KLINIČNO OCENJEVANJE RAVNOTEŽJA IN PREMIČNOSTI
CLINICAL ASSESSMENT OF BALANCE AND MOBILITY

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Izvleček

Ocenjevanje ravnotežja in premičnosti pri kliničnem delu nam pomaga pri ugotavljanju tveganja za padce in najprimernejših ukrepov za zmanjšanje nestabilnosti drže. Laboratorijske raziskave so pokazale, da nadzor drže vključuje različne reakcije na zunanje motnje, pričakovane prilagoditve drže na perturbacije, ki jih povzročijo lastni gibi (npr. dvigovanje predmeta), in dinamično ravnotežje med hojo. Toda do nedavnega klinični testi za ravnotežje niso sistematično ocenjevali vseh teh področij.

V tem kratkem pregledu razpravljamo o najpogosteje uporabljanih kliničnih orodjih za ocenjevanje drže in ravnotežja. Delimo jih na štiri skupine: (a) preprosti klinični testi za ravnotežje in premičnost; (b) lestvice za ocenjevanje verjetnosti padca in učinkovitosti padca; (c) klinične lestvice za ocenjevanje ravnotežja in premičnosti; (d) nove lestvice za ravnotežje in premičnost: BESTest in njegova kratka oblika mini-BESTest.

Mini-BESTest je novo orodje za ocenjevanje ravnotežja, s štirinajstimi nalogami, ki so ga ustvarili pred kratkim in pri tem uporabili klasične psihometrične tehnike in Raschevo analizo. Ustreza obsežnim merskim zahtevam (glede dimenzionalnosti, kakovosti ocenjevalnih kategorij, konstruktne veljavnosti in indeksov zanesljivosti), osredotočen pa je na dinamično ravnotežje. Izvedemo ga lahko v 10-15 minutah. Sestavljajo ga naloge, ki v enakem deležu obravnavajo prehode in pričakovane prilagoditve drže, posturalne odgovore na perturbacije, senzorično orientacijo med stojo na ravni ali nagnjeni podporni ploskvi in dinamično stabilnost med hojo. V nedavni raziskavi, kjer so ocenjevali motnje ravnotežja pri bolnikih s Parkinsonovo boleznijo, so se psihometrične lastnosti mini-BESTesta izkazale kot primerljive z Bergovo lestvico ravnotežja.

Abstract

Assessment of balance and mobility in clinical settings can help to determine both risk of falling and the most suitable measures to reduce postural instability. Laboratory studies have shown that postural control embraces different reactions to external disturbances, anticipatory postural adjustments to perturbations caused by self-initiated movements (e.g. lifting an object), and dynamic balance during gait. However, until recently clinical balance tests did not systematically evaluate all these subdomains.

In this short review, the most widely used clinical assessments of posture and balance are discussed. Clinical evaluations are divided into four groups: (a) simple clinical tests for balance and mobility; (b) fear of falling and fall-efficacy scales; (c) clinical balance and mobility scales; (d) the new balance and mobility scales: BESTest and its short form, the mini-BESTest.

The mini-BESTest is a new 14-item balance measurement tool recently created using both classical psychometric techniques and Rasch analysis. It meets a wide range of measurement requirements (regarding dimensionality, quality of the rating categories, construct validity and reliability indices), focuses on dynamic balance and can be conducted in 10-15 minutes. The scale contains items belonging evenly to: transitions and anticipatory postural adjustments, postural responses to perturbation, sensory orientation while standing on a compliant or inclined base of support, and dynamic stability in gait. In a recent study evaluating balance disorders in Parkinson's disease, the psychometric characteristics of the mini-BESTest compared favourably with those of the Berg Balance Scale.

Ključne besede:
ravnotežje, premičnost, strah pred padcem, učinkovitost padca, klinično ocenjevanje

Key words:
balance, mobility, fear of falling, fall efficacy, clinical assessment

CLINICAL ASSESSMENTS OF POSTURE AND BALANCE

Assessment of balance and mobility in clinical settings can help to determine both risk of falling and the most suitable measures to reduce postural instability. Laboratory studies have shown that postural control embraces different reactions to external disturbances, anticipatory postural adjustments to perturbations caused by self-initiated movements (e.g. lifting an object), and dynamic balance during gait. However, until recently clinical balance tests did not systematically evaluate all these subdomains.

