Functional Assessments for Geriatric Clients

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Disability Schemes
- International Classification of Functioning, Disability, and Health
- Nagi Scheme (adopted by APTA and included in the Guide to PT Practice)

Interaction of Concepts ICF

Health Condition (disorder/disease) → Body function & structure (Impairment) → Activities (Limitation) → Participation (Restriction) → Environmental Factors

Contextual Factors

Person
- gender
- age
- other health conditions
- coping style
- social background
- education
- profession
- past experience
- character style

Environment
- Products
- Close milieu
- Institutions
- Social Norms
- Culture
- Built-environment
- Political factors
- Nature
Components of Functional Assessment
- Basic Activities of Daily Living (ADL, BADL)
- Instrumental Activities of Daily Living (IADL)
- Work
- Recreation ???? measures
- **Mobility**
  - Balance
  - Ambulation

Assessments of ADL
- **Functional Independence Measure (FIM)**
  - 18 items, 7 point scale
  - Includes cognitive and communication components
- **Barthel Index**
  - 10 items, 100 points total

Instrumental ADL
- **Lawton IADL** (Lawton and Brody, 1969; Lawton, 1988)
  - 9 items, 3 points for a total score of 27
  - Financial management, shopping, transportation use, telephoning, medication use, housekeeping, cooking, laundry

<table>
<thead>
<tr>
<th></th>
<th>Community</th>
<th>Public Housing</th>
<th>In-Home</th>
<th>Waiting for LTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>24.51</td>
<td>25.15</td>
<td>19.86</td>
<td>18.15</td>
</tr>
</tbody>
</table>
Work

- Walk up 10 steps
- Walk quarter of a mile
- Sit for 2 hours
- Stand for 2 hours
- Stoop, crouch, kneel
- Reach up overhead
- Reach out to shake hands
- Grasp with fingers
- Lift or carry 10 pounds
- Lift or carry 25 pounds

- 95% of people classified as having no disability had minimal physical limitations
- 67.9% of people considered disabled had severe physical limitations

Measures of Functional Mobility

- Psychological measures
- Sitting measures
- Standing measures
  - Static
  - Dynamic
- Measures of functional mobility

Assessing Psychological Aspects of Balance

- Activity-Specific Balance Confidence Scale (ABC)
- Falls Efficacy Scale (FES)

Activity-Specific Balance Confidence (ABC) Scale (Powell & Myers, 1995)

- 16-item self-report questionnaire asking patients to rate their confidence level while completing various functional activities
- Scoring: 11-point scale ranging from 0% = no confidence to 100% = complete confidence
- Interpretation:
  - less than 50 = low level of physical functioning (home care)
  - 51-80 = moderate level of functioning (retirement homes/chronic conditions)
  - 81-100 = highly functioning active older adults
**Falls Efficacy Scale (FES)**

- **FES (10 point scale with high score associated with low confidence)**
  - Rate confidence for completing 10 activities without falling
  - Reduced FES associated with decline in ADL, IADL, and social function
  - Discriminates between those who avoid activity due to fear of falling and those who do not

- **rFES (revised; 11 point scale with low score associated with low confidence)**
  - Same as FES but scoring reversed
  - Good test-retest reliability ICC = .88

- **mFES (modified) low score associated with low confidence**
  - Original 10 items plus 4 more
  - Good test-retest reliability ICC = .95
  - Compared healthy elders with patients at a falls and balance clinic (Hill et al., 1996)
    - Mean scores on each item for healthy elders: 9.76 (136.6)
    - Mean scores for patients: 7.69 (107.7)

**Sitting Tests**

- Sitting forward reach
- Sitting lateral reach
- SBS

**SITTING FUNCTIONAL REACH**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Forward Reach</th>
<th>Lateral Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>44.9 cm</td>
<td>29.5 cm</td>
</tr>
<tr>
<td>Middle</td>
<td>42.3 cm</td>
<td>26.7 cm</td>
</tr>
<tr>
<td>Old</td>
<td>32.9 cm</td>
<td>20.3 cm</td>
</tr>
</tbody>
</table>

