Field-based to Assess Fitness and Function in Middle-aged and Elderly Individuals

Peter Ronai
Field-based Tools To Assess Fitness and Function In Middle-Aged and Elderly Individuals

Peter Ronai, M.S. RCEP, CSCS-D, FACSM
Clinical Associate Professor
Sacred Heart University
Fairfield, CT 06825-1000
ronaip@sacredheart.edu
Objectives

• Describe specific, **VALID** “Field-Based” Assessments Practitioners Can Use With Patients and Clients

• Describe methods to score or categorize performances on these assessments

• Describe how results assist practitioners and patients/clients establish fitness program goals and measure progress

• Provide resources, tips and tools for practitioners interested in performing assessments and developing fitness programs for their middle-aged, and elderly clients
Purpose of Assessment

1. Determine Current Physical Fitness Levels

2. Determine Ability to Perform Basic Activities of Daily Living
   - Walking, Dressing, Squatting, Transferring from Bed to Chair, Squatting, Climbing

3. Predict Success Performing Instrumental Activities of Daily Living (IADL)
   - Complex Movements (housework, shopping, paying bills, using a telephone

4. Determine Exercise Program Needs and Set Realistic Goals

5. Measure Progress and Success and Provide Additional Motivation
## Types of Fitness Assessments

### Clinical/Lab-Based

**Pros**
- Considered to have “High Construct Validity” *(Measure what they are supposed to)*
- Supported by Scientific Literature
- Progenitor to Many High-Quality “Field-Based” Tests/Assessments *(EX. Underwater Weighing, GXT, Electrogoniometry, Isokinetics, etc.)*

**Cons**
- Not portable
- Often Time Consuming
- Expensive
- Often Impractical
- Technical Expertise May Vary

### Field-Based

**Pros**
- Often time efficient
- Can have excellent “Convergent Construct Validity” *(very good proxy measurements and “predictor(s)” of a construct ex. 1.5 mile run, etc…) if done properly*
- Often very portable and practical
- Cost effective & supported by literature
- Good measurement of physical deficiencies & progress

**Cons**
- Reliant on Technical Ability/ technician
- Potential variability of testing technique
- Population and delivery specific
Things That Make A Test A Valid Tool

• Cut-Off Scores
  A cut-off score designates a positive or negative test outcome.
  Normative data provides "normal" values for specific variables within a population.

• Normative Data
  The SEM is the amount of error that you can consider as measurement error.
  The MDC is the minimum amount of change in a patient's score that ensures the change isn't the result of measurement error.
  the minimum amount of change required for your patient to feel a difference in the variable you are measuring.
  If you are planning to use an instrument for individual decision-making, it is recommended that you use an instrument with an ICC > 0.9.
  Determines variation between two or more raters who measure the same group of subjects.
  Determines stability of data recorded by one individual across two or more trials
  Indicates that the outcomes of an instrument predict a future state or outcome.
  Establishes validity when two measures are taken at relatively the same time, often indicates that the test could be used instead of a gold-standard.
  Convergent validity refers to the degree to which two measures demonstrate similar results.

• Standard Error of Measurement (SEM)

• Minimal Detectable Change (MDC)

• Minimal Clinically Important Difference (MCID)

