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FICSIT-4

(Frailty and Injuries: Cooperative Studies of Intervention Techniques)

Tests of Static Balance: parallel, semi-tandem, tandem, and one-legged stance tests

Journals of Gerontology Series A: Biological Sciences and Medical Sciences, Vol 50, Issue 6 M291-M297,

MULTICENTER STUDY
A cross-sectional validation study of the FICSIT common data base static balance measures. Frailty and Injuries: Cooperative Studies of Intervention Techniques
JE Rossiter-Fornoff, SL Wolf, LI Wolfson and DM Buchner
Division of Biostatistics, Washington University School of Medicine, St. Louis, USA.

BACKGROUND. Two simple balance scales comprising three or four familiar tests of static balance were developed, and their validity and reliability are described. The scales were such that the relative difficulties of the basic tests were taken into consideration. METHODS. Using FICSIT data, Fisher's method was used to construct scales combining ability to maintain balance in **parallel, semi-tandem, tandem, and one-legged stances**. Reliability was inferred from the stability of the measure over 3-4 months. Construct validity was assessed by cross- sectional correlations. RESULTS. Test-retest reliability (over 3-4 months) was good (r = .66). Validity of the FICSIT-3 scale was suggested by its low correlation with age, its moderate to high correlations with physical function measures, and three balance assessment systems. The FICSIT-4 scale discriminated balance over a wide range of health status; the three-test scale had a substantial ceiling effect in community samples. CONCLUSION. A balance scale was developed that appears to have acceptable reliability, validity, and discriminant ability.

INSTRUCTIONS: Demonstrate each position to the subject, then ask them to perform and time.

F-1. **FEET CLOSELY TOGETHER**, UNSUPPORTED, **eyes open** (ROMBERG POSITION)
INSTRUCTIONS: Stand still with your feet together as demonstrated for 10 seconds. ***[Berg #7 = 60 seconds]***
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to stand 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop.

F-2. **FEET CLOSELY TOGETHER**, UNSUPPORTED, **eyes closed** (ROMBERG POSITION)
INSTRUCTIONS: Please close your eyes and stand still with your feet together as demonstrated for 10 seconds.
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to keep eyes closed 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop.

F-3. **SEMI-TANDEM**: **eyes open** HEEL OF 1 FOOT PLACED TO THE SIDE OF THE 1ST TOE OF THE OPPOSITE FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)
INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to stand 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop.

F-4. **SEMI-TANDEM**: **eyes closed** HEEL OF 1 FOOT PLACED TO THE SIDE OF THE 1ST TOE OF THE OPPOSITE FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)
INSTRUCTIONS: Please close your eyes and stand still with your feet together as demonstrated for 10 seconds.
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to keep eyes closed 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop.

F-5. **FULL TANDEM**: **eyes open** HEEL OF 1 FOOT DIRECTLY IN FRONT OF THE OTHER FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD) ***[Berg #14 = 30 seconds]***
INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to stand 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop.

F-6. **FULL TANDEM**: **eyes closed** HEEL OF 1 FOOT DIRECTLY IN FRONT OF THE OTHER FOOT (SUBJECT CHOOSES WHICH FOOT GOES FORWARD)
INSTRUCTIONS: Please stand still with your feet together as demonstrated for 10 seconds.
☐4 able to stand 10 seconds safely
☐3 able to stand 10 seconds with supervision
☐2 able to stand 3 seconds
☐1 unable to stand 3 seconds but stays steady
☐0 needs help to keep from falling
If subject is able to do this, proceed to the next position, if not, stop

F-7. **STANDING ON ONE LEG**: **eyes open** ***[Same as Berg #13]***
INSTRUCTIONS: Stand on one leg as long as you can without holding.
☐4 able to lift leg independently and hold >10 seconds
☐3 able to lift leg independently and hold 5-10 seconds
☐2 able to lift leg independently and hold = or >3 seconds
☐1 tries to lift leg unable to hold 3 seconds but remains standing independently
☐0 unable to try or needs assist to prevent fall

Total FICSIT-4 Static Balance score = ____ / 28

Four Square Step Test (FSST)

Authors: Dite W. Temple VA.
Title: A clinical test of stepping and change of direction to identify multiple falling older adults.
Source: Archives of Physical Medicine & Rehabilitation. 83(11):1566-71, 2002 Nov.
Abstract
OBJECTIVES: To establish the reliability and validity of a new clinical test of dynamic standing balance, the Four Square Step Test (FSST), to evaluate its sensitivity, specificity, and predictive value in identifying subjects who fall, and to compare it with 3 established balance and mobility tests. DESIGN: A 3-group comparison performed by using 3 validated tests and 1 new test. SETTING: A rehabilitation center and university medical school in Australia. PARTICIPANTS: Eighty-one community-dwelling adults over the age of 65 years. Subjects were age- and gender-matched to form 3 groups: multiple fallers, nonmultiple fallers, and healthy comparisons. INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: Time to complete the FSST and Timed Up and Go test and the number of steps to complete the Step Test and Functional Reach Test distance. RESULTS: High reliability was found for interrater (n=30, intraclass correlation coefficient [ICC]=.99) and retest reliability (n=20, ICC=.98). Evidence for validity was found through correlation with other existing balance tests. Validity was supported, with the FSST showing significantly better performance scores (P<.01) for each of the healthier and less impaired groups. **The FSST also revealed a sensitivity of 85%, a specificity of 88% to 100%, and a positive predictive value of 86%.** CONCLUSION: As a clinical test, the FSST is reliable, valid, easy to score, quick to administer, requires little space, and needs no special equipment. It is unique in that it involves stepping over low objects (2.5cm) and movement in 4 directions. The FSST had higher combined sensitivity and specificity for identifying differences between groups in the selected sample population of older adults than the 3 tests with which it was compared.

