	Balance Evaluation Systems Test (BESTest)
eAppendix. Balance Evaluation Systems Test (BESTest) ^a	
Test Number/Subject Code	Date
Examiner Name	
 Examiner Instructions for BESTest Subjects should be tested with flat-heeled shoes or If subject must use an assistive device for an item, so 	

Tools Required

- Stopwatch
- Measuring tape mounted on wall for Functional Reach Test
- Approximately 60×60 cm $(2 \times 2 \text{ ft})$ block of 4-inch, medium-density, Tempur® foam^b
- 10-degree incline ramp (at least 2×2 ft) to stand on
- Stair step, 15 cm (6 in) in height for alternate stair tap
- 2 stacked shoe boxes for obstacle during gait
- 2.5-kg (5-lb) free weight for rapid arm raise
- Firm chair with arms with 3 m in front marked with tape for Timed "Get Up & Go" Test
- Masking tape to mark 3-m and 6-m lengths on the floor for Timed "Get Up & Go" Test

Summary of Performance: Calculate Percent Score

Section I:	/15 × 100 =	Biomechanical Constraints
Section II:	/21 × 100 =	Stability Limits/Verticality
Section III:	/18 × 100 =	Anticipatory Postural Adjustments
Section IV:	/18 × 100 =	Postural Responses
Section V:	/15 × 100 =	Sensory Orientation
Section VI:	/21 × 100 =	Stability in Gait
TOTAL:	_/108 points =	Percent Total Score

Balance Evaluation Systems Test (BESTest) eAppendix. Continued Balance Evaluation Systems Test (BESTest) Interrater Reliability Subjects should be tested with flat-heeled shoes or shoes and socks off. If subject must use an assistive device for an item, score that item one category lower. If subject requires physical assistance to perform an item, score the lowest category (0) for that item. I. Biomechanical Constraints Section I: _____/15 Points 1. Base of support (3) Normal: Both feet have normal base of support with no deformities or pain (2) One foot has deformities and/or pain (1) Both feet have deformities OR pain (0) Both feet have deformities AND pain 2. CoM alignment (3) Normal AP and ML CoM alignment and normal segmental postural alignment (2) Abnormal AP OR ML CoM alignment OR abnormal segmental postural alignment (1) Abnormal AP OR ML CoM alignment AND abnormal segmental postural alignment (0) Abnormal AP AND ML CoM alignment 3. Ankle strength and range (3) Normal: Able to stand on toes with maximal height and to stand on heels with front of feet up (2) Impairment in either foot of either ankle flexors or extensors (ie, less than maximum height) (1) Impairment in two ankle groups (eg, bilateral flexors or both ankle flexors and extensors in one foot) (0) Both flexors and extensors in both left and right ankles impaired (ie, less than maximum height) 4. Hip/trunk lateral strength (3) Normal: Abducts both hips to lift the foot off the floor for 10 s while keeping trunk vertical (2) Mild: Abducts both hips to lift the foot off the floor for 10 s but without keeping trunk vertical (1) Moderate: Abducts only one hip off the floor for 10 s with vertical trunk (0) Severe: Cannot abduct either hip to lift a foot off the floor for 10 s with trunk vertical or without trunk vertical 5. Sit on floor and stand up Time ______ seconds (3) Normal: Independently sits on the floor and stands up (2) Mild: Uses a chair to sit on floor OR to stand up (1) Moderate: Uses a chair to sit on floor AND to stand up (0) Severe: Cannot sit on floor or stand up, even with a chair, or refuses II. Stability Limits/Verticality Section II: _____/21 Points 6. Sitting verticality and lateral lean Verticality Lean Left Right Left Right Maximum lean, subject moves upper (3) Realigns to vertical with very small or (3) (3) (3) shoulders beyond body midline, very no overshoot (2) (2) Moderate lean, subject's upper Significantly overshoots or (2) (2) undershoots but eventually realigns to shoulder approaches body midline or some instability vertical

(1)

(0)

(1)

(0)

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(1)

(0)

(1)

(0)