• Test-retest Reliability

• Interrater Reliability

• Intrarater Reliability

• Predictive Validity

• Concurrent Validity

• Convergent Validity
<table>
<thead>
<tr>
<th>Measure and Description</th>
<th>Administration Time</th>
<th>Cut-point Indicative of Lower Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Fitness Test (96)</td>
<td>30 min total</td>
<td>≤25th percentile of age-based norms</td>
</tr>
<tr>
<td>Seven items: 30 s chair stand, 30 s arm curls, 8 ft up and go, 6-min walk, 2-min step test, sit and reach, and back scratch with normative scales for each test.</td>
<td>Individual items range from 2 to 10 min each</td>
<td></td>
</tr>
<tr>
<td>Short Physical Performance Battery (51)</td>
<td>10 min</td>
<td>10 points</td>
</tr>
<tr>
<td>A test of lower extremity functioning that combines scores from usual gait speed and timed tests of balance and chair stands. Scores range from 0 to 12 with higher score indicating better functioning.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usual Gait Speed</td>
<td>&lt;2 min</td>
<td>1 m · s⁻¹</td>
</tr>
<tr>
<td>Usually assessed as the better of two trials of time to walk a short distance (3–10 m) at a usual pace.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Min Walk Test</td>
<td>&lt;10 min</td>
<td>≤25th percentile of age-based norms (97)</td>
</tr>
<tr>
<td>Widely used as an indicator of cardiorespiratory endurance. Assessed as the most distance an individual can walk in 6 min. A change of 50 m is considered a substantial change (49).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Scale Physical Performance Test (29)</td>
<td>60 min</td>
<td>57 points</td>
</tr>
<tr>
<td>Two versions — long and short — are available. Each consists of serial performance of daily living tasks such as carrying a weighted pot of water, donning and removing a jacket, getting down and up from the floor, climbing stairs, carrying groceries, and others, performed within an environmental context that represent underlying physical domains. Scores range from 0 to 100 with higher scores representing better functioning.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. A functional ability framework indicating the physiologic parameters associated with functions required for basic and advanced everyday activities. R.E. Rikli & C.J. Jones, 2001, Senior Fitness Test Manual (Champaign, IL: Human Kinetics). Adapted with permission.

<table>
<thead>
<tr>
<th>PHYSICAL PARAMETERS</th>
<th>FUNCTIONS</th>
<th>ACTIVITY GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle strength/endurance</td>
<td>Walking</td>
<td>Personal care</td>
</tr>
<tr>
<td>Aerobic endurance</td>
<td>Stair climbing</td>
<td>Shopping/errands</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Standing up from chair</td>
<td>Housework</td>
</tr>
<tr>
<td>Motor ability</td>
<td>Lifting/reaching</td>
<td>Gardening</td>
</tr>
<tr>
<td>power</td>
<td>Bending/kneeling</td>
<td>Sports</td>
</tr>
<tr>
<td>speed/agility</td>
<td>Jogging/Running</td>
<td>Traveling</td>
</tr>
<tr>
<td>balance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body composition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical impairment</td>
<td>Functional limitation</td>
<td>Reduced ability/Disability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Protocol Text

30-Second Chair Stand

Purpose. To assess lower body strength.

Equipment. Stopwatch, straight-backed chair.

Protocol. The test begins with the participant seated in the chair, with their back against the backrest, feet flat on the floor, and hands placed across the chest. On the signal "go," the participant rises to a full standing position, and their weight is supported by the tester, a practice trial of one 30 s. After a demonstration by the tester, the participant performs the test as accurately and safely as possible for 30 s.

Scoring. The score is the total number of stands executed correctly within 30 s. If the participant is more than half-way up at the end of 30 s, it counts as a full stand.
Arm Curl

Purpose. To assess upper body strength.

Equipment. Wristwatch with second hand; straight-back or folding chair (without arms), hand weights (dumbbells-5 lb for women, 8 lb for men).

Protocol. The participant is seated on a chair, back straight and feet flat on the floor, with the dominant side of the body close to the side edge of the chair. The weight is held at the side in the dominant hand (handshake grip). The test begins with the arm down beside the chair, perpendicular to the floor. At the signal "go" the participant turns the palm up while curling the arm through a full range of motion and then returns to the fully extended position. At the down position the weight should have returned to the handshake grip position.

The examiner kneels (or sits in a chair) next to the participant on the dominant-arm side, placing his or her fingers on the person’s mid-biceps to prevent the upper arm from moving and to ensure that a full curl is made (participant’s forearm should squeeze examiner’s fingers). It is important that the participant’s upper arm remain stabilized (still) throughout the test.

The examiner may also need to position his or her other hand behind the participant’s elbow so that the participant will know when full extension has been reached, as well as to prevent a back-swinging motion of the arm.