Equipment:

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

Sequence: (square 1 = the upper left) CW → 2-3-4-1 then immediately move CCW → 4-3-2-1

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 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

Subjects who were unable to face forward during the entire sequence and needed to turn before stepping into the next square were still given a score.

Scoring: time in seconds. *Note: the stopwatch starts when the first foot contacts the floor in square 2.

Functional Reach*

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. Instruct them to "Reach as far forward as you can without taking a step." They are free to use various reaching strategies. Take note of the end position of the MCP joints against the ruler, and record the difference between the starting and ending position numbers. If they move their feet, that trial must be discarded and the trial repeated. Guard the subject as the task is performed to prevent a fall. Subjects are given two practice trials, and then their performance on an additional three trials is recorded and averaged. 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.

*Duncan P, Weiner D, Chandler J, et al. Functional reach: a new clinical measure of balance. *J of Gerontol* 1990; 45: M192-197.

6-Minute Walk Test

The vital sign norms described below assume an **elderly** population and / or a population with **cardiovascular or metabolic disease**. "Relative Contraindications to exercise training for patients with cardiac muscle dysfunction From Cahalin L.: In Hillegass, E, Essentials of Cardiopulmonary Physical Therapy. Saunders, Philadelphia, 1994, p 166" *

Description: The 6-Minute Walk test is a measure of endurance.

Equipment: stopwatch, tape measure, track/loop walkway, portable chair, Borg RPE and Dyspnea scales

Instructions: Monitor vital signs before and after each test (see table below). If there is an untoward vital sign response, continue monitoring and documenting every 5 minutes until SBP returns to within 10-20mm of pre-exercise, and also HR returns to within 10bpm of pre-exercise. Note heart rhythm pre and post, especially if changes from regular HR in pre-exercise to irregular HR in post-exercise period.

If participant has **congestive heart failure** profile (ankle edema, dyspnea / shortness of breath at rest or with minimal exertion, S3 heart sound, crackles / fine inspiratory rales in lower lobes of lungs), auscultate lung bases for adventitious breath sounds pre/post; also auscultate heart rhythm apically.

***Do not begin** testing if:

- resting SBP is > 180mm
- resting DBP is > 100
- resting HR is > 130, < 40 bpm
- resting Resp rate > 35 / min (too breathless to converse)

A **normal, expected response** to exercise (submaximal, 13/20 RPE on Borg) would be:

- Rise in SBP 20-30
- BP returns to within 10mm of pre-exercise rate within 5 minutes after stopping, and sitting in the chair
- HR returns to within 10 bpm of pre-exercise rate within 5 minutes after stopping, and sitting in the chair
- In the absence of findings from a 12-lead ECG graded exercise test, keep exercise HR < 130 bpm.

An **abnormal response** to exercise would be:

- Failure to return to baseline promptly (described above)
- SBP drops 10-20 below baseline (instead of rising)
- SBP > 210-240
- DBP > 110
- HR drops >10 bpm below baseline (instead of rising)
- HR rise > 50 bpm with low level activity

Comparing HR in the elderly to the normal young population:

- Resting HR in the elderly is no different than resting HR in normal, young population
- In the elderly population, HR response to exercise can be less brisk, and also will not rise to as high of a maximal HR (compared to young normal),
- In the absence of graded exercise stress test results, keep exercise HR under 120-130bpm.
- NOTE IF PARTICIPANT IS TAKING A BETA BLOCKER: this will blunt their HR response to exercise, therefore HR is not a reliable measure. Rely on Borg RPE scales and BP response.

Assure patient safety throughout the test. Give the same verbal instructions each time. "***When I say 'go', I want you to walk up and down this walkway, doing laps. I will walk with you. Walk at a pace that you think you can maintain for 6 minutes. If you get tired, short of breath, have chest pain, leg pain, or any other symptom, we will stop and have you rest until you feel ready to go again. While you rest, we let the stopwatch run, and then when you are through resting you can continue to walk for what is left of the remaining 6 minutes. We measure the total distance that you are able to walk in 6 minutes. You can begin when I say 'go'***."

Inform the patient of the time elapsed at each minute. Time the subject for 6 minutes, then say 'stop'.
At the end of the 6 minues:

- Have participant sit down (portable chair)
- Immediately take vital signs

- Have patient rate their RATE OF PERCEIVED EXERTION, and also SHORTNESS OF BREATH using the Borg visual analog scales
- Calculate and record the distance walked.

