Reviewer ID: Ben Mortenson, Tyra Chu, Carlos L. Cano Herrera

Last updated: August 28th, 2024

**Research Summary – Craig Handicap Assessment and Reporting Technique (CHART) – Community Reintegration**

| Author Year Research Design Setting (country) | Demographics and Injury Characteristics of Sample | Validity | Reliability | Responsiveness Interpretability |
|---|---|---|---|---|
| De Wolf et al. 2010<br><br>Longitudinal study exploring reliability, validity, sensitivity to change and clinical usefulness of the CHART<br><br>Three SCI rehabilitation units in Sydney, Australia (Royal Rehabilitation Centre Sydney; Royal North Shore Hospital; and Prince of Wales Hospital) | N=58 (control n=29; intervention n=29) (45 male, 13 female) Mean age: 35.3±15.2y<br><br>Traumatic SCI<br><br>*Lesion Level* Paraplegia: 25 Tetraplegia: 33<br><br>*Impairment Grade* AIS A: 33 AIS B: 4 AIS C: 5 AIS D: 16 | See table 1. | | **Floor/Ceiling Effect:** No floor effects. Ceiling effects occurred for the Social and Cognitive dimensions at both 6 weeks post-discharge from inpatient rehabilitation (57-66% and 65-66%, respectively) and 1-year post discharge (44-66% and 84-86%, respectively).<br><br>**Interpretability:** MDC = 53.3 between Time 1 (6 weeks post-discharge from inpatient rehabilitation) and Time 2 (1 year post-discharge) The percentage of participants that met |

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| | | | | the minimum difference for CHART: 14% |

**Table 1.** Spearman rank-order correlation coefficients between CHART domains and SPRS & SF-6D domains:

**Sydney Psychosocial Reintegration Scale (SPRS)**

| *SPRS Occupation with CHART:* | *SPRS Relationships with CHART:* | *SPRS Living skills with CHART:* |
|---|---|---|
| Physical: 0.34** | Physical: 0.22 | Physical: 0.70** |
| Mobility: 0.64** | Mobility: 0.23 | Mobility: 0.64** |
| Occupation: 0.57** | Occupation: 0.28* | Occupation: 0.50** |
| Social: 0.36** | Social: 0.17 | Social: 0.28* |
| Cognitive: 0.09 | Cognitive: 0.13 | Cognitive: 0.12 |

**Short Form-6D**

| *CHART Physical with SF-6D:* | *CHART Mobility with SF-6D:* | *CHART Occupation with SF-6D:* | *CHART Social with SF-6D:* | *CHART Cognitive with SF-6D:* |
|---|---|---|---|---|
| Physical: -0.71** | Physical: -0.46** | Physical: -0.46** | Physical: -0.19 | Physical: -0.22 |
| Role: -0.23 | Role: -0.19 | Role: -0.06 | Role: 0.06 | Role: -0.12 |
| Social: -0.22 | Social: -0.25 | Social: -0.25 | Social: 0.00 | Social: -0.03 |
| Pain: -0.17 | Pain: -0.21 | Pain: -0.12 | Pain: 0.08 | Pain: -0.31* |
| Mental: -0.19 | Mental: -0.27* | Mental: -0.18 | Mental: 0.04 | Mental: -0.13 |
| Vitality: -0.22 | Vitality: -0.33* | Vitality: -0.26 | Vitality: -0.14 | Vitality: 0.04 |

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| | *p<0.05, **p<0.001<br><br>SPRS showed significant correlation coefficients with CHART (r=0.72, p<0.001).<br>A moderate and statistically significant correlation coefficient was found between the Community Integration Measure (CIM) and CHART total (r=0.47, p<0.001).<br><br>Time 1 = 6 weeks post-discharge from inpatient rehabilitation<br>Time 2 = 1 year post-discharge<br>Intervention = Received support from a coordinator to improve community reintegration after SCI. Used a whole of life approach which incorporated individualised support, liaising on behalf of the individual, and planning for the future.<br><br>Sensitivity to change of CHART (intervention group):<br>Time 1: 408.2±50.1<br>Time 2: 431.6±57.4<br><br>Results showed a statistically significant improvement between Time 1 and Time 2 for CHART (p=0.002). | | | |
| Johnston et al. 2005<br><br>Cross-sectional survey<br><br>New Jersey Outpatient SCI Center | N=107 (88M, 19F)<br>Mean age 39.1(11.16)<br>Median age 38.0<br>Mean post-injury time: 11.36(9.56) yrs<br>Median post-injury time: 8.71 yrs<br>Community-living traumatic SCI individuals | Pearson's correlation between ASIA Motor Score and:<br>CHART Total: 0.07 (P=0.54)<br>CHART Physical Total: 0.46 (P=0.001)<br>CHART Mobility Total: 0.04 (P=0.75) | | |

