### Reviewer ID: Nicole Elfring, John Zhu, Jeremy Mak, Kyle Diab

**ICF Level:** Activity

**Type of Outcome Measure:** Timed Up and GO (TUG) walking test

<table>
<thead>
<tr>
<th>Author ID Year</th>
<th>Study Design</th>
<th>Setting</th>
<th>Population (sample size, age) and Group</th>
</tr>
</thead>
</table>
| Duffell, et al. 2015 | Outpatient service at the Rehabilitation Institute of Chicago | N=83, (26F, 57M)  
Age: 18 - 50  
Mean age = 47.28  
Time Since Injury: > 12 months  
All AIS C or D |
| Lam et al. 2008 | Systematic review | Data reported in study was from Van Hedel, Wirz & Dietz 2005 (population characteristics available above). |
| Lemay & Nadeau 2010 | Longitudinal study | 32 SCI subjects (25 males, 7 females)  
mean age: 47.9± 12.8 yrs  
Neurological level: 15 paraplegic, 17 tetraplegic  
Level of injury: 17 cervical, 10 thoracic, 5 lumbar  
Type of injury: 21 traumatic, 11 non-traumatic  
Inclusion criteria: (1) Adults with SCI AIS D either of traumatic or non-traumatic etiology and (2) the ability to walk 10m independently with or without upper-extremity assistive devices. |
Validity Test:  
FIM-L 6:  
N=33, mean age = 50.9±13.5, Time since injury: 59.5 ± 85.8 months  
AIS-C=9, AIS-D=24, tetraplegia=9, paraplegia=24  
FIM-L 7:  
N=33, mean age = 50.23±9.5, Time since injury: 44±64.5 months  
AIS-C=1, AIS-D=32, tetraplegia=13, paraplegia=20  
Reliability Test:  
N=16, mean age = 50.8±10.3, Time since injury: 30.6±19.9 months  
AIS-C=2, AIS-D=15, tetraplegia=6, paraplegia=10 |
| Poncumhak, et al. 2014 | Cross-sectional | A tertiary rehabilitation center in Thailand  
N=60, 42 male  
Mean age = 49.95  
Mean time since injury = 55.5 yrs |
| Saensook, et al. 2014 | Cross-sectional | N=85, 59 male |
| Srisim et al. 2015 | Prospective cohort study | Tertiary Rehab Center (Thailand)  
N = 83  
23 Multiple Fallers (Age: 44.21 ± 10.7):  
Time Since injury (months): 58.70 ± 60.03  
AIS C: 9 (39%)  
60 Non-multiple fallers (52.68 ± 11.21):  
Time Since injury (months): 46.72 ±36.42  
AIS C: 12 (20%) |
### van Hedel 2008
**Retrospective analysis**
The European Multicenter Study of Human Spinal Cord Injury Database. 19 SCI rehabilitation centers across Europe.

N = 6 – 127 (range seen below)
Acute, Subacute, Chronic SCI

### van Hedel, Wirz & Dietz 2005
**Cross-sectional and repeated assessments**
SCI center of a university hospital in Switzerland

Validity study participants:
N = 75 (30 females & 45 males)
Mean age = 54±20 years
Cervical = 25
Thoracic = 21
Lumbar = 21
Sacral = 8

Reliability study participants:
N = 22 (8 females & 14 males)
Mean age = 52±20 years
Cervical = 7
Thoracic = 7
Lumbar = 7
Sacral = 1

### 1. RELIABILITY

<table>
<thead>
<tr>
<th>Author ID</th>
<th>Internal Consistency</th>
<th>Test-retest, Inter-rater, Intra-rater</th>
</tr>
</thead>
</table>
| Van Hedel, Wirz & Dietz 2005 | No data available | Pearson correlations
Intrarater r=0.979, P<.001
Interrater r=0.973, P<.001
Bland-Altman plot:
Significant difference in intra-rater (3.3±7.0s) using Wilcoxon signed-rank test at p=0.001. No significant differences with inter-rater assessment (-0.3±7.5s).
|
| Poncumhak, et al. 2013 | | Interrater ICC = 0.999 (0.999-1.000) for FIM-L 6 (N=8); 1.000 (0.999-1.000) for FIM-L 7 (N=8)
|
| Poncumhak, et al. 2014 | | Interrater ICC (N=20) = 0.998 (95%CI=0.997~0.999), p<0.001
|
| Srisim et al. 2015 | | Interrater ICC= 0.999 (0.999-1.000) |
### 2. VALIDITY

<table>
<thead>
<tr>
<th>Author ID</th>
<th>Validity</th>
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</table>
| Van Hedel, Wirz & Dietz 2005 | Correlation of the TUG with other scales measuring the same construct as the TUG:  
10MWT and TUG: $r = 0.89$, $n=70$  
6MWT and TUG: $ρ = -0.88$, $n=62$  
  
Subgroups:  
  
WISCI scores of 0 to 10:  
10MWT and TUG: $r=0.92$, $n=15$  
6MWT and TUG: $r=-0.96$, $n=15$  
  