Stop testing based on the following criteria:
C/o angina symptoms (chest pain or tightness)
Any of the following symptoms:
Light-headedness, Confusion, Ataxia, staggering unsteadiness, Pallor, Cyanosis, Nausea, Marked dyspnea, Unusual fatigue, Signs of peripheral circulatory insufficiency, Claudication or other significant pain, Facial expressions signifying distress

Abnormal cardiac responses described below assume a **normal, health** population:
Systolic blood pressure drops > 10 mmHg (instead of rising)
Systolic blood pressure rises < 250 mmHg
Diastolic blood pressure rises to > 120 mmHg
Heart rate drops more than 15 beats per minute (given the subject was walking the last minutes of the test versus resting)
Notify physician if test is terminated for any of the above reasons

6 minute walk	HR	Resp	BP	Borg	Distance	#Rests, time	Assitive Device? Type: Gait deviation:
Resting							
Post							
5 minutes Post							

6 minute walk: ESPF, Brown M, et al.,
Distance in feet
Mean age of participants: 84

	N		Mean	Median	Std. Deviation
	Valid	Missing			
Aerobic group	40	0	920	1013	295
Balance group	35	0	706	700	303
Strength group	20	0	970	990	340

6-Minute Walk Test Distances: Means and Standard Deviations by Age and Gender **(Meters)**
Steffen, T.M. (2000) Functional assessment: A literature review of four tools. Focus: Geriatric Physical Therapy: An Independent Home Study Course for Individual Continuing Education.

Age	Gender (N)	Mean (meters)	SD	Normal Range (2SD)
60-69	Male (15) Female (22)	572 538	92 92	388-756 354-722
70-79	Male (14) Female (22)	527 471	85 75	357-697 321-621
80-89	Male (8) Female (15)	417 392	73 85	271-563 222-562

Modified - Physical Performance Test

Testing Protocol:
Administer the test as outlined below. Subjects are given up to two chances to complete each item. Assistive devices are permitted for tasks 6 – 9.

Feet together: "Stand still with your feet together as demonstrated for 10 seconds."
Semi Tandem: "Stand with the heel of one foot placed to the side of the 1st toe of the opposite foot for 10 seconds." Subject chooses which foot goes forward.
Tandem: "Stand with the heel of one foot directly in front of the other foot, for 10 seconds. Subject chooses which foot goes forward.

Chair Rise: Use a straight back chair with a solid seat that is 16" high. Ask participant to sit on the chair with arms folded across their chest. "Stand up and sit down as quickly as possible 5 times, keeping your arms folded across your chest."

Book Lift: Place a Physician's Desk Reference Book (1988 PDR: 5.5 lbs) or other heavy book on a table in front of the patient. Ask the patient, when given the command "go" to place the book on a shelf above shoulder level. Time from the command "go" to the time the book is resting on the shelf.

Put on and remove a jacket: If the subject has a jacket or cardigan sweater, ask them to remove it. If not, give the subject a lab coat. Ask the subject, on the command "go" to put the coat on completely such that it is straight on their shoulders and then remove the garment completely. Time from the command "go" until the garment has been completely removed.

Pick up a penny from floor: Place a penny approximately 12 inches from the patient's foot on the dominant side. Ask the patient, on the command "go" to pick up the penny from the floor and stand up. Time from the command "go" until the subject is standing erect with a penny in hand.

Turn 360 degrees: With subject in a corridor or in an open room, ask the subject to turn 360 degrees. Evaluate using the scale on PPT scoring sheet.

50-foot walk test: Bring subject to start on a 50 foot walk test course (25 feet out and 25 feet back) and ask the subject, on the command "go" to walk to the 25-foot mark and back. Time from the command "go" until the starting line is crossed on the way back.

Stairs: Bring subject to foot of stairs (nine to 12 steps) and ask subject, on the command "go" to begin climbing stairs until they feel tired and wishes to stop. Before beginning this task, alert the subject to the possibility of developing chest pain or shortness of breath and inform the subject to tell you if any of these symptoms occur. Escort the subject up the stairs. Time from the command "go" until the subjects' first foot reaches the top of the first flight of stairs. Record the number of flights (maximum is four) completed (up and down is one flight).

Scoring:
32/36-36/36 = not frail
25/36-32/36 = mild frailty
17/36-24/36 = moderate frailty
< 17/36 = unlikely to be able to function in the community

Modified - Physical Performance Test

1.	Standing Static Balance	Feet Together: _____ sec.	Semi Tandem: _____ sec.	Tandem: _____ sec.	Score
		10s.	10s.	☐ 10s.	☐ 4
		10s.	10s.	☐ 3-9.9s.	☐ 3
		10s.	10s.	☐ 0-2.9s.	☐ 2
		10s.	☐ 0-9s.	Unable	☐ 1
		☐ 0-9s.	Unable	Unable	☐ 0

		Time	**Scoring values**	**Score**
2.	Chair rise		≤ 11 sec = 4 11.1--14 sec = 3 14.1--17 sec = 2 >17 sec = 1 unable = 0	
3.	Lift a book and put it on a shelf		≤ 2 sec = 4 2.1--4 sec = 3 4.1-- 6 sec = 2 > 6 sec = 1 unable = 0	
4.	Put on and remove a jacket		≤ 10 sec = 4 10.1 --15 sec = 3 15.1 – 20 sec = 2 >20 sec = 1 unable = 0	
5.	Pick up a penny from floor.		≤ 2 sec = 4 2.1--4 sec = 3 4.1-- 6 sec = 2 > 6 sec = 1 unable = 0	
6.	Turn 360 degrees	Discontinuous steps = 0 Continuous steps = 2		
		Unsteady (grabs, staggers) = 0 Steady = 2		
7.	50-foot walk test. .		≤ 15 sec = 4 15.1--20 sec = 3 20.1--25 sec = 2 >25 sec = 1 unable = 0	
8.	Climb one flight of stairs.		≤ 5 sec = 4 5.1--10 sec = 3 10.1 – 15 sec = 2 >15 sec = 1 unable = 0	
9.	Climb stairs.	Number of flights of stairs up and down (maximum 4)		
TOTAL SCORE			9-item score	**/36**

Dynamic Gait Index*

Description:
Developed to assess the likelihood of falling in older adults.
This scale was designed to test eight facets of gait.