Very little lean, or significant instability

No lean or falls (exceeds limits)

(Continued)

Failure to realign to vertical

Falls with the eyes closed

			Balance	Evaluation Syste	ms Test (BESTest)
eAppendix. Continued					
(2) Moderate:(1) Poor: <16	to limits: >32 cm (12.16.5-32 cm (6.5-12.5	.5 in) in)	cm OR	inches	
8. Functional read	ch lateral <i>Distanc</i>	e reached: Left	cm (_ in)	_ cm (in)
Left Right (3) (3) (2) (2) (1) (1) (0) (0)	Maximum to limit: Moderate: 10-25.5 Poor: <10 cm (4 in No measurable lean	cm (4-10 in)			
III. Anticipatory	Postural Adjustm	nents		Section III: _	/18 Points
(2) Comes to so back of leg (0) Requires m 10. Rise to toes (3) Normal: St (2) Heels up,	able for 3 s with good but not full range (sn	npt with the usempts or requiressist to stand	e of hands s minimal assist to	stand or stabilize o	
11. Stand on one	leg				
	in seconds	Right <i>Tin</i>	ne in seconds		
	table for $>20 \text{ s}$ tion, $OR \ 10-20 \text{ s}$ 10 s		Stable for >20 s notion, OR 10-20 s -10 s	s	
(2) Completes trunk moti (1) Completes	touching # of su ands independently an 8 steps in <10 secon on, hesitation, or arhy <8 steps—without as <8 steps in 10 s, eve	nd safely and co ds, but shows i thmical steppin ssistance (ie, ass	mpletes 8 steps ir nstability such as g istive device) <i>OR</i>	inconsistent foot pl	acement, excessive
13. Standing arm (3) Normal: Re (2) Visible swa	emains stable	1	lalan matala o e 1 a t	a balanaa	

(1) Steps to regain equilibrium/unable to move quickly without losing balance

(0) Unable, or needs assistance for stability

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IV. Postural Responses

Section IV: _____/18 Points

14. In-place response—forward

- (3) Recovers stability with ankles, no added arm or hip motion
- (2) Recovers stability with arm or hip motion
- (1) Takes a step to recover stability
- (0) Would fall if not caught OR requires assist OR will not attempt

15. In-place response—backward

- (3) Recovers stability at ankles, no added arm/hip motion
- (2) Recovers stability with some arm or hip motion
- (1) Takes a step to recover stability
- (0) Would fall if not caught OR requires assistance OR will not attempt

16. Compensatory stepping correction—forward

- (3) Recovers independently with a single, large step (second realignment step is allowed)
- (2) More than one step used to recover equilibrium, but recovers stability independently *OR* one step with imbalance
- (1) Takes multiple steps to recover equilibrium, or needs minimum assistance to prevent a fall
- (0) No step OR would fall if not caught OR falls spontaneously

17. Compensatory stepping correction—backward

- (3) Recovers independently with a single, large step
- (2) More than one step used, but stable and recovers independently OR one step with imbalance
- (1) Takes several steps to recover equilibrium or needs minimum assistance
- (0) No step OR would fall if not caught OR falls spontaneously

18. Compensatory stepping correction—lateral

Left

- (3) Recovers independently with one step of normal length/width (crossover or lateral OK)
- (2) Several steps used, but recovers independently
- (1) Steps, but needs to be assisted to prevent a fall
- (0) Falls, or cannot step

Right

- (3) Recovers independently with one step of normal length/width (crossover or lateral OK)
- (2) Several steps used, but recovers independently
- (1) Steps, but needs to be assisted to prevent a fall
- (0) Falls, or cannot step

Section V: _____/15 Points

V. Sensory Orientation

19. Sensory integration for balance (modified CTSIB)

A–Eyes open,	B–Eyes closed,	C–Eyes open,	D–Eyes closed,
firm surface	firm surface	foam surface	foam surface
Trial 1 s	Trial 1 s	Trial 1 s	Trial 1 s
Trial 2 s	Trial 2 s	Trial 2 s	Trial 2 s
(3) 30 s stable			
(2) 30 s unstable			
(1) < 30 s			
(0) Unable	(0) Unable	(0) Unable	(0) Unable