**Sitting Tests (continued)**

- Rate confidence for completing 10 activities without falling
12 item tool with 4 point scales

Strong relationship (r = .76, p < .001) between total score of self-assessed steadiness & total SBS score

Clinicians agreed that reaching forward with an outstretched arm was most important while side bending on foam was least important in assessing sitting balance

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sitting unsupported with eyes open</td>
</tr>
<tr>
<td>2</td>
<td>Sitting unsupported with eyes closed</td>
</tr>
<tr>
<td>3</td>
<td>Sitting unsupported with arms in front</td>
</tr>
<tr>
<td>4</td>
<td>Reaching forward with outstretched arm while sitting</td>
</tr>
<tr>
<td>5</td>
<td>Pick up object from the floor while sitting unsupported</td>
</tr>
<tr>
<td>6</td>
<td>Placing alternate foot on a step stool while sitting unsupported</td>
</tr>
<tr>
<td>7</td>
<td>Reaching laterally with outstretched arm while unsupported</td>
</tr>
<tr>
<td>8</td>
<td>Turning to look behind over left and right shoulders while sitting</td>
</tr>
<tr>
<td>9</td>
<td>Lateral bend to elbow in sitting</td>
</tr>
<tr>
<td>10</td>
<td>Sit to stand transfers</td>
</tr>
<tr>
<td>11</td>
<td>Pick up an object from the floor while sitting unsupported on foam</td>
</tr>
<tr>
<td>12</td>
<td>Lateral bend to allow in sitting on foam</td>
</tr>
</tbody>
</table>

**ROMBERG TEST**

- Stand with feet parallel and together
- Close eyes for 20-30 seconds
- Judge the amount of sway or time position held
- Abnormal test:
  - Eyes open
  - Loss of balance
  - Stepping during test

**SHARPENED ROMBERG**

- Stand in heel-to-toe position
- Arms folded across chest with eyes closed for 60 seconds
- Time 4 trials for a maximum score of 240 seconds; or just time one trial up to 60 s
- Abnormal test:
  - Excessive sway
  - Loss of balance
  - Stepping during test
**SHARPENED ROMBERG PERFORMANCE NORMS**

<table>
<thead>
<tr>
<th>Age</th>
<th>Score (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-64</td>
<td>56</td>
</tr>
<tr>
<td>65-69</td>
<td>56</td>
</tr>
<tr>
<td>70-74</td>
<td>48</td>
</tr>
<tr>
<td>75-79</td>
<td>39</td>
</tr>
<tr>
<td>80-86</td>
<td>45</td>
</tr>
</tbody>
</table>

**ONE LEG STANCE TEST**

- Stand with arms crossed, then pick up one leg and hold with hip in neutral and knee flexed to 90 degrees
- Five 30-second trials, max score 150 sec. or hold for 60 seconds one trial
- Test both sides noting any differences
- Criteria to stop: legs touch each other, foot touches down, arms move from start position

**ACTIVE STANDING TESTS**

- Functional Reach (forward and lateral)
- Multi Directional Reach Test
- Berg Balance Scale
- Step Test

**ONE LEG STANCE TEST**

<table>
<thead>
<tr>
<th>Age</th>
<th>Dominant</th>
<th>Non-dominant</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-64</td>
<td>38</td>
<td>34</td>
</tr>
<tr>
<td>65-69</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>70-74</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>75-79</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>80-86</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>All groups</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
FUNCTIONAL REACH

- Designed for elderly population
- Consists of patient reaching as far forward as possible while maintaining a fixed BOS in standing
- Score is norm-based on extent of forward reach along a yardstick
- Score of 6-7 inches indicates a frail person with limited ability to perform ADLs & increased risk of falls (Duncan et al., 1990)

