Diabetic Foot Ulcer (DFU) Toolkit

Recommended Outcome Measures

Appropriate outcome measures for persons with Diabetes are classified by weight-bearing status, setting, and construct measured.

Measures highlighted in green are highly recommended, yellow are recommended, and blue may be appropriate for persons with Diabetes.

Included in each flashcard is the construct measured, purpose, equipment needed, time to administer, measurement instructions, test directions, and testing pearls.

Normative data is provided where available.

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DFU Toolkit Flashcards

Outcome Measures included:

1	Hand-held Dynamometer/ Handgrip strength test (dominant and non-dominant hand)
2	Right OR Left Chair Sit and Reach Test (CSRT)
3	Timed "Up & GO" Test (TUG)
4	6-minute Walk Test (6MWT)
5	30 second Sit-To-Stand Test (30STS)
6	Step Counting
7	Standing Time
8	Five Times Sit to Stand Test (5TSTS)
9	Function in Sitting Test (FIST)
10	Mini BESTest
11	Submaximal and Maximal exercise Testing (Treadmill Tests and Cycle Tests)
12	Strength Tests (1-repetition maximum, strength dynamometry)
13	Walking Test (10 or 20 meter shuttle)
14	Two-minute Walk Test (2MWT)
15	10 Times Sit to Stand Test
16	10-meter Walk Test (10MWT)
17	Functional Tests for Persons who Self Propel a Manual Wheelchair (4FTPSMW)
18	Functional Reach Test (FRT) /Modified Functional Reach Test mFRT)

Measures 1-5 are highly recommended, 6-7 are recommended, 8-18 may be appropriate for persons with Diabetes

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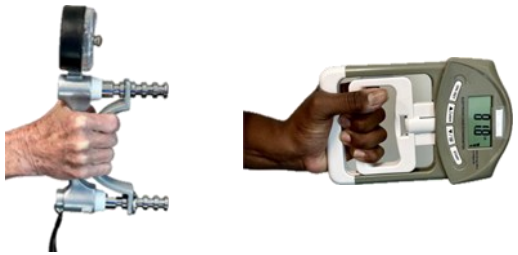
Hand-held Dynamometer/ Handgrip strength test



Construct measured: Upper body muscular strength

Purpose: Quantitative and objective measure of isometric muscular strength of the hand and forearm

Equipment needed: Manual or electronic hand-held dynamometer

Time to administer: Less than 5 minutes

Measurement: Force production in kilograms (0-90) or pounds (0-200)

Level of recommendation: Highly recommended

Pearls: 3 second or less grip contraction is sufficient to register maximum reading; calibrate equipment yearly

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Hand-held Dynamometer/ Handgrip strength test

Directions: Standardized procedure for positioning of instrument :

1) Person is seated with back, pelvis, and knees as close to 90 degrees as possible.
2) Shoulder is adducted and neutrally rotated, elbow flexed at 90 degrees, forearm neutral, wrist held between 0-15 degrees of ulnar deviation.
3) The arm is not supported by examiner or armrest and the dynamometer is presented vertically and in line with the forearm. Maximum grip is the mean of three trials.

Normative Grip Strength Data (lbs)
Community dwelling adults using Jamar device

Age (yrs)	Side	Male Mean (lbs)	Male Range (lbs) 25-75 percentiles	Female Mean (lbs)	Female Range (lbs) 25-75 percentiles
30 to 40	Dominant	94.0	73.7 - 114.3	70.0	53.1 - 84.4
	Non-Dom	88.2	71.3 - 107.1	66.0	49.9 - 80.1
40 to 50	Dominant	90.9	73.8 - 108.5	66.5	50.4 - 79.5
	Non-Dom	85.0	70.0 - 102.0	63.0	47.5 - 77.4
50 to 60	Dominant	85.5	71.6 - 100.5	62.1	47.4 - 73.8
	Non-Dom	79.8	66.9 - 94.8	58.8	45.1 - 72.4
60 to 70	Dominant	77.8	67.0 - 90.1	56.6	44.1 - 67.4
	Non-Dom	72.6	61.9 - 85.4	53.4	42.5 - 65.0
70 to 80	Dominant	67.7	60.0 - 77.6	50.1	40.5 - 60.3
	Non-Dom	63.5	55.0 - 74.0	46.7	39.9 - 55.2
80 to 90	Dominant	55.3	50.6 - 62.8	42.7	36.6 - 52.4
	Non-Dom	52.4	46.4 - 60.6	38.8	37.2 - 43.1

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Chair Sit and Reach Test (CSRT)

Construct measured: Flexibility

Purpose: Measures lower body flexibility

Equipment needed: Chair, tape measure or ruler

Time to administer: Less than 5 minutes

Measurement: Negative (finger tips do not reach toes with deficit measured with tape measure, Zero, (finger tips touch toes) Positive (finger tips touch past toes); distance reached is measured to the nearest 1/2 inch or 1 cm

Level of recommendation: Highly recommended

Pearls: 2 second reach is sufficient to determine result; subject should start with hips scooted to edge of chair. Person may self-select test leg or may test left and right legs individually. Perform 2 trials. Precaution: significant osteoporosis.