20. Incline-eyes closed

Toes Up

- (3) Stands independently, steady without excessive sway, holds 30 s, and aligns with gravity
- (2) Stands independently 30 s with greater sway than in item 19B OR aligns with surface
- (1) Requires touch assist OR stands without assist for 10-20 s
- (0) Unable to stand >10 s OR will not attempt independent stance

	Balance Evaluation Systems Test (BESTest)
eAppendix. Continued	
VI. Stability in Gait	Section V:/21 points
21. Gait-level surface (3) Normal: Walks 20 ft, good speed (≤5.5 s), no evidence of (2) Mild: Walks 20 ft, slower speed (>5.5 s), no evidence of (1) Moderate: Walks 20 ft, evidence of imbalance (wide base, at any preferred speed (0) Severe: Cannot walk 20 ft without assistance or severe ga	imbalance lateral trunk motion, inconsistent step path)—
 22. Change in gait speed (3) Normal: Significantly changes walking speed without imbalance (2) Mild: Unable to change walking speed without imbalance (1) Moderate: Changes walking speed but with signs of imbal (0) Severe: Unable to achieve significant change in speed ANA 	ance
 (3) Normal: Performs head turns with no change in gait speed (2) Mild: Performs head turns smoothly with reduction in gait (1) Moderate: Performs head turns with imbalance (0) Severe: Performs head turns with reduced speed AND in available range while walking 	t speed
24. Walk with pivot turns (3) Normal: Turns with feet close, fast (≤3 steps) with good (2) Mild: Turns with feet close, slow (≥4 steps) with good ba (1) Moderate: Turns with feet close at any speed with mild si (0) Severe: Cannot turn with feet close at any speed and sign	alance gns of imbalance
25. Step over obstacles (3) Normal: able to step over 2 stacked shoe boxes without of (2) Mild: steps over 2 stacked shoe boxes but slows down, with (1) Moderate: steps over shoe boxes with imbalance or touch (0) Severe: cannot step over shoe boxes AND slows down with	rith good balance nes box.
26. Timed "Get Up & Go" Test (3) Normal: Fast (<11 s) with good balance (2) Mild: Slow (>11 s) with good balance (1) Moderate: Fast (<11 s) with imbalance (0) Severe: Slow (>11 s) AND imbalance	Get Up & Go: Time seconds
 27. Timed "Get Up & Go" Test With Dual Task (3) Normal: No noticeable change between sitting and standin and no change in gait speed (2) Mild: Noticeable slowing, hesitation, or errors in counting (1) Moderate: Affects on BOTH the cognitive task AND slow (0) Severe: Cannot count backward while walking or stops we 	backwards <i>OR</i> slow walking (10%) in dual task walking (>10%) in dual task
	(Continued)

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Instructions for BESTest

Biomechanical Constraints

1. Base of support

Examiner Instructions: Closely examine both feet to look for deformities or complaints of pain such as abnormal pronation/supination, abnormal or missing toes, pain from plantar fasciitis, bursitis, etc.

2. CoM alignment

Examiner Instructions: Look at the patient from the side and imagine a vertical line through their center of body mass (CoM) to the feet. (The CoM is the imaginary point inside or outside the body about which the body would rotate if floating in outer space.) In an adult, standing erect, a vertical line through the CoM to the support surface is aligned in front of the vertebrae at the umbilicus and passes about 2 cm in front of the lateral malleolus, centered between the two feet. Abnormal segmental postural alignment such as scoliosis or kyphosis or asymmetries may or may not affect CoM alignment.

3. Ankle strength and range

Examiner Instructions: Ask the patient to rest their fingertips in your hands for support while they stand on their toes as high as possible and then stand on their heels. Watch for height of heel and toe lift.