The participant is encouraged to execute as many curls as possible within the 30 s time limit. After a demonstration by the examiner, a practice trial of one or two repetitions should be given to check for proper form, followed by one 30 s trial.

Scoring. The score is the total number of curls made correctly within 30 s. If the arm is more than halfway up at the end of the 30 s, it counts as a curl.
6-Minute Walk

**Purpose.** To assess aerobic endurance.

**Equipment.** Stopwatch, long measuring tape, cones, popsicle sticks, chalk, masking tape (or some other type of marker). For safety purposes, chairs should be positioned at several points alongside the walkway.

**Set-Up.** The test involves assessing the maximum distance that can be walked in 6 min along a 50 yd course marked into 5 yd segments (see Figure A1).

![50 yd marked into 5 yd segments](image)

Figure A1 50 yd measured into 5 yd segments.

The inside perimeter of the measured distance should be marked with cones, and the 5 yd segments with masking tape or chalk. The walking area, which can be indoors or outdoors, should be well lit, with a non-slippery, level surface.

**Protocol.** To keep track of distance walked, a popsicle stick (or similar object) can be given to the participant each time he or she rounds a cone, or a partner can mark a score card each time a lap is completed. Two or more participants should be tested at a time, with starting times staggered (10 s apart) so that participants do not walk in clusters or pairs. When testing several people at once, numbers should be placed on the participants to indicate the order of starting and stopping. On the signal "go," participants are instructed to walk as fast as possible (not run) around the course as many times as they can in 6 min. If necessary, participants may stop and rest (on provided chairs), then resume walking. The timer should move to the inside of the marked area after everyone has started. To assist with pacing, elapsed time should be called out when participants are approximately half done, when 2 min are left, and when 1 min is left. Encouragement phrases such as "you are doing well" and "keep up the good work" should be called out at approximately 30-s. intervals. At the end of 6 min, participants (staggered every 10 s) are instructed to stop and move to the right, where an assistant will record their score. To assist with proper pacing and to improve scoring accuracy, a practice test should be given prior to the actual test day.

**Safety.** The test should be discontinued if at any time a participant shows signs of dizziness, pain, nausea, or undue fatigue. At the end of the test each participant should slowly walk around for about a minute to cool down.

**Scoring.** The score is the total number of yards walked in 6 min, to the nearest 5 yd. The test administrator or aide records the nearest 5 yd mark.
Purpose. To assess aerobic endurance.

Equipment. Stopwatch, tape measure

Set-Up. The proper (minimum) knee height can be determined using a tape measure, ensuring that the participant maintains the correct position. Stepping may be resumed. To assist with proper pacing, participants may practice briefly to regain.

Safety. At the end of the test the participant should slowly walk around for about a minute to cool down.

Scoring. The score is the total number of times the right knee reaches the minimum height. To assist with pacing, participants should be told when 1 min has passed and when there are 30 s to go.

Risk zone
Less than 65 steps for men and women.
Chair Sit-and-Reach

Purpose. To assess lower body (primarily hamstring) flexibility.

Equipment. Straight-back or folding chair (approximately 17-in. seat height), 18-in. ruler. For safety purposes, the chair should be placed against a wall and checked to see that it remains stable (doesn’t tip forward) when the participant sits on the front edge.

Protocol. Starting in a sitting position on a chair, the participant moves forward until she or he is sitting on the front edge. The crease between the top of the leg and the buttocks should be even with the edge of the chair seat. Keeping one leg bent and foot flat on the floor, the other leg (the preferred leg*) is extended straight in front of the hip, with heel on floor and foot flexed (at approximately 90°; see the picture).

With the extended leg as straight as possible (but not hyperextended), the participant slowly bends forward at the hip joint (spine should remain as straight as possible, with head in line with spine, not tucked) sliding the hands (one on top of the other with the tips of the middle fingers even) down the extended leg in an attempt to touch the toes. The reach must be held for 2 s. If the extended knee starts to bend, ask the participant to slowly sit back until the knee is straight before scoring. Participants should be reminded to exhale as they bend forward; to avoid bouncing or rapid, forceful movements; and to never stretch to the point of pain.