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| | AIS-A/B/C/D: 56.4%/20.2%/14.9%/8.5% Neurologic Category: Tetraplegia complete: 38.7% Tetraplegia incomplete: 15.1% Paraplegia complete: 37.6% Paraplegia incomplete: 8.6% | CHART Occupational Total: -0.11 (P=0.37) CHART Social Interaction Total: -0.22 (P=0.06) CHART Economic Total: -0.04 (P=0.72) | | |
| Masedo et al. 2005 Reliability and validity (comparison to the self-report Functional Independence Measure (FIM)) studied: double blind/randomized trials. | SCI clinical trial of amitriptyline for pain: n=84 subjects; 44 given amitriptyline, 40 given an active placebo. Avg. age; 41.43±10.02 years, 80% Men. Mean time since injury was 13.96 yrs (SD = 9.36 yrs) Neurological level of injury: | Correlations of the CHART with FIM-SR were positive, as expected: CHART total score: r=0.26 (p<0.01) CHART mobility subscale: r=0.30 (p<0.01) CHART physical subscale: r=0.49 (p<0.01) | | |

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| Harborview Medical Center and University of Washington's Northwest Regional SCI System | 53.6% cervical<br>38.1% thoracic<br>7.1% lumbar/sacral | Almost all subscales of the FIM-SR had moderate and significant correlations (p<0.005, p<0.001) with CHART subscales; support provided for the motor scales of FIM-SR, with the exception of locomotion subscale of FIM-SR which did not correlate significantly with the Physical Independence subscale of the CHART. | | |
| Walker et al. 2003<br><br>Cross-sectional analysis<br><br>Colorado, USA | N SCI = 236, 75% male | | **Test-retest, Intra-rater, Inter-rater:**<br>Test retest:<br>ICC: 0.87 | |
| Middleton et al. 2003 | Sample 1: People with SCI living in the | Spearman correlations of Moorong Self- | | |

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| Descriptive, correlational study, validation study of a new instrument (MSES)<br><br>Moorong Spinal Unit of the Royal Rehabilitation Centre Sydney, Sydney, New South Wales, Australia. | community who previously were at in-patient rehabilitation<br>    N=36, 28 male<br>    Mean age 36.33 (SD = 9.52)<br>    Mean time post-trauma 11.23 (SD = 9.67) years<br>    11 paraplegia, 25 tetraplegia<br>    15 incomplete, 21 complete<br><br>Sample 2: People who had recently sustained a SCI and were currently enrolled at in-patient rehabilitation<br>    N=31, 23 male<br>    Mean age 31.48 (SD = 10.46)<br>    Mean time post-trauma 2.01 (SD = 2.50) months<br>    21 paraplegia, 10 | Efficacy Scale with (Sample 1 only, N=36):<br>    CHART physical (N=29): -0.07 ($P>0.05$)<br>    CHART mobility: 0.15 ($P>0.05$)<br>    CHART occupational: 0.47 ($P<0.05$)<br>    CHART social: -0.24 ($P>0.05$) | | |

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| | tetraplegia<br>      13 incomplete, 18 complete<br><br>Sample 3: People with SCI living in the community who previously were at in-patient rehabilitation<br>      N=108, 30 male<br>      Mean age 45.26 (SD = 15.99)<br>      Mean time post-trauma 7.92 (SD = 9.83) years<br>      66 paraplegia, 42 tetraplegia<br>      58 incomplete, 49 complete | | | |
| Cusick 2001<br><br>Reliability study: level of agreement between proxies and persons | N=983 and their proxies<br>57% participants were men<br>61% of proxies were women (43% of | | **Test-retest, Inter-rater, Intra-rater:** Participant-proxy Total CHART: ICC =0.84 | |