4. Hip/trunk lateral strength

Examiner Instructions: Ask the patient to rest their fingertips in your hands while they lift their leg to the side off the floor and hold. Count for 10 s while their foot is off the floor with a straight knee. If they must use moderate force on your hands to keep their trunk upright, score as without keeping trunk vertical.

5. Sit on floor and stand up

Examiner Instructions: Start with the patient standing near a sturdy chair. The patient can be considered to be sitting when both buttocks are on the floor. If the task takes more than 2 minutes to complete, with or without a chair, score 0. If the patient requires any physical assistance, score 0.

Patient: Stand up in your bare feet and tell me if you currently have any pain in your feet or ankles or legs.

Patient: Stand relaxed, looking straight ahead.

Patient: Rest your fingers in my hands for support while you stand on your toes. Now stand on your heels by lifting up your toes. Maintain each position for 3 s.

Patient: Lightly rest your fingertips in my hands while you lift your leg out to the side and hold until I tell you to stop. Try to keep your trunk vertical while you hold your leg out.

Patient: Are you able to sit on the floor and then stand up in less than 2 minutes? If you need to use a chair to help you go onto the floor or to stand up, go ahead, but your score will be affected. Let me know if you cannot sit on the floor or stand up without my help.

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Stability Limits/Verticality

6. Verticality and lateral lean

Examiner Instructions: Patient is sitting comfortably on a firm, level, armless surface (bench or chair) with feet flat on floor. It is okay to lift ischium or feet when leaning. Watch to see if the patient returns to vertical smoothly without overshooting or undershooting. Score the worst performance to each side.

7. Functional reach forward

Examiner Instructions: Examiner places the ruler at the end of the fingertips when the arms are out at 90 degrees. The patient may not lift heels, rotate trunk, or protract scapula excessively. Patient must keep their arms parallel to ruler and may use less-involved arm. The recorded measure is the maximum horizontal distance reached by the patient. Record best reach.

8. Functional reach lateral

Examiner Instructions: Have patient align feet evenly so that the fingertips, when the arm is out at 90 degrees, are at the start of the ruler. The recorded measurement is the maximum horizontal distance reached by the patient. Record the best reach. Make sure the patient starts in neutral. The patient is allowed to lift one heel off the floor but not the entire foot.

Anticipatory Postural Adjustments

9. Sit to stand

Examiner Instructions: Note the initiation of the movement, and the use of hands on the arms of the chair or their thighs or thrusts arms forward.

10. Rise to toes

Examiner Instructions: Allow the patient to try it twice. Record the best score. (If you suspect the patient is using less than their full height, ask them to rise up while holding the examiner's hands.) Make sure patients look at a target 4-12 ft away.

11. Stand on one leg

Examiner Instructions: Allow the patient two attempts and record the best. Record the seconds they can hold posture, up to a maximum of 30 s. Stop timing when patient moves their hands off hips or puts a foot down.

Patient: Cross your arms over your chest. Place feet shoulder width apart. I'll be asking you to close your eyes and lean to one side as far as you can. You'll keep your spine straight and lean sideways as far as you can without losing your balance OR using your hands. Keeping your eyes closed, return to your starting position when you've leaned as far as you can. It's okay to lift your buttocks and feet. Close your eyes. Lean now. (REPEAT other side)

Patient: Stand normally. Please lift both arms straight in front of you, with fingertips held even. Stretch your fingers and reach forward as far as you can. Don't lift your heels. Don't touch the ruler or the wall. Once you've reached as far forward as you can, please return to a normal standing position. I will ask you to do this two times. Reach as far as you can.

Patient: Stand normally with feet shoulder width apart. Arms at your sides. Lift your arm out to the side. Your fingers should not touch the ruler. Stretch your fingers and reach out as far as you can. Do not lift your toes off the floor. Reach as far as you can. (REPEAT other side)

Patient: Cross arms across your chest. Try not to use your hands unless you must. Don't let your legs lean against the back of the chair when you stand. Please stand up now.

Patient: Place your feet shoulder width apart. Place your hands on your hips. Try to rise as high as you can onto your toes. I'll count out loud to 3 s. Try to hold this pose for at least 3 s. Look straight ahead. Rise now.

