Reviewer ID: Carlos L. Cano Herrera, Matthew Querée, Janice Eng

Last updated: December 31, 2024

Research Summary – Toronto Rehabilitation Institute-Hand Function Test (TRI-HFT) – Upper Limb

Author Year Country Research Design Setting	**Demographics and Injury Characteristics of Sample**	**Validity**	**Reliability**	**Responsiveness Interpretability**
Kapadia et al. 2012 To evaluate the interrater reliability, construct validity, and sensitivity of the TRI-HFT, within an interventional RCT. Rehabilitation setting in Toronto	N=21 participants with traumatic incomplete (AIS B-D) SCI with injury level C4-C7; Time since injury: <6 months Unable to grasp and manipulate objects unilaterally or bilaterally to allow independent performance of activities of daily living.	**Construct validity** post-therapy: • For the right hand between TRI-HFT and FIM self-care subscore: Adequate, r=0.56 • For the right hand between TRI-HFT and the SCIM self-care subscore: Adequate, r=0.48 • For the left hand between TRI-HFT and FIM self-care subscore: Excellent, r=0.73 • For the left hand between TRI-HFT and the SCIM self-care subscore: Excellent, r=0.62	Excellent **interrater reliability:** • ICC=0.98 for pretherapy total score of the right and left hand. • ICC=0.99 for posttherapy total score of the right and left hand.	

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Kapadia et al. 2021 Observational study to evaluate the inter-rater and intra-rater reliability; and criterion and construct validity of the 3D printed TRI-HFT (3D TRI-HFT) in individuals with SCI Inpatient Rehabilitation Hospital	This study was a sub-study conducted within two single arm interventional studies that aimed at assessing the feasibility and efficacy of EEG-Triggered Functional Electrical Stimulation Therapy for Upper Limb Rehabilitation: • Sub-acute study: ○ N=4 ○ 3M, 2F ○ Mean age 51.8 years ○ Level of injury: C4 (n = 4), C5 (n 1) ○ AIS B (n=2), AIS C (n=2), AIS D (n=1) • Chronic study: ○ N=3 ○ 2M, 1F ○ Mean age 57.5 years	**Construct and criterion validity:** For the sub-acute and chronic studies, moderate to strong correlations were found between 3D TRI-HFT object manipulation scores and the FIM and SCIM selfcare sub-scores, with r values in the range of 0.7–0.8. Strong correlations were found between the various components of GRASSP and the 3D TRI-HFT, with r values exceeding 0.9. Full results are available in table 1.	**Inter-rater reliability:** For both the sub-acute and chronic SCI study, it was found a statistically significant strong correlation between the two assessors for the 10-object manipulation component of the 3D TRI-HFT with an ICC=0.994 (95% CI: 0.985–0.998; p<0.000) and ICC=0.990 (95% CI:0.976–0.996; p<0.000) respectively. The inter-rater reliability for the 9 rectangular blocks could not be assessed for both studies as the assessor had difficulty identifying	

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	○ Level of injury: C4 (n=3) ○ AIS B (n=1), AIS C (n=2).		the blocks based on their weight and texture from the video recorded assessments. **Intra-rater reliability:** A statistically significant strong correlation was found between the first and second rating on the 10-object manipulation component of the TRI-HFT within each assessor. ICC values for the sub-acute and chronic study are ICC=0.995 (95% CI: 0.992–0.998; p<0.000) and ICC=0.999 (95% CI: 0.999–1.00; p<0.000) respectively.	

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Table 1.

Outcome Measure	3D TRI-HFT Object Manipulation	3D TRI-HFT Rectangular Blocks	3D TRI-HFT Instrumented Cylinder	3D TRI-HFT Instrumented Credit Card	3D TRI-HFT Bar
Sub-acute study					
FIM-Selfcare sub-score	0.770**	0.760**	0.669**	0.705**	0.636**
SCIM-Selfcare sub-score	0.769**	0.758**	0.656**	0.700**	0.625**
GRASSP Strength	0.946**	0.918**	0.846**	0.774**	0.837**
GRASSP Sensation	0.523	0.512	0.346	0.235	0.280
GRASSP Qualitative Prehension	0.951**	0.941**	0.843**	0.800**	0.841**
GRASSP Quantitative Prehension	0.974**	0.938**	0.889**	0.804**	0.885**
Chronic study					
FIM-Selfcare sub-score	0.756**	0.759**	0.481	0.608**	0.527
SCIM-Selfcare sub-score	0.725**	0.726**	0.464	0.578**	0.540
GRASSP Strength	0.936**	0.938**	0.737**	0.731**	0.601**

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<table>
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<tr><td></td><td>
<table>
<tr><td>GRASSP Sensation</td><td>0.274</td><td>0.284</td><td>0.053</td><td>0.123</td><td>-0.035</td></tr>
<tr><td>GRASSP Qualitative Prehension</td><td>0.965**</td><td>0.965**</td><td>0.779**</td><td>0.851**</td><td>0.635**</td></tr>
<tr><td>GRASSP Quantitative Prehension</td><td>0.997**</td><td>0.995**</td><td>0.775**</td><td>0.807**</td><td>0.633**</td></tr>
</table>
** Correlation is significant at the 0.01 level (2-tailed).
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<tr><td>Nagai et al. 2018

To establish the reliability and validity of the TRI-HFT as an evaluation tool of unilateral gross motor function of the hand for SCI or hemiplegic stroke patients.</td><td>N=10 with C5 to C7 SCI
8M, 4F
N=10 with stroke
Mean (SD) age 46 (17.6) years

*The content validity of the TRI-HFT was established through discussions with two third-party occupational therapy experts in the field of SCI rehabilitation, who critically reviewed the items in the test.</td><td>Content Validity:
• Four main themes were identified: 1) assessment guidelines; 2) scoring criteria; 3) internal consistency; and 4) activity-based tasks.
• Strict administration and scoring guidelines are required for standardization of the TRI-HFT. To improve the</td><td>Inter-Rater Reliability: The Spearman correlation coefficient was 1.0 (p<0.01).

Intra-Rater Reliability: The Spearman correlation coefficient was 1.0 (p<0.01).</td><td>Responsiveness:
Nine participants with baseline TRI-HFT scores of zero were treated with FES plus/minus OT for six weeks. At the end of the 6 weeks, 6 of the participants attained a significant improvement (20%) in their TRI-HFT scores. Three participants had no improvement in their TRI-HFT scores (remained at zero). The Wilcoxon Signed</td></tr>
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		sensitivity and prevent floor and ceiling effects, the experts proposed a scoring scale with more gradations than the existing 3-point ordinal scale. Potential variability in shoulder and trunk instability may influence the scores. The use of ADLs to assess hand function significantly enriches the value of the results obtained from the TRI-HFT.		Ranks Test resulted in z=2.201, p=0.028.