Equipment needed: Box (Shoebox)
Cones (2)
Stairs

Completion:

Time: 15 minutes

Scoring: A four-point ordinal scale, ranging from 0-3. "0" indicates the lowest level of function and "3" the highest level of function.
Total Score = 24

Interpretation: **< 19/24 = predictive of falls in the elderly**
> 22/24 = safe ambulators

*Shumway-Cook A, Woollacott M. *Motor Control Theory and Applications*, Williams and Wilkins Baltimore, 1995: 323-324

Dynamic Gait Index

Gait level surface _____
Instructions: Walk at your normal speed from here to the next mark (20')
Grading: Mark the lowest category that applies.
(3) Normal: Walks 20', no assistive devices, good sped, no evidence for imbalance, normal gait pattern
(2) Mild Impairment: Walks 20', uses assistive devices, slower speed, mild gait deviations.
Moderate Impairment: Walks 20', slow speed, abnormal gait pattern, evidence for imbalance.
Severe Impairment: Cannot walk 20' without assistance, severe gait deviations or imbalance.

Change in gait speed _____
Instructions: Begin walking at your normal pace (for 5'), when I tell you "go," walk as fast as you can (for 5'). When I tell you "slow," walk as slowly as you can (for 5').
Grading: Mark the lowest category that applies.
(3) Normal: Able to smoothly change walking speed without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast and slow speeds.
(2) Mild Impairment: Is able to change speed but demonstrates mild gait deviations, or not gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.
Moderate Impairment: Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, or changes speed but has significant gait deviations, or changes speed but loses balance but is able to recover and continue walking.
Severe Impairment: Cannot change speeds, or loses balance and has to reach for wall or be caught.

Gait with horizontal head turns _____
Instructions: Begin walking at your normal pace. When I tell you to "look right," keep walking straight, but turn your head to the right. Keep looking to the right until I tell you, "look left," then keep walking straight and turn your head to the left. Keep your head to the left until I tell you "look straight," then keep walking straight, but return your head to the center.
Grading: Mark the lowest category that applies.
(3) Normal: Performs head turns smoothly with no change in gait.
(2) Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.
Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.
Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 15" path, loses balance, stops, reaches for wall.

Gait with vertical head turns _____
Instructions: Begin walking at your normal pace. When I tell you to "look up," keep walking straight, but tip your head up. Keep looking up until I tell you, "look down," then keep walking straight and tip your head down. Keep your head down until I tell you "look straight," then keep walking straight, but return your head to the center.
Grading: Mark the lowest category that applies.
(3) Normal: Performs head turns smoothly with no change in gait.
Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.
(1) Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.
(0) Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 15" path, loses balance, stops, reaches for wall.

Dynamic Gait Index continued….

Gait and pivot turn _____
Instructions: Begin walking at your normal pace. When I tell you, "turn and stop," turn as quickly as you can to face the opposite direction and stop.
Grading: Mark the lowest category that applies.
(3) Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
(2) Mild Impairment: Pivot turns safely in > 3 seconds and stops with no loss of balance.
Moderate Impairment: Turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.
Severe Impairment: Cannot turn safely, requires assistance to turn and stop.

Step over obstacle ____
Instructions: Begin walking at your normal speed. When you come to the shoebox, step over it, not around it, and keep walking.
Grading: Mark the lowest category that applies.
(3) Normal: Is able to step over the box without changing gait speed, no evidence of imbalance.
Mild Impairment: Is able to step over box, but must slow down and adjust steps to clear box safely.
Moderate Impairment: Is able to step over box but must stop, then step over. May require verbal cueing.
Severe Impairment: Cannot perform without assistance.

Step around obstacles _____
Instructions: Begin walking at normal speed. When you come to the first cone (about 6' away), walk around the right side of it. When you come to the second cone (6' past first cone), walk around it to the left.
Grading: Mark the lowest category that applies.
Normal: Is able to walk around cones safely without changing gait speed; no evidence of imbalance.
Mild Impairment: Is able to step around both cones, but must slow down and adjust steps to clear cones.
Moderate Impairment: Is able to clear cones but must significantly slow, speed to accomplish task, or requires verbal cueing.
Severe Impairment: Unable to clear cones, walks into one or both cones, or requires physical assistance.

Steps _____
Instructions: Walk up these stairs as you would at home, i.e., using the railing if necessary. At the top, turn around and walk down.
Grading: Mark the lowest category that applies.
(3) Normal: Alternating feet, no rail.
(2) Mild Impairment: Alternating feet, must use rail.
Moderate Impairment: Two feet to a stair, must use rail.
(0) Severe Impairment: Cannot do safely.

TOTAL SCORE: ___ / 24

Tinetti Performance Oriented Mobility Assessment (POMA)*

Description:
The Tinetti assessment tool is an easily administered task-oriented test that measures an older adult's gait and balance abilities.