In this short review, the most widely used clinical assessments of posture and balance are discussed. Clinical evaluations are divided into four groups: (a) simple clinical tests for balance and mobility; (b) fear of falling and fall-efficacy scales; (c) clinical balance and mobility scales; (d) the new balance and mobility scales: BESTest and its short-form, the mini-BESTest.

Simple clinical tests for balance and mobility

Sharpened Romberg (SR)

This test is a more challenging version of the Romberg test, requiring subjects to stand barefoot with a narrowed base of support (tandem stance, i.e. heel-to-toe, with the non-dominant foot just in front of the other), arms folded across the chest. The test is performed with eyes open (EO) in the first trial, and eyes closed (EC) in the second trial. The score corresponds to the number of seconds the subject maintains the test position. Maximum score is the longest period recorded in three or five repetitions of the trial (1,2). Normal values of SR are available for both males and females and it has been demonstrated that scores decrease with age (3,4). Unfortunately, no relationship has been found between score of SR and previous fall history of patients (1).

One-Legged Stance Test (OLST)

This test requires subjects to stand on the dominant limb, barefoot, with arms folded across the chest, EO in the first trial and EC in the second (1,2). Timing starts when the subject raises one foot off the ground and stops when a change of posture occurs or when the subject reaches the 30-s time limit (2,5). The score is the best time obtained in five repetitions of the test. No significant difference has been found between right and left or dominant and non-dominant limbs while performing the test (1,2). The maximum time decreases significantly as age increases and is always longer with EO than EC. In a large number of asymptomatic adults, normative data of the test are available (4). Unfortunately, no significant difference has been found in mean balance time between subjects with previous fall history and those without (6).

Functional Reach (FR)

This test evaluates the maximum distance a subject can reach forward beyond arm's length in a plane parallel with a levelled yardstick secured to the wall at shoulder height, while maintaining a fixed base of support in the standing position (7). Subjects, barefoot, are positioned with the right side of the body close to the wall. Feet are parallel, freely spaced apart behind a starting line that must not be stepped over. Distance of reaching is measured as the difference between the starting and the ending position of the head of the third metacarpophalangeal joint of the clenched fist. The score is the average of three valid trials. Subjects' height, age and sex have been shown to influence FR, and normal values have been provided (7,8). FR correlates with physical frailty. The association between FR and recurrent falls is not confounded by age, depression, or cognition. FR is sensitive to detect changes in balance after rehabilitation. However, its usefulness has been queried in patients with vestibular dysfunction because they show similar FR values to those of normal elderly subjects. Finally, FR has proved to be a weak measure of stability limits. Indeed, movements of the trunk seem to influence the test more than the true displacement of the centre of pressure. However, it has been shown that the FR of faller elderly subjects is lower than that of non-faller subjects (9) and that may better predict the risk of postural instability encountered during daily activities among individuals with Parkinson's disease (10).

Timed Up-and-Go (TUG) test

TUG is a variation of the Get Up and Go test, using a stopwatch to measure the time taken to perform the task (11). It evaluates the subject's ability to maintain balance during transfers and gait (12). During the test, subjects are allowed to use their usual walking aid. Time is measured from the "go" instruction to when the subject is once again completely seated. One training trial and two evaluation trials are performed. The time taken by the subject is the mean of the last two trials.

Normal values for elderly subjects have been reported (11,13). It has been demonstrated that elderly subjects taking more than 14 s to complete the TUG have a high risk of fall. It has been proposed to lengthen the walk distance from 3 to 10 m in order to increase sensitivity of the test to detect subjects at risk of fall. TUG has proved to be sensitive in the assessment of clinical changes during rehabilitation (14). However, it has been shown that gait speed predicts most geriatric outcomes, including falls, as does TUG (15). A more recent and reliable version of TUG, the "Expanded Timed Up & Go test" (ETUG), times the single components (e.g. sit to stand phase, gait initiation, turning) of the task using a multi-memory stopwatch (16).