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Chair Sit and Reach Test (CSRT)

Directions: Standardized procedure for positioning of instrument :

1) Person is seated on a chair with 17 inch seat height with back, pelvis, and knees as close to 90 degrees as possible.
2) Test leg has knee fully extended, ankle at neutral dorsiflexion, heel on floor. Non-test leg is flexed with foot flat on floor.
3) Person reaches toward toes with bilateral arms with one hand over the other, palms aimed down.
4) Determine by observation if the person's fingertips reach their toes. Use a tape measure or ruler to measure the distance of deficit for the negative finding or the excess for the positive finding.

Normative data: Recommended ranges for this test for persons ages 60 to 84 years using measurements in inches:

Women	Below avg.	Average	Above avg.	**Men**	Below avg.	Average	Above avg.
60-64	< -0.5	-0.5 to 5.0	> 5.0	60-64	< -2.5	-2.5 to 4.0	> 4.0
70-74	< -1.0	-1.0 to 4.0	> 4.0	70-74	< -3.5	-3.5 to 2.5	> 2.5
80-84	< -2.0	-2.0 to 3.0	> 3.0	80-84	<-5.5	-5.5 to 1.5	> 1.5

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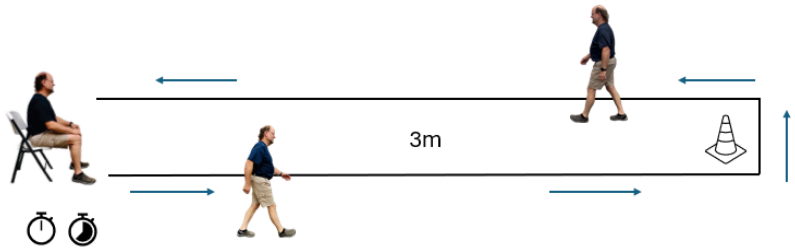
Timed Up & Go Test (TUG)



Construct measured: General Agility/General Mobility

Purpose: Assesses mobility, balance, walking ability, and fall risk in older adults

Equipment needed: Standard height (46 cm) chair, stopwatch

Time to administer: Less than 3 minutes

Measurement: The stopwatch should start when you say go, and should be stopped with the patient's buttocks touch the seat.

Level of recommendation: Highly recommended

Pearls: TUG was designed to be tested with person walking at a comfortable speed, yet at times is tested with the walking at a "quick yet safe speed". Clinically it is important that the chair is free standing, and not placed against a wall.

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Timed Up & Go Test (TUG)

Directions: Standardized procedure for test:

1) Measure and mark a 3 meter (9.8 feet) walkway
2) The person should sit on a standard arm chair, placing his/her back against the chair and resting his/her arms chair's arms. Any assistive device used for walking should be nearby. Regular foot-wear and customary walking aids should be used.
3) The person should walk to a line that is 3 meters (9.8 feet) away, turn around at the line, walk back to the chair, and sit down. The test ends when the person's buttocks touch the seat. Persons should be instructed to use a comfortable and safe walking speed. A stopwatch should be used to time the test (in seconds).

Normative data: Recommended cut-off scores for risk of falls for this test for persons ages 60 to 89 years using measurements in seconds:

Population	Cut-Off Score (seconds)
Community Dwelling Adults	>13.5
Older Adults with Stroke	>14
Older Adults already attending a	>15
Older Adults with Frailty	>32.6
Adults with LE Amputation	>19
Adults with Parkinson's Disease	>11.5
	>7.96
Adults with Hip Osteoporosis	>10
Adults with Vestibular Disorders	>11.1

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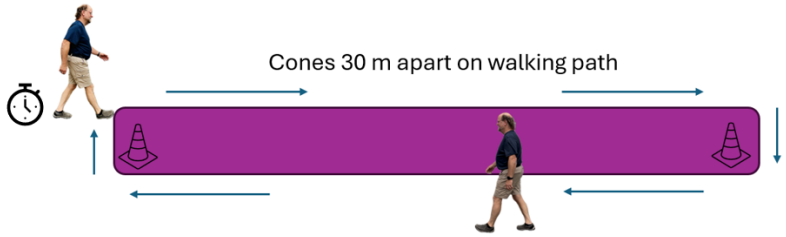
6 Minute Walk Test (6MWT)



Construct measured: Cardiorespiratory fitness

Purpose: Measures walking endurance and aerobic capacity

Equipment needed: chair, tape measure, stopwatch, 2 cones

Time to administer: Less than 10 minutes

Measurement: Record distance ambulated in meters without a sitting rest during the 6 minute walk.

