Proprioception and Fall Prevention

By Ashlee Jones

Falls are the leading cause of fatal and non-fatal injuries for those aged 65 and older. An estimated one in three older adults fall every year. Thirty percent of these falls result in a moderate to severe injury, such as a hip fracture, or even death based on the fear of falling.

This fear can lead to inactivity, which further decreases an elderly individual’s postural stability, gait and balance.

Several studies and authors indicate that dynamic proprioception training is linked to decreasing the risk of falls. Proprioception is awareness of one’s body position. As we age, this system decreases in function, thus increasing the risk of falls.

Dynamic proprioception training utilizes unstable surfaces, such as an exercise ball or a stability trainer, to challenge an individual’s core strength. Advancing core strength improves postural steadiness with walking, turning and reaching.

Unstable surfaces such as a stability trainer challenge core strength to improve postural steadiness.

A control group was asked not to change activity levels during the 12-week intervention. The experimental group participated in a proprioception intervention program for two days per week. Each exercise session was 50 minutes (10 minutes warm-up, 30 minutes proprioceptive exercises, and 10 minutes cool-down). As the participants improved with the exercise, training was progressed into two or three phases.

The experimental group significantly improved on stability tests “eyes open” and “eyes closed”, on postural control during anterior-posterior and medial-lateral movements on the force platform; and on scores on the Tinetti and Berg balance tests.

**Discussion**

Although aging is inevitable, the risk of falling can be prevented. No matter the living situation of the older adult, it is important to address balance for improved quality of life. Reoccurrence of falls in individuals older than 65 tends to result from the loss of agility and dynamic control during activities of daily living.

Maintaining a level of physical activity is important for improved steadiness during walking, turning and reaching activities. This study showed that participation in proprioception exercises has a positive effect on gait, postural stability and balance in older adults.

Another significant piece of fall prevention is guidance by a physical therapist, who can take an older individual through a challenging proprioception exercise regime to decrease the risk of falling.

**Methods**

This study comprised 44 subjects aged 65 and older. Baseline characteristics were collected on the participants through:

- A self-administered questionnaire (“Have you experienced a fall to the ground in the last 12 months?”).
- Pre- and post-intervention assessments on stability tests with “eyes open” and “eyes closed.”
- Tinetti and Berg tests (functional tests to objectively determine a patient’s ability to complete tasks safely, identifies falls risk).
- A force platform assessment (measures the amount of sway associated with changes in weight bearing).

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**RESULTS**

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By Jessica Heath and Neal Goulet

Life, it turns out, literally is a balancing act. And the longer we live, the more challenged we are to stay on our feet.

Consider that more than 30 percent of people aged 65 and older will fall this year. If you reach age 80, your odds of falling increase to better than 50 percent.

And it gets worse for some. In 2012–2016, according to the Centers for Disease Control and Prevention (CDC), falls caused 55 percent of all unintentional deaths among adults aged 65 and older. This far exceeds the number of injury deaths caused by motor vehicle accidents in that age group.

Among other staggering numbers about falls, which while sweeping toward the older population can negatively affect all ages:

- One out of five falls causes a serious injury such as broken bones or a head injury.
- More than 95 percent of hip fractures are caused by falling, usually by falling sideways.
- The direct medical costs for fall injuries is $31 billion annually. That figure could reach $54 billion by 2030.

**Three Body Systems**

Aging is but one of many factors that contribute to a balance disorder, or dysfuntion, a condition that makes you feel unsteady or dizzy when walking or standing.

Muscle weakness, joint stiffness, inner ear problems, medications and sedentary lifestyle also can contribute to balance problems. Common medical conditions can play a role, too, including diabetes, arthritis, stenosis, high blood pressure, heart conditions, muscular degeneration.

Progressive neurological disorders, such as multiple sclerosis and Parkinson’s disease, also present with balance dysfunctions and can affect independence and safety.

**Screening for Risks**

Balance problems can manifest as tripping, swaying, stumbling, dizziness, vertigo, and, worst of all, falling. Standing still or performing a single task may not be troublesome, but moving about or doing more than one thing at a time (walking while turning your head to speak with another person) can become problematic.

