Vestibular Disorders Activities of Daily Living Scale

• Developed by Helen Cohen EdD, OTR
• 28-item scale with 3 subscales:
  – Functional
  – Ambulation
  – Instrumental
• Level of independence is rated from 1-10 or N/A
• Median score utilized as the summary score
Dynamic Gait Index

- Developed by Anne Shumway-Cook (1995)
- 24 point scale
- 8 tasks scored from 0-3
- < 10 minutes
- Can be used to measure progress
Dynamic Gait Index

- < or = to 19 correlated with high fall risk (Shumway-Cook 2000)
- Moderate interrater reliability (0.68) possibly secondary to lack of descriptive grading criteria (Wrisley 2003)
- Possible ceiling effect for patients with vestibular disorders
Timed Up and Go

- Measure time involved with rising from standard chair with armrests, walking 3m or 10 ft, turning, and returning to sitting position

- Usually < one minute
- Correlated with fall risk and functional status
- >13 seconds correlated with falls
- >30 seconds probable ADL impairment
Five Times “Sit to Stand” Test (FTSST)

• Chair: 43 cm high
• Subjects encouraged to perform test as quickly as possible
• Arm placed across chest
• Reliability .89 (Lord 2002)

• Moderately responsive to change and moderately related to measure of gait and dynamic balance (Meretta 2006)
• Score of >15 seconds may identify high risk of falls (Buatois 2008)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Younger Control Subjects (n=32)</th>
<th>Younger Subjects With Balance Dysfunction (n=47)</th>
<th>Older Control Subjects (n=49)</th>
<th>Older Subjects With Balance Dysfunction (n=46)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (y)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{x}$</td>
<td>41</td>
<td>48</td>
<td>73</td>
<td>75</td>
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<tr>
<td>SD</td>
<td>11</td>
<td>10</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Range</td>
<td>23–57</td>
<td>14–59</td>
<td>63–84</td>
<td>61–90</td>
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<tr>
<td><strong>Sex</strong></td>
<td></td>
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<tr>
<td>Men</td>
<td>16</td>
<td>15</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Women</td>
<td>16</td>
<td>32</td>
<td>26</td>
<td>28</td>
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<tr>
<td><strong>FTSST score (s)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>$\bar{x}$</td>
<td>8.2</td>
<td>15.3</td>
<td>13.4</td>
<td>16.4</td>
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<tr>
<td>SD</td>
<td>1.7</td>
<td>7.6</td>
<td>2.8</td>
<td>4.4</td>
</tr>
<tr>
<td>Range</td>
<td>4.9–12.7</td>
<td>6.4–56.6</td>
<td>7.5–19.6</td>
<td>9.6–27.5</td>
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<tr>
<td>95% CI</td>
<td>7.5–8.8</td>
<td>13.1–17.6</td>
<td>12.5–14.1</td>
<td>15.1–17.7</td>
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<tr>
<td><strong>DGI score</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$\bar{x}$</td>
<td>23.9</td>
<td>18.0</td>
<td>22.2</td>
<td>15.8</td>
</tr>
<tr>
<td>SD</td>
<td>0.3</td>
<td>4.4</td>
<td>1.7</td>
<td>5.1</td>
</tr>
<tr>
<td>Range</td>
<td>23–24</td>
<td>7–24</td>
<td>15–24</td>
<td>4–23</td>
</tr>
<tr>
<td>95% CI</td>
<td>23.9–24</td>
<td>16.7–19.4</td>
<td>21.5–22.5</td>
<td>14.3–17.3</td>
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<tr>
<td><strong>ABC score</strong></td>
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<td></td>
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<tr>
<td>$\bar{x}$</td>
<td>98.2</td>
<td>65.0</td>
<td>88.0</td>
<td>60.6</td>
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<tr>
<td>SD</td>
<td>4.2</td>
<td>21.7</td>
<td>19.1</td>
<td>22.1</td>
</tr>
<tr>
<td>Range</td>
<td>78–100</td>
<td>0–100</td>
<td>60.6–100</td>
<td>12–98</td>
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<tr>
<td>95% CI</td>
<td>96.7–99.7</td>
<td>58.3–71.6</td>
<td>79–95.2</td>
<td>53.9–68</td>
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</tbody>
</table>
Who is appropriate for vestibular rehabilitation therapy?