Equipment needed: Hard armless chair
Stopwatch or wristwatch
15 ft walkway

Completion:

Time: 10-15 minutes

Scoring: A three-point ordinal scale, ranging from 0-2. "0" indicates the highest level of impairment and "2" the individuals independence.
Total Balance Score = 16
Total Gait Score = 12
Total Test Score = 28

Interpretation:
25-28 = low fall risk
19-24 = medium fall risk
< 19 = high fall risk

* Tinetti ME. Performance-oriented assessment of mobility problems in elderly patients. *JAGS* 1986; 34: 119-126. (Scoring description: PT Bulletin Feb. 10, 1993)

Tinetti Performance Oriented Mobility Assessment (POMA)

- Balance Tests -

Initial instructions: Subject is seated in hard, armless chair. The following maneuvers are tested.

1. **Sitting Balance** — Leans or slides in chair =0; Steady, safe =1 _____

2. **Arises** — Unable without help =0; Able, uses arms to help =1; Able without using arms =2 _____

3. **Attempts to Arise** — Unable without help =0; Able, requires > 1 attempt =1; Able to rise, 1 attempt =2 _____

4. **Immediate Standing Balance** (first 5 seconds)
   Unsteady (swaggers, moves feet, trunk sway) =0
   Steady but uses walker or other support =1
   Steady without walker or other support =2 _____

5. **Standing Balance**
   Unsteady =0
   Steady but wide stance(medial heals > 4 inches apart) and uses cane or other support =1
   Narrow stance without support =2 _____

6. **Nudged** (subject at maximum position with feet as close together as possible, examiner pushes lightly on subject's sternum with palm of hand 3 times)
   Begins to fall =0
   Staggers, grabs, catches self =1
   Steady =2 _____

7. **Eyes Closed** (at maximum position of item 6)
   Unsteady =0
   Steady =1 _____

8. **Turing 360 Degrees** — Discontinuous steps =0; Continuous steps =1 _____; Unsteady (grabs, staggers) =0; Steady =1 _____

9. **Sitting Down**
   Unsafe (misjudged distance, falls into chair) =0
   Uses arms or not a smooth motion =1
   Safe, smooth motion =2 _____

BALANCE SCORE: _____/16

Tinetti Performance Oriented Mobility Assessment (POMA)

- Gait Tests -

Initial Instructions: Subject stands with examiner, walks down hallway or across room, first at "usual" pace, then back at "rapid, but safe" pace (using usual walking aids)

10. **Initiation of Gait** (immediately after told to "go"

Any hesitancy or multiple attempts to start =0
No hesitancy =1 _____

11. **Step Length and Height**

Right swing foot
- Does not pass left stance foot with step =0
- Passes left stance foot =1 _____
- Right foot does not clear floor completely
  - With step =0
- Right foot completely clears floor =1 _____

Left swing foot

Does not pass right stance foot with step =0
Passes right stance foot =1 _____
Left foot does not clear floor completely
- With step =0

Left foot completely clears floor =1 _____

12. **Step Symmetry**

Right and left step length not equal (estimate) =0
Right and left step length appear equal =1 _____

13. **Step Continuity**

Stopping or discontinuity between steps =0
Steps appear continuous =1 _____

14. **Path** (estimated in relation to floor tiles, 12-inch diameter; observe excursion of 1 foot over about 10 ft. of the course)

Marked deviation =0
Mild/moderate deviation or uses walking aid =1
Straight without walking aid =2 _____

15. **Trunk**

Marked sway or uses walking aid =0
No sway but flexion of knees or back or
- Spreads arms out while walking =1

No sway, no flexion, no use of arms, and no
- Use of walking aid =2 _____

16. **Walking Stance**

Heels apart =0
Heels almost touching while walking =1 _____

GAIT SCORE = _____/12

BALANCE SCORE = _____/16

TOTAL SCORE (Gait + Balance) = _____/28

{< 19 high fall risk, 19-24 medium fall risk, 25-28 low fall risk}

Tinetti Performance Oriented Mobility Assessment (POMA)	Date	Date	Date	Date
Balance Tests: Subject is seated on hard, armless chair				
SITTING BALANCE Leans or slides in chair =0, Steady, safe =1				
ARISES Unable without help =0; Able, uses arms =1, Able without using arms = 2				
ATTEMPTS TO RISE: Unable w/o help=0; Able, requires > 1 attempt =1; Able in 1 attempt =2				
IMMEDIATE STANDING BALANCE (first 5 seconds) Unsteady (sway/stagger/feet move)=0; Steady, w/ support =1;Steady w/o support =2				
STANDING BALANCE Unsteady =0; Steady, stance > 4 inch BOS & requires support =1; Narrow stance, w/o support =2				
STERNAL NUDGE (feet close together) Begins to fall =0; Staggers, grabs, catches self =1; Steady =2				
EYES CLOSED (feet close together) Unsteady =0; Steady =1				
TURNING 360 DEGREES Discontinuous steps =0; Continuous steps =1				
TURNING 360 DEGREES Unsteady (staggers, grabs) =0;Steady =1				
SITTING DOWN Unsafe (misjudges distance, falls) =0;Uses arms, or not a smooth motion =1; Safe, smooth motion =2				
BALANCE SCORE TOTAL	/16	/16	/16	/16
GAIT INITATION (immediate after told "go) Any hesitancy, multiple attempts to start =0; No hesitancy =1				
STEP LENGTH R swing foot passes L stance leg =1; L swing foot passes R =1				
FOOT CLEARANCE R foot completely clears floor =1; L foot completely clears floor =1				
STEP SYMMETRY R and L step length unequal =0; R and L step length equal=1				
STEP CONTINUITY Stop/discontinuity between steps =0; Steps appear continuous =1				
PATH (excursion) Marked deviation =0; Mild/moderate deviation or use of aid =1; Straight without device=2				
TRUNK Marked sway or uses device =0; No sway but knee or trunk flexion or spread arms while walking =1; None of the above deviations=2				
BASE OF SUPPORT Heels apart =0; Heels close while walking =1				
GAIT SCORE TOTAL	/12	/12	/12	/12
ASSISTIVE DEVICE				
TOTAL SCORE (BALANCE + GAIT) **FALL RISK** **(minimal >23, Mod. 19-23, High < 19)**	/28	/28	/28	/28
Therapist initials				