A person challenged in these ways can grow fearful of performing daily activities, in the process losing muscle strength as a result of avoiding strenuous movements.

“Some of the major consequences of falls among older adults,” according to the CDC, “are hip fractures, brain injuries, decline in functional abilities, and reductions in social and physical activities.”

The more risk factors a person has — older victims typi-
Fall-Proof Your Home

Make these simple changes to help prevent falls and eliminate hazards in various parts of your house.

**Kitchen**
- Never stand on chairs or boxes to reach cabinets or shelves. Use a step stool with a bar to hang on to.
- Store food, dishes and cooking equipment in easily-reachable places.
- Immediately clean up any liquid or food spilled on the floor.

**Bathroom**
- Place a slip-resistant rug next to the bathtub for safe entry and exit.
- Use a non-slip rubber mat or non-slip strips in tub or shower.
- Install grab bars for support inside the tub and next to the toilet.
- Replace glass shower enclosures with non-shattering material.

**Stairs and Steps**
- Always keep objects off stairs.
- Fix any loose or uneven steps.
- Provide enough light to see each stair and landing to the toilet.
- Make sure carpet is firmly attached to every step.
- Make sure handrails are on both sides of the stairs.

**Fall-Prevention Tips**
- To prevent falls, focus on modifiable risk factors:
  - Talk to your health care provider. Ask for an assessment of your risk for falls. Share any chronic conditions and any history of falls.
  - Review your medications with your doctor and pharmacist. Don’t forget the counter medications or herbal supplements.
  - Talk to a physical therapist about a balance assessment and exercise program to build balance, strength and flexibility.
  - Get your vision and hearing checked annually.
  - Talk to your family members. Exällt their help to take steps to make your home safer.

**Case Study**

**All Balance Components**

By Courtney Myers

**Patient History**
A 71-year-old male presented to outpatient physical therapy with complaints of imbalance and dizziness after oral medication treatment for hematomat (blood) on his brain. He noted that his overall level of mobility was affected and reported several near falls. He described difficulty with activities such as yard work, showering and grocery shopping along with overall increased fatigue. The patient had a history of nasal cancer, Type 2 diabetes, polynuropathy and macular degeneration.

**Assessment**
The patient presented with reduced hip strength and range of motion. He had an inconsistent response with testing of sharp/dull sensations on the plantar surface of both feet, indicating a possible loss of sensation.

He displayed severe loss of balance with static testing, deteriorating with his eyes closed or with a change of surface. When asked to turn his head, the patient demonstrated decreased walking speed, walking off to the sides versus maintaining a straight path, and frequent loss of balance.

Vestibular hypofunction (a poorly functioning vestibular system) was apparent given the above findings. However, additional impairments influenced his balance and needed to be addressed.

**Treatment**
Treatment consisted of manual stretching of hip flexors and extensors, gluteal and general lower extremity strengthening, and vestibular exercises. He performed vestibular ocular reflex (VOR) exercises, static and dynamic balance activities on both compliant (stable) and noncompliant (unstable, such as foam or balance board) surfaces, and activities with visual suppression (eyes closed). Anodyne (infrared) treatment was incorporated to both feet to improve sensation.

**Outcome**
After 12 physical therapy treatments focused on all three of the primary balance systems (vestibular, visual and somatosensory), the patient displayed remarkable improvement. The patient reported improved balance with general activities of daily living, including decreased need for upper extremity assistance while showering and decreased fear of imbalance or falls. The patient noted improved sensation in his feet while driving. His Activities-specific Balance Confidence Scale score improved from 81.3 percent confidence to 92.5 percent confidence.

**Summary**
Patients with balance problems can present with multiple system deficits. In addition to vestibular impairments, we must consider injury to both the somatosensory (proprioception, sensation, range of motion and strength) and visual systems.

Physical therapists have the tools to incorporate exercises and improve these deficits to provide the best care available. It is important to consider all balance components.