FR Test: Reach Forward

FUNCTIONAL REACH NORMS

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-40 yrs</td>
<td>16.7”+ 1.9”</td>
<td>14.6”+ 2.2”</td>
</tr>
<tr>
<td>41-69 yrs</td>
<td>14.9”+ 2.2”</td>
<td>13.8”+ 2.2”</td>
</tr>
<tr>
<td>70-87 yrs</td>
<td>13.2”+ 1.6”</td>
<td>13.2”+ 1.6”</td>
</tr>
</tbody>
</table>

FUNCTIONAL REACH STUDIES

- Reliability (Duncan et al., 1990)
  - Test-retest reliability r = .89
  - Interrater agreement on reach measurement = .98
- Validity
  - Discriminates levels of physical frailty
    - FR< 7 in were unable to stand on one leg for 1 sec*
    - FR< 7 could not perform tandem walking*
    - FR< 7 had slower walking speed*
    - FR< 6-7 in more likely to fall**
  - Weiner, et al., 1992 *
  - Duncan, et al., 1992 **
Lateral Reach

- Measures lateral postural stability
- Maximum distance an individual can reach laterally in a standing position
- Start position: 90 degrees abduction with elbow extended
- Feet in contact with floor, no knee flexion, no trunk flexion or rotation
- Good test-retest reliability: ICC .94

FR Test: Lateral Reach

Lateral Reach Performance Data

<table>
<thead>
<tr>
<th>Author</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brauer et al., 1999</td>
<td>20.06 cm ± 4.9</td>
<td>21.04 cm ± 2.5</td>
</tr>
<tr>
<td></td>
<td>(7.9 ± 1.9)</td>
<td>(8.3 ± 1)</td>
</tr>
<tr>
<td>DeWaard et al., 2002</td>
<td>14.9 cm ± 5.9</td>
<td>14.3 cm ± 5.6</td>
</tr>
<tr>
<td></td>
<td>(5.9 ± 1.8)</td>
<td>(5.4 ± 1.8)</td>
</tr>
</tbody>
</table>

Normative Values for Lateral Reach (Isles et al., 2004)

<table>
<thead>
<tr>
<th>Age Group (n)</th>
<th>Lateral Reach (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29 (40)</td>
<td>22.95 ± 0.7</td>
</tr>
<tr>
<td>30-39 (47)</td>
<td>23.09 ± 0.66</td>
</tr>
<tr>
<td>40-49 (95)</td>
<td>18.96 ± 0.47</td>
</tr>
<tr>
<td>50-59 (93)</td>
<td>18.37 ± 0.48</td>
</tr>
<tr>
<td>60-69 (90)</td>
<td>17.11 ± 0.48</td>
</tr>
<tr>
<td>70-79 (91)</td>
<td>15.7 ± 0.49</td>
</tr>
</tbody>
</table>
Multi-Directional Reach Test

- Reach forward, to the right, the left and lean backward.
- Means
  - Forward: 8.9 in
  - Backward: 4.6 in
  - Right: 6.8 in
  - Left: 6.6 in

Newton, 1997

Validity of Multi-Directional Reach Test

<table>
<thead>
<tr>
<th></th>
<th>NO AD</th>
<th>AD*</th>
<th>Excellent Health</th>
<th>Good Health</th>
<th>Fair Health</th>
<th>Poor Health</th>
<th>Faller</th>
<th>Non-Faller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward</td>
<td>9.72</td>
<td>7.10</td>
<td>9.29</td>
<td>9.01</td>
<td>8.81</td>
<td>8.43</td>
<td>8.30</td>
<td>9.01</td>
</tr>
<tr>
<td>Backward</td>
<td>5.39</td>
<td>7.25</td>
<td>5.16</td>
<td>5.09</td>
<td>5.06</td>
<td>4.86</td>
<td>4.60</td>
<td>4.80</td>
</tr>
<tr>
<td>Right</td>
<td>7.57</td>
<td>5.62</td>
<td>7.54</td>
<td>7.19</td>
<td>6.53</td>
<td>5.25</td>
<td>6.12</td>
<td>7.08</td>
</tr>
<tr>
<td>Left</td>
<td>7.31</td>
<td>5.31</td>
<td>6.94</td>
<td>6.58</td>
<td>6.60</td>
<td>5.72</td>
<td>5.67</td>
<td>6.01</td>
</tr>
</tbody>
</table>