Level of recommendation: Highly recommended

Pearls: Document any assistive device/bracing used. Document the amount of assistance using the 7-point ordinal scale described in the standardized administration protocol. If person requires total assistance, is unable to ambulate, or requires assistance for limb swing or forward propulsion, a score of 0 should be documented. If person needs to sit and rest, the test stops and this distance is recorded as the 6MWT score. No talking during the test.

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6 Minute Walk Test (6MWT)

Directions: Standardized procedure for test:

1) Instructions to the person in sitting: “The aim of this test is to walk as far as possible in six minutes. You will walk back and forth in the hallway. Six minutes is a long time to walk, so you will be exerting yourself. You may get out of breath or become tired. You are allowed to slow down, to stop, and to rest as necessary. You may stand and rest, but resume walking as soon as you are able. Are you ready to do that?”

2) "Walk around the object at each end. I am going to use this counter to keep track of the laps you complete. Remember the aim is to walk as far as possible, but do not run or jog.”

“Start now or when you are ready.”

3) Encouragement (eg, “You’re doing a good job and you have 5 minutes left, or “Keep up the good work. You have 4 minutes to go.”) is given after each minute of the test; no other communication should occur during the test.

Normative data: MDC for persons with Parkinson’s Disease is 82 meters, for persons post stroke 34.4 m to 36.6 meters and MCID for chronic stroke 34.4 m, MDC for Geriatrics is 58.2 meters.

Community dwelling older adults normative values:

AGE	MALE	FEMALE
60-69 yrs	572 meters	538 meters
70-79 yrs	527 meters	471 meters
80-89 yrs	417 meters	392 meters

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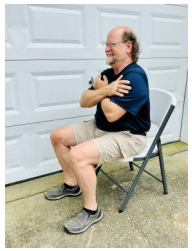
30 Second Sit-to-Stand Test (30STS)



Construct measured: Strength, Motor Agility, General Mobility

Purpose: Assesses functional lower extremity strength in older adults

Equipment needed: 17 inch seat height folding chair with back, stopwatch

Time to administer: Less than 3 minutes

Measurement: The score is the total number of stands within 30 seconds (more than halfway up at the end of 30 seconds counts as a full stand).

Level of recommendation: Highly recommended

Pearls: Monitor the participant's performance to ensure proper form and silently count the completion of each correct stand. Incorrectly executed stands are not counted.

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30 Second Sit-to-Stand Test (30STS)

Directions: Standardized procedure for test:

1) The participant is seated in the middle of the chair, back straight; feet approximately shoulder width apart and placed on the floor at an angle slightly back from the knees, with one foot slightly in front of the other to help maintain balance. Arms are crossed at the wrists and held against the chest.

2) Demonstrate the task both slowly and quickly.

3) Have the patient practice a repetition or 2 before completing the test. If a patient must use their arms to complete the test they are scored 0.

4) The participant is encouraged to complete as many full stands as possible within 30 seconds. The participant is instructed to fully sit between each stand.

Normative data: Recommended cut-off and mean for this test for persons ages 60 to 94 years in seconds:

Age (yrs)	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Female	15	15	14	13	12	11	9
Male	17	16	15	14	13	11	9

Normative data: Mean Test time in seconds for Community Dwelling Elderly:

Age (yrs)	60-69	70-79	80-89
Test time in seconds	14	12.9	11.9

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Step Counting

Construct measured: Physical Activity

Purpose: Records the number of steps in a time interval over extended periods of monitoring.

Equipment needed: Step Watch or Step App or Pedometer

Time to administer: Continuous step monitoring during the day

Measurement: Steps per day; can be translated into distance per day

Level of recommendation: Recommended

Pearls: Comparison of steps per day over two month period is preferred. Step counter use significantly increased physical activity.

Walking can improve blood glucose (blood sugar) levels, weight , bone and muscle strength, balance, blood pressure, cholesterol, heart health , concentration, and mental outlook by lowering stress levels and anxiety.

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Step Counting

Directions: Standardized procedure for step counting:

1) Wear step count monitor during all waking hours for more accurate account of total steps taken

Step Count Recommendations: Fewer steps were accumulated via wrist-worn step count monitors than via hip-worn pedometers in treadmill walking in a recent study. More steps were accumulated via wrist-worn monitors than hip-worn pedometers during ADLs.*

Normative data: Recommended ranges for step counting for ages 18 and older:**

Sedentary Persons: 5,000 steps per day recommended

Healthier Steps: 10,000 steps per day recommended

2500 steps per day began to see health benefits

3900 steps per day: linked to lower risks of dying from any cause during the study period

1,000-step increment was associated with a 15% decreased risk of dying and 500-step increment was tied to a 7% decrease in death from cardiovascular disease

*Nelson RK, Hasanaj K, Connolly G, Millen L, Muench J, Bidolli NS, et al. Comparison of Wrist- and Hip-Worn Activity Monitors When Meeting Step Guidelines. Prev Chronic Dis 2022;19:210343. DOI: http://dx.doi.org/10.5888/pcd19.210343

**Banach M, Lewek J, Surma S, et al. The association between daily step count and all-cause and cardiovascular mortality: a meta-analysis. Eur J Prev Cardiol. 2023;30(18):1975-1985. doi:10.1093/eurjpc/zwad229

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Standing Time

Construct measured: Physical Activity

Purpose: Records the amount of standing in a time interval over extended periods of monitoring.