After a demonstration by the tester, the participant is asked to determine the preferred leg. The participant is then given two practice (stretching) trials on that leg, followed by two test trials.

Scoring. Using an 18-in. ruler, the scorer records the number of inches person is short of reaching the toe (minus score) or reaches beyond the toe (plus score). The middle of the toe at the end of the shoe represents a zero score. Record both test scores to the nearest 1/2 in., and circle the best score. The best score is used to evaluate performance. Be sure to indicate “minus” or “plus” on the score card.

*The preferred leg is defined as the one that results in the better score. Obviously, it is important to work on flexibility on both sides of the body, but for the sake of time, only the “better” side has been used in developing norms.
Back Scratch

Purpose
To assess upper body (shoulder) flexibility, which is important in tasks such as combing one's hair, putting on overhead garments and reaching for a seat belt.

back, the number of inches (cm) between extended middle fingers (+ or -).

Risk zone
Men: Minus (-) 4 inches or more
Women: Minus (-) 2 inches or more
8-Foot Up-and-Go

Purpose. To assess agility/dynamic balance.

Equipment. Stopwatch, tape measure.

Set-Up. The chair should be positioned such that the marker exactly 8 ft away (measured from the sitting position) does not allow ample turning room for the participant.

Protocol. The test begins with the participant sitting in the chair facing the marker. The participant gets up from the chair as quickly as possible, turns 180° midway between the chair and the marker, and sits in the chair again. The tester should be told that this is a timed test and the timer at the exact instant the participant has started to move, and stop the timer when the participant has seated themselves again (lowest time). The best score is the lowest time.

Scoring. The score is the time elapsed. This score can be used to evaluate performance.

National norms of these tests are available.

Rikli & Jones Senior Fitness Test - Validated with over 7,000 elderly males and females (average age 71 years) Can be used for individuals 60+ Years!!!

Jones, CJ and R Rikli

Table 1: Normal range of scores for men, with normal defined as the middle 50% of the population. Those scoring above this range would be considered above average for their age and those below the range as below average.

<table>
<thead>
<tr>
<th>Normal Range of Scores - Men</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85-89</th>
<th>90-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair stand (no. of stands)</td>
<td>14 - 19</td>
<td>12 - 18</td>
<td>12 - 17</td>
<td>11 - 17</td>
<td>10 - 15</td>
<td>8 - 14</td>
<td>7 - 12</td>
</tr>
<tr>
<td>Arm Curl (no. of reps)</td>
<td>16 - 22</td>
<td>15 - 21</td>
<td>14 - 21</td>
<td>13 - 19</td>
<td>13 - 19</td>
<td>11 - 17</td>
<td>10 - 14</td>
</tr>
<tr>
<td>6-Min Walk (no. of yds)</td>
<td>610 - 735</td>
<td>560 - 700</td>
<td>545 - 680</td>
<td>470 - 640</td>
<td>445 - 605</td>
<td>380 - 570</td>
<td>305 - 500</td>
</tr>
<tr>
<td>2-Min Step (no. of steps)</td>
<td>87 - 115</td>
<td>86 - 116</td>
<td>80 - 110</td>
<td>73 - 109</td>
<td>71 - 103</td>
<td>59 - 91</td>
<td>52 - 86</td>
</tr>
<tr>
<td>Chair Sit-&amp;-Reach (inches +/?)</td>
<td>-2.5 +4.0</td>
<td>-3.0 +3.0</td>
<td>-3.5 +2.5</td>
<td>-4.0 +2.0</td>
<td>-5.5 +1.5</td>
<td>-5.5 +0.5</td>
<td>-5.5 +0.5</td>
</tr>
<tr>
<td>Back Scratch (inches +/?)</td>
<td>-6.5 +4.0</td>
<td>-7.5 +1.0</td>
<td>-8.0 +1.0</td>
<td>-9.0 +2.0</td>
<td>-9.5 +2.0</td>
<td>-10.0 +3.0</td>
<td>-10.5 +4.0</td>
</tr>
<tr>
<td>8-Ft Up-&amp;-Go (seconds)</td>
<td>5.6 -3.8</td>
<td>5.7 -4.3</td>
<td>6.0 -4.2</td>
<td>7.2 -4.6</td>
<td>7.6 -5.2</td>
<td>8.9 -5.3</td>
<td>10.0 -6.2</td>
</tr>
</tbody>
</table>