Fear of falling and fall-efficacy scales

Fall Efficacy Scale (FES)

The FES has been developed in order to study fear of falling (17). It assumes that fear of falling can be measured by evaluating how confident patients are of avoiding falls while they perform activities of daily living. The scale is a questionnaire made up of 10 questions, for instance: "How confident are you when you do light housework?". Subjects have to assign a score (from 1 to 10) to each question, where 1 indicates "extreme confidence" and 10 "no confidence at all". Each single score is summed to produce a total score. Subjects who report avoiding activities because of fear of falling have higher FES scores, that represent lower self-efficacy or confidence in carrying out these activities. Owing to the fact that FES excludes outdoor occupations, this scale is particularly suitable for patients with low levels of mobility. A four-level modified version of the scale (the Falls Efficacy Scale-International, FES-I) has been developed in order to assess both easy and difficult physical activities, and social activities (18). The FES-I proved to have good validity and reliability and can be useful for research and clinical purposes (19).

Activities-Specific Balance Confidence (ABC) Scale

The ABC Scale is a questionnaire developed to evaluate the psychological impact of balance impairment and falls in elderly subjects (20). It consists of a 16-item questionnaire investigating subjects' confidence in maintaining balance on a visual-analogue scale. Activities measured range from "walk around the house" to "walk outside on icy sidewalks". Subjects are asked to rate their confidence in performing activities without losing balance or becoming unsteady on a scale from 0 % (no confidence) to 100 % (complete confidence). A mean percentage is calculated from the 16 items. The ABC is a useful clinical tool for evaluating patients over a wide range of activities; however, administration of the scale requires that the patient have intact cognition and understands that what is being assessed is *confidence in doing* the activity, not if the activity can be performed. The ABC scale can discriminate elderly subjects with low mobility confidence from those with good balance confidence (21). Low ABC scores are associated with low mobility (16) and falls (22). The ABC scale is also useful for evaluating balance confidence in stroke and Parkinsonian patients (23,24). A shortened version of the 16-item ABC scale, the ABC-6, has been proposed as an alternative balance confidence measure. The ABC-6 proved to be a valid and reliable measure of balance confidence in community-dwelling older adults, and showed stronger relationships to falls than the original ABC (25).

Survey of Activities and Fear of falling in the Elderly (SAFE)

SAFE (or SAFFE) was developed to assess fear of fall and is indicated for examining the negative consequences that fear of fall may have on quality of life. The scale deals with decrease of activity and worsening of quality of life as a consequence of fear of fall (26). SAFE examines 11 activities of daily living: instrumental activities of daily living, movement performances and social activities. In this scale, at variance with FES, the assessment of participation in social activities has also been included, on the assumption that avoidance of these activities might indicate an initial sign of fear of falling. Each question is scored on a 5-point scale and the sum represents the degree of the patient's fear of falling. One advantage of SAFE over other measures is the possibility it gives of differentiating fear of falling that *leads to* activity restriction from fear of falling that *accompanies* activity. Finally, SAFFE can discriminate with good sensitivity subjects who had falls from those who have not (27). The validity and reliability of SAFE proved to be good in patients with Parkinson's Disease (28).

Clinical balance and mobility scales

Performance-Oriented Mobility Assessment (POMA)

The POMA scale encompasses two subscales: a balance (B-POMA) and a gait (G-POMA) evaluation (29). Balance items are scored on a 0-2 point scale, where 0 corresponds to "impossible to perform", 1 = abnormal and 2 = normal. Conversely, gait items are simply scored as 0-1, depending on the abnormal or normal finding. In different studies, the number of items and maximum scores have been modified. The balance scale has been validated with regards to the prediction of falls in elderly: it has been suggested that difficulty in sit-to-stand, instability in turning, short and discontinuous steps are essential items for detecting people at risk of falls (30, 31). Simultaneous administration of POMA and Berg Balance Scale in elderly patients undergoing a rehabilitation program showed that the latter scale was more sensitive than POMA (32).