Equipment needed: Watch, standing feature on health App

Time to administer: Continuous standing monitoring during the day

Measurement: Minutes per day

Level of recommendation: Recommended

Pearls: Glycemic control can be improved by reducing daily sitting time and replacing it with stepping. Standing is also beneficial for those at higher risk of developing Type 2 Diabetes.

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Standing Time

Directions: Standardized procedure for standing counting :

1) Wear standing count watch with standing App or record number of minutes stood per day

Normative data: Associations for beneficial outcomes for persons with type 2 diabetes were greater standing time, physical activity, and sleeping combined with lower sitting time. The mean (range) optimal compositions of 24 h (hour) time use, considering all outcomes, were:

6 h (range 5 h 40 min-7 h 10 min) for sitting

5 h 10 min (4 h 10 min-6 h 10 min) for standing

2 h 10 min (2 h-2 h 20 min) for light-intensity physical activity

2 h 10 min (1 h 40 min-2 h 20 min) for moderate-to-vigorous physical activity and

8 h 20 min (7 h 30 min-9 h) for sleeping *

*Brakenridge CJ, Koster A, de Galan BE, et al. Associations of 24 h time-use compositions of sitting, standing, physical activity and sleeping with optimal cardiometabolic risk and glycaemic control: The Maastricht Study. Diabetologia. 2024;67(7):1356-1367. doi:10.1007/s00125-024-06145-0

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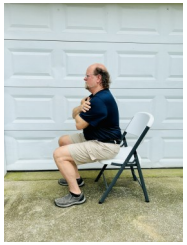
Five Times Sit to Stand Test (5TSTS)



Construct measured: Strength, Motor Agility, General Mobility

Purpose: Assesses functional lower extremity strength in older adults

Equipment needed: 17—18 inch seat height freestanding chair with backrest, stopwatch

Time to administer: Less than 3 minutes

Measurement: Timer starts when tester says "Go" and stops when the person's body touches the chair following the fifth repetition. Score is recorded in seconds.

Level of recommendation: May be appropriate

Pearls: If person is unable to perform test without the use of their arms, record a score of 0. A person with hemiplegia can have the impaired arm at their side or in a sling.

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Five Times Sit to Stand Test (5TSTS)

Directions: Standardized procedure:

1) One trial is administered.

2) A person is instructed to sit with arms folded across their chest and with back against the chair.

3) Instruct the person: " I want you to stand up and sit down five times a row, as quickly as you can, when I say "Go". Be sure to stand up fully and try not to let your back touch the chair back between each repetition. Do no use the back of your legs against the chair.

Cut-off scores for falls risk: **12 seconds or greater** to identify need of further assessment for fall risk.

A cut-off score of **15 seconds is predictive of fallers in older adults.**

For community-dwelling older adults, estimated values for normal performance:

Older Adult Age (yrs)	Mean time in seconds
60-69	11.4
70-79	12.6
80-89	14.8

For persons with Parkinson's Disease, greater than 16 seconds indicates the risk of falls. For person's with Vestibular disorders, those older than 60 years, 14.2 seconds identified balance dysfunction.

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Function in Sitting Test (FIST)

Construct measured: Balance, Seated postural control

Purpose: Measures lower body flexibility

Equipment needed: Bed, stopwatch

Time to administer: Less than 15 minutes

Measurement: 14 items are scored 0-4 with test scores 0-56 points

Level of recommendation: May be appropriate

Pearls: Standard position: Individual seated at edge of hospital bed with half of femur supported (neutral abd / adduction / rotation), hips and knees at 90 degrees, and feet flat in support. Hands are placed in lap unless needed for support.

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Function in Sitting Test (FIST)

Outcome Measure includes: 14 items scored including: sitting EOB with anterior, posterior, lateral nudges; static sitting with eyes open and closed, shaking head left and right, lifting one foot 1 inch twice, pickup objects or reaching from behind, forward, lateral, floor; scooting posterior, anterior, and lateral in sitting.

