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STUDY OF OSTEOPOROTIC FRACTURES (V3)

Protocol for Neuromuscular Performance Tests

I. INTRODUCTION:

Footwear: To eliminate the effect of different footwear on test performance, these tests should be performed in tennis shoes or comfortable walking shoes with minimal or no heels. The participant may perform the tests in stocking or bare feet if appropriate footwear is not available.

Instructions to participants: To some participants, the detailed verbal instructions may seem pedantic or unnecessary. It may help to say that you are going to explain each test to the participant in detail since this is the best way to make sure that everyone does the test in a similar manner. The detailed protocols indicate which scripts are required and which are optional. The individual examiner must determine whether a participant understands what is required and provide the appropriate level of instruction.

Screening: Ask each participant:

"Do you have any problems from recent surgery, injury, or other health conditions that might prevent you from standing up from a chair or walking up steps."

If the answer is yes, record on the scoring form. Tell the respondent who says yes that after you describe each test, you will discuss with her whether she should attempt that test given the physical problems or disabilities present.

Refused/unable: If a test is not attempted because the participant refuses, for whatever reason, record "refused" on the scoring form. If possible, record a reason for the refusal. If a test is attempted but cannot be completed or scored, record "unable" on the scoring form.

Walking Aids: Walking aids should not be used for the tandem stance, tandem walk, and chair stand tests (1-4). Walking aids may be used for the timed and video walking tests, but should be discouraged. If aids are used for any test, this should be recorded on the scoring form.

Demonstrations: Demonstrate each maneuver for the participant.

Practice trial: Practice trial for each test should be limited to that described in the individual protocols.

Rest: The participant should be allowed to rest between tasks if out of breath or fatigued during the assessments.

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II. STAND UP FROM CHAIR 5 TIMES

1. Description:

This tests the subject's ability to stand up from a standard chair without using arms for support and the time required to stand up from a chair five times, measured with a stopwatch.

2. Equipment:

A straight-backed, armless, hard seated chair (such as plastic molded chair) approximately 45 centimeters high at the front edge. The seat should incline no more than a few degrees from front to back. Stopwatch.

Place the back of the chair against a wall to steady it. Stand next to the participant to provide assistance if she loses her balance.

3. Measurement Procedures:

a) Have the participant sit in the chair, assuming the position from which she would normally stand up from a chair (but no more than half-way forward on the seat of the chair) with the feet resting on the floor and the arms folded across the chest. Say:

"The next test measures the strength in your legs. Please fold your arms across your chest. When I say 'Ready? Stand!', please stand up straight as rapidly as you can five times without stopping in between and without using your arms to push off. After standing up each time, sit down and then stand again without stopping. I'll be timing you with the stopwatch. Please try to do this as rapidly as you can safely do it."

Ask her to stand up a couple of times for practice.

b) When the subject is properly seated after practicing say

"Ready! Stand."

Count out loud as she or he arises each time, up to 5. Stop the stopwatch when she has straightened up completely the fifth time.

c) If she is unable to arise without using her arms say:

"O.K., try to stand up using your arms to push off."

Be sure to record armuse on the form.

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d) If the participant fatigues before completing 5 stand-ups, confirm that she can't do any more by asking:

"Can you continue?"

If she says yes, keep timing. If she says no, record that she could not complete five stand-ups.

e) Record:

- i) whether she can stand up once and five times without help,
- ii) armuse (none, some stands, all stands),
- iii) the time to complete five stands to the nearest tenth of a second.

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III. TANDEM STANCE SEQUENCE

1. Description:

This is a graded series of timed (up to 10 seconds) static balance tests with the feet side by side, in semi-tandem and full tandem position. The trials are performed with eyes open and eyes closed.

2. Equipment: Stopwatch.

3. Measurement Procedure:

POSITION 1. Full Tandem Stance (Eyes Open)

a) Tell the participant,

"This series of tests will assess both the strength in your legs and your balance. First, I would like you to stand with the heel of one foot in front of and touching the toes of the other foot for about ten seconds.

b) Demonstrate the tandem stance for the participant. The participant can place the heel of either the right or left foot in front of and touching the toes of the opposite foot; whichever is more comfortable. Stand next to the participant to help her into the tandem position, supplying just enough support to the her arm to prevent loss of balance. Tell the participant

"You may use your arms to maintain your balance, but try not to move your feet. Try to hold this position until I say stop."

c) When the participant has her feet in the tandem position, ask if she is ready. When her stance has stabilized, let go gently and start timing as you say "Start". Stop the stopwatch after 10 seconds or when the subject steps out of position or touches the examiner for support.

d) Record time to the nearest second.

e) If the participant cannot attain the tandem position at all, or cannot hold it for at least one second, score "tried, but unable." GO TO POSITION 2. If the participant holds the tandem stance for less than 10 seconds, record the time and GO TO POSITION 2.

f) If the participant holds the tandem position for ≥ 10 seconds or more, GO TO POSITION 4.