Jones, CJ and R Rikli

Table 2: Normal range of scores for women, with normal defined as the middle 50% of the population. Those scoring above this range would be considered above average for their age and those below the range as below average.

<table>
<thead>
<tr>
<th>Normal Range of Scores - Women</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85-89</th>
<th>90-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair stand (no. of stands)</td>
<td>12 - 17</td>
<td>11 - 16</td>
<td>10 - 15</td>
<td>10 - 15</td>
<td>9 - 14</td>
<td>8 - 13</td>
<td>4 - 11</td>
</tr>
<tr>
<td>Arm Curl (no. of reps)</td>
<td>13 - 19</td>
<td>12 - 18</td>
<td>12 - 17</td>
<td>11 - 17</td>
<td>10 - 16</td>
<td>10 - 15</td>
<td>8 - 13</td>
</tr>
<tr>
<td>6-Min Walk (no. of yds)</td>
<td>545 - 660</td>
<td>500 - 635</td>
<td>480 - 615</td>
<td>430 - 585</td>
<td>385 - 540</td>
<td>340 - 510</td>
<td>275 - 440</td>
</tr>
<tr>
<td>2-Min Step (no. of steps)</td>
<td>75 - 107</td>
<td>73 - 107</td>
<td>68 - 101</td>
<td>68 - 100</td>
<td>60 - 91</td>
<td>55 - 85</td>
<td>44 - 72</td>
</tr>
<tr>
<td>Chair Sit-&amp;-Reach (inches +/?)</td>
<td>-0.5 +5.0</td>
<td>-0.5 +4.5</td>
<td>-1.0 +4.0</td>
<td>-1.5 +3.5</td>
<td>-2.0 +3.0</td>
<td>-2.5 +2.5</td>
<td>-4.5 +1.0</td>
</tr>
<tr>
<td>Back Scratch (inches +/?)</td>
<td>-3.0 +1.5</td>
<td>-3.5 +1.5</td>
<td>-4.0 +1.0</td>
<td>-5.0 +0.5</td>
<td>-5.5 +0.0</td>
<td>-7.0 +1.0</td>
<td>-8.0 +1.0</td>
</tr>
<tr>
<td>8-Ft Up-&amp;-Go (seconds)</td>
<td>6.0 -4.4</td>
<td>6.4 -4.8</td>
<td>7.1 -4.9</td>
<td>7.4 -5.2</td>
<td>8.7 -5.7</td>
<td>9.5 -5.2</td>
<td>11.5 -7.3</td>
</tr>
</tbody>
</table>

The Journal on Active Aging • March April 2002
### Hand Grip Strength-Dynamometry

#### Table 2. Results of Meta-Analysis of Grip Strength Data Obtained from Men 75 or More Years of Age

<table>
<thead>
<tr>
<th>Age Group (yrs)</th>
<th>Side</th>
<th>Studies (Subjects)</th>
<th>Homogeneity</th>
<th>Strength (lb) (95% CI)</th>
<th>Strength (kg) (Mean 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-79</td>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Right</td>
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</tr>
<tr>
<td>80-84</td>
<td>Left</td>
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<td></td>
<td>Right</td>
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<tr>
<td>85-89</td>
<td>Left</td>
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<td></td>
<td>Right</td>
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<td></td>
</tr>
<tr>
<td>90-99</td>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Right</td>
<td></td>
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</tr>
</tbody>
</table>


Summary Ordinal Score: ____
Range: 0 (worst performance) to 12 (best performance). Shown to have predictive validity showing a gradient of risk for mortality, nursing home admission, and disability.