Testing Instructions:1) One trial of each item is allowed

2) Verbal directions and demonstration are given as needed by the therapist

Scoring Key:

4	Independent, completes the task independently and successfully
3	Needs Cues, completes the task independently and successfully; may need verbal / tactile cues or more time
2	Upper extremity support, unable to complete task without using upper extremities for support or assistance
1	Needs assistance, unable to complete task successfully without physical assistance
0	Complete assistance, requires complete physical assistance to perform task successfully, is unable to complete task successfully with physical assistance, or dependent

Normative data: MDC = 5.5 and 6.5 for MCID for adults with sitting balance dysfunction*

*Gorman SL, Harro CC, Platko C, Greenwald C. Examining the function in sitting test for validity, responsiveness, and minimal clinically important difference in inpatient rehabilitation. Arch Phys Med Rehabil. 2014;95(12):2304-2311. doi:10.1016/j.apmr.2014.07.415

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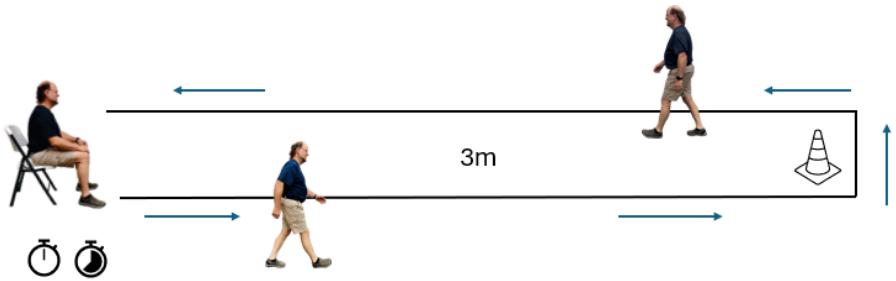
Mini BEST Test

(Mini Balance Evaluation Systems Test)



Construct measured: Balance, Motor Agility and General Mobility

Purpose: Measures dynamic balance.

Equipment needed: 4 inch thick T-foam, chair without armrests, 10 degree incline ramp, 9" height box, 3 meter distance marked on floor with tape from chair.

Time to administer: 10-15 minutes

Measurement: 14 items testing anticipatory, and reactive postural control, sensory orientation, and dynamic gait scored 0-2 with possible score of 0-28 with 28 the highest score.

Level of recommendation: May be appropriate

Pearls: Person should be tested with flat-heeled shoes OR shoes and socks off.

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Mini BEST Test

Directions: Persons are seat to begin test with sit to stand. Items 2-13 require standing and gait. Item 14 starts and finishes in a chair (TUG-COG).

Normative data: Recommended MDC for persons with Parkinson's Disease is 5.52 points. Preferred Fall risk cut off score 20/32 points total identified fallers in one study and 16/32 in another study. For persons with stroke, scores of less than or equal to 17.5 identified those with a history of falls. Those with vestibular disorders had a MCD of 3.5 and MCID of 4 points out of 28.

Mini Bestest Components:

Sit to Stand	**Compensatory Stepping Correction-Lateral**	**Walk with Head Turns-Horizontal**
Rise to Toes	**Stance (Feet Together) Eyes Open, Firm Surface**	**Step Over Obstacles**
Stand on One Leg	**Stance (Feet Together) Eyes Closed, Foam Surface**	**Timed Up & Go with Dual Task**
Compensatory Stepping Correction-Forward	**Incline Eyes Closed**	
Compensatory Stepping Correction-Backward	**Change in Speed**	

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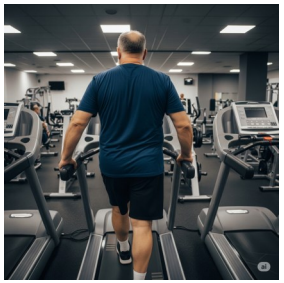
Submaximal and Maximal exercise Testing (Treadmill Tests and Cycle Tests)



Construct measured: Exercise tolerance, Muscular fitness

Purpose: The primary purpose of submaximal exercise testing is to determine the **HR response** to one or more submaximal work rates and use the result to predict the VO2 max. Submaximal measures of HR, BP, workload, RPE, and others. Maximal tests require a person to exercise to the point of volitional fatigue, which may may be inappropriate for some persons.

Equipment needed: Treadmill, stationary bicycle, hand-held dynamometry

Time to administer: Variable

Measurement: This test should be terminated when the person reaches 70% of HR reserve (85% of age-predicted HRmax).

Level of recommendation: May be appropriate

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Submaximal and Maximal exercise Testing (Treadmill Tests and Cycle Tests)

Submaximal Testing of Cardiorespiratory Fitness Directions:

1) Obtain resting HR and BP immediately prior to exercise in the exercise posture.
2) Person should be familiarized with treadmill or ergometer.
3) The test should begin with a 2-3 minute warm up to acquaint the person with the equipment and prepare them for the exercise intensity of the first stage.
4) A protocol should consist of 2 or 3-minute states with increments of work rate. HR should be monitored at least two times during each stage. BP should be monitored in the last minute of each stage. RPE and additional rating scales should be used a the last minute of each stage. Person's appearance and symptoms should be monitored and recorded.
5) The test should be terminated when the person reaches 70% of HR reserve. Cool down/recovery period should be included either to include warm-up activity, or a passive cooldown. Monitor patient during the 5 minutes cooldown.