| Author Year Research Design Setting (country) | Demographics and Injury Characteristics of Sample | Validity | Reliability | Responsiveness Interpretability |
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| with disabilities in reporting on CHART<br><br>Participants living in the community 6 months after onset of disability or completion of rehab. | proxies were participant's spouse)<br><br>Disabilities (reported separately) resulting from: SCI (224), MS (235), Traumatic brain injury (199) Stroke (177), Amputation (83), Burn (65), | | Physical Independence: ICC=0.69<br>Cognitive Independence: ICC=0.34<br>Mobility: ICC=0.86<br>Occupation: ICC=0.60<br>Social Integration: ICC=0.57<br>Economic Independence: ICC=0.59 | |
| Dijkers 1999<br><br>Follow-up survey comparing CHART to Satisfaction with Life Scale (SWLS)<br><br>1-20 years post-injury | N=2183 (1766M, 417F)<br>19% <19 years<br>37% 20-29 years<br>20% 30-39<br>12% 40-49<br>12% >50yrs.<br><br>Records from the National SCI database, containing entries since 1973. | *CHART scores were associated with those for the Satisfaction With Life Scale (SWLS).*<br><br>**ANOVA and Eta².**<br>All four CHART subscales were significantly correlated to SLWS scores | | |

| Author Year Research Design Setting (country) | Demographics and Injury Characteristics of Sample | Validity | Reliability | Responsiveness Interpretability |
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| Followed up with SCI care | | • Physical independence score Eta²= 0.14, F= 85.17, df=4 (p<0.001)<br>• Mobility score Eta²= 0.11, F= 159.18, df=3 (p<0.001)<br>• Social integration score Eta²= 0.11, F= 84.3, df=3 (p<0.001)<br>• Occupation score Eta²= 0.14, F= 85.18, df=4 (p<0.001) | | |
| Hall et al. 1998<br><br>Analysis of SCI Model Systems database: CHART follow-up at 1, 2, 5 years post-injury<br>Data used for this analysis was at one time point: April 1997 | N=1,998<br>81.5% males<br>67% <31 years of age<br>21% 21-40<br>22% >41<br><br>Traumatic Spinal Cord Injury with inpatient rehabilitation services:<br>18% high tetraplegia<br>34% low tetraplegia | <u>Correlations:</u><br>GENDER<br>• Gender and Mobility Subscales was significant r=-0.06 (p≤0.05)<br>• Males were significantly more mobile than Females t=2.998 (p<0.01)<br>AGE | | **Floor/Ceiling Effect:**<br>See table 1.<br><br>**Interpretability:**<br>See table 2. |

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| No data available | 48% paraplegia | • Age and all Subscales were significant r= -0.20 to -0.10 (p≤0.0001) <br> INJURY <br> • Injury level and all Subscales, except economic self-sufficiency, were significant r=0.11 to 0.45, (p≤0.0001) <br> • Completeness of injury and all Subscales, except social integration, were significant r=0.07 to 0.17 (p≤0.05) <br> • Years since injury and Subscales r=0.09 to 0.21 (p≤0.0001) <br> RACE/ETHNICITY <br> • Race/ethnicity and all Subscales r=0.12 to 0.34 (p≤0.0001) | | |

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| | | EDUCATION/OCCUPATION<br>• Education and Subscales r=0.12 to 0.33 (p≤0.0001)<br>• Occupation and Subscales r=0.24 to 0.60 (p≤0.0001)<br>MARITAL STATUS<br>• Marital status and all Subscales, except physical independence and mobility, were significant r=0.08 to 0.32 (p≤0.05) | | |

Table 1. Percentage of sample who received maximum score on CHART subscales

| | AIS A, B, or C | | | AIS D |
|---|---|---|---|---|
| | High tetra | Low tetra | Para | All |
| **Subscale** | % (n) | % (n) | % (n) | % (n) |
| Physical Independence | 6 (14) | 18 (89) | 56 (442) | 63 (213) |
| Mobility | 13 (34) | 34 (172) | 49 (393) | 55 (189) |
| Occupational status | 10 (27) | 23 (117) | 34 (270) | 36 (125) |
| Social integration | 39 (103) | 45 (224) | 45 (341) | 52 (172) |
| Economic self-sufficiency | 44 (56) | 41 (113) | 49 (225) | 62 (123) |

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|---|---|---|---|---|
| | Table 2. | | | |

Table 2.

| Subscale: | AIS A,B, or C High tetraplegia: Mean (SD) [n] | AIS A,B, or C Low tetraplegia: Mean (SD) [n] | AIS A,B, or C Paraplegia: Mean (SD) [n] | AIS D All: Mean (SD) [n] |
|---|---|---|---|---|
| Physical Independence | 49.9 (30.4) [253] | 71.8 (28.3) [498] | 90.3 (19.8) [787] | 90.7 (20.6) [340] |
| Mobility | 58.5 (28.0) [267] | 76.0 (25.6) [513] | 85.5 (21.0) [804] | 86.2 (22.4) [346] |
| Occupational status | 34.5 (32.9) [270] | 51.0 (36.9) [512] | 61.8 (35.5) [793] | 62.1 (36.5) [347] |
| Social integration | 78.7 (25.6) [261] | 83.5 (23.1) [493] | 85.6 (20.4) [760] | 86.7 (20.2) [331] |
| Economic self-sufficiency | 59.6 (40.7) [128] | 62.0 (36.7) [274] | 66.0 (37.6) [460] | 77.6 (32.0) [201] |
| Total score | 294.1 (101.4) [116] | 369.2 (89.9) [259] | 404.1 (87.5) [419] | 420.5 (85.3) [186] |