**Procedures**

- Fill five (5) one gallon jugs with water.
- Set bottom and top shelves of a bookcase level with top of patella and tip of the acromion process respectively.
- Time how long it takes to pick all five jugs (one at a time) with one arm (dominant arm) up from the bottom shelf and place them each on the top shelf.

* A measure of full body strength and Power!!!

**Scoring:** Signorile, 2011. Bending the Aging Curve. The Complete Exercise Guide for Older Adults Human Kinetics.
Gait Speed (self selected)

**Test Protocol:** Measure and mark a standard distance (e.g., 15 or 20 feet, or use 5 or 6 meters for easier math). Then measure and mark 5 feet (2 meters) before the start and 5 feet (2 meters) at the end of this middle section.

Instructions: “Walk at a comfortable pace.” Have the person perform 3 repetitions and calculate the average time.

**Gait Speed = distance / time**

Gain of 0.1 m/s is predictor for well-being in those without normal WS. (Purser 2005; Hardy, Perera 2007). *0.05 meters/second is considered a small meaningful change whereas a change of 0.1 meters/second is considered a substantial change Therefore could use a change of 0.1 m/s for patient goal.


Four Square Step Test (FSST)

**Equipment:**
- Stop watch
- 4 canes (laid in a cross pattern)
- Gait belt

**Sequence:**
- Start by standing in square 1, facing square 2 (imagine that direction is facing “north”)

**Instructions:**
- "Try to complete the sequence as fast as possible without touching the sticks. Both feet must make contact with the floor in each square. If possible, face forward (“north”) during the entire sequence”.
- Demonstrate.
- Allow a practice trial.
- Two trials → the best time (in seconds) is taken as the score.
- Repeat a trial if the subject:
  - fails to complete the sequence successfully
  - loses balance
  - makes contact with the cane

**Scoring:**
- Subjects who were stepping into the next square were given a score.
- Scoring: time in seconds.
- Begin in a clockwise direction, i.e. 2 → 3 → 4 → 1; then immediately move counterclockwise, i.e. to squares 4 → 3 → 2 → 1.

- "Cutoff score of 15 seconds was identified. Subjects with scores of greater than 15 seconds were considered as multiple fallers and those with scores < 15 as nonmultiple fallers. At 15 seconds, the FSST has a positive predictive value of 86% and a negative predictive value of 94% for the sample tested." (Dite, 2002)
Functional Reach Test

- **Functional Reach is item #8 in the Berg Balance Scale**

**Directions:**

Using a yardstick mounted on the wall at shoulder height, ask the subject to position themselves close to, but not touching the wall with their arm outstretched and hand fisted. Take note of the starting position by determining what number the MCP joints line up with on the yardstick. Have the subject reach as far forward as possible in a plane parallel with the measuring device.

**Instructions:** "Reach as far forward as you can without taking a step, keeping your feet flat on the floor, and keeping your hand at the level of the ruler."

- They are free to use various reaching strategies. Take note of the end position of the MCP joints against the yardstick, and record the difference between the starting and ending positions. If they move their feet, that trial must be discarded and the trial repeated.

**HINT:** to prevent a starting position with the scapula protracted, have the person hold both arms out horizontally. If the fingers match, they are not protracting. Then lower the non-testing arm and begin the test.

- Scores less than 6 or 7 inches indicate limited functional balance. Most health individuals with adequate functional balance can reach 10 inches or more.

**Instructions to the patient:**

- Please reach as far forward as you can without losing your balance. Keep your feet on the floor. You are not allowed to touch the wall or the ruler as you reach. You will have two practice trials and then I will record the distance that you reach forward.

**Criteria to stop the test:**

- The patient's feet lifted up from the floor or they fell forward. Most patients fall forward with this test. The therapist should guard from the front as that is the direction that you reach forward.