Maximal strength with 1 rep-Max and hand-held dynamometry:

50th percentile of grip strength for 70-74 yrs is 38 kg. for males and 23 kg. for females.

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Strength Tests (1 repetition maximum, strength dynamometry)

Construct measured: Upper and lower body strength

Purpose: Supine bench press and shoulder press for upper body strength and leg press or squat for lower body strength were used to estimate 1-RM of upper and lower body musculature.

Prediction of 1-RM muscle strength by Brzycki 1-RM prediction equation, can be used reliably to measure upper and lower body muscle strength in persons with Type 2 Diabetes

Equipment needed: Manual or electronic dynamometry unit, related weight lifting equipment

Time to administer: 10-15 minutes

Measurement: Brzycki 1-RM prediction equation is used to estimate the 1-RM based on the resistance and repetitions recorded. The equation is mathematically expressed as 1RM = W/ [102.78– 2.78(R)]/100, where W is the weight used and R is the maximal number of repetitions performed.

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Strength Tests (1 repetition maximum, strength dynamometry)

Directions: Standardized procedure for 1RM:

1) Testing should be completed only after the person has participated in practice sessions. The person should warm up by completing a number of submaximal reps of the specific exercise that will be used to determine the 1-RM
2) Determine the 1-RM or any multiple of 1-RM within four trials with rest periods of 3-5 minutes between trials
3) Select an initial weight that is within the person's perceived capacity (50-70% of capacity).
4) Resistance is progressively increased by 5%-10% for upper body or 10%-20% for lower body exercise from the previous successful attempt until the person cannot complete the selected repetitions. All reps should be performed at the same speed of movement and Rom to instill consistency between trials.
5) The final weight lifted successfully is recorded as the absolute 1-RM or multiple RM

RM Percentage of 1-RM

Number of completed repetitions	Percentage of 1-RM	Number of completed repetitions	Percentage of 1-RM
1	100	8	80
2	95	9	77
3	93	10	75
4	90	11	70
5	87	12	67
6	85	15	65
7	85		

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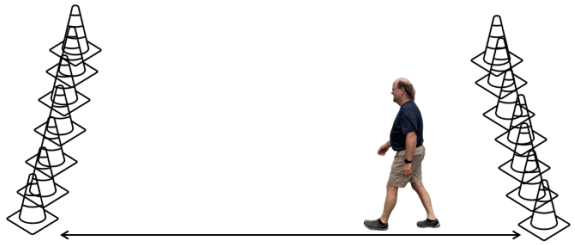
Walking Test

(10 or 20 meter Shuttle)



10 m or 20 m

Construct measured: Endurance, Physical Ability

Purpose: Fitness test to estimate VO2max, Evaluates exercise capacity

Equipment needed: Marked 10* or 20** meters on a flat, nonslip surface, cones, stopwatch, audible beep that is variable. *Incremental Shuttle Walk Test (ISWT); **20 Meter Shuttle Run

Time to administer: 8-12 minutes

Measurement: Distance walked and number of shuttles successfully completed is recorded

Level of recommendation: May be appropriate

Pearls: Person's motivation and environmental factors such as ambient temperature, relative humidity and elevation can influence performance.

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Walking Test

(10 or 20 meter Shuttle)

Directions: Standardized procedure for 10 **m Incremental Shuttle Walk Test (ISWT)** instrument. Distance of 10 meters is marked.

1) Person walks at a slow pace in time with the audible beeps. Each minute the required walking speed increases by 0.5 km/h.
2) The test ends when the person is unable to maintain the required pace or when they reach their limit due to fatigue, shortness of breath, or other symptoms.
3) The total distance covered (in meters) is the key outcome measure. The greater the distance walked, the better the individual's exercise capacity. Record the number of stages completed.

Directions: Standardized procedure for **20 m Shuttle Run** instrument :

Person repeatedly runs a 20-meter distance at increasing speeds until they can no longer keep pace. A number of equations are available to predict VO2max from assessment performance. Distance of 20 meters is marked.

1) The person will run the 20 m, beginning with an audible beep. The audible beep begins at a rate of 8.5 km/h (5.28 miles per hour pace)
2) The audible beep is incrementally increased by 0.5 km/h every 1 minute
3) The test continues until failure or fatigue occurs on 2 consecutive runs.

Normative data for 20 m Shuttle Run: In healthy adults, males MDC is 5.5 shuttles and females is 1.7 shut-

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Two-minute Walk Test (2MWT)

Construct measured: Endurance

Purpose: Measures lower body flexibility

Equipment needed: Hallway, stopwatch

Time to administer: Less than 5 minutes

Measurement: Walks without assistance for 2 minutes and the distance is measured.

