advance
for Physical Therapists & PT Assistants®

Assessment of Gait in the Elderly: A Plea for Time

February 2004

Vol. 15 •Issue 5 • Page 12
Geriatric Function
Assessment of Gait in the Elderly: A Plea for Time

By James Wall, PhD, and Carole Lewis, PhD, PT, MSG, MPA, GCS

When people go to visit the family physician, they are usually met first by the receptionist and then by the nurse. Irrespective of the reason for the visit—be it a check-up, a prescription refill or to have some health issue addressed—the nurse will take some measurements including, weight, pulse, temperature and blood pressure.

Once these vital signs have been measured, information that is more specific is obtained including the reason for the visit. Having collected and recorded all this information, the nurse hands the file and the patient off to the physician.

Compare this scenario with that which typically happens when an older person visits a physical therapist. Such a visit starts with the receptionist and then the therapist, who determines the reason for the visit from the patient and/or from the information provided by the referring physician.

The critical difference between these scenarios is measurement. When family physicians walk in to meet patients they do so armed with some global measures of the health of the patient, which can be compared to the values obtained on previous visits as well as to normal values. Why should we not apply this same concept to physical therapy? Apart from the vital signs, what measures in the elderly could be routinely measured to reflect functional ability? In this article, we answer this question with specific regard to one measurement of gait.

Shumway-Cook and Woollacott provide the following summary of gait changes seen in the older adult.[1]

Temporal/distance factors

Decreased velocity;

Decreased step length;

Decreased step rate;

Decreased stride length;

Increased stride width;

Increased stance phase;

Increased time in double support;

Decreased swing phase.

Kinematic changes

Decreased vertical movement of the center of gravity;

Decreased arm swing;

Decreased hip, knee, ankle flexion;

Flatter foot on heel contact;

Decreased ability to covary hip/knee movements;*

Decreased dynamic stability during stance;*

Muscle activation patterns

Increased coactivation (increased stiffness)*

Kinetic changes

Decreased power generation at push-off;

Decreased power absorption at heel contact.

It is noteworthy that the very first change in this list is walking speed, noteworthy because all but three changes, those indicated by asterisks, are speed-related. This means that if you got a healthy young individual to walk slowly, you would see these same parameters change, although the extent of the changes may be different.

One of the instruments that is used to assess walking in the elderly, with a view to determining fall risk, is the modified gait abnormality rating scale (GARS-M).[2] VanSwearingen et al showed substantial interrater and intrarater reliability with this shortened tool as well as demonstrated concurrent validity. The concurrent validity showed a relationship between the GARS-M scores and walking speed as well as distinguishing frail older people both with and without a history of recurrent falls. This instrument assesses the following seven attributes:

Variability–a measure of inconsistency and arrhythmicity of stepping and/or arm movements;

Guardedness–hesitancy, slowness, diminished propulsion, and lack of commitment in stepping and arm swing;

Staggering–sudden and unexpected laterally directed partial losses of balance;

Foot contact–the degree to which heel strikes the ground before the forefoot;

Hip ROM–the degree of loss of hip range of motion seen during a gait cycle;

Shoulder extension–a measure of the decrease of shoulder range of motion;

Arm-heel-strike synchrony–the extent to which the contralateral movements of an arm and leg are out of phase.

Measuring Walking Speed

Not surprisingly, there is some overlap between the age-related changes in gait described by Shumway-Cook and Woollacott and the seven attributes that comprise the GARS-M.[1] In looking carefully at these attributes, it will be seen that, with the exception of staggering (number 3) all the others could be attributed, at least to some extent, to slow walking speed.

Measuring walking speed is not difficult. All that is needed is a clear area in which to walk with marks to indicate a known distance and a stopwatch.

Determining the time to walk a set distance is something that is done routinely in many clinics. It has been stated that the timed walk is "remarkably simple, reliable, valid, sensitive, communicable, useful, and relevant–almost the perfect measure."[3] The problem is that the distance used differs, according to the condition of the patient or the space available in the clinic, making it difficult to compare results. This difficulty may be overcome if walking speed is determined by dividing the known distance walked by the time taken to walk that distance.

A comparison of the gait patterns of healthy young and elderly was undertaken in Canada.[4] The interesting thing about this study is that the elderly were recruited from an Elderobics class; a fitness program offered by the local YMCA for those age 55 and older. These motivated, non-sedentary individuals were asked to walk at their self-selected slow, medium and fast speeds, as were the healthy young subjects. At each self-selected speed, the elderly group walked slower than their younger counterparts.

In elderly individuals with balance problems, the differences are much more striking. For example, it has been shown that subjects with idiopathic gait disorder of the elderly (IDGE) that is, those who have a history of falls or a fear of falling but with no discernable neurological cause, walk very slowly when compared with the healthy elderly, and their ability to speed up and slow down is also greatly reduced.[5] So striking are the differences between these two groups that the fastest speed of the IDGE group was slower than the slow group of similarly aged healthy individuals.

…berg et al conducted a much larger investigation into age-related changes in gait in both men and women.[6] They had

groups from each decade throughout the lifespan and walked each subject at slow, medium and fast self-selected walking speeds. The results show that as age increases, walking speed decreases for all three self-selected walking speeds.

The results also indicate that the changes were most marked for the fast speed resulting in a reduced range of walking speeds. In other words, the older individuals had less capacity to change their walking speed, especially when asked to go faster. The data provided by this study can be used as a source against which to compare data collected on a patient—if only we took the time to collect such data.

Goals for Walking

Walking speed is an important consideration in determining functional mobility and as such can be used when setting goals. For example, traffic engineers use a walking speed of 1.2 millimeters per second as part of their determination of how much time to allow a pedestrian to cross a street. Very often an older patient will complain about the time it takes them to do some activity of daily living, such as walking around a store or even their own home. Goals should be set in terms of improved walking speed that will allow these functional activities to be achieved.

Walking speed may also be used for documentation. First, it is a measurement that all can understand. Walking speed is a sensitive and objective measurement that may be used to demonstrate maintenance, decline or improvement of functional ability. This is exactly the kind of evidence that should be used to convince reimbursement agencies of the need for treatment or to demonstrate efficacy of treatment provided.

Use walking speed like physicians use temperature; you might even get a "nurse equivalent" to measure walking speed. Chart it as a matter of course with each visit. Use the results to document change, set goals and make decisions about treatment.

We know that many of the changes that are associated with aging are speed related. We have a good database that shows how gait speed changes in healthy individuals across the lifespan. If the measurement of gait speed is objective, sensitive, valid, reliable, simple and cheap, then why don't we use walking speed as our "vital sign" of functional ability?

We are not suggesting that all one needs to do when assessing gait is to measure walking speed; walking is far too complex for us to rely on a single measurement. Walking speed alone tells us nothing about endurance or quality of movement, for example. However, we are advocating that taking the time to measure the time taken to walk a known distance is a step in the right direction–and should be done as a minimum when assessing gait in the elderly.

References

1. Shumway-Cook, A. & Woollacott, M. (2001). *Assessment and treatment of the patient with mobility disorders. Motor control.* Philadelphia: Williams and Wilkens.

2. VanSwearingen, J., et al. (1996). The modified gait abnormality rating scale for recognizing the risk of recurrent falls in community-dwelling elderly adults. *Physical Therapy*, (76)9, 994-1001.

3. Wade, D., (1992). Measurement in neurological rehabilitation. Oxford: Oxford University Press.

4. O'Brien, M., et al. (1983). Temporal gait patterns in healthy young and elderly females. *Physiotherapy Canada*, 35, 323-326.

5. Wall, J., et al. (1991). The kinematics of idiopathic gait disorder of the elderly. *Scandinavian Journal of Rehabilitative Medicine*, 23, 159-164.

6. …berg, T., et al. (1993). Basic gait parameters: Reference data for normal subjects, 10-79 years of age. *Journal of Rehabilitation Research and Development*, 30, 51-55.

Dr. Wall is a professor in the department of physical therapy at the University of South Alabama. His research has focused on the development of clinically viable techniques for assessing functional mobility. He offers a course on assessment and treatment of gait and balance in the elderly for GREAT Seminars and Books. Dr. Lewis is a physical therapist in private practice and president of Physical Therapy Services of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com.

advance
for Physical Therapists & PT Assistants®

Benefits of the Four Square Step Test (FSST)

June 20, 2005

Vol. 16 •Issue 14 • Page 8
Geriatric Function
Benefits of the Four Square Step Test (FSST)

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Keiba Shaw, EdD, MPT, MA

Envision yourself casually walking down a sidewalk in a busy city where you are conscious of maintaining your "own space" and respecting the space of others. Suddenly, you find yourself jostled and pushed from multiple directions. With some grace, sheer determination, and maybe a little luck, you manage not to fall.