Field-Based Power Equations


1. Average power for (A) the stair climb stands in.
2. Peak power for (B) ramp (33), and (C) chair stand (37) power tests. See Figures 6 to 8.
APPENDIX-SEATED STRENGTH EXERCISES
<table>
<thead>
<tr>
<th>Position</th>
<th>Balance exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting:</td>
<td>- Sit upright and complete progressions listed below.</td>
</tr>
<tr>
<td></td>
<td>- Perform the activities from the side of the table with the right hand raised.</td>
</tr>
<tr>
<td>Standing:</td>
<td>- Choose a side, the choice is made with your favorite foot (i.e., right foot).</td>
</tr>
<tr>
<td></td>
<td>- Kick in a pattern with the foot on your chosen side, either downwards or upwards.</td>
</tr>
<tr>
<td></td>
<td>- Perform the activity in two directions with your chosen side.</td>
</tr>
<tr>
<td>In motion:</td>
<td>- Angle your body, face in one direction, and kick in the other direction.</td>
</tr>
<tr>
<td>Training</td>
<td>- Arm position, add a new focal point, and challenge your balance.</td>
</tr>
<tr>
<td>progression</td>
<td>- Simple tasks, complex tasks, light tasks, and challenging tasks.</td>
</tr>
<tr>
<td>The number of repetitions at the client’s conditioning level</td>
<td></td>
</tr>
</tbody>
</table>
Research Corner

Outcome Measures in Cardiopulmonary Physical Therapy: Short Physical Performance Battery

Michael L. Puthoff, PT, PhD
Physical Therapy Department, St. Ambrose University, Davenport, IA

INTRODUCTION

In the last edition of the Research Corner, gait speed was presented as a functional assessment tool for patients with cardiovascular and pulmonary (CVP) disease. The benefits of this assessment tool included good reliability, validity, and responsiveness, making it a useful tool for measuring outcomes in patients with cardiovascular and/or pulmonary conditions. Additionally, gait speed is easy to measure, takes less than 2 minutes to complete, and requires minimal training for the tester. Outcomes of physical function may be enhanced by the use of tools that address other aspects of lower extremity performance, such as the Short Physical Performance Battery (SPPB).

The SPPB is a simple test to measure lower extremity function using tasks that mimic daily activities. The SPPB examines 3 areas of lower extremity function: static balance, gait speed, and getting in and out of a chair. These areas represent essential tasks important for independent living and are thus an important outcome measure for patients with CVP disease.

Detailed instructions for the SPPB are listed in Appendix 1 and a sample score sheet is given in Appendix 2. To assess static balance, the patient is asked to maintain up to 3 hierarchical standing postures for up to 10 seconds. First, the patient stands with feet together. If the patient can maintain this posture for 10 seconds, he or she then performs a semi-tandem stance position. If semi-tandem is held for 10 seconds, it is followed by a tandem stance posture. For the 4 meter walk test, the patient is asked to walk at his or her comfortable speed across a 4 meter distance. Timing starts on the “begin” command and ceases when one foot crosses the end of the course. No room is provided for acceleration. After assessment of gait speed, the patient is asked to stand from a standard chair without upper extremity assistance. If the patient can stand 1 time, then he or she is instructed to complete 5 sit to stands as quickly as possible without upper extremity assistance. The time taken to complete the 5 sit to stands is recorded.

Each subscale is scored 0-4 with 0 being “unable to complete the task” and 4 being the “highest level of performance.” Scores from each subscale are added to create a summary score between 0 and 12. Table 1 lists how patients can be classified with severe, moderate, mild, or minimal limitations based on their SPPB scores. Subscale scores can also be used separately. Balance subscale performance can provide a quick screen of balance abilities. Performance on the 4 meter walk test can be used to calculate gait speed. The time in seconds to complete the 5 sit to stands can be used to assess lower extremity strength and power. As part of the Women’s Health and Aging Study, normative data on subscale performance for the SPPB has been published and is available at http://www.grc.nia.nih.gov/branes/ex/bds/whasbook/chap4/chap4.htm. Therapists can use this information to gain more insight on their patients’ performance and to assist in writing goals.