Berg Balance Scale (BBS)

This is the most widely used and validated instrument for assessing balance performance (33). It includes 14 items that require subjects to maintain positions of varying difficulty and perform specific functional tasks. Scoring is based on the subject's ability to perform the 14 tasks independently and/or meet certain time or distance requirements. Each item is scored on a 5-point ordinal scale ranging from 0 (unable to perform) to 4 (normal performance) so that the aggregate score ranges from 0 to 56: the higher the score, the better the performance. BBS was shown to be a better functional test than POMA or TUG in discriminating faller from non-faller elderly subjects (34). However, a recent review demonstrated that the BBS alone is not useful for predicting falls in the older adults with and without pathological conditions (35).

Dynamic Gait Index (DGI)

DGI has been proposed as a measure to assess dynamic balance in elderly subjects at risk of falling (36). It documents the subject's ability to adapt gait during eight different tasks: walking at different speeds, walking with head turns, walking along a path with obstacles, climbing/descending stairs, and pivot turning. Each item is scored on an ordinal scale that ranges from 0 to 3, with a maximum score of 24. In elderly subjects, a score lower than 19 indicates increased risk of fall. Gait instability assessed with DGI is a good measure of fall risk in both elderly and young vestibular patients (37). In addition, DGI showed high reliability and evidence of concurrent validity with BBS, timed walking test, TUG, and ABC scale (38), and a good validity also in individuals with multiple sclerosis (39). It is important to underline that DGI is the only validated clinical tool for assessing gait and dynamic balance in patients with vestibular disorders (40).

The new balance and mobility scales: BESTest and mini-BESTest

Recently, some limitations (e.g. ceiling effect, relatively low responsiveness) have been described in POMA, BBS and DGI (41). On the other hand, a new clinical tool for assessing several subdomains underlying balance deficits has been presented, the Balance Evaluation Systems Test (BESTest) (42). The BESTest is a comprehensive balance assessment tool developed to identify the postural control systems underlying poor functional balance, so that treatments can be targeted to the specific balance problem. Since the BESTest encompasses 4–6 items for each of 6 different balance domains, it takes approximately 35 min to administer, compared with only approximately 15 min for other balance scales (e.g. the BBS). This is an important shortcoming of the BESTest, limiting its routine use. On the other hand, the main disadvantage of other popular balance scales, including the BBS, is that they do not include important aspects of dynamic balance control, such as the capability to react to postural perturbations, to stand on a compliant or inclined surface, or to walk while performing a cognitive task. All of these features of balance control are known to be important in assessing balance disorders in different types of patients, and reflect balance challenges during activities of daily living. Therefore, there was a need for a comprehensive balance assessment tool that can be administered in a short time period.

Using both classical psychometric techniques and Rasch analysis, we recently examined performance of the BESTest in a convenience sample of 115 consecutive adult patients with diverse neurological diagnoses and disease severity, referred to rehabilitation for balance disorders (43). A wide range of measurement requirements (e.g. dimensionality, quality of the rating categories, construct validity, reliability indexes) was investigated, in order to improve the structure and measurement qualities of the test. Based on this analysis, a new, reduced and coherent balance measurement tool (a 14-item scale, dubbed mini-BESTest) has been produced (43) (see Appendix), that focuses on dynamic balance and can be conducted in about 15 min, and contains items belonging evenly to four of the six sections from the original BESTest. In a study evaluating balance disorders in Parkinson's Disease, the psychometric characteristics of the mini-BESTest compared favourably with those of the BBS (44).

CONCLUSIONS

The principal aim of clinical assessment of posture and balance is not making a diagnosis but providing a functional evaluation of balance impairments, in particular regarding activities that resemble as closely as possible those of daily living. It is useful to assess posture and balance not only in the presence of an already known disease but also during assessment of so-called normal elderly subjects. In this way, it is possible to gain information not only about the severity of balance changes in subjects with known postural instability, but also about fall risk in elderly subjects and patients. Chronic dizziness is strongly associated with fear of falling; among dizzy patients, nearly half may express fear of falling. Fear of falling and participation in real-life activities therefore need to be analyzed for a comprehensive clinical assessment of patients with balance disorders.