*Assistive Device

BERG BALANCE SCALE

- Designed to test sitting & standing balance of elderly patients
- Consists of 14 items including sitting balance, sit ⇔ stand, transfers
- Scoring on a five point ordinal scale (0=unable, 4=independent)
- Score of < 45 = risk for multiple falls
- Score of ≤ 36: 100% risk of falling

Berg, et al., 1992

Step Test

- Stepping one foot on, then off, a block as quickly as possible in a set time period (15 seconds)
- Incorporates dynamic single limb stance

Hill et al., 1996
**DYNAMIC BALANCE TESTS**

- Dynamic Gait Index
- Functional Gait Assessment
- Tinetti Performance Oriented Assessment of Balance and Gait

**DYNAMIC GAIT INDEX**

- Evaluates and documents the ability to modify gait in response to changing task demands
- Excellent intrarater, interrater and test-retest reliability (Wolf et al., 2001; Shumway-Cook, Gruber, et al., 1997)
- Predicts falls among the elderly
- Score associated with fall risk
  - $<19$, 2.58 times more likely to fall

**Functional Gait Assessment**

- 10 item tool based on DGI
- Developed for use with younger patients with vestibular problems
- **Reliability**
  - **Intra rater; ICC = .83**
  - **Inter rater; ICC = .84**
- Moderate correlations with other balance measures

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**Step Test**

<table>
<thead>
<tr>
<th></th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill et al., 1996</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wiltz et al., 2003</td>
<td>18.88</td>
<td>16.69</td>
<td>16.91</td>
<td>15.59</td>
<td>14.00</td>
<td>14.28</td>
</tr>
<tr>
<td>Isles et al., 2004</td>
<td>20.72</td>
<td>20.17</td>
<td>18.77</td>
<td>17.13</td>
<td>15.50</td>
<td></td>
</tr>
<tr>
<td>Sherrington et al., 2005 (5 cm block post hip fxs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.73</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>20.28</th>
<th>20.29</th>
<th>20.39</th>
<th>20.49</th>
<th>20.59</th>
<th>20.69</th>
<th>20.78</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill et al., 1996</td>
<td>17.67 ± 2.22</td>
<td>17.39 ± 2.03</td>
<td>17.67 ± 2.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isles et al., 2004</td>
<td>13.88</td>
<td>15.69</td>
<td>15.91</td>
<td>14.59</td>
<td>13.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sherrington et al., 2005 (5 cm block post hip fxs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.73</td>
<td></td>
</tr>
</tbody>
</table>
PERFORMANCE ORIENTED ASSESSMENT OF BALANCE & GAIT SCALE

- Designed for elderly patients
- Consists of 9 balance items & 7 gait items
- Scoring on ordinal scale of 0-2
  - 0 = most impairment
  - 2 = independent
- Maximum combined score = 28 (Balance=16, Gait=12)
- Interpretation:
  - score below 19 = high risk for falls
  - score between 19-24 = moderate risk for falls

Tests of Functional Mobility

- Five times sit to stand
- TUG
  - TUGC
  - TUGM
  - L-test

Five Times Sit to Stand Test

- Sit in chair with arms across chest
- Stand and sit down 5 times as quickly as possible
- Time on word “go” and end when buttocks touch chair on 5th trial.
  - Chair 43 cm height, 47.5 cm depth

<table>
<thead>
<tr>
<th></th>
<th>Young control 23-57 years</th>
<th>Young with balance 16-59 years</th>
<th>Older control 63-84 years</th>
<th>Older with balance 61-90 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whitney, et al. 2005</td>
<td>8.2</td>
<td>15.3</td>
<td>13.4</td>
</tr>
<tr>
<td></td>
<td>60-89</td>
<td>70-79</td>
<td>80-89</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bohannon, 2005 Meta analysis</td>
<td>11.4</td>
<td>12.6</td>
<td>12.7</td>
</tr>
</tbody>
</table>
Four Square Step Test