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| Whiteneck et al. 1992<br><br>Design and development of CHART: psychometric evaluation. & weighting scheme | 135 SCI individuals;<br>16% Women<br>Avg. age = 33. range 16-74<br><br>41 complete quadriplegia,<br>38, incomplete quadriplegia, | Significantly different CHART scores between high & low level of handicap groups support the validity of the CHART CHART total score t=6.36, p<0.001 subscales: | **Test-retest, Inter-rater, Intra-rater:** CHART administered by same examiner twice (1 week apart) to each subject<br>**test-retest reliability** coefficient = 0.93 for overall CHART score. | |

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| 2-35 years post recovery living in the community | 42 complete paraplegia, 14 incomplete paraplegia <u>Rehab professional rating</u> 65 low level handicap 70 high handicap | • physical independence t=4.54, p<0.001 • mobility t=3.89, p<0.001 • occupation t=6.8, p<0.001, social integration t=2.02, p<0.05 | <u>Individual dimensions:</u> • physical dimensions 0.92 • mobility 0.95, • occupation 0.89 • economic self-sufficiency 0.80, • social integration 0.81. **Subject-proxy**, r=0.83 for total chart score. <u>Individual dimensions:</u> • physical dimensions 0.8 • mobility 0.84, • occupation 0.81 • economic self-sufficiency 0.69, • social integration 0.29. (p<0.001) better agreement when proxy lives with | |

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| | | | subject (social integration 0.57) Item separation defined 11 statistically distinct handicap strata. Item separation reliability = 0.99, indicating a well calibrated scale. | |

**Research Summary – Craig Handicap Assessment and Reporting Technique (CHART) – Community Reintegration – Cross-cultural Validation Studies**

| Author Year Research Design Setting (country) | Demographics and Injury Characteristics of Sample | Validity | Reliability | Responsiveness Interpretability |
|---|---|---|---|---|
| Tozato et al. 2005 <br><br> Test-retest and discriminative validity study; CHART Japanese version <br><br> NRCD, Japan | 293 participants in validity study; upper age limit =60 years old; 246M, 47F, avg. age = 38.3 years <br> 54 participants in test-retest measure; 45M, 9F; avg. age = 42.5 years <br> mean time since injury = 8.7 (SD = 6.6) <br><br> 926 SCI discharged from the National Rehabilitation Center for the Disabled (NRCD) between 1992 – 2001 <br> Meant | Validity (compared score differences between employed and unemployed) acceptable in all domains, with exception of Social integration. Employed respondents exhibited significantly higher sub scores than unemployed respondents in all CHART subscales except Social Integration <br> CHART-J total score t=11.39, p<0.0001; <br> Physical independence t=4.795, p<0.0001; <br> Mobility t=11.092, p<0.0001; <br> Occupation t=15.030, p<0.0001 | **Test-retest, Intra-rater, Inter-rater:** Test-retest reliability with 21-25 day interval (Pearson's r): <br><br> CHART-J total score r=0.78, p<0.001; <br> Physical independence r=0.53, p<0.001; <br> Mobility r=0.96, p<0.001; <br> Occupation r=0.86, p<0.001 <br> Social Integration r=0.78, p<0.001 <br> Economy r=1.00, p<0.001 | **Interpretability:** See table 1. |

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| | | Social Integration t=0.997 p=0.319<br><br>Economy t=3.799, p<0.0001 | | |

**Table 1.** CHART-J (Japanese version) mean (SD) scores and SEM:

| Domain: | Mean (SD) CHART-J score: | SEM (calculated from data in this article): | MDC (calculated from data in this article): |
|---|---|---|---|
| Physical independence | 93 (12) | 8.2 | 22.8 |
| Mobility | 77 (25.9) | 5.2 | 14.4 |
| Occupation | 56.8 (39.6) | 14.8 | 41.1 |
| Social Integration | 76.4 (24.7) | 11.6 | 32.1 |
| Economy | 75.5 (28.1) | 0 | 0 |
| CHART-J total score: | 378.7 (86.8) | 40.7 | 112.9 |