- BPPV
- Unilateral vestibular loss
- Bilateral vestibular loss
- Central vestibular
- Motion hyper-sensitivity
Indications: Uncompensated stable unilateral peripheral vestibular dysfunction

- Vestibular neuritis
- Anterior Vestibular Artery ischemia
- Labyrinthitis
- s/p acoustic neuroma resection
- s/p ablative procedure
- Labyrinthine trauma
Indications: Uncompensated stable bilateral peripheral vestibular dysfunction

- Aminoglycocide Toxicity
- Cisplatinin
- Auto-Immune
- Component of neuro-degenerative disease
- Idiopathic (~50% of cases?) Zingler et al 2009
Indications: Uncompensated stable central vestibular dysfunction

- Stroke
  - PICA
  - AICA
- Multiple sclerosis
- Traumatic Brain Injury
- Cerebellar degenerative disorders
VRT???

- Migraine to address motion sensitivity
- Severe anxiety and other psychological disorders (equivalent to exposure therapy)
- Head trauma
- Meniere’s Disease
- Degenerative CNS disorders
Management Options

- Vestibular Rehabilitation Therapy (VRT)
- Falls prevention
- Contact PCP: Request further testing and/or recommend referral to specialist
Compensation Fundamentals:
VRT is directed at *dynamic deficits*

- Static defects *(resolve without VBRT)*
  - Spontaneous nystagmus
  - Ocular tilt reaction / skew deviation
  - Lateropulsion

- Dynamic defects *(recovery enhanced with VBRT)*
  - Decreased responsiveness of the VOR to angular accelerations
  - Decreased responsiveness of the VOR to translations
  - Dynamic postural imbalance
Compensation for Oscillopsia: Mechanisms

- Preprogrammed saccades (embedded in head movements)
- Modification of saccade amplitudes with combined head and eye following (saccade amplitude decreased to compensate for a decreased VOR)
- Blinks with head movement
- Utility of smooth pursuit to maintain gaze stabilization may be enhanced by ~10%
- Reweighting of sensory cue utilization (cerebellar function)
- Cervical ocular reflex enhancement? (limited to low frequencies)
VRT: Gaze Stabilization

- Exercises focused on improving the gain of the vestibular-ocular reflex
- Common Gaze Stabilization Exercises
  - VOR x 1: Head moving, target is stationary
  - VOR x 2: Head and target moving in opposite directions
  - Two Target VOR: Gaze held on target followed by head movement
  - Imaginary Targets: Gaze held on target, close eyes, move head, open eyes to assess accuracy
VRT: Gaze Stabilization

• Additional Considerations:
  – Vary axis of rotation (yaw, pitch, not roll)
  – Include rotations and translations
  – Monitor and progress acceleration / frequency of the patient’s head movements

  – Progress from hand-held targets to objects in periphery
  – Vary target distance
  – Alter the visual target utilized (progressing to busy visual environments)
  – Alter the sensory environment
Compensation for Imbalance: (Horak 2009)

- Enhancement in the use of proprioception
  - Reduced cerebellar inhibition of proprioceptively triggered postural responses
  - Synaptogenesis of somatosensory inputs to the vestibular nucleus

- Residual vestibular function (Statler 2004)

- Sensory substitiution:
  - Light touch (Creath 2002)
  - Vision (Buchanan and Horak 2002)

- Sensory addition??
  - Vibratory / auditory prosthetic
Balance Prosthetic

• Provides biofeedback (vibratory cues) through the trunk in response to medial-lateral tilt

• In individuals with unilateral vestibulopathy, the device appears to improve
  – static postural control (Wall 2005)
  – dynamic postural control (Dozza 2008)

• In community dwelling older healthy adults at risk for falling:
  – Decreased medial / lateral sway with gait and DGI score (Wall 2009)