Some of these evaluations are useful not only for an initial functional evaluation but also for assessing treatment outcome, be it pharmacological or rehabilitative. Another advantage of clinical assessment of posture and balance is that it can often avoid the need for expensive instrumentation for studying balance and posture. In fact, these clinical assessments are quite simple, quick to perform, well accepted, and their feasibility is good. Moreover, their validity has been clearly demonstrated. These aspects make them very useful in rehabilitation practice.

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Appendix

MINI BESTest of DYNAMIC BALANCE

Balance Evaluation – Systems Test © 2009

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.

1. SIT TO STAND

(2) Normal: Comes to stand without use of hands and stabilizes independently.
(1) Moderate: Comes to stand WITH use of hands on first attempt.
(0) Severe: Impossible to stand up from chair without assistance –OR- several attempts with use of hands.

2. RISE TO TOES

(2) Normal: Stable for 3 sec with maximum height
(1) Moderate: Heels up, but not full range (smaller than when holding hands)-OR-noticeable instability for 3 s
(0) Severe: ≤ 3 sec

3. STAND ON ONE LEG

Left Time in sec Trial 1:________ Trial 2:________
(2) Normal: 20 s
(1) Moderate: < 20 sec
(0) Severe: Unable

Right Time in sec Trial 1: _______ Trial 2:________
(2) Normal: 20 s
(1) Moderate: < 20 sec
(0) Severe: Unable

4. COMPENSATORY STEPPING CORRECTION – FORWARD

(2) Normal: Recovers independently a single, large step (second realignment step is allowed)
(1) Moderate: More than one step used to recover equilibrium
(0) Severe: No step, OR would fall if not caught, OR falls spontaneously

5. COMPENSATORY STEPPING CORRECTION – BACKWARD

(2) Normal: Recovers independently a single, large step
(1) Moderate: More than one step used to recover equilibrium
(0) Severe: No step, OR would fall if not caught, OR falls spontaneously

6. COMPENSATORY STEPPING CORRECTION – LATERAL

Left
(2) Normal: Recovers independently with 1 step (crossover or lateral OK)
(1) Moderate: Several steps to recovers equilibrium
(0) Severe: Falls, or cannot step

Right
(2) Normal: Recovers independently with 1 step (crossover or lateral OK)
(1) Moderate: Several steps to recovers equilibrium
(0) Severe: Falls, or cannot step

7. EYES OPEN, FIRM SURFACE (FEET TOGETHER)

*Time in sec:*________
(2) Normal: 30s
(1) Moderate: < 30s
(0) Severe: Unable

8. EYES CLOSED, FOAM SURFACE (FEET TOGETHER)

*Time in Sec:*________
(2) Normal: 30s
(1) Moderate: < 30s
(0) Severe: Unable

9. INCLINE- EYES CLOSED

*Time in sec:*________
(2) Normal: Stands independently 30 sec and aligns with gravity
(1) Moderate: Stands independently <30 SEC *OR* aligns with surface
(0) Severe: Unable

10. CHANGE IN GAIT SPEED
(2) Normal: Significantly changes walking speed without imbalance
(1) Moderate: Unable to change walking speed or imbalance
(0) Severe: Unable to achieve significant change in speed AND signs of imbalance

11. WALK WITH HEAD TURNS – HORIZONTAL
(2) Normal: performs head turns with no change in gait speed and good balance
(1) Moderate: performs head turns with reduction in gait speed
(0) Severe: performs head turns with imbalance

12. WALK WITH PIVOT TURNS
(2) Normal: Turns with feet close, FAST ($\leq$ 3 steps) with good balance
(1) Moderate: Turns with feet close SLOW ($\geq$4 steps) with good balance
(0) Severe: Cannot turn with feet close at any speed without imbalance

13. STEP OVER OBSTACLES
(2) Normal: able to step over box with minimal change of speed and with good balance
(1) Moderate: steps over shoe boxes but touches box OR displays cautious behavior by slowing gait.
(0) Severe: cannot step over shoe boxes OR hesitates OR steps around box

14. TIMED UP & GO (TUG) WITH DUAL TASK
TUG: ________sec; Dual Task TUG: ________sec

(2) Normal: No noticeable change between sitting & standing in backward counting & no change in gait speed between TUG and TUG with dual task.
(1) Moderate: Dual task affects either counting OR walking.
(0) Severe: Stops counting while walking OR stops walking while counting.