But while you are congratulating yourself on this great display of athleticism, you trip over a crack in the sidewalk and barely manage to keep yourself upright. Depending on your age and general physical health, preventing the fall may be more attainable. For older adults, this scenario may prove to be devastating, as they may not be able to correct their balance, which in turn would result in a fall.

At least once per year, community-dwelling individuals over the age of 65 years fall as a result of losing their balance.[1] Additionally, adults 65 and older who fall account for one-fifth of occupants in trauma and emergency rooms.[2] Trips and slips in a study by Berg, et al were identified as the most common cause of falls in community-dwelling older adults, with falls by men occurring mostly from slips and falls in women occurring mostly from trips.[3] The older adults in this study also believed that their falls were a result of walking in a hurry.

In assessing the effect of exercise over a 12-month period on balance, strength and falls in women ages 60 to 85, it was found that a significantly greater percentage of women who did not participate in exercise intervention related the cause of their falls to be balance.[3] In addition, those who received the exercise intervention and adhered more than 75 percent of the time to the exercise program suffered fewer falls in general as well as within their homes.[4]

In the elderly population, loss of balance and subsequent falls often result in debilitating consequences, such as hip fractures. Of those who fall, 20 percent to 30 percent sustain hip fractures or head traumas that reduce mobility and independence, and increase the risk of premature death.[5] In fact, findings of a study assessing lateral stability, sensorimotor function and falls in the elderly suggest that decreased lateral stability, i.e., increased lateral sway and stepping, were associated with falling in older individuals.[6] Not only is fall risk increased, but direction of fall (onto the side and the greater trochanter), will significantly increase the likelihood of a hip fracture.[7]

According to the CDC, in 2001 more than 11,600 people age 65 and older died from fall-related injuries.[8] It is clear that a clinical assessment tool that will detect the complex nature related to balance and falls in the older population before, as well as after sustaining a fall, is necessary. One measure purported to do this is the Four Square Step Test (FSST).[9] This is a timed test, developed to assess the rapid change in direction while stepping forward, backward and sideways over a low obstacle.

Reliability and Validity

The reliability and validity of the FSST has been appraised in a group of community-dwelling adults age 65 and older.[9] Interrater and test-retest reliability were found to be high (ICC = .99 & .98 respectively). Concurrent validity was found through significant correlations ($p<.001$) with other balance measures such as the Step Test[10] ($r=-.83$), Timed Up and Go[11]

(TUG;r=.88), and the Functional Reach Test[12] (FRT; r=-.47).

By definition, sensitivity is the proportion of true positives that are correctly identified by the test, and specificity is the proportion of true negatives that are correctly identified by the test.[13] An ideal cutoff score of greater than 15 seconds was identified, with subjects with scores of greater than 15 seconds being considered as multiple fallers. If individuals scored less than or equal to 15 seconds, they were classified as non-multiple fallers. It was unclear whether "non- multiple" meant no falls or one fall. At 15 seconds, the FSST is considered to be positively predictive 86 percent of the time and 94 percent negatively predictive in the sample tested.

FSST Administration

Administration of the FSST takes approximately five minutes to complete. The equipment required includes a stopwatch and four canes (approximately 2.5cm above the floor and 90 cm long). Using the canes, a square is formed by laying the canes flat on the floor. The patient/client is asked to stand in square number 1 facing square number 2, the objective being to step as quickly as possible into each square following this sequence: 2,3,4,1,4,3,2,1. The timing is started when the first foot contacts the floor in square 2 and finished when the last foot comes back to touch the floor in square 1.

Patients/clients are asked to wear their preferred shoes. Shoes that are comfortable with a non-slip sole are recommended. Instructions to the patient/client should be, "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."[9] At this time, a demonstration of the sequence should be given to the patient.

The therapist administering the FSST should have a clear view of the patient/client as he takes the steps. In addition, a second person serving as an assistant should provide close supervision to patients as they perform the test. A practice trial needs to be completed to make sure the patient is familiar with the sequence of the steps.

Once the practice trial is completed, patients are asked to perform the test twice with the best time between the two taken as their score. A test trial is repeated if the patient fails to complete the described sequence successfully or if he loses his balance. A trial is also repeated if the patient makes contact with a cane during the sequence. A score is still recorded for patients who were unable to face forward for the duration of the sequence and who needed to turn before stepping into the next square. If needed, the patient is allowed to use a cane while performing the test.

There are some key differences between the FSST and other measure of stepping speed. First, the FSST requires that the patient understand and incorporate the stepping sequence, thereby making this test more cognitively challenging. Second, combinations of movements are necessary to complete the test. Patients are required to weight shift from one foot to the other while changing direction. Third, the FSST requires what the developers describe as a "higher level of skilled physical supervision" on the part of the tester in order to ensure the patient's safety.[9] Lastly, the FSST is an "all-or-nothing" test, in that a score cannot be given to a patient or client who does not complete the test.

This somewhat different but interesting test includes variables crucial to the safety and independence of older patients. With work on the components of this test, our patients may be able to envision themselves walking down the street with confidence.

References

1. Tinetti, M., Speechley, M., & Ginter, S. (1988). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine*, 319, 1701-1706.

2. Lightbody, E., Watkins, C., & Leathley, M., et al. (2002). Evaluation of a nurse-led falls prevention programme versus usual care: A randomized controlled trial. *Age and Aging*, 31, 203-210.

3. Berg, W. Alessio, H., & Tong, C. (1997). Circumstances and consequences of falls in independent community-dwelling older adults. *Age and Aging*, 26, 261-268.

4. Lord, S., Ward, J., & Williams, P., et al. (1995). The effect of a 12-month exercise trial on balance, strength, and falls in older women: A randomized controlled trial. *Journal of the American Geriatric Society*, 43, 1198-1206.

5. Sterling, D., O'Connor, J., & Bonadies, J. (2001). Geriatric falls: Injury severity is high and disproportionate to mechanism. *Journal of Trauma*, 50(1), 116-119.

6. Lord, S., Rogers, M., & Howland, A., et al. (1999). Lateral stability, sensorimotor function and falls in older people. *Journal of the American Geriatric Society*, 47, 1077-1081.

7. Nevitt, M., & Cummings, S. (1993). Type of fall and risk of hip and wrist fractures: The study of osteoporotic fractures.

Journal of the American Geriatric Society, 41, 1226-1234.

8. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2003). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (producer). Available at: http://www.cdc.gov/ncipc/wisqars. Accessed May 3, 2005.

9. Dite, W., & Temple, V. (2002). A clinical test of stepping and change of direction to identify multiple falling older adults. *Archives of Physical and Medical Rehabilitation*, 83, 1566-1571.

10. O'Loughlin, J., Robitaille, Y., Bolvin, J., & Suissa, S. (1993). Incidence of and risk factors for falls and injurious falls among community-dwelling elderly. *American Journal of Epidemiology*, 137, 342-354.

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

12. Duncan, P., Weiner, D., Chandler, J., & Studenski, S. (1990). Functional reach: A new clinical measure of balance. *Journal of Gerontology*, 45, M192-M197.

13. Altman, D., & Bland, J. (1994). Statistics Notes: Diagnostic tests 1: Sensitivity and specificity. *British Medical Journal*, 308, 1552.

Dr. Lewis is a physical therapist in private practice and president of Premier Physical Therapy of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. and is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. *Dr. Shaw is an assistant professor in the physical therapy program at the University of South Florida and dedicated to the area of geriatric rehabilitation. She lectures exclusively for GREAT Seminars and Books on geriatric function.*

---

advance
for Physical Therapists & PT Assistants®

Doing Our Functional Best for Gait and Balance

March 2003

Vol. 14 •Issue 7 • Page 6
Geriatric Function
Doing Our Functional Best for Gait and Balance

By Carole B. Lewis, PhD, PT, GCS, MSG, MPA, and Mark Traffas, MPT, GTC

If the following question were asked: "In what area are physical therapists experts?" there would be a vast array of answers, but it is likely that in this list the words "function" and "exercise" would most certainly appear.