POSITION 2. Semi-Tandem Stance (Eyes Open)

a) Tell the participant,

"Next I would like you to try to stand with the side of the heel of one foot touching the great toe of the other foot for about ten seconds."

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b, c, d) SAME AS ABOVE

e) If the participant cannot attain the semi-tandem position at all, or cannot hold it for at least one second, score "tried, but unable." GO TO POSITION 3. If the participant holds the semi-tandem stance for less than 10 seconds, record the time and GO TO POSITION 3.

f) If the participant holds the semi-tandem position for ≥ 10 seconds, GO TO POSITION 4.

POSITION 3. Side by Side Stance (Eyes Open)

a) Tell the participant:

"Now I would like you to try to stand with your feet together, side by side, for about ten seconds."

b, c, d) SAME AS ABOVE.

e) If the subject cannot attain the position, or cannot hold it for at least one second, THEN STOP AND GO ON TO NEXT TEST. OTHERWISE, record the time and GO TO POSITION 4.

POSITION 4. Side by Side Stand (Eyes Closed)

a) Tell the participant,

"Now I would like you to try to stand for about ten seconds with your eyes closed and your feet together, side by side."

b) Stand next to the participant . If necessary, supply just enough support to the participant's arm to prevent loss of balance. Tell the participant

"Now close your eyes. Try not to move your feet. Try to hold this position until I say stop".

c) When the participant has her feet in position and her eyes closed, ask if she is ready. When her stance has stabilized, let go gently and start timing as you say "Start". Stop the stopwatch after 10 seconds or when the subject steps out of position, touches the examiner or opens her eyes.

d) Record time to the nearest second.

e) If the participant cannot attain the side by side position with eyes closed at all, or holds it for less than one second, score "tried, but unable". THEN STOP. If the subject holds the position for one second or more, record the time and GOT TO POSITION 5.

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POSITION 5. Semi-Tandem Stance (Eyes Closed)

a) Tell the participant,

"Now I would like you to try to stand for about ten seconds, this time with the side of the heel of one foot against the great toe of the other foot, as before. Again, I want you to close your eyes."

b) Stand next to the participant to help her into position, supplying just enough support to the her arm to prevent loss of balance.

"Now close your eyes. Try not to move your feet. Try to hold this position until I say stop".

c, d) SAME AS ABOVE

e) If the participant cannot attain the semi-tandem position with eyes closed at all, or holds it for less than one second, score "tried, but unable". THEN STOP. If she holds the position for one second or more, record the time and GO TO POSITION 6.

POSITION 6. Full Tandem (Eyes Closed)

a) Tell the participant,

"Now, I would like you to stand, again with your eyes closed, with the heel of one foot in front of and touching the toes of the other foot for about ten seconds. Just like you did before but with your eyes closed."

b, c, d) SAME AS ABOVE.

e) If the participant cannot attain the tandem position at all, or cannot hold it for one second, score "tried, but unable."

f) GO TO TANDEM WALK.

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IV. TANDEM WALK (ATTEMPTED FOR ALL PARTICIPANTS)

1. Description:

This is a test of the subject's ability to walk two meters placing heel and toe together on a line. Performance on this test has been shown to be predictive of falls in other populations.

2. Equipment: Gait course as in Figure 1, stopwatch.

3. Use of an Aid:

Use of a cane on the tandem walk should definitely be discouraged as the score will be difficult to interpret. Use of an aid should be recorded on the scoring form. If a cane is used, firmly encourage the participant to take as many steps as possible without actually using the cane for support. (Do not attempt the test with anyone who needs to use a walker.) Similarly, if a participant wants to hold tight to the examiner or lean steadily on the wall during the test, firmly encourage her to let go and take as many steps as possible on her own.

