was noted throughout the first three treatments in the episode of care, by decreasing scores in repeated administrations of the Oswestry outcomes instrument. On the fourth treatment however, an increased score was found, indicating that the patient’s condition had worsened.

What could have happened to increase the outcomes score on the fourth visit? Perhaps as a result of good response to treatment in treatments 1-3, the therapist suggested returning to work, increasing exercises or increasing activities. These strategies may have resulted in a short-term worsened score. The much improved Oswestry Disability Index outcomes score on treatment 5 however may have resulted from changed treatment approaches following treatment 4 response, such as strategies to assist with remaining at work and reduce physical load, modifying exercises or activities and/ or providing additional treatment or a referral to another practitioner.

Reflection on this episode of care outcome for quality improvement purposes should provide the practitioner with assurance that the patient benefited overall, and that a ‘glitch’ observed at treatment 4 was dealt with appropriately.
Comparing this patient’s outcome from treatment with an expected (hypothesized) benchmark of care, in which every treatment produced an incremental decrease in Oswestry score, this patient’s progress mapped relatively well to the expected care path outcome. Thus treatment in this instance produced a response in the expected range and should provide the practitioner with indications that treatment decisions were appropriate.

Now consider another case scenario, outlined as a CAHE Outcomes Calculator episode graph in Figure 6.2.

**Figure 9.2: Example of a second patient’s progress throughout an episode of care using the CAHE outcomes calculator**

This patient also received five treatments for low back pain in an episode of care. The patient’s initial Oswestry score was high, indicating that he/she rated problems in most domains of the instrument. Worsening was noted at the second treatment in the episode of care, by an increased score in second administration of the Oswestry outcomes instrument. On the third and fourth treatments the score plateaued, indicating that the patient’s condition had stabilised, but on the fifth treatment the score increased again.
Considering the hypothesized progress of outcome scores throughout the episode of care, this patient’s progress did not map well. Improvement was only noted after one treatment, whilst worsening with treatment was noted on two occasions of treatment, and plateauing was noted on two treatments.

In this patient’s case, perhaps this practitioner’s treatment may be inappropriate for the presentation and alternative methods of management should be considered. Certainly this treatment should not continue without a thorough review of the patient’s risk factors for a good outcome, and the therapist’s clinical decision-making.

Quality improvement and the CAHE Outcomes Calculator

The advantages of the CAHE Outcomes Calculator are that it allows therapists and patients to quantify patient response to treatment using choices of standard outcome measures throughout the episode of care. The response to treatment can be measured at each contact, or at whatever treatment contact intervals are deemed to be appropriate for the condition and the likelihood of response. The response to treatment throughout the episode of care can be compared with expected progress, such as that reported in clinical guidelines, or outlined in clinical indicators (i.e. 60% patients will demonstrate at least 50% improvement in one outcome of care score after five treatments). Use of the quantitative measures of outcome in the CAHE Outcomes Calculator allow quantification of the influence of risk factors on patient outcome, for instance in the example of the second patient, a review of the patient’s clinical signs, therapists’ notes and yellow flags may indicate the reasons as to why this patient’s outcomes were poorer than expected. Use of the episode of care graphs also allow therapists to quantify the influence of different funding models on patient outcome, for instance to compare patients’ responses to treatments, when they are funded by a compensable funding system (such as WorkCover or Motor Accident Insurance) or when they are privately responsible for funding treatment. This data allows clinicians to reflect on why specific individuals did not comply with expected treatment outcomes, and may highlight poor practice, inappropriate benchmarks for specific patients or opportunities for improvement in diagnosis, risk factor identification or care processes.