Within the past month we received two interesting letters. The first was from an orthopedic physical therapist, who conducted an informal study in which he asked people to whom they would go for exercise advice. Guess what he found? PTs were not at the head of the list. The second letter was from a woman who conducted a study for her master's thesis, in which she investigated the use of standardized tools. She found that on 74 charts reviewed, only four used standardized tests. In this light, we feel these issues should be addressed.

Socrates once said, "The unevaluated life is not worth living." Dr. Loren Fishman took this quote into the realm of rehabilitation and said "Unevaluated therapy is not worth giving."[1] This quote says it all. We are unable to assess the effectiveness of our treatment without standardized tools. Many patients say they feel better because they enjoy coming to PT and want to continue to be treated. But this is not very scientific. At our core, PTs are scientists. With our background in assessment and our immense knowledge of exercise, we should be the first thought in everyone's mind when looking for advice about exercise.

If we use sound principles of exercise management and assessment, we will continue to grow and make a difference. This article will focus on using standard functional balance tools and the recommended exercises to fit the results of these tools.

The One-Legged Stance Test

The simplest tool for assessing balance is the One Legged Stance Test (OLST). The amount of time an individual is able to stand on one leg directly relates to the risk of injurious falls,[2] and can be compared to norms at various ages (see table 1). According to the study by Vellas et al, a score of 5 or below is indicative of a high risk of injurious falls.

To conduct the OLST, patients cross the arms across the chest and stand on one leg. Both legs should be tested; it is the patient's choice for which leg to start the test. Also, the therapist should not allow patients to hold their hands, as this would invalidate the test. Therapists can spot closely but should not touch the patient. The test should be stopped if:

1. The arms uncross;
2. The elevated foot touches the ground;
3. The stationary leg moves;
4. The trunk tilts greater than 25 degrees;
5. The person stands longer than 30 seconds.

Possible Causes, Suggested Exercises

What could be some of the possible causes for poor performance on this test? Below is a list. After a thorough assessment of the causes, the appropriate exercises noted can be given and progressed.

1. Ankle weakness and motion–Toe and calf up exercises, followed by calf stretches;

2. Knee weakness and motion–Terminal knee extension/quad sets, step-ups;[3]

3. Hip weakness and motion–Illiopsoas stretch/PRE to hips./chair stands (see picture 1);

4. Poor proprioception–Proprioceptive exercises (see picture 3);[4]

5. Pain in hips, knees or ankles–Gentle joint mobs, modalities;[5]

6. Increased postural sway–One-legged standing training;

7. Lateral sway instability–Hip circles (see picture 2);

8. Vestibular dysfunction–Vestibular training (see VHI Exercise Kit on vestibular exercises);[6]

9. Cerebellar dysfunction–Neuromuscular reeducation to use available sensory cues, reduce speed of movements and number of joint movements;

10. Ptophobia (fear of falling)–See the Functional Reach Test below for suggestions.

Functional Reach

The next test of note is the Functional Reach.[7] The original Functional Reach Test was only conducted in the forward direction. This test has been expanded to multiple directions.[8] This article will only discuss the original test; however, the authors strongly suggest that the more recent test be res.earched and used as well.

The following are instructions for conducting the functional reach test. The interpretation is in table 2.

1. Tape a 12-inch (or longer) ruler to the wall at the level of the patient's acromion;

2. Have the patient extend arm to 90 degrees while making a fist using the arm closest to the wall;

3. Ask the patient to reach forward as far as possible without moving feet or losing balance. The patient may not rise up on the toes;

4. Measure the distance the patient reaches from the tips of the knuckles;

5. Do not allow the pa.tient to protract the shoulder and rotate trunk to increase distance.

Possible Causes, Suggested Exercises

What could be some of the possible causes for poor performance on the OLST? Below is a list. After a thorough assessment of the causes, the appropriate exercises noted can be given and progressed.

1. Hip extensor weakness—proprioceptive exercises to hip muscles;

2. Postural deviations—Treat deviation;

3. Lumbar extensor weakness—Arokouski's protocol;[9]

a. Backward rocking in sitting;

b. In standing, trunk rotation with cane behind head, or resisted shoulder flexion and extension;

c. On balance board, shoulder flexion and extension;

d. On trampoline, walk using arm swing.

4. Poor proprioception—Beanbag pass with feet for eight minutes, 3x/week;[4]

5. Poor static balance and control at limits of stability—Progressive static balance training, narrowing base of support (i.e., wide base, narrow base, semi-tandem, tandem). Work on reaching, trunk twisting, head movements, ball throw with patient in one of the positions noted above. The chosen position should be somewhat challenging;

6. Vestibular and cerebellar dysfunction—see Functional Reach Test for suggestions.

7. Ptophobia—Use techniques that increase confidence:

a. Incorporate reinforcing conversation;

b. Use sensory cues;

c. Reassure visual deficits;

d. Reinforce improvement in other functional skills;

e. Encourage independence with staff and family;

f. Explore fears of previous falls;

g. Break up treatments into smaller and more frequent sessions, if possible;

h. Remember success begets success. Stress whenever the patient succeeds in treatment.

Rather than covering exercises as they relate to a myriad of balance tests based on input from our readers, we have taken two tests and described how to do them, interpret them, and how to design an exercise program from the results. Unfortunately, we could not do that with all the balance tests that are available. We have provided a template to tie functional tools and exercises together.

Our purpose was to show that there are standard tests used in the clinic and these tests can also be used by physical therapists as exercise experts to design comprehensive exercise programs.

Our hope is that when the two physical therapists who did the studies mentioned at the beginning of the article inquire again, they will get a very different answer. They will hear a resounding roar that therapists are exercise experts, who are using standard tools to design effective exercise programs and are doing their functional best for gait and balance.

References

1. Fishman, L. (1999). In C. Lewis, *Functional Toolbox* I. Greatseminarsandbooks.com.

2. Vellas, B., Wayne, S., Romero, L., Baumgartner, R., & Garry, P. (1997). Fear of falling and restriction of mobility in elderly fallers. *Age and Ageing*, 26(3), 189-193.

3. Nishimoto, K., et al. (1999). Increasing gait performance in elderly women using a step exercise program. *Journal of Physical Therapy Science*, 11, 71-78.

4. Kobayashi, R., Hosoda, M., & Minematsu, A., et al. (1999). Effects of toe grasp training for the aged on spontaneous postural sway. *Journal of Physical Therapy Science*, 11, 31-34.

5. Deyle, G., Henderson, N., Matekel, R., Ryder, M., Garber, M., & Allison, S. (2000). Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee: A randomized, controlled trial. *Annals of Internal Medicine*, 132(3), 173-181.

6. Lewis, C. (2002). Geriatric exercise and rehabilitation kit. Tacoma, WA: Visual Health Inc.

7. Weiner, D., Duncan, P., Chandler, J., & Studenski, S. (1992). Functional reach: A marker of physical frailty. *Journal of the American Geriatrics Society*, 40(3), 203-207.

8. Newton, R. (2001). Validity of the multi-directional reach test: A practical measure for limits of stability in older adults. *Journal of Gerontological and Biological Science and Medicine*, 56(4), M248-M252.

9. Arokoski, J., Kankaanpaa, M., Valta, T., Juvonen, I., Partanen, J., Taimela, S., Lindgren, K., & Airaksinen, O. (1999). Back and hip extensor muscle function during therapeutic exercises. *Archives of Physical and Medical Rehabilitation*, 80(7), 842-850.

Dr. Lewis is a physical therapist in private practice and president of Physical Therapy Services of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website is www.greatseminarsandbooks.com*. Mark Traffas is a physical therapist and lecturer with GREAT Seminars and Books.*

---

advance
for Physical Therapists & PT Assistants®

Gait Changes With Age: The Role of Physical Therapy

February 18, 2002

Vol. 13 •Issue 4 • Page 6
Geriatric Function
Gait Changes With Age: The Role of Physical Therapy

Carole Lewis, PhD, PT, MSG, MPA, GCS, and Jean Marie McAndrew, MPT, MSG, GTC

Emily pushes intensely and deliberately on the armrests of her wheelchair as she begins to stand for her gait training session. With much effort and no assistance, she smiles with a sense of accomplishment as she comes to standing. She is now ready to attempt walking. She takes four, uneven, cautious, shuffling steps and asks if she is finished.

Does Emily exhibit normal gait changes that occur with age? It is important to know which gait changes are considered normal aging and what tests are available to examine these gait changes. We will discuss this as well as what aspects of gait will be detrimental to the patient and what new treatment techniques exist for rehabilitation.