Berg Balance Scale

Description:
14-item scale designed to measure balance of the older adult in a clinical setting.

Equipment needed: Ruler
2 standard chairs (one with arm rests, one without)
Footstool or step
Stopwatch or wristwatch
15 ft walkway

Completion:
Time: 15-20 minutes

Scoring: A five-point ordinal scale, ranging from 0-4. "0" indicates the lowest level of function and "4" the highest level of function.
Total Score = 56

Interpretation:
41-56 = low fall risk
21-40 = medium fall risk
0 –20 = high fall risk

Criterion Validity: "Authors support a cut off score of 45/56 for independent safe ambulation". Riddle and Stratford, 1999, examined 45/56 cutoff validity and concluded:
Sensitivity = 64% (Correctly predicts fallers)
Specificity = 90% (Correctly predicts non-fallers)
Riddle and Stratford encouraged a lower cut off score of 40/56 to assess fall risk

Comments: Potential ceiling effect with higher level patients. Scale does not include gait items

Berg Balance Scale

Name: _____ Date: _____

Location: _____ Rater: _____

ITEM DESCRIPTION	SCORE (0-4)
Sitting to standing	_____
Standing unsupported	_____
Sitting unsupported	_____
Standing to sitting	_____
Transfers	_____
Standing with eyes closed	_____
Standing with feet together	_____
Reaching forward with outstretched arm	_____
Retrieving object from floor	_____
Turning to look behind	_____
Turning 360 degrees	_____
Placing alternate foot on stool	_____
Standing with one foot in front	_____
Standing on one foot	_____

Total _____

GENERAL INSTRUCTIONS
Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

Berg Balance Scale

SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hand for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or stabilize
( ) 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding on.
( ) 4 able to stand safely for 2 minutes
( ) 3 able to stand 2 minutes with supervision
( ) 2 able to stand 30 seconds unsupported
( ) 1 needs several tries to stand 30 seconds unsupported
( ) 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
( ) 4 able to sit safely and securely for 2 minutes
( ) 3 able to sit 2 minutes under supervision
( ) 2 able to able to sit 30 seconds
( ) 1 able to sit 10 seconds
( ) 0 unable to sit without support 10 seconds

STANDING TO SITTING
INSTRUCTIONS: Please sit down.
( ) 4 sits safely with minimal use of hands
( ) 3 controls descent by using hands
( ) 2 uses back of legs against chair to control descent
( ) 1 sits independently but has uncontrolled descent
( ) 0 needs assist to sit

TRANSFERS
INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 4 able to transfer safely with minor use of hands
( ) 3 able to transfer safely definite need of hands
( ) 2 able to transfer with verbal cuing and/or supervision
( ) 1 needs one person to assist
( ) 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
( ) 4 able to stand 10 seconds safely
( ) 3 able to stand 10 seconds with supervision
( ) 2 able to stand 3 seconds
( ) 1 unable to keep eyes closed 3 seconds but stays safely
( ) 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding on.
( ) 4 able to place feet together independently and stand 1 minute safely
( ) 3 able to place feet together independently and stand 1 minute with supervision
( ) 2 able to place feet together independently but unable to hold for 30 seconds
( ) 1 needs help to attain position but able to stand 15 seconds feet together
( ) 0 needs help to attain position and unable to hold for 15 seconds

Berg Balance Scale continued…..

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
( ) 4 can reach forward confidently 25 cm (10 inches)
( ) 3 can reach forward 12 cm (5 inches)
( ) 2 can reach forward 5 cm (2 inches)
( ) 1 reaches forward but needs supervision
( ) 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up the shoe/slipper, which is place in front of your feet.
( ) 4 able to pick up slipper safely and easily
( ) 3 able to pick up slipper but needs supervision
( ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
( ) 1 unable to pick up and needs supervision while trying
( ) 0 unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.
( ) 4 looks behind from both sides and weight shifts well
( ) 3 looks behind one side only other side shows less weight shift
( ) 2 turns sideways only but maintains balance
( ) 1 needs supervision when turning
( ) 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touch the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)
( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds
( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding on.
( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold ≥ 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

Timed Up & Go Test (TUG)

Research Report

Author: Anne Shumway-Cook, Sandy Brauer, and Marjorie Woollacott

Description of the Instrument

- Patients are timed (in seconds) when performing the TUG—3 conditions

1. TUG alone-from sitting in a chair, stand up, walk 3 meters, turn around, walk back, and sit down..
2. TUG Cognitive-complete the task while counting backwards from a randomly selected number between 20 and 100.
3. TUG manual-complete the task while carrying a full cup of water.