INSTRUCTIONS

1. 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.

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.

2. RISE TO TOES
Examiner Instructions: Allow the patient to try it twice. Record the best score. (If you suspect that subject is using less than their full height, ask them to rise up while holding the examiners' hands.) Make sure subjects look at a non-moving target 4-12 feet away.

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 seconds. Try to hold this pose for at least 3 seconds. Look straight ahead. Rise now.

3. STAND ON ONE LEG
Examiner Instructions: Allow the patient two attempts and record the best. Record the number of seconds they can hold posture up to a maximum of 30 sec. Stop timing when subject moves their hand off hip or puts a foot down. Make sure subjects look at a non-moving target 4-12 feet ahead. (Repeat other side)

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.

4. COMPENSATORY STEPPING CORRECTION – FORWARD
Examiner Instructions: Stand in front, to the side, of patient with one hand on each shoulder and ask them to lean 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. The test must elicit a step. NOTE: Be prepared to catch patient.

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.

5. COMPENSATORY STEPPING CORRECTION – BACKWARD

Examiner Instructions: Stand in back, 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. After you feel their body weight in your hands, very suddenly release your support. The test must elicit a step.
NOTE: Be prepared to catch the patient.

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.

6. 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 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 hold.
NOTE: Be prepared to catch patient.

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.

7. EYES OPEN, FIRM SURFACE

Examiner Instructions: Record the time the patient was able to stand with feet together up to a maximum of 30 seconds. Make sure subjects look at non-moving target 4-12 feet away.

Patient: Place your hands on your hips. Place your feet together until almost touching. Look straight ahead. Stay as stable as possible until I say stop.

8. EYES CLOSED, FOAM SURFACE

Examiner Instructions: Use medium density Temper® foam, 4 inches thick. Assist subject in stepping onto foam. Tell patient to "Close Eyes" Record the time the patient was able to stand in each condition to a maximum of 30 seconds. Have the subject step off the foam between trials.

Patient: Place your hands on your hips. Place your feet together until almost touching. Stay as stable as possible until I say stop. I will start timing when you close your eyes.

9. INCLINE, EYES CLOSED

Examiner Instructions: Aid the patient onto the ramp. Once the patient closes their eyes, begin timing and record and average both times. Note if sway is greater than when standing on firm, level, surface with eyes closed (Item 7) or if there is poor alignment to vertical.

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

10. CHANGE IN SPEED

Examiner Instructions: Allow the patient to take 3-5 steps at their normal speed, and then say "fast", after 3-5 fast steps once say "slow". Allow 3-5 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.

11. WALK WITH HEAD TURNS – HORIZONTAL

Examiner Instructions: Allow the patient to reach their normal speed, and give the commands »right, left« every 3-5 steps. Score if you see a problem in either direction. If patient has severe cervical restrictions allow combined head and trunk movements.

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.

12. 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 when you say "turn" until the subject is stable. Imbalance may be indicated by wide stance width, extra stepping or trunk motion.

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.

13. STEP OVER OBSTACLES

Examiner Instructions: Place the box (9« 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 feet.

Patient: Begin walking at your normal speed. When you come to the shoe boxes (9« or 22.9 cm height), step over them, not around them and keep walking.

14. TIMED UP & GO (TUG) WITH DUAL TASK

Examiner Instructions: Use the TUG score to determine the effects of dual tasking.

TUG: Have the patient sit with their back 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.

TUG with Dual Task: While sitting, determine how fast and accurately the patient can count backwards by 3's from a number between 90 and 100. Then, ask them to count from a different number and after a few numbers say »Go«. Time the patient from the time you say »Go« until they return to the sitting position. Score dual task as affecting walking if speed slows >10% from TUG &/or new signs of imbalance.

Patient:

TUG: When I say "Go", stand up from chair, walk at your normal speed across the tape on the floor; turn around, and come back to sit in the chair. Continue counting backwards the entire time.

TUG with Dual Task: Count backwards by 3's starting at _____. When I say "Go", stand up from chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair. Continue counting backwards the entire time.