Literature abounds with articles on gait changes that occur with age. Older people consistently demonstrate reduced hip extension,[1] knee extension and a shorter stride length[2] during ambulation, which may affect walking performance. These characteristics are present regardless of a person's risk for falls.

Researchers have found four alterations of gait in the elderly that contribute to falls. They are increased hip flexion in stance, decreased hip extension, decreased knee swing in the pre-swing phase and decreased knee power absorption in the pre-swing phase.[3] In older people who fall, the characteristics of fallers versus nonfallers is that they have slower speed, shorter step, narrow stride width, wide range of stepping frequencies and a large variability of step length.[4]

The influence of lower extremity (LE) joint torque can also affect gait characteristics. In a study of elderly men, hip extension torque was found to be the only significant predictor of gait velocity.[5] DeVita found that age causes a redistribution of joint torques and powers during gait.[6] Specifically, older people generate more hip torque than knee or ankle plantar flexors but the amount generated is still less than younger people. Hausdorff noticed an increased gait unsteadiness in community dwelling elderly and found that fallers had more stride-to-stride temporal variance.[7] Older people have less control of momentum and may be unable to control lateral momentum during gait.[8] This could explain why older people tend to walk slower.

In a comparison of slow walking speeds in healthy young and elderly females, Gillis found that older people's cautiousness may be a feature of gait that is not symptomatic of pathology but just a result of slow walking speeds.[9] For example, if someone tries to do an arm swing at a slow walking speed, the movement either doesn't happen or appears forced, like a marching step. At a faster speed, arm swing will occur naturally. Cress studied the relationship between physical performance and self-perceived physical function and determined that gait speed was the strongest independent predictor of self-perceived physical function.[10]

Gait speed is a useful indicator of activities of daily living (ADL) function. So what is normal gait speed? According to Potter, gait speeds of less than .25 m/second means that the person will be dependent in one or more ADLs, whereas gait speeds of .35 to .55 m/second means the person will be independent in all ADLs.[11] Muscle strength and mobility are also predictive and related to gait speed according to Laukkanen.[12] The mean value of the 10-meter walking test for those age 75 to 80 was 7.7 seconds. Wolfson hypothesized that strength is a major factor in gait and found that there is a strong relationship between the qualities of gait as measured by stride length and walking speed and falls.[13] Specifically, he found that fallers had a stride

length of .53 meters or less with a walking speed of .45 m/second or less. Bohannon determined walking speed reference values and correlations in older adults.[14] He established that the comfortable gait speed for men was 94.3 to 200.1 cm/second, and for women, 71.3 to 188.4 cm/second.

Gait and Turning

Turning as a part of walking is also an interesting phenomenon and should be looked at carefully, not only as a characteristic that changes with age but a powerful indicator of falling. Elderly adults age 65 or older with difficulty turning took more steps to make a turn, had no pivot and took more time to complete the turn than older people without difficulty.[15] When an unexpected turn must be made, older subjects had lower success in completing the turn compared with younger subjects.[16]

So what are some of the tests that can be used to assess gait? An interesting test is determining whether the patient can walk and talk at the same time. One study found 95 percent of residents who had to stop to talk sustained a fall within the six-month follow-up.[17-18] This is a good predictive tool for fall risk. Another good tool is the Timed Up and Go test. The subject is timed to rise from a chair, walk 3 meters, turn, walk back to the chair and sit down. Fallers take 21.5 .seconds to complete this test while nonfallers take 11.3 seconds.[19-20] The GARS (Gait Abnormality Rating Scale) has both a short and a long version.[21] This tool is descriptive regarding gait. People who score more than an 18 on the long version are at risk for falls, or if they score an 8 on the short version, they are also at risk for falls. This test also provides a precise description about a patient's gait. The only drawback for this test is that it has not been validated for patients requiring the use of assistive devices, which eliminates a large portion of the geriatric population.

Finally, let's talk about treatment. Tinetti has conducted numerous studies on interventions to reduce the risk of falling among elderly people living in their communities. Her multi-risk factor intervention resulted in a significant reduction in the risk of falling among older people in one community and saved approximately $2,000 per patient.[22] This figure includes paying for the cost of the care and shows that the number of people who fell and did not receive the intervention was exponential compared to those who did. Her intervention program worked on gait, transfer training and progressive resistive exercises (PREs). Patients were seen on an average of eight visits.

Campbell developed a protocol that is most likely the mainstay of many rehabilitation programs and validates physical therapists' chosen interventions (see sample gait protocol).[23] Patients were required to .perform the exercise protocol three times a week in addition to a home exercise program.

Hauer's exercise training program for patients with a history of injurious falls consisted of a 10 minute warm-up, PREs to the lower extremity three times a week (hip abduction, extension, knee extension, plantarflexion), stepping forward, backward, balance challenges with ball throw, t'ai chi, chair sits, one-legged stance training and progressive functional training.[24]

Nishimoto increased gait performance in the elderly using a stepping exercise program.[25] Her inventive step training program had patients go up and down steps five times, five times a day for eight weeks. Other suggestions include stretching and strengthening exercises for the hip flexors to improve walking ability.[1,4]

The most innovative and easiest treatment technique was described by Hausdorff in discussing the power of ageism on the physical function of older adults.[26] Reversibility of age-related gait changes, exposure to either positive or negative reinforcement subconsciously resulted in a significant increase in walking speed and swing time. In this randomized controlled study, older people were working at a computer while subliminally receiving either positive words or negative words. They tested both groups pre- and post-computer session with a gait task and found that the group that received the positive comments did much better in their walking speed and swing time.

As we work with patients it is important to remember to give positive reinforcement. The positive comments used during the study were "wise," "astute" and "accomplished." We wish all of you wise, astute and accomplished therapists the best of luck improving the gait of patients like Emily.

• References available online at www.physical-therapy.advanceweb.com. Select "References" on the left menu bar.

Dr. Lewis is a physical therapist in private practice and president of Physical Therapy Services of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. Jean Marie McAndrew is a practicing physical therapist specializing in geriatrics. She is the national director of a rehabilitation education and training company and is co-teaching a course in geriatrics to PT students.

Sample Gait Protocol

Progressive resistive exercises (PREs) to the hip extensors, abductors, knee flexors and extensors, ankle dorsiflexors and plantarflexors:

- One Legged Stance training
- Tandem standing and walking
- Walking on heels
- Backward and Sideward walking
- Turns
- Stepping over objects
- Picking objects up
- Stair climbing
- Sit to stand transfers
- Knee squats
- Active ROM to the whole body

---

advance
for Physical Therapists & PT Assistants®

One-Legged (Single Limb) Stance Test

February 27, 2006

Vol. 17 •Issue 6 • Page 10
Geriatric Function
One-Legged (Single Limb) Stance Test

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Keiba Shaw, MPT, MA, EdD

The One-Legged Stance Test (OLST)[1,2] is a simple, easy and effective method to screen for balance impairments in the older adult population.

You may be asking yourself, "how can standing on one leg provide you with any information about balance, after all, we do not go around for extended periods of time standing on one leg?"

True, as a rule we are a dynamic people, always moving, our world always in motion, but there are instances were we do need to maintain single limb support. The most obvious times are when we are performing our everyday functional activities.

Stepping into a bath tub or up onto a curb would be difficult, if not impossible to do without the ability to maintain single limb support for a given amount of time. The ability to switch from two- to one-leg standing is required to perform turns, climb stairs and dress.

As we know, the gait cycle requires a certain amount of single limb support in order to be able to progress ourselves along in a normal pattern. When the dynamics of the cycle are disrupted, loss of balance leading to falls may occur.

This is especially true in older individuals whose gait cycle is altered due to normal and potentially abnormal changes that occur as a result of aging.

Reliability

The One-Legged Stance Test measures postural stability (i.e., balance) and is more difficult to perform due to the narrow base of support required to do the test. Along with five other tests of balance and mobility, reliability of the One-Legged Stance Test was examined for 45 healthy females 55 to 71 years old and found to have "good" intraclass correlations coefficients (ICC range = .95 to .099). Within raters ICC ranged from 0.73 to 0.93.[3]

To perform the test, the patient is instructed to stand on one leg without support of the upper extremities or bracing of the unweighted leg against the stance leg. The patient begins the test with the eyes open, practicing once or twice on each side with his gaze fixed straight ahead.