4. Measurement Procedure:

a) Explain to the participant

"Now I'm going to ask you to do something which some people actually find easier than trying to balance while standing still and other people find a little more difficult. I want you to walk on this line as though walking a tightrope (or performing a drunk-driver test.)"

b) Demonstrate the tandem walk for the participant. As you demonstrate say:

"Keep your feet on the line with the heel of the foot in front touching the toe of the foot behind. You can move your arms to help keep your balance. If you have to steady yourself by stepping off the line or reaching out for the wall or the examiner, that's OK. Steady yourself and then keep going. But try to walk on the line without touching the wall or stepping off. I'll be walking next to you and will time you to see how long it takes to walk all the way to the end."

c) Position the participant at the starting line. Ask her to try 2 or 3 practice steps. Encourage her to touch heel and toe together on every step. When she is back in proper position say,

"Remember, touch and heel and toe together. I will be right here next to you to help if you lose your balance. You may begin when you are ready."

d) Guard the subject closely, and time her with the stopwatch. Start the stopwatch when she first puts her foot on the line and stop it when either foot goes over the end of the line.

e) Keep a running count of the number of errors made. There are three types of error: i) stepping off the line (foot all the way off), ii) touching the examiner or wall for support, and iii) taking a step with the heel and toe visibly separated (e.g. about an inch or more between).

f) If the participant wants to give up before reaching the end, encourage her to continue.

"Even if you can't stay on the line or keep your heel and toes together on every step, continue trying to walk the line, placing your heel and toe together on the line as often as possible until you reach the end of the red line. It is important to continue to move along the line, even if you can't stay on it very well."

g) Record:

i) the number of times the subject steps off the line (entire foot off the line),

ii) the number of steps taken with heel and toe visibly separated,

iii) the number of times the subject touches the wall or the examiner for support,

iv) if the subject holds on most or all of the way

v) whether the 2 meter course is completed, and,

vi) the time from beginning to completion (or last step attempted) to the nearest tenth of a second.

Special circumstances:

i) If the P uses a cane during the test, count each step in which external support is used as a "step off". Be sure to record that a cane was used.

ii) If the P holds tight to the examiner or touches or leans steadily on the wall after being encouraged to let go, then count each step taken while holding on as a "touch". If she holds on or touches the wall all or most of the length of the line, record this on the scoring form.

iii) If the P touches the examiner or wall, steps off the line, or fails to touch heel and toe together so frequently that you cannot keep even a roughly accurate count (e.g. 10 ± 2 touches is adequate), then score 88. Otherwise record your most accurate estimate.

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V. TIMED GAIT

1. Description:

This part of the exam measures the time required to walk a six meter course (seconds) and the average step length (centimeters). In addition, we will video tape the gait of participants for later analysis of qualitative gait characteristics. Taping will include a lateral view of usual pace, a lateral view of starting, turning, and stopping, and an anterior view of usual pace. Key joints will be marked with reflective tape.

2. Equipment:

Stopwatch. Gait course as in Figure 1. 8mm video camera with a 9mm minimum focal length and a 5-7 LUX rating, a 0.60 wide-angle conversion lens, tripod for camera, and remote control switch. Board for taping ID numbers. Reflective tape and velcro straps for marking joints.

3. Subject Preparation:

The participant should be wearing slacks and comfortable walking shoes. She may use a walking aid, but should be encouraged to walk without one.

"Now I am going to observe how you normally walk. If you use a cane or other walking aid and would feel more comfortable with it, then you may use it. However, if possible I would like you to walk without using any aids."

4. Measurement Procedures:

A. WALKING SPEED AND STEP LENGTH, USUAL PACE

a) Ask the subject to stand behind the line at one end of the course, at the red center mark.

"When I say 'begin', I would like you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the store. Walk all the way past the line at the other end before you stop.

b) Ask the subject to begin the usual walk.

"Remember, walk at your usual pace all the way past the line at the other end before you stop. "Ready? Begin."

Start the stopwatch at the word "Begin" and stop timing when one of the her feet is all the way across the end line. Count the number of steps taken to cover the course. One step is counted when either foot is placed down on the floor, including the first step and the step which first takes a participant's foot completely across the end line.

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c) When the participant crosses the end line, ask her to turn around and stand at the end line as before.

"Now do the same thing in the other direction. Walk at your usual pace and go all the way past the line at the other end. Ready? Begin."

d) Record time and steps for the two trials.

B. RAPID PACE

a) For the third trial, ask the participant to walk at a rapid but safe pace.

"This time I would like you to walk at a rapid, but safe, pace. Walk as fast as you can while still feeling safe".

b) Record the time and number of steps.