- Start timing when the person is instructed to "Go" and therapist stops timing at 2 minutes .
- Assistive devices can be used but should be kept consistent and documented from test to test.
- If physical assistance is required to walk, this should not be performed .
- A measuring wheel is helpful to determine distance walked should be performed at the fastest speed possible.

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Two-minute Walk Test (2MWT)

Directions: Standardized procedure for test :

1) Instructions : "Cover as much ground as possible over 2 minutes. Walk continuously if possible, but do not be concerned if you need to slow down or stop to rest. The goal is to feel at the end of the test that more ground could not have been covered in the 2 minutes."

Pearls: One trial is performed. Recommended a 50 ft course. Assistive devices may be used but should be kept consistent from test to test.

Normative data: Recommended ranges for this test for persons ages 5 to 85 years using measurements in meters or feet.

Person with lower extremity amputation: MDC 34.3 meters or 112.5 feet.

Person with Multiple Sclerosis: 18.21 meters for MDC. Mean score of 144 with range of 92-630.

Person with mixed conditions: 12.2 meters or 40 ft for MDC for older adults.

Mean score of 77.5 (25.6) meters for long term care group and 150.4 (23.1) meters for retirement dwelling older adults.

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10 Times Sit to Stand Test

Construct measured: Strength, Motor Agility, General Mobility

Purpose: Assesses functional lower extremity strength in older adults

Equipment needed: 17—18 inch seat height freestanding chair with backrest, stopwatch

Time to administer: Less than 5 minutes

Measurement: Timer starts when tester says "Go" and stops when the person's body touches the chair following the tenth repetition. Score is recorded in seconds.

Level of recommendation: May be appropriate

Pearls: If person is unable to perform test without the use of their arms, record a score of 0. A person with hemiplegia can have the impaired arm at their side or in a sling.

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10 Times Sit to Stand Test

Directions: Standardized procedure:

1. One trial is administered.
2. A person is instructed to sit with arms folded across their chest and with back against the chair.
3. Instruct the person: " I want you to stand up and sit down five times a row, as quickly as you can, when I say "Go". Be sure to stand up fully and try not to let your back touch the chair back between each repetition. Do no use the back of your legs against the chair.

Cut-off scores for falls risk have not been set for 10 TSTS but 12 seconds or greater for the first 5 identify the need for further assessment for fall risk.

A cut-off score of 15 seconds for the first 5 sit to stands is predictive of fallers in older adults.

For community-dwelling older adults, estimated values

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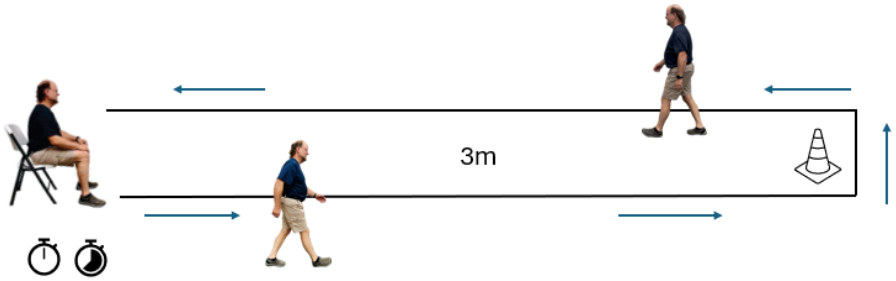
10-meter Walk Test (10MWT)



Construct measured: Motor Ability, General Mobility

Purpose: Measures walking speed over a short duration

Equipment needed: Chair, cone, tape measure, stopwatch

Time to administer: Less than 5 minutes

Measurement: Two trials are administered at the person's comfortable walking speed, followed by 2 trials at his/her fast walking speed, per the instructions. The 2 trials, for each speed, are averaged and the 2 gait speeds are documented in meters/second.

Level of recommendation: Highly recommended

Pearls: Assistive devices may be used but must be documented from test to test. If a person requires assistance, only the minimum amount of assistance required for a person to complete the task should be provided.

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10-meter Walk Test (10MWT)

Directions: Standardized procedure for test:

1) The time is started when any part of the leading foot crosses the plane of the 2 m mark.
2) The time is stopped when any part of the leading foot crosses the plane of the 8 m mark.
3) Divide 6 m by the seconds recorded to get a speed in m/s.

Cutoff Scores (Stroke): <0.4 m/s household ambulators; 0.4-0.8 m/s limited community ambulators; >0.8 m/s community ambulators

Cutoff Scores (Healthy older adults): < 0.7 m/s is indicative of increased risk of adverse events (fall, hospitalization, need for caregiver, fracture, etc.)

Pearls: A walking speed of 0.6 to 1.0 m/sec correlates with 51% increase in one-year fall risk, while a gait speed of 0.6 m/s or less correlates with 145% greater chance of falling.