The patient is then instructed to close his eyes and maintain balance for up to 30 seconds.[1]

The number of seconds that the patient/client is able to maintain this position is recorded. Termination or a fail test is recorded if 1) the foot touches the support leg; 2) hopping occurs; 3) the foot touches the floor, or 4) the arms touch something for support.

Normal ranges with eyes open are: 60-69 yrs/22.5 ± 8.6s, 70-79 yrs/14.2 ± 9.3s. Normal ranges for eyes closed are: 60-69 yrs/10.2 ± 8.6s, 70-79 yrs/4.3 ± 3.0s.[4] Briggs and colleagues reported balance times on the One-Legged Stance Test in females age 60 to 86 years for dominant and nondominant legs.

Given the results of this data, there appears to be some difference in whether individuals use their dominant versus their nondominant leg in the youngest and oldest age groups.

When using this test, having patients choose what leg they would like to stand on would be appropriate as you want to record

their "best" performance.

It has been reported in the literature that individuals increase their chances of sustaining an injury due to a fall by two times if they are unable to perform a One-Legged Stance Test for five seconds.[5] Other studies utilizing the One-Legged Stance Test have been conducted in older adults to assess static balance after strength training,[6] performance of activities of daily living and platform sway tests.[7]

Interestingly, subscales of other balance measures such as the Tinetti Performance Oriented Mobility Assessment[8] and Berg Balance Scale[9] utilize unsupported single limb stance times of 10 seconds and 5 seconds respectively, for older individuals to be considered to have "normal" balance.

Thirty percent to 60 percent of community-dwelling elderly individuals fall each year, with many experiencing multiple falls.[10] Because falls are the leading cause of injury-related deaths in older adults and a significant cause of disability in this population, prevention of falls and subsequent injuries is a worthwhile endeavor.[11]

The One-Legged Stance Test can be used as a quick, reliable and easy way for clinicians to screen their patients/clients for fall risks and is easily incorporated into a comprehensive functional evaluation for older adults.

References

1. Briggs, R., Gossman, M., Birch, R., Drews, J., & Shaddeau, S. (1989). Balance performance among noninstitutionalized elderly women. *Physical Therapy*, 69(9), 748-756.

2. Anemaet, W., & Moffa-Trotter, M. (1999). Functional tools for assessing balance and gait impairments. *Topics in Geriatric Rehab*, 15(1), 66-83.

3. Franchignoni, F., Tesio, L., Martino, M., & Ricupero, C. (1998). Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. *Aging* (Milan), 10(1), 26-31.

4. Bohannon, R., Larkin, P., Cook, A., & Singer, J. (1984). Decrease in timed balance test scores with aging. *Physical Therapy*, 64, 1067-1070.

5. Vellas, B., Wayne, S., Romero, L., Baumgartner, R., et al. (1997). One-leg balance is an important predictor of injurious falls in older persons. *Journal of the American Geriatric Society*, 45, 735-738.

6. Schlicht, J., Camaione, D., & Owen, S. (2001). Effect of intense strength training on standing balance, walking speed, and sit-to-stand performance in older adults. *Journal of Gerontological Medicine and Science*, 56A(5), M281-M286.

7. Frandin, K., Sonn, U., Svantesson, U., & Grimby, G. (1996). Functional balance tests in 76-year-olds in relation to performance, activities of daily living and platform tests. *Scandinavian Journal of Rehabilitative Medicine*, 27(4), 231-241.

8. Tinetti, M., Williams, T., & Mayewski, R. (1986). Fall risk index for elderly patients based on number of chronic disabilities. *American Journal of Medicine*, 80, 429-434.

9. Berg, K., et al. (1989). Measuring balance in the elderly: Preliminary development of an instrument. *Physio Therapy Canada*, 41(6), 304-311.

10. Rubenstein, L., & Josephson, K. (2002). The epidemiology of falls and syncope. *Clinical Geriatric Medicine*, 18, 141-158.

11. National Safety Council. (2004). *Injury Facts*. Itasca, IL: Author.

Dr. Lewis is a physical therapist in private practice and president of Premier Physical Therapy of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. *Dr. Shaw is an assistant professor in the physical therapy program at the University of South Florida dedicated to the area of geriatric rehabilitation. She lectures exclusively for GREAT Seminars and Books in the area of geriatric function.*

APTA Encouraged by Cap Exceptions

New process grants automatic exceptions to beneficiaries needing care the most

Calling it "a good first step toward ensuring that Medicare beneficiaries continue to have coverage for the physical therapy they need," Ben F Massey, Jr, PT, MA, president of the American Physical Therapy Association (APTA), expressed optimism that the new exceptions process will allow a significant number of Medicare patients to receive services exceeding the $1,740 annual financial cap on Medicare therapy coverage. The new procedure, authorized by Congress in the recently enacted

Deficit Reduction Act (PL 109-171), will be available to Medicare beneficiaries on March 13 under rules released this week by the Centers for Medicare and Medicaid Services (CMS).

"APTA is encouraged by the new therapy cap exceptions process," Massey said. "CMS has made a good effort to ensure that Medicare beneficiaries who need the most care are not harmed by an arbitrary cap."

As APTA recommended, the process includes automatic exceptions and also grants exceptions to beneficiaries who are receiving both physical therapy and speech language pathology (the services are currently combined under one $1,740 cap).

"We have yet to see how well Medicare contractors will be able to implement and apply this process. Even if it works well, Congress only authorized this new process through 2006. Congress must address this issue again this year, and we are confident that this experience will demonstrate to legislators that they must completely repeal the caps and provide a more permanent solution for Medicare beneficiaries needing physical therapy," Massey continued.

The therapy caps went into effect on Jan. 1, 2006, limiting Medicare coverage on outpatient rehabilitation services to $1,740 for physical therapy and speech therapy combined and $1,740 for occupational therapy.

The American Physical Therapy Association is a national professional organization representing more than 65,000 members. Its goal is to foster advancements in physical therapy practice, research and education.

New Mouthwash Helps With Pain

Doctors in Italy are studying whether a new type of mouthwash will help alleviate pain for patients suffering from head and neck cancer who were treated with radiation therapy, according to a new study (International Journal of Radiation Oncology*Biology*Physics, Feb. 1, 2006).

Fifty patients, suffering from various forms of head and neck cancer and who received radiation therapy, were observed during the course of their radiation treatment. Mucositis, or inflammation of the mucous membrane in the mouth, is the most common side effect yet no additional therapy has been identified that successfully reduces the pain.

This study sought to discover if a mouthwash made from the local anesthetic tetracaine was able to alleviate the discomfort associated with head and neck cancer and if there would be any negative side effects of the mouthwash. The doctors chose to concoct a tetracaine-based mouthwash instead of a lidocaine-based version because it was found to be four times more effective, worked faster and produced a prolonged relief.

The tetracaine was administered by a mouthwash approximately 30 minutes before and after meals, or roughly six times a day. Relief of oral pain was reported in 48 of the 50 patients. Sixteen patients reported that the mouthwash had an unpleasant taste or altered the taste of their food.

---

advance
for Physical Therapists & PT Assistants®

Self-efficacy: When PT Ends and Belief Begins

July 22, 2002

Vol. 13 •Issue 15 • Page 6
Geriatric Function
Self-efficacy: When PT Ends and Belief Begins

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Jean Marie McAndrew, MPT, MSG, GTC

Have you ever had the opportunity to do something that you really didn't think you could do? Standing up in front of a group to give a lecture? Riding a horse and jumping over a fence? Cliff diving?

That is how many patients may feel about being able to return to normal walking, being free from pain in their joints or carrying out daily activities. This is what realizing self-efficacy is all about. It is not a peripheral part of rehabilitation. Evidence-based medicine is showing that it is an integral part of recovery and must be explored in terms of prognostic indicators, evaluation and how we can provide an adjunct to our treatments in order to help patients in this area.

Being a Believer

What is self-efficacy? It is a belief in one's ability to successfully execute a behavior.[1] Self-efficacy has been shown in patients who have a fear of falling, those who have been diagnosed with fibromyalgia, osteoarthritis, and rheumatoid arthritis. These people believe that they cannot improve or feel better. For example, patients with a fear of falling don't believe they can acquire a safer gait pattern or improve their balance.