WISCI scores of 11 to 20  
6MWT and TUG: $r=-0.78$, $n=47$  
10MWT and TUG: $r=0.88$, $n=27$  
  
Dependent walking group:  
6MWT and TUG: $ρ=-0.74$, $n=18$  
10MWT and TUG: $r=0.88$, $n=27$  
  
Independent walking group:  
6MWT and TUG: $ρ=-0.88$, $n=44$  
10MWT and TUG: $ρ=-0.86$, $n=43$  
  
Walking Index for Spinal Cord Injury II (WISCI II): $ρ = -0.76$, $n=67$  
  
Subgroups:  
  
WISCI II scores of 0 to 10: $ρ = 0.16$, $n=20$  
WISCI II scores of 11 to 20: $ρ = -0.65$, $n=47$  
WISCI II dependent walking group: $ρ = -0.22$, $n=23$  
WISCI II independent walking group: $ρ = -0.66$, $n=45$  |
| Lemay & Nadeau 2010 | Spearman’s correlations with other walking scales: (all $P<0.01$)  
  
Berg Balance Scale: -0.815  
  
Spinal Cord Injury-Functional Ambulation Inventory (SCI-FAI) parameter: -0.761  
  
SCI-FAI assistive devices: -0.802  
  
SCI-FAI mobility: -0.724  
  
WISCI II: -0.799  
  
10 Meter Walk Test:  
-0.646 (For 10 MWT, Pearson’s product moment correlation instead of Spearman’s $ρ$) |
| Poncumhak, et al. 2013 | With 10MWT Scores: point biserial correlation coefficient = -0.692 ($P<0.05$) |
| Poncumhak, et al. 2014 | Score of <18s “had good-to-excellent capability to determine the ability of walking without a walking device of subjects with SCI:  
  
ROC curve area: 0.95 (95%CI=0.89~1.00)  
  
Sensitivity=90%  
  
Specificity=87% |
| Sris et al. 2015 | Unable to predict and discriminate non-multiple fallers and multiple fallers  
  
Ability of cut-off score ($≥ 26$ s) to predict risk of multiple falls:  
  
Sensitivity: 56%  
  
Specificity: 69%  
  
AUC: 0.57 |
<p>| Van Hedel 2008 | Construct validity with the 10 MWT over time: |</p>
<table>
<thead>
<tr>
<th>Time Since Injury</th>
<th>N</th>
<th>Spearman Rho</th>
<th>R2 (adjusted value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 weeks</td>
<td>6</td>
<td>0.81*</td>
<td>0.96</td>
</tr>
<tr>
<td>1 month</td>
<td>74</td>
<td>0.87**</td>
<td>0.57</td>
</tr>
<tr>
<td>3 months</td>
<td>136</td>
<td>0.95**</td>
<td>0.75</td>
</tr>
<tr>
<td>6 months</td>
<td>131</td>
<td>0.96**</td>
<td>0.76</td>
</tr>
<tr>
<td>12 months</td>
<td>127</td>
<td>0.92**</td>
<td>0.72</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.001

3. RESPONSIVENESS

<table>
<thead>
<tr>
<th>Author ID</th>
<th>Responsiveness</th>
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</thead>
<tbody>
<tr>
<td>Saensook, et al. 2014</td>
<td>Non-ambulative assistive device patients perform significantly better than patients with device (p&lt;0.001); Cane users perform significantly better than walker (p&lt;0.001) and crutches users. (p&lt;0.05)</td>
</tr>
</tbody>
</table>

4. FLOOR/CEILING EFFECT – no data available

5. INTERPRETABILITY

<table>
<thead>
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<th>Interpretability</th>
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<tbody>
<tr>
<td>Van Hedel et al. 2005</td>
<td>Mean (SD) TUG score: 36 (27) seconds</td>
</tr>
<tr>
<td></td>
<td>Range: 8-156 seconds</td>
</tr>
<tr>
<td>Lemay &amp; Nadeau 2010</td>
<td>Mean (SD) TUG scores of the whole group and subgroups:</td>
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<tr>
<td></td>
<td>Total group: 17.0 (18.7), range: 6.4-111.3</td>
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<tr>
<td></td>
<td>Paraplegia: 19.7 (25.9), range: 6.4-111.3</td>
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<tr>
<td></td>
<td>Tetraplegia: 14.6 (8.8), range: 6.5-36.7</td>
</tr>
<tr>
<td>Lam et al. 2008 (systematic review)</td>
<td>Calculated from data from Van Hedel et al. 2005:</td>
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<tr>
<td></td>
<td>SEM = 3.9 seconds</td>
</tr>
<tr>
<td></td>
<td>MDC = 10.8 seconds</td>
</tr>
<tr>
<td>Duffell, et al. 2015</td>
<td>MCID = -14.5s</td>
</tr>
<tr>
<td>Poncumhak, et al. 2014</td>
<td>SEM = 0.41</td>
</tr>
<tr>
<td>Srisim et al. 2015</td>
<td>SEM: 0.23</td>
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</tbody>
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