- The time taken to complete the task is strongly correlated to level of functional mobility, (i.e. the more time taken, the more dependent in activities of daily living).
- **The cutoff levels for TUG is 13.5 seconds or longer with an overall correct prediction rate of 90%**; for TUG manual is 14.5 seconds or longer with a 90% correct prediction rate; and Tug cognitive is 15 seconds or longer with an overall correct prediction rate of 87%.

Form of instrument:

- Hazard/Risk Assessment Tools
- To identify/screen elderly individuals who are prone to falls
- Interrater reliability was very high, with *r*=.98, .99, and .99 for the TUG, TUGmanual, and TUGcognitive respectively
- The TUG alone correctly classified 13/15 fallers (87% sensitivity) and 13/15 nonfallers (87% specficity).

Validity Measures

- **Older adults who take longer than 14 seconds to complete the TUG have a high risk for falls. This cutoff is different from Podsiadlo and Richardson, which is 30 seconds.**

Reference

Lundlin-Olsson, L., Nyberg, L., & Gustafson, Y. (1998). Attention, frailty, and falls: the effect of a manual task on basic mobilty. Journal of the American Geriatrics Society, 46, 758-761.

Podsiadlo, D., & Richardson, S. (1991). The timed "up & go": A test of basic functional mobility for frail elderly persons. Journal of the American Geriatrics Society, 39, 142-148.

Shumway-Cook, A., Brauer, S., & Woollacott, M. (2000). Predicting the probability for falls in community-dwelling older adults using the timed up & go test. Physical Therapy, 80(9), 896-903.

Timed "Up and Go"*

Directions:
The timed "Up and Go" test measures, in seconds, the time taken by an individual to stand up from a standard arm chair (approximate seat height of 46 cm [18in], arm height 65 cm [25.6 in]), walk a distance of 3 meters (118 inches, approximately 10 feet), turn, walk back to the chair, and sit down. The subject wears their regular footwear and uses their customary walking aid (none, cane, walker). No physical assistance is given. They start with their back against the chair, their arms resting on the armrests, and their walking aid at hand. They are instructed that, on the word "go" they are to get up and walk at a comfortable and safe pace to a line on the floor 3 meters away, turn, return to the chair and sit down again. The subject walks through the test once before being timed in order to become familiar with the test. Either a stopwatch or a wristwatch with a second hand can be used to time the trial.

Instructions to the patient:
"When I say 'go' I want you to stand up and walk to the line, turn and then walk back to the chair and sit down again. Walk at your normal pace."

Variations:
You may have the patient walk at a fast pace to see how quickly they can ambulate. Also you could have them turn to the left and to the right to test any differences.

*Podsiadlo D, Richardson S. The timed "up and go": a test of basic functional mobility for frail elderly persons. *JAGS* 1991; 39: 142-148.

Scoring:
Time for 'Up and Go' test _____sec.
☐ Unstable on turning?
☐ Walking aid used? Type of aid: _____

The Activities-specific Balance Confidence (ABC) Scale*

Administration:
The ABC can be self-administered or administered via personal or telephone interview. Larger typeset should be used for self-administration, while an enlarged version of the rating scale on an index card will facilitate in-person interviews. 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. The Activities-specific Balance Confidence (ABC) Scale. *J Gerontol Med Sci* 1995; 50(1): M28-34

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:

0% 10 20 30 40 50 60 70 80 90 100%
no confidence completely confident

"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? ____%

*Powell, LE & Myers AM. The Activities-specific Balance Confidence (ABC) Scale. *J Gerontol Med Sci* 1995; 50(1): M28-34

Test of Reaction Time

Participant is sitting in a chair. Instructions: "Tap your toe as quickly as you can for 10 seconds." Record the number of taps in 10 seconds

Left _____ Right _____
Average for 78 y.o. = 30 taps (Brown et al., n = 35)

Functional Mobility:

Standing → Floor
Independent? Assist given _____

Floor → Stand
Independent? Assist given _____

Rolling supine – prone - supine
Starting position is in supine.
Instructions: "Roll onto your stomach, and then without stopping, roll back onto your back." Be sure participant achieves full prone position (unless shoulder or back pain prevents that) before rolling back to supine.

Supine → Prone → Supine: Right side _____sec.

Supine → Prone → Supine: Left side _____ sec.