Is this phenomenon able to be evaluated? Yes, validated tests are available for, fibromyalgia[2,3] and osteoarthritis.[4-6] The simplest evaluation that a therapist can do is to administer paper and pencil tests for self-efficacy. These tests are simply scored on a 0Ð10 or 0Ð100 scale and averaged. If patients score above the median (5 or 50, respectively), they have a high self-efficacy and believe they can accomplish their goals for rehabilitation.

Once self-efficacy is assessed, the therapist can design goals with the patient and family. For someone with high self-efficacy, a typical therapy program can be initiated. For someone with low self-efficacy, additional interventions will be needed. These interventions will not take much more time but will enhance the patient's success with rehabilitation.

Changing Reactions

Various treatment options are available for patients with low self-efficacy. The first is performance accomplishments. Patients must receive positive feedback and see that they are continuing to improve. Vicarious experience involves showing videotapes or having the patient in the gym with other patients. When the patient is displaying successful behaviors, show the similarities from one patient to the other. When the patient is displaying unsuccessful or self-defeating behaviors, outline the differences of the patients. Persuasive communication provides instruction, suggestions and advice to the patient that are helpful in providing confidence.

Change their psychological reaction to the interpretation of their physiological state. For example, let the patient know that it is OK to have some pain and that there may be soreness after exercise. Explain to patients where the soreness may occur. A patient with knee osteoarthritis performing a quadriceps strengthening program may feel soreness in the quadriceps muscles after exercise; however, if the patient has increased pain in the joint, this may not be normal and should be reported to the therapist.

Stress management may also be helpful.[5] Bell found that four hours of community-based rehabilitation intervention delivered over a six-week period when the above techniques were used improved the person's self-efficacy, disease management and morning stiffness. [7]

Avoiding Falls

In the area of falling, gait and balance, self-efficacy is even more important. A therapist was the first person to coin the term ptophobia for fear of falling.[8] He showed that it was a special phobia, having all the characteristics: it is out of proportion to the demands of the situation; it cannot be explained or reasoned away; it is beyond the person's voluntary control, and it results in avoidance of the feared situation.

Petrella found that restrictions in function from fear of falling might negate any gains made through rehabilitation and limit the person's success.[9] At that point, Petrella called for more emphasis to be placed on fear of falling treatment. Murphy showed participation in daily living tasks among older adults affected with fear of falling.[10] The older adults with the lowest confidence regarding fall ability participated significantly less in daily activity.

There are several treatment ideas for patients with ptophobia. An interesting study done by Hausdorff found that exposure to either positive or negative reinforcement subconsciously resulted in a significant impact in walking speed and swing time. [11] Those receiving the positive reinforcement words (e.g., wise, astute, accomplished) demonstrated an increase in walking speed and swing time. Negative words (e.g., senile, dependent, diseased) had the reverse effect.

Use as much sensory input as possible. For example, have a patient lean forward and rub his legs to initiate rising from a chair.[12] When working, reassure visual deficits, let the person know when he is going to leave a carpeted area and enter a tiled one.[13] Use contact desensitization, helping him on an assistive device or constantly providing manual contact until confidence improves, then gradually decrease both the aids and the contact.

Create a Safe Area

Improving other functional areas besides gait can positively affect gait. Treat the patient in more familiar surroundings, for example always treat the patient in the same treatment room or room in their home. Use social persuasion to encourage independence. For example, tell family members to not always tell Dad to wait until someone is there, let Dad try some things on his own. Talk with the patient about the previous fall, find out what happened and discuss ways to avoid or handle the situation in the future. Patients may do better with shorter treatments done more frequently. Stress reduction tapes can be played prior to walking.

Tennstedt studied gait interventions to reduce the fear of falling.[14] The subjects in the group had increased levels of activity increased mobility control, increased social function and increased mobility range after the study was completed. The intervention was an eight-week, two-hour session, twice a week watching videotapes about safety, listening to lectures on appropriate walking techniques, therapeutic exercise, range of motion and a strengthening program as well as assertiveness training and behavioral contracting.

We believe that having patients overcome their fears as an adjunct to a treatment program can be helpful. So if you've ever wondered why a patient isn't improving while you are providing good evidenced based care, consider that the missing piece may well be her fear of falling and our fear of trying something new.

• Reference available online at www.advance.forPT.com. Click References on the left menu bar.

Dr. Lewis is a physical therapist in private practice and president of Physical Therapy Services of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. Jean Marie McAndrew is a practicing physical therapist specializing in geriatrics. She is the national director of a rehabilitation education and training company and is co-teaching a course in geriatrics to PT students.

---

advance
for Physical Therapists & PT Assistants®

Stretching Boundaries In the Quest For Flexibility

October 28, 2002

Vol. 13 •Issue 22 • Page 6
Geriatric Function
Stretching Boundaries In the Quest For Flexibility

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Jean Marie McAndrew, MPT, MSG, GTC

It is the year 2015. What does physical therapy look like? What tools are we still using to treat our patients? Modalities may be very different but therapeutic exercise, which may be done differently, will still be there.

Therapeutic exercise has many components; stretching is a main one. Without flexibility, you or your patient is an injury waiting to happen. Tight muscles cannot go through full range of motion.

Stretching is important for many reasons, from improved motion and function that results to even the temporary but significant increase in pain threshold it confers.[1] This article will review the components of stretching as they relate to older people—when to do it, what helps, where to do it, and for how long and how often.

The Best Time

Let's start with one of the most recently controversial components: when. When is the best time to stretch: before or after exercise? Recent systematic reviews strongly support that little benefit is gleaned from stretching prior to exercise. Soreness, athletic performance and injury occurrence are not significantly affected.[2-6] Since stretching may confer analgesic effects it may even be deleterious to stretch before exercising because this may mask pain when performing an activity after a stretch. It appears at this time it is better to stretch after activity when the muscle is warm.[2-6]

What helps muscles stretch? Heat. Gary Lentell's study dramatically showed how heating a muscle prior to stretching increased range of motion to over six degrees in comparison to a non-heated but stretched muscle.[7] Superficial as well as deep heat may augment the benefits. Heating a muscle can be done through a warm-up activity or applying heat directly to the muscle to be stretched.

Superficially heating a muscle brings us directly to where to heat the muscle. This piece of the puzzle has two answers. The answer would seem obvious, yet it is so often being done incorrectly. The worst offender is application of heat to stretch the shoulder. If a person were limited due to adhesive capsulitis, where should heat be applied? The most often seen position is with a cervical hot pack wrapped around the shoulder where the heat is directly on the deltoids. Are the deltoids tight? Is the arm at the side in internal rotation in a position of stretch? The arm should be placed in the most tolerable external rotation and abduction with the hot packs on the tight muscles (i.e., the pectorals, latissimus dorsi, serratus anterior, teres major/minor).

The other question is, which muscles become tightest in our older patients? The answer relates to the concept of hypokinetics (decreased activity). Older patients sit for longer periods of time and develop tightness accordingly.

The Time Factor

How long do we heat the muscle and how long do we stretch the muscle? Superficial heat is effective if applied for a minimum of 10 minutes.[7] Longer is not necessarily better, especially for older patients. Ultrasound at thermal settings is most effective if applied for seven minutes.[9]

Stretches for older patients are better if held for 60 seconds.[10] Feland's program performed exclusively with older patients

had subjects stretch four times each session, five sessions per week for six weeks.[10]

But are this many sessions truly needed? How frequently should one really stretch? Bandy did a study that showed that doing a stretch three times is no more effective than doing a one-time stretch; however, his subjects were not over 65 years old.[11] Therefore, the recommended frequency for older patients is still uncertain.

References

1. Shrier, I. (1999). Stretching before exercise does not reduce the risk of local muscle injury: A critical review of the clinical and basic science literature. *Clinical Journal of Sports Medicine*, 9, 221-227.

2. Herbert, R.D., & Gabriel, M. (2002). Effects of stretching before and after exercising on muscle soreness and risk of injury: Systematic review. *British Medical Journal*, 325(7362), 468.

3. Nagourney, E. (September 10, 2002). Regimens: Looking for the point of stretching. *New York Times*.

4. Pope, R.P., et al. (2000). A randomized trial of pre-exercise stretching for prevention of lower-limb injury. *Medicine and Science in Sports and Exercise*, 32(2), 271-277.

5. Pope, R.P., et al. (1998). Effects of ankle dorsiflexion range and preexercise calf muscle stretching on injury risk in army recruits. *Australian Journal of Physiotherapy*, 44, 165-177.

6. Shrier, I. (2000). Streching before exercise: An evidence based ap.proach. *British Journal of Sports Medicine*, 34, 324-325.

