Reviewer ID: Carlos L. Cano-Herrera, Elsa Sun

Last updated: 31 December 2024

Research Summary - Van Lieshout Test Short Version (VLT-SV) – Upper Limb

Author Year Research Design Setting (country)	**Demographics and Injury Characteristics of Sample**	**Validity**	**Reliability**	**Responsiveness Interpretability**
Franke et al. 2013 Prospective Retrospective longitudinal cohort study to assess responsiveness of the VLT to changes in arm hand skilled performance. Long-term follow up (1 and 5 years after start of inpatient rehabilitation) Eight rehabilitation centres in the Netherlands with specialised	N = 55 (40M, 15F) Mean (SD) age: 38 (12.93) years (18-64) Level of Injury: C3-C6: N=49 C7-T1: N=6 AIS A-B: N=38 AIS C-D: N=17 5 measurement moments: t1 = start of active rehabilitation (N=47) t2 = at 3 months after the start (N=45) t3 = at discharge from the rehabilitation centre (N=54) t4 = 1 year after discharge (N=42) t5 = 5 years after discharge (N=29)	Motor completeness MSUE and pain were significantly related to the VLT score (P<.001, P<.001, P=0.015, respectively). Age, gender and lesion level had no significant relationship . Final multilevel regression model for the total score of the VLT-SV: Please see Table 1 below. After the backward selection procedure, three independent variables, namely, incomplete lesion (P<.001), high motor	**Test-Retest:** ICC for more affected hand = 0.98 ICC for less affected hand = 0.93	**Responsiveness** Scores of VLT improved significantly during in-patient rehabilitation (mean: t1=25; t3=33) (P=.005), scores remained unchanged at 1 year (t4=32) and 5 years (t5=32) (P=.903) after in-patient rehabilitation.

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<tr><th>Author Year
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<tr><td>spinal cord injury departments.

Netherlands</td><td></td><td>score upper extremity (P<.001) and no pain in the tested arm (P=0.015) were found to be significantly related to the total score of the VLT-SV. The relationship was positive, that is, an incomplete lesion adds 3.0 extra points, no pain in the tested arm adds 2.6 points and every point of the MSUE adds 1.1 point to the total VLT-SV score.</td><td></td><td></td></tr>
<tr><td></td><td colspan="4">Table 1
<table><tr><td></td><td colspan="2">VLT total score</td></tr><tr><td></td><td>β (s.e.)</td><td>P</td></tr><tr><td>Intercept</td><td>2.074 (2.569)</td><td>--</td></tr><tr><td>Change from t1-t3</td><td>-0.518 (1.739)</td><td>.766</td></tr><tr><td>Change from t2-t3</td><td>-1.239 (1.350)</td><td>.359</td></tr><tr><td>Change from t3-t4</td><td>0.474 (1.379)</td><td>.731</td></tr></table></td></tr>
</table>

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	Change from t3-t5 | 10.258 (2.816) | <.001 Completeness | -2.966 (1.161) | <.001 Motor score – upper extremity | 1.115 (0.059) | <.001 Pain tested arm | -2.595 (1.068) | .015 Lesion level | NS | -- Age | NS | -- Gender | NS | --			
Post et al. 2006 Two validation studies Study 1: The VLT-SV was administered twice (7 days between both) to a sample of 12 persons with tetraplegia. Designed to assess inter-rater reliability.	Study 1 N=12 (9M, 3F) Mean (SD) age=43.2 (12.7) Mean (SD) time since injury=13.0 (11.2) years Hand surgery performed: 8.3% for left hand, 41.6% for right hand Please see Table 2 below.	Study 2: **Spearman Correlation between:** [L= left hand, R=right hand] VLT-SV and GRT =0.87 (L) and 0.90 (R) VLT-SV and motor level of injury: 0.58 (L) and 0.65 (R) VLT-SV and ASIA impairment scale: 0.35 9L) and 0.69 (R) VLT-SV and International	**Internal Consistency** Study 2: Cronbach's α Left hand=0.88 Right hand=0.94 Most item-rest correlations were above 0.60; only the left-hand scores of the 3 bimanual items showed relatively poor correlations with the rest of the items, although these were still above 0.30.	**Interpretability** The limit of agreement was defined to be +/- 2 SDs of the difference score, indicating the minimum difference between scores exceeding chance. The Bland Altman plot showed that agreement between scores of both raters was independent of the height of the

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Study 2: Cross-sectional study designed to assess convergent validity. Two specialized rehabilitation centres in The Netherlands. Netherlands	AIS impairment scale: A=50%; B=16.7%; C=0%; D=33.3% Study 2: N=55 (46M, 9F) Mean (SD) age=42.1 (13.5) Mean (SD) time since injury=11.0 (8.5) years Hand surgery performed: 18.2% for left hand, 29.1% for right hand Please see Table 3 below. AIS impairment scale: A=43.6%; B=30.9%; C=9.1%; D=16.4%	classification (motor): 0.67 (L) and 0.85 (R) VLT-SV and FIM self-care: 0.61 (L) and 0.69 (R) VLT-SV and FIM transfers: 0.71 (L) and 0.72 (R) As expected, correlations between the VLT-SV scores and scores on the other measures besides the GRT were lower than correlations between the VLT-SV and GRT. However, 8 out of 10 correlations were still strong.	The distribution of total scores for the left and right hand did not deviate significantly from the normal distribution (left hand: Z=0.443, P=.990; right hand: Z=0.714, P=.687). Spearman correlation between left- and right- hand scores = 0.50 **Test-retest, Inter-rater, Intra-rater** Study 1: Interrater reliability ICC Left hand=0.98 (95% CI: 0.94-0.99) Right hand=0.99 (95% CI: 0.94-1.00) Weighted Kappa=0.74-0.99 for 9	mean score. The limits of agreement was about +/- 0.5 points, indicating that an increase of 0.5 points on the VLT-SV represents an improvement of functioning exceeding measurement error. Please see Table 4