Average for 78 y.o. = 8.2 seconds (Brown et al., n = 35)

Dynamometry:

1 Rep Max

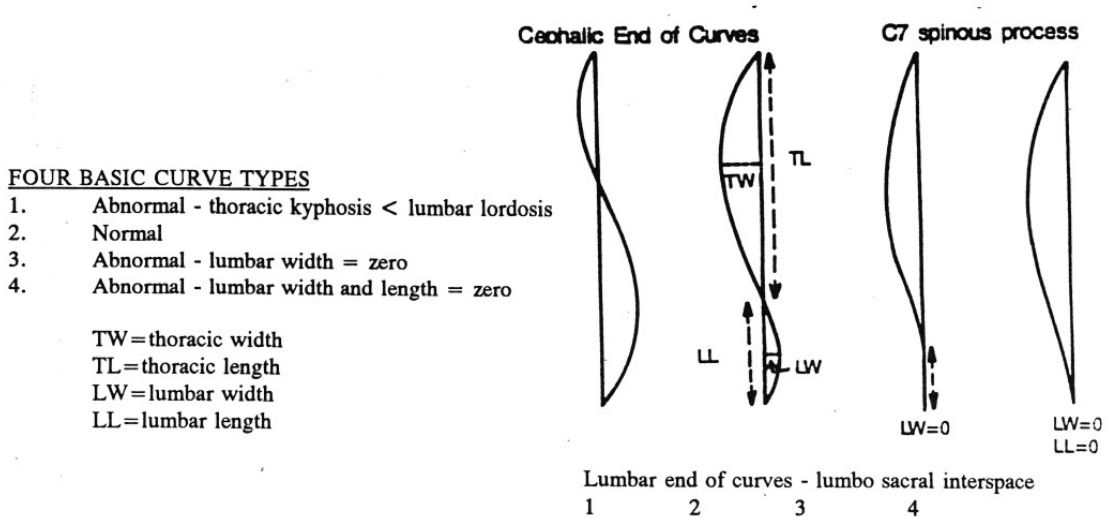
FLEXICURVE SPINAL MEASUREMENT

PROTOCOL FOR CLINICAL ASSESSMENT:

KYPHOSIS AND LORDOSIS

Always record time of day as well as date.
Measure standing height beforehand (if possible using a "stature board" rather than standard office scale).
Shoes off (unless otherwise noted) backed up to wall, feet comfortably under the pelvis
Instruct to "STAND IN YOUR USUAL BEST POSTURE"
Move headpiece down firmly to contact patient's head, then ask for final effort to "STAND TALL" and adjust headpiece appropriately.
The black marker line marks the correct number to record.
Mark centers of C7 spinous process and L-S joint space with a grease pencil while the patient is instructed to "STAND IN YOUR USUAL **BEST** POSTURE, RESTING YOUR HANDS ON THE CHAIR OR TABLE IN FRONT OF YOU. LOOK STRAIGHT AHEAD."
Use 3 fingers when palpating in order to sense relative movement above and below when identifying landmarks. Stand to the side of the patient with your left arm lightly across the shoulders and sternum. Place your right fingers 2,3,4 LIGHTLY on the landmarks, with your 3rd finger on the one you are looking for.
Identify **C7 as the spinous process that "doesn't disappear"** when the patient extends the neck to "look up". C6 will "disappear" under your 2nd finger, and T1 will remain prominent under your 4th finger.
Identify the **L-S interspace as the most inferior interspace that opens** and closes with trunk ROM. S1-2 will have a bony feel, will not change its boundaries with trunk movement, and should be under your 4th finger. L4-5 and L5-S1 will open and close, and should be under your 2nd and 3rd fingers. Start by asking the patient to extend the trunk, guiding them with your right hand across the shoulders, while palpating lightly with your right 2nd, 3rd, and 4th fingertips. Check other motions if you don't feel confident of landmark identification during extension.
Mark each landmark (C7 process and LS space) with a **single horizontal grease pencil line.** Make sure the patient is standing in their usual best posture so that the marks are in the correct place during measurement. Do NOT put tension on the skin while drawing, as this will change the location of the mark.
Clean flexicurve using a damp paper towel to remove previous marks. Make sure there are no bumps and that it is in a smooth "S" shape.
Mold flexicurve to exact shape of external kypholordosis between C7 and LS interspace.
Start by getting the "macro curve" generally "right". Hold at the top and the bottom, and gently adjust it to match the curve of the patient.
Fine-tune each area where there is "air" showing between f-curve and skin. Bring it about 1 millimeter away from the skin, and grasp at the top and bottom of the problem area. Lightly adjust this area only, **AVOIDING PUSHING THE FLEXICURVE INTO THE PATIENT'S BACK.**
Ask the patient to **remove hands from the support**; and to stand in "your usual best posture".
Check to see that there is still "no air" between flexicurve and skin.
When satisfied that the f-curve is accurate in shape, mark the LS interspace on the side of the f-curve with a single straight grease pencil line as if you were continuing the mark from the skin directly onto the side of the f-curve. Mark C7 similarly only if it does not line up with the top end of the f-curve.
Carefully remove f-curve from patient. Immediately place it on 10 x 10 grid paper (inches are divided into 1/10). **Carefully align C7 with a bold line intersection and place L-S directly underneath, intersecting the same vertical line.** It can be helpful to draw in the vertical line to better visualize that both landmarks are on the same line.

Use a pen (not the grease pencil) to trace the curve onto the paper, being certain that your pen is following the surface that was contacting the patient directly. It helps to "angle" the pen in toward the f-curve so it is as close as possible to where the patient's body was.
Use a ruler with 1/10th cm markings to measure the length and width of each segment. **Draw in the TW and LW lines as you measure.** Compute TW/LW and TL/LL ratios.
Kypholordosis variations:



Be sure to record patient name, ID number, time and date, shoe status, and whether the test was done in "Best usual", "Cued ideal" or another posture condition on the grid paper as well as in the chart.

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