7. Lentell, G., et al. (1992). The use of thermal agents to influence the effectiveness of a low-load prolonged stretch. *JOSPT*, 16(5), 200-207.

8. Knight, C.A., Rutledge, C.R., Cox, M.E., Acosta, M., & Hall, S.J. (2001). Effect of superficial heat, deep heat, and active exercise warm-up on the extensibility of the plantar flexors. *Physical Therapy*, 81(6), 1206-1214.

9. Feland, J., Myrer, J., Schulthies, S., Fellingham, G., & Meason, G. (2001). The effect of duration of stretching of the hamstring muscle group for increasing range of motion in people aged 65 years or older. *Physical Therapy*, 81(5), 1100-1117.

10. Bandy, W., Irion, J., & Briggler, M. (1997). The effect of time and frequency of static stretching on flexibility of the hamstring muscles. *Physical Therapy*, 77(10), 1090-1096.

11. Photos Source–Pictures reprinted from *VH-I Geriatric Exercise and Rehabilitation Prescription Kit*.

12. Photo Source–Picture reprinted from Kisner, C., & Colby, L. (1990). *Therapeutic exercise: Foundations and techniques*, 2nd Edition. Philadelphia: F.A. Davis.

Carole Lewis is a physical therapist in private practice and president of Physical Therapy Services of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website is www.greatseminarsandbooks.com. Jean Marie McAndrew is a practicing physical therapist specializing in geriatrics. She is the national director of a rehabilitation education and training company and is co-teaching a course in geriatrics to PT students.

---

advance
for Physical Therapists & PT Assistants®

The Role of Self-Efficacy in Geriatric Rehab

March 27, 2006

Vol. 17 •Issue 8 • Page 6
Geriatric Function
The Role of Self-Efficacy in Geriatric Rehab

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Keiba Shaw, EdD, MPT, MA

An individual's self-efficacy—or rather their relative belief that they have the necessary capabilities to execute viable courses of action to successfully complete a desired task—has been identified as an important determinant in the promotion of health behavior in older adults.[1]

Of most concern to our readers is how this psychological concept relates to older people with various chronic conditions such as cardiovascular disease[2] and chronic obstructive pulmonary disease,[3] functional declines such as decreased ability to perform activities of daily living (ADLs), deviant gait and falls.

In fact, studies have shown a correlation with decreases in gait speed[1,4] and overall physical and social functioning in individuals who demonstrated with lower levels of perceived self-efficacy.[1,5]

Social Cognitive Theory

In discussing self-efficacy, it is necessary to discuss the social cognitive theory from which it is derived. This theory examines the interaction between a person's behavior, environment and his cognitions.[6]

The interface between these factors can play a role in whether confidence in one's ability to perform (self-efficacy) is present, whether goals are attained and outcomes achieved.

Therefore, increasing self-efficacy through the use of observation (cognitive appraisal) and subsequent modeling of successful behavior can lead to positive outcomes in the future. Self-efficacy expectations were significantly related to performance of ADLs in 624 community-dwelling older adults.[7] Recovery of function was partially attributed to self-efficacy expectations when examined over a two-year period in a sample of disabled community dwelling older adults.[8]

Resnick has examined self-efficacy in older patients after an orthopedic injury and found that self-efficacy expectations for functional ability on admission to rehabilitation were significantly related to functional performance as observed on admission ($r=.37$, $p<.05$), at discharge ($r=.52$, $p<.05$).[9,10] In this same study, discharge self-efficacy is significantly related to function upon discharge ($r=.69$, $p<.05$).[9,10]

In light of the past and current research, we hope we are building a strong case for the importance of evaluating self-efficacy levels in older adults.

Using the Scale

There are several scales that have been used to examine self-efficacy in both the general and older adult populations. In 1992, the English version of the General Self-Efficacy Scale (GSES)[11] was developed by Matthias Jerusalem and Ralf Schwarzer. The intended purpose of the scale was to measure perceived self-efficacy in order to predict coping with daily hassles and adaptation to stressful life events in the adolescent and adult population. Reliability of the GSES appears to be good with Cronbach alpha's ranging from .76 to .90.

Criterion and predictive validity of the scale has been established through numerous studies.[12] The developers suggest using

this scale pre- and post-surgical intervention to assess changes in quality of life as related to self-efficacy. For further information on the GSES and a copy of the scale, refer to http://www.userpage.fu-berlin.de/~health/selfscal.htm

Another useful scale for examining self-efficacy in individuals who have sustained or who are at risk for falls is the Falls Efficacy Scale (FES).[13] This scale, developed by Tinetti et al.[14] and later modified by Hellstrom and Lindmark,[15] contains 10 items that assesses a person's level of confidence in performing ADLs without falling. Each item is rated, from 1 = extreme confidence to 10 = no confidence at all. Scores for each item are then added together for a total score.

The Arthritis Self-Efficacy Scale (ASES) is used to measure perceived self-efficacy in those persons with chronic arthritis. This scale consists of 20 items divided into three subscales: Pain (5 items), Function (9 items), and Other symptoms (6 items).[16]

While the scale is not specifically indicated for the older adult population, the initial development and subsequent replication and reliability studies were conducted on individuals in their early to mid 1960s.

Internal consistency for each subscale range from .75 (pain) to .90 (function), with "other" having an internal consistency of .87. Test-retest for the subscales were .85 (function), .87 (pain) and .90 (other).

The ASES is a self-administered test where individuals are asked to indicate where on a scale from 1 (very uncertain) to 10 (very certain) they are able to regularly accomplish the indicated tasks.

To score the ASES, the score for each item is the number circled. If two consecutive numbers are circled, the lower number (less self-efficacy) is recorded. If the numbers are not consecutive, the item is not scored. The score for the scale is the mean of the items. Scoring the scale is not recommended if more than 25 percent of the items are missing.

An eight-item version of the ASES has been developed by researchers at the Stanford Patient Education Research Center. This modified version does not include any items regarding function; therefore, a quality of life or other function questionnaire would be needed to garner this type of information. The internal consistency for this scale is .92. Scoring is performed as per the original scale.

Exercising Self-Efficacy

There are scales that are currently being used to assess self-efficacy geared toward not only rehabilitation but exercise in general. One such scale is the Barriers Self-Efficacy (BSE) scale developed by McAuley in 1992.[17] This scale was designed to evaluate individual's abilities to exercise in the face of commonly identified barriers to exercise participation.

Participants are asked to rate their degree of confidence on the 13 item scale from 0 percent (no confidence at all) to 100 percent (complete confidence). Scoring is done by adding and dividing the total number of items, giving a possible range of 0 percent to 100 percent.

The Exercise Self-Efficacy (ESE) scale is used to assess a person's ability to participate in exercise over time.[18] Like the Barriers Self-Efficacy scale, the ESE scores are based on a confidence scale from 0 percent to 100 percent, summed and divided by the total number of items. Unlike the BSE, which has only been used in the middle-aged population, the Exercise Self-Efficacy scale has been used in the older adult population.

At times, it may seem burdensome to you the clinician and/or your patients to fill out yet another form/questionnaire. But the knowledge that you gain as a clinician will help you establish treatment programs based on using your patients' perceived self-efficacy for establishing and accomplishing set goals.

The self-knowledge patients obtain from this type of assessment will help them begin to change their cognitions and subsequent behaviors in order to achieve the most success from their rehabilitation.

So consider incorporating one of these forms into your evaluation repertoire—it may be just the thing to help motivate and increase physical functioning in your patients.

References

1. McAuley, E., Jermome, G., Marques, D., & Elavsky, S. (2003). Exercise self-efficacy in olders adults: Social, affective and behavioral influences. *Annals of Behavioral Medicine*, 25, 1-7.

2. Carroll, D. (1995). The importance of self-efficacy expectations in elderly patient recovering from coronary artery bypass surgery. *Heart Lung*, 24, 50-59.

3. Kaplan, R., Ries, A., Preweitt, L., & Eakin, E. (1994). Self efficacy expectations predict survival for patients with chronic obstructive pulmonary disease. *Health Psychology*, 13, 366-368.

4. Rosengren, K., McAuley, E., & Mihalko, S. (1998). Gait adjustments in older adults: Activity and efficacy influences. *Psychology and Aging*, 13, 375-386.

5. Tinetti, M., Mendes de Leon, C., Doucette, J., & Baker, D. (1994). Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *Journal of Gerontological Medical Science*, 49, M140-M147.