Normative data: Recommended normative values for healthy adults for this test for persons age 20 to 99 years:

Decade	Men (m/s)	Women (m/s)
20s	1.358	1.341
30s	1.433	1.337
40s	1.434	1.390
50s	1.433	1.313
60s	1.339	1.241
70s	1.262	1.132
80s/90s	0.968	0.943

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Functional Tests for Persons who Self Propel a Manual Wheelchair (4FTPSMW)

Construct measured: General Mobility

Purpose: Measures functional mobility in a manual wheelchair

Equipment needed: Chair, meter stick, felt pen, marking board, 1.5 cm pile carpet, 10.3 m ramp with 1:13 grade and 4.5 m prior to ramp, stopwatch

Time to administer: 45 minutes

Measurement: This test consists of 4 functional tests: Timed Forward Wheeling and Ramp Ascent in seconds, and Forward Vertical Reach and One-Stroke Push measured in cm.

Level of recommendation: Highly recommended

Normative data: MDC for Chronic SCI: 2.27 seconds forward wheeling, 2.52 cm forward vertical reach, 22.65 seconds ramps ascent, 10.64 cm one stroke push.

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Functional Tests for Persons who Self Propel a Manual Wheelchair (4FTPSMW)

Timed Forward Wheeling 1. Start the person from a stationary position (anterior edges of front castors positioned directly behind start line). 2. Instruct the person to start wheeling on "go" and stop when they have passed a line marked 23 meters away from the start line. 3. Measure the duration of time it takes the person to wheel 23 m, starting from the first movement of the casters and stopping when the rear wheels completely cross the line.

Forward Vertical Reach Equipment: 1 meter measuring stick with felt pen attached to one end and a carpenter's level secured in the middle 1. Position the person's wheelchair parallel to a marking board and instruct the to hold a measuring stick with both hands (palms facing down), and keep their forearms parallel to their thighs. 2. Position the tip of the felt pen within 1 inch of the marking board. 3. Instruct the subject to raise the measuring stick upward, but to keep the stick level and to avoid excessive backward arching. 4. Mark the marking board at the highest point reached. 5. Record the distance from the floor to the point reached.

Ramp Ascent (forward wheeling) Equipment: Ramp (10.3m in length, 1:13 grade) 1. The subject begins wheeling 4.5 m from the base of the ramp and is instructed to wheel up the entire ramp until they reach the top flat surface. 2. If the person is unable to complete the ramp without stopping, a maximum rest period of 30 seconds is allowed. 3. As many rest periods as necessary can be taken, so long as independent forward propulsion is resumed before the 30 second rest time is over. 4. Time the duration it takes to get from the base of the ramp to the top of the ramp to the nearest second.

One-Stroke Push 1. Position the person's wheelchair with all 4 wheels on a carpeted surface. 2. Instruct the person to propel the wheelchair forward by pushing once with maximal effort.

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Functional Reach Test (FRT)/

Modified Functional Reach Test (mFRT)

Construct measured: Flexibility

Purpose: Measures measuring the maximum distance an individual can reach forward while standing /sitting in a fixed position.

Equipment needed: Chair, tape measure or ruler

Time to administer: Less than 5 minutes

Measurement: Instructions should include leaning as far as possible in each direction without rotation and without touching the wall. Record the distance in centimeters covered in each direction.

Level of recommendation: May be appropriate

Pearls: If the person is unable to raise the affected arm, the distance covered by the acromion during leaning is recorded. First trial in each direction is a practice trial and should not included in the final result . The yardstick should be affixed to the wall at the level of the person's acromion.

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Functional Reach Test (FRT)/

Modified Functional Reach Test (mFRT)

Directions: Standardized procedure for **FRT :**

The person is instructed to next to, but not touching, a wall and position the arm that is closer to the wall at 90 degrees of shoulder flexion with a closed fist. The therapist records the starting position at the 3rd metacarpal head on the yardstick. Instruct the person to "Reach as far as you can forward without taking a step." The location of the 3rd metacarpal is recorded. Scores are determined by assessing the difference between the start and end position is the reach distance, usually measured in inches. Three trials are done and the average of the last two is noted.

Modified Functional Reach Test (Adapted for persons who are unable to stand): Performed with a leveled yardstick that has been mounted on the wall at the height of the person's acromion level in the non-affected arm while sitting in a chair Hips, knees and ankles positioned are at 90 degree of flexion, with feet positioned flat on the floor. The initial reach is measured with the person sitting against the back of the chair with the upper-extremity flexed to 90 degrees, measure was taken from the distal end of the third metacarpal along the yardstick. Consists of three conditions over three trials :

1) Sitting with the unaffected side near the wall and leaning forward
2) Sitting with the back to the wall and leaning right
3) Sitting with the back to the wall leaning left.

Normative data: Community Dwelling older adult: FRT < 7 inches are unable to leave neighborhood without help, are limited in mobility skills, and most restricted in ADLs.

Frail older Adults: <18.5 cm (7.28 inches) indicates fall risk.

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