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<tr><td></td><td></td><td></td><td>out of 10 items (“writing”=0.47 and 0.48).</td><td></td></tr>
<tr><td></td><td colspan="4">Table 2
<table><tr><td>International classification (% in each category)</td><td>Left hand</td><td>Right hand</td></tr><tr><td>0-2</td><td>16.6</td><td>25.0</td></tr><tr><td>3-5</td><td>74.9</td><td>50.0</td></tr><tr><td>6-8</td><td>8.3</td><td>25.0</td></tr><tr><td>9-10</td><td>0</td><td>0</td></tr></table></td></tr>
<tr><td></td><td colspan="4">Table 3
<table><tr><td>International classification (% in each category)</td><td>Left hand</td><td>Right hand</td></tr><tr><td>0-2</td><td>21.8</td><td>20.0</td></tr><tr><td>3-5</td><td>49.1</td><td>49.1</td></tr><tr><td>6-8</td><td>10.9</td><td>12.8</td></tr><tr><td>9-10</td><td>18.2</td><td>18.2</td></tr></table></td></tr>
<tr><td></td><td colspan="4">Table 4
<table><tr><td>Item</td><td>Left hand Mean (SD)</td><td>Right hand Mean (SD)</td></tr></table></td></tr>
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<tr><td></td><td>
<table>
<tr><td>Forward reaching</td><td>3.4 (1.7)</td><td>3.5 (1.6)</td></tr>
<tr><td>Arch task</td><td>3.4 (1.9)</td><td>3.5 (1.9)</td></tr>
<tr><td>Thumb closure</td><td>2.9 (1.8)</td><td>3.1 (1.7)</td></tr>
<tr><td>Grip function thumb</td><td>2.3 (1.7)</td><td>2.2 (1.6)</td></tr>
<tr><td>Thumb strength</td><td>2.7 (1.5)</td><td>3.1 (1.3)</td></tr>
<tr><td>Finger closure</td><td>3.0 (1.8)</td><td>3.1 (1.8)</td></tr>
<tr><td>Finger strength</td><td>3.0 (1.9)</td><td>3.5 (1.7)</td></tr>
<tr><td>Pen grip</td><td>1.6 (1.8)</td><td>3.1 (1.4)</td></tr>
<tr><td>Lighting a match</td><td>1.6 (1.9)</td><td>3.1 (1.8)</td></tr>
<tr><td>Opening a bottle</td><td>1.4 (1.8)</td><td>2.7 (1.4)</td></tr>
<tr><td>Mean total VLT score</td><td>2.6 (1.3)</td><td>3.1 (1.3)</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td></td><td>
Table 5
<table>
<tr><th>Test</th><th>Total score</th><th>A-B score</th><th>C-D score</th><th>C3-C6 score</th><th>C7-T1 score</th></tr>
<tr><td>VLT3-1</td><td>24.14 (21.86)</td><td>21.59 (17.78)</td><td>27.6 (26.47)</td><td>24.39 (19.68)</td><td>23.56 (26.86)</td></tr>
<tr><td>VLT2-1</td><td>18.3 (19.19)</td><td>15 (14.49)</td><td>22.8 (23.77)</td><td>18.54 (18.2)</td><td>17.78 (21.84)</td></tr>
<tr><td>VLT3-2</td><td>5.83 (8.69)</td><td>6.59 (9.6)</td><td>4.8 (7.33)</td><td>5.85 (8.75)</td><td>5.78 (8.81)</td></tr>
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Research Summary - Van Lieshout Test Short Version (VLT-SV) – Upper Limb - Cross-cultural Validation Studies

Author Year Research Design Setting (country)	**Demographics and Injury Characteristics of Sample**	**Validity**	**Reliability**	**Responsiveness Interpretability**
Berardi et al. 2019 Psychometric study Italian version Three Italian spinal units Italy	N = 61 (80%M) Mean age: 47±14.76 years AIS: 25A, 15B, 15C, 6D Level of injury number: 3 C3, 13 C4, 20 C5, 19 C6, 6 C7	**Pearson coefficient with level of injury** =0.51 **Concurrent validity:** Pearson's correlation between VLT-SV-IT and Italian version of Jebsen Taylor Hand Function Test (JTHFT) (Negative Linear correlations) Right hand: -0.94- (-0.15) Left hand: -0.82-(-0.06) **Pearson correlation** between VLT-SV-IT and Italian version of SCIM III=0.07	**Internal Consistency** Cronbach's α: Left hand=0.95 Right hand=0.95 **Test-retest, Inter-rater, Intra-rater Test-retest reliability** (VLT-SV-IT) ICC=0.90 **Inter-rater reliability** (original VLT-SV) ICC=0.98	