6. Bandura, A. (1989). Human agency in social cognitive theory. *American Psychology*, 44(9), 1175-1184.

7. Kempen, G., van Heuvelen, M., van Sonderen, E., van den Brink, R., Kooijman, A., & Ormel, J. (1999). The relationship of functional limitations to disability and the moderating effects of psychological attributes in community dwelling older persons. *Social Science and Medicine*, 48(9), 1161-1172.

8. Gill, T., Robison, J., & Tinetti, M. (1997). Predictors of recovery in activities of daily living among disabled older persons living in the community. *Journal of General Internal Medicine*, 12(12), 757-762.

9. Resnick, B. (1998). Efficacy beliefs in geriatric rehabilitation. *Journal of Gerontological Nursing*, 24, 34-45.

10. Resnick, B. (2002). The impact of self-efficacy and outcome expectations on functional status in older adults. *Topics in Geriatric Rehab*, 17(4), 1-10.

11. Jerusalmen, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal processes. In R. Schwarzer (Ed), *Self-efficacy: Thought control of action*. Washington, DC: Hemisphere. http://www.userpage.fu-berlin.de/~health/selfscal.htm

12. Tinetti, M., Richman, D., & Powell, L. (1990). Falls efficacy as a measure of fear of falling. *Journal of Gerontology*, 45(6), P239-P243.

13. Tinetti, M., Mendes de Leon, C., Doucette, J., & Baker, D. (1994). Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *Journal of Gerontology*, 49(3), M140-M147.

14. Hellstrom, K., & Lindmark, B. (1999). Fear of falling in patients with stroke: A reliability study. *Clinical Rehabilitation*, 13, 508-717.

15. Lorig, K,, Chastain, R., Ung, E., Shoor, S., & Holman, H. (1989). Development and evaluation of a scale to measure self-efficacy in people with arthritis. *Arthritis Rheumatology*, 32, 37-44.

16. McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioral Medicine*, 15, 65-88.

17. McAuley, E. (1993). Self-efficacy and the maintenance of exercise participation in older adults. *Journal of Behavioral Medicine*, 116, 103-113.

Dr. Lewis is a physical therapist in private practice and president of Premier Physical Therapy of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. *Dr. Shaw is an assistant professor in the physical therapy program at the University of South Florida dedicated to the area of geriatric rehabilitation. She lectures exclusively for GREAT Seminars and Books in the area of geriatric function.*

---

advance
for Physical Therapists & PT Assistants®

Treatment Ideas to Combat Self-Efficacy

April 24, 2006

Vol. 17 •Issue 10 • Page 8
Geriatric Function
Treatment Ideas to Combat Self-Efficacy

By Carole Lewis, PhD, PT, MSG, MPA, GCS, and Keiba Shaw, MPT, MA, EdD

We are physical therapists, but that does not mean that everything we do centers around the physical.

In the last column (March 27) on evaluation of self-efficacy, it was clear how important this non-physical aspect of care is to a patient's success.

A physical therapist may be the world's most highly technically trained clinician, but if a patient has low self-efficacy, that patient may never improve.

The key then is to first screen for self-efficacy (as noted in last month's column) and then incorporate some interventions that don't detract from the professional care to get the best results possible.

Utilizing Research

Many studies have looked at ways to improve self-efficacy. Taal was one of the earliest researchers to explore this area and suggested several interventions.[1]

Performance accomplishments. Help patients to succeed. He found that success begets success.

Vicarious experience. Use the experience of others to encourage improvement. If the other is successful, point out the similarities. If the other is a failure, point out the differences.

Persuasive communication. Encouragement, positive reinforcement and honest compliments can all help in increasing self-efficacy.

Explain physiological changes. Let patients know that some pain is OK.

Smarr's research looked at stress management programs as an adjunct to a rehabilitation program and found those with low self-efficacy who participated in a stress management program either before or during rehabilitation, improved to a greater degree than those who did not.[2]

Petrella simply incorporated confidence building in the rehabilitation process for patients with low self-efficacy.[3]

Finally, Tennstedt used assertiveness training and behavioral contracting to improve results in patients with low self-efficacy.

In addition to these studies, Conn provides additional interventions to strengthen self-efficacy.[5] These are listed and explained below.

• Role modeling. Show videotapes of positive role models. Foster alliances with others who have similar conditions.

• Verbal encouragement.

• Set realistic short- and long-term goals.

• Educate patients about the benefits of the rehabilitation program.

• Show progress toward goals and give positive reinforcement for any notable achievements.

• Individualized care.

• Use caring, kindness and humor.

• Know each individual patient and try to modify the schedule and program to meet each patient's needs.

• Share in the patients excitement and joy with improvements made in rehabilitation.

Social Support

Reward the patient with attention and encouragement from social support systems.

Use social supports to encourage the patient to participate and encourage the patient.

Decrease unpleasant activities associated with functional activities.

Comprehensively assess pain with activities and evaluate how this impacts performance and participation.

Help the patient to develop coping skills for unpleasant situations. Develop more realistic attitudes. Encourage experimentation with new attitudes. Use relaxation and distraction. Encourage the use of ice/heat or meds as needed to continue with the program.

Self-efficacy is important. Linking the non-physical methods listed above can help our patients to improve the physical areas dramatically.

References

1. Taal, E., Rasker, J., & Wiegman, O. (1996). Patient education and self-management in the rheumatic diseases: A self-efficacy approach. *Arthritis Care and Research*, 9(3).

2. Smarr, K., Parker, J., Wright, G., Stucky-Ropp, R., et al. (1997). The importance of enhancing self-efficacy in rheumatoid arthritis. *Arthritis Care and Research*, 10(1).

3. Petrella, R., Myers, P., Overend T., et al. (2000). Physical function and fear of falling after hip fracture rehabilitation in the elderly. *American Journal of Physical and Medical Rehabilitation*, 79(2), 154-160.

4. Tennstedt, S., et al. (1998). A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *Journal of Gerontology*, 53B(6), P384-P392.

5. Conn, V., Burks, K., Pomeroy, S., & Cochran, J. (2003). Are there different predictors of distinct exercise components? *Rehabilitation Nursing*, 28(3).

Dr. Lewis is a physical therapist in private practice and president of Premier Physical Therapy of Washington, DC. She lectures exclusively for GREAT Seminars and Books, Inc. Dr. Lewis is also the author of numerous textbooks. Her Website address is www.greatseminarsandbooks.com. *Dr. Shaw is an assistant professor in the physical therapy program at the University of South Florida dedicated to the area of geriatric rehabilitation. She lectures exclusively for GREAT Seminars and Books in the area of geriatric function.*

Motor problems: gait or balance impairment; muscle weakness [2] Rubenstein LZ, Josephson KR. Falls and their prevention in elderly people: what does the evidence show? Med Clin North Am. 2006 Sep;90(5):807-24. http://www.ncbi.nlm.nih.gov/pubmed/16962843?tool=bestpractice.com [4] Ganz DA, Bao Y, Shekelle PG, et al.Â It also found that multifactorial interventions (component interventions that differ between people depending on their assessment of risk of falls) may reduce falls in older people in the community compared with usual care or attention control. [18] Hopewell S, Adedire O, Copsey BJ, et al. Multifactorial and multiple component interventions for preventing falls in older people living in the community. Investigation of gait in elderly subjects over 88 years of age. J Geriatr Psychiatry Neurol. 1992;5:78â€“84.Google Scholar. 6. Collen FM, Wade DT, Robb GF, Bradshaw CM. The Rivermead mobility index: a further development of the Rivermead Motor Assessment. Int Disabil Stud. 1991;13:50â€“4.CrossRefGoogle Scholar.Â Steffen TM, Hacker TA, Mollinger L. Age- and gender-related test performance in community-dwelling elderly people: six-minute walk test, berg balance scale, timed up & go test, and gait speeds. (Participants discuss which types of assessment they could use to assess their learners that they have not used before.) How can candidates prepare for this area of the syllabus? (Candidates can note when, how and why they assess their learners during a school year. They can also look at examples of types of assessment in the TKT: CLIL Handbook which is on the Cambridge ESOL website). Additional information. See TKT: CLIL handbook for a further example of a test from Part 2: Types of assessment.Â Definitions of assessment 1. Assessment of curricular content that can be done at any time. It benefits learners as. they evaluate anotherâ€™s work using sets of criteria.