Patient: Look straight ahead. Keep your hands on your hips. Bend one leg behind you. Don't touch your raised leg on your other leg. Stay standing on one leg as long as you can. Look straight ahead. Lift now. (REPEAT other side)

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12. Alternate stair touching

Examiner Instructions: Use standard stair height of 6 in. Count the number of successful touches and the total time to complete the 8 touches. It's permissible for patients to look at their feet.

13. Standing arm raise

Examiner Instructions: Use 2.5-kg (5-lb) weight. Have patients stand and lift weight with both hands to shoulder height. Patients should perform this as fast as they can. Lower score by 1 category if weight must be less than 2.5 kg (5 lb) and/or lifts <75 degrees.

Patient: Place your hands on your hips. Touch the ball of each foot alternately on the top of the stair. Continue until each foot touches the stair four times (8 total taps). I'll be timing how quickly you can do this. Begin now.

Patient: Lift this weight with both hands from a position in front of you to shoulder level. Please do this as fast as you can. Keep your elbows straight when you lift and hold. Hold for my count of 3. Begin now.

Postural Responses

14. In-place response—forward

Examiner Instructions: Stand in front of the patient, place one hand on each shoulder and lightly push the patient backward until their anterior ankle muscles contract (and toes just start to extend), then suddenly release. Do not allow any pre-leaning by patient. Score only the best of 2 responses if the patient is unprepared or you pushed too hard.

15. In-place response—backward

Examiner Instructions: Stand behind patient, place one hand on each scapula and isometrically hold against patient's backward push until heels are about to be lifted, not allowing trunk motion. Suddenly release. Do not allow any pre-leaning by patient. Score the best of 2 responses if patient is unprepared, or you pushed too hard.

16. Compensatory stepping correction—forward Examiner Instructions: Stand in front and to the side of patient with one hand on each shoulder and ask them to push forward. (Make sure there is room for them to step forward.) Require them to lean until their shoulders and hips are in front of their toes. Suddenly release your support when the patient is in place. The test must elicit a step. Be prepared to catch patient.

17. Compensatory stepping correction—backward Examiner Instructions: Stand in back and to the side of the patient with one hand on each scapula and ask them to lean backward. (Make sure there is room for them to step backward.) Require them to lean until their shoulders and hips are in back of their heels. Release your support when the patient is in place. Test must elicit a step.

Patient: For the next few tests, I'm going to push against you to test your balance reaction. Stand in your normal posture with your feet shoulder width apart, arms at your sides. Do not allow my hands to push you backward. When I let go, keep your balance without taking a step.

Patient: Stand with your feet shoulder width apart, arms at your sides. Do not allow my hands to push you forward. When I let go, keep your balance without taking a step.

Patient: Stand with your feet shoulder width apart, arms at your sides. Lean forward against my hands beyond your forward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall.

Patient: Stand with your feet shoulder-width apart, arms down at your sides. Lean backward against my hands beyond your backward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall.

NOTE: Be prepared to catch patient.

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18. Compensatory stepping correction—lateral

Examiner Instructions: Stand behind the patient, place one hand on either the right (or left) side of the pelvis, and ask them to lean their whole vertical body into your hand. Require them to lean until the midline of pelvis is over the right (or left) foot, and then suddenly release your support.

Patient: Stand with your feet together, arms down at your sides. Lean into my hand beyond your sideways limit. When I let go, step if you need to, to avoid a fall.

NOTE: Be prepared to catch patient.

Sensory Orientation

19. Sensory integration for balance (modified CTSIB)

Examiner Instructions: Do the tests in order. Record the time the patient was able to stand in each condition to a maximum of 30 s. Repeat condition if not able to stand for 30 s, and record both trials (average for category). Use medium-density Tempur® foam, 4-in thick. Assist patient in stepping onto foam. Have the patient step off the foam between trials. Include leaning or hip strategy during a trial as "instability."

Patient: For the next 4 assessments, you'll either be standing on this foam or on the normal ground, with your eyes open or closed. Place your hands on your hips. Place your feet together until almost touching. Look straight ahead. Each time, stay as stable as possible until I say "stop."