- Reliability
  - Test retest ICC = .98
  - Inter rater ICC = .99
- Cut off score of 15 seconds
  - >15 seconds: multiple faller
  - <15 seconds: non multiple faller

<table>
<thead>
<tr>
<th></th>
<th>Multiple Fall</th>
<th>Non-multiple Falls</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dite, et al., 2002</td>
<td>23.59</td>
<td>12.01</td>
<td>6.7</td>
</tr>
<tr>
<td>&gt;64 years</td>
<td>12.4 ± 4.2</td>
<td>14.8 ± 4.3</td>
<td></td>
</tr>
<tr>
<td>Whitney, et al., 2007; vestibular</td>
<td>32.6 ± 10.1</td>
<td>16.2 ± 5.3</td>
<td></td>
</tr>
</tbody>
</table>

Timed Up & Go (TUG) Test

- Adaptation of Get Up & Go Test
- Designed for elderly population
- Scoring based on time it takes to go from sit → stand → walk 3 meters & back to → sit
  - Score of 20 or less = independent with transfers & gait
  - Score of 20-30 = “a gray zone”
  - Score of 30 or more = assistance with balance & functional activities

TUG Test—continued

- Studies by Thompson & Medley (1995)
  - 175 subjects (65-79yr) without device scored 10.34 seconds
  - 50 subjects (mean age 24) without device scored 7.5 seconds
  - 175 volunteers with a cane scored 13.67 seconds
**TUG Test & Effect of Assistive Devices**

- 187 subjects randomly assigned to one of three groups: cane, RW, SW
- Age accounted for 15% of variance
- Device accounted for 75% of variance (Medley & Thompson, 2007)

<table>
<thead>
<tr>
<th>Device</th>
<th>Without device</th>
<th>With device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cane</td>
<td>10.04s</td>
<td>13.14s</td>
</tr>
<tr>
<td>RW</td>
<td>11.36s</td>
<td>18.37s</td>
</tr>
<tr>
<td>SW</td>
<td>12.92s</td>
<td>42.27s</td>
</tr>
</tbody>
</table>

**TUG Test & Parkinson Disease**

- Thompson & Medley (1998) reported:
  - TUG Test did not discriminate between subjects with unilateral involvement vs. bilateral involvement
  - TUG Test did differentiate between subjects with functional limitations vs. subjects without limitations

**TUG Variations**

- Instructions
  - Normal safe pace
  - Fast safe pace
- Cognitive
  - Perform cognitive task (math)
  - Difference score of 5.56 s or greater likely to fall (Shumway-Cook et al., 2000)
- Manual
  - Carry a cup of water while walking
  - Difference score of >4.5 (Leask-Gibson et al., 1993) or >4.98 (Shumway-Cook et al., 2000) likely to fall

**L-Test**

- Modified version of the TUG; total distance 20 m
- 2 transfers and 2 turns
- Comfortable and safe pace
- Reliability with frail older adults
  - Interrater: ICC = 1.00
  - Intrarater: ICC = .97

Nguyen, et al., 2007
## L-Test

<table>
<thead>
<tr>
<th>Study</th>
<th>Trans tibial</th>
<th>Trans femoral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death &amp; Miller, 2005; patients with amputations</td>
<td>29.5 sec</td>
<td>41.7 sec</td>
</tr>
<tr>
<td>Nguyen, et al. 2007; frail elders</td>
<td>62.2 - 47 sec</td>
<td>62.2 - 47 sec</td>
</tr>
<tr>
<td>Medley &amp; Thompson, 2008 unpublished data; 160 participants</td>
<td>19.38 sec</td>
<td>19.38 sec</td>
</tr>
</tbody>
</table>

## LAB
- Go through lab packet and perform measures that you are not familiar with