Table 1. Classification of Limitations Based on Short Physical Performance Score

<table>
<thead>
<tr>
<th>Score</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>Severe limitations</td>
</tr>
<tr>
<td>4-6</td>
<td>Moderate limitations</td>
</tr>
<tr>
<td>7-9</td>
<td>Mild limitations</td>
</tr>
<tr>
<td>10-12</td>
<td>Minimal limitations</td>
</tr>
</tbody>
</table>


Intended Population

The populations used to create and establish the SPPB were community dwelling older adults who participated in the Established Populations for Epidemiologic Studies of the Elderly (EPESE). The subjects involved in this longitudinal study were described as mostly Caucasian with higher than average education levels. However since the inception of the SPPB, it has been used successfully in more diverse populations. Investigators primarily have used community dwelling individuals when study-
The Activities-specific Balance Confidence (ABC) Scale

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

<table>
<thead>
<tr>
<th>0%</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>no confidence</td>
<td>completely confident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How confident are you that you will **not** lose your balance or become unsteady when you...

- ...walk around the house? ____%
- ...walk up or down stairs? ____%
- ...bend over and pick up a slipper from the front of a closet floor ____%
- ...reach for a small can off a shelf at eye level? ____%
- ...stand on your tiptoes and reach for something above your head? ____%
- ...stand on a chair and reach for something? ____%
- ...sweep the floor? ____%
- ...walk outside the house to a car parked in the driveway? ____%
- ...get into or out of a car? ____%
- ...walk across a parking lot to the mall? ____%
- ...walk up or down a ramp? ____%
- ...walk in a crowded mall where people rapidly walk past you? ____%
- ...are bumped into by people as you walk through the mall? ____%
- ...step onto or off an escalator while you are holding onto a railing? ____%
- ...step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? ____%
- ...walk outside on icy sidewalks? ____%
The Activities-specific Balance Confidence (ABC) Scale*

**Administration:**
The ABC can be self-administered or administered via personal or telephone interview. Regardless of method of administration, each respondent should be queried concerning their understanding of instructions, and probed regarding difficulty answering specific items.

**Instructions to Participants:**
For each of the following, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale form 0% to 100%. If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as it you were using these supports. If you have any questions about answering any of these items, please ask the administrator.

**Instructions for Scoring:**
The ABC is an 11-point scale and ratings should consist of whole numbers (0-100) for each item. **Total the ratings (possible range = 0 – 1600) and divide by 16 to get each subject’s ABC score.** If a subject qualifies his/her response to items #2, #9, #11, #14 or #15 (different ratings for “up” vs. “down” or “onto” vs. “off”), solicit separate ratings and use the **lowest confidence of the two** (as this will limit the entire activity, for instance the likelihood of using the stairs.)

- Powell, LE & Myers AM 1995
- Myers AM, Fletcher PC, Myers AN, Sherk 1998

- 80% = high level of physical functioning
- 50-80% = moderate level of physical functioning
- < 50% = low level of physical functioning
  Myers AM (1998)
- < 67% = older adults at risk for falling; predictive of future fall
  LaJoie Y (2004)
Source: Phenxtoolkit.org


References-Continued


References


• LaJoie Y, and Gallagher SP. Predicting falls within the elderly community: comparison of postural sway, reaction time, the Berg balance scale and ABC scale for comparing fallers and non-fallers. Arch Gerontol Geriatr. 2004;38:11-26.


Websites, Tips, Tools, Videos

• Rehabilitation Measures Database Research Institute of Chicago
  http://www.rehabmeasures.org/default.aspx

• University of Missouri, School of Health Professions, Department of Physical Therapy Geriatric Examination Tool Kit
  Available at:
  http://web.missouri.edu/~proste/tool/indexnorm.htm

• MedlinePlus.gov
  http://www.medlineplus.gov

• Exercise Prescription on the Net. Available at
  http://exrx.net/index.html
Thank You