20. Incline—eyes closed

Examiner Instructions: Aid the patient onto the ramp. Once the patient closes their eyes, begin timing. Repeat condition if not able to stand for 30 s and average both trials. Note if sway is greater than when standing on level surface with eyes closed (item 15B) or if poor alignment to vertical. Assist includes use of a cane or light touch any time during the trial.

Patient: Please stand on the incline ramp with your toes toward the top. Place your feet shoulder width apart. Place your hands on your hips. I will start timing when you close your eyes.

Stability in Gait

21. Gait—level surface

Examiner Instructions: Place two markers 20 ft (6 m) apart and visible to the patient on a level walkway. Use a stopwatch to time gait duration. Have patients start with their toes on the mark. Start timing with the stopwatch when the first foot leaves the ground and stop timing when both feet stop beyond the next mark.

Patient: Walk at your normal speed from here past the next mark and stop.

22. Change in speed

Examiner Instructions: Allow the patient to take 2-3 steps at their normal speed, and then say "fast"; after 2-3 fast steps, say "slow." Allow 2-3 slow steps before they stop walking.

Patient: Begin walking at your normal speed. When I tell you "fast," walk as fast as you can. When I say "slow," walk very slowly.

23. Walk with head turns—horizontal

Examiner Instructions: Ask the patient to turn their head and hold it so they are looking over their shoulder until you tell them to look over the opposite shoulder every 2-3 steps. If the patient has cervical restrictions, allow combined head and trunk movements (en bloc).

Patient: Begin walking at your normal speed. When I say "right," turn your head and look to the right. When I say "left," turn your head and look to the left. Try to keep yourself walking in a straight line.

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24. Walk with pivot turns

Examiner Instructions: Demonstrate a pivot turn. Once the patient is walking at normal speed, say "turn and stop." Count the steps from turn until the patient is stable. Instability is indicated by wide stance width, extra stepping, or trunk and arm motion.

25. Step over obstacle

Examiner Instructions: Place the 2 stacked boxes (9in or 22.9-cm height) 10 ft away from where the patient will begin walking. Use a stopwatch to time gait duration to calculate average velocity by dividing the number of seconds into 20 ft. Look for hesitation, short steps and touch on obstacle.

26. Timed "Get Up & Go" Test

Examiner Instructions: Have the patient sit with their backs against the chair. Time the patient from the time you say "go" until they return to sitting in chair. Stop timing when the patient's buttocks hit the chair bottom. The chair should be firm with arms to push from if necessary. Tools: tape on floor 3 m from the front of the chair legs.

27. Timed "Get Up & Go" Test With Dual Task

Examiner Instructions: Before beginning, practice with the patient how to count backward from a number between 90 and 100 by 3s, to make sure they can do the cognitive task. Then ask them to count backward from a different number, and after a few numbers say "go" for the get up and go task. Time the patient from when you say "go" until they return to sitting. Stop timing when the patient's buttocks touch the chair bottom. The chair should be firm with arms to push from if necessary.

Patient: Begin walking at your normal speed. When I tell you to "turn and stop," turn as quickly as you can to face the opposite direction and stop. After the turn, your feet should be close together.

Patient: Begin walking at your normal speed. When you come to the shoe boxes, step over them, not around them, and keep walking.

Patient: When I say "go," stand up from the chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair. I will time how long it takes.

Patient: (a) Count backward by 3s starting at 100 OR (b) List random numbers, and when I say "go," stand up from the chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair, but continue listing numbers.

^a The Balance Evaluation Systems Test (BESTest) may not be used or reproduced without written permission of Dr Fay Horak. Copyright 2008, Fay B Horak, PT, PhD. AP=anteroposterior, ML=mediolateral, CoM=center of mass, CTSIB=Clinical Test of Sensory Integration for Balance. ^b Tempur-Pedic North America Inc, Medical Division, 1713 Jaggie Fox Way, Lexington, KY 40511.