

# Balance and bands

**Designed to reduce falls in older adults, this exercise program has produced significant improvements in participants' strength and balance in just three months**

*by Michael E. Rogers, Ph.D., CSCS*

One-third of community-residing adults ages 65 years and older suffer a fall each year. With more than 35 million older adults in the United States, this rate equates to more than 10 million falls each year. Falls are the leading cause of injury-related deaths in older adults, and a significant cause of injury, disability and healthcare costs. In 2000, 1.8 million falls in the U.S. resulted in an emergency room visit for head trauma, soft tissue injuries, dislocations and fractures (including 340,000 broken hips), accounting for \$16.4 billion in direct medical expenses.<sup>1</sup>

A variety of issues can contribute to falls. These include the effects of diseases and medications; environmental factors, such as slippery floors and poor lighting; and many physical factors, including poor strength and balance.<sup>2</sup>

Although sometimes difficult to define and measure, balance is basically the ability to maintain the body's position over its base of support, whether the base is stationary or moving.<sup>3</sup> There are two types of balance:

- *Static balance*, which is the ability to control postural sway during quiet standing; and
- *Dynamic balance*, which is the ability to react to changes in balance and to anticipate changes as the body moves. Dynamic balance includes maintaining balance while walking and stepping over or around objects.

In older adults, static balance is maintained until significant functional



declines occur, but losses in dynamic balance are evident much earlier.<sup>4</sup>

Based on the importance of strength and dynamic balance, researchers Skelton and Dinan recommend training of postural muscles along with dynamic balance training as a means to reduce the risk of falls in older adults.<sup>5</sup>

### **Why train strength and balance in tandem?**

Many studies have shown that strength can be improved in older adults using different types of resistance training. But resistance training alone has had only a modest effect on improving balance, even though strength and balance are related. This is likely because the ability to maintain balance involves a complex set of processes that require the successful integration of multiple components, including several sensory systems not typically affected by resistance training. These sensory systems include the following:

- The *visual system*, which provides information about a person's position and movement through the environment, plus identifies objects on the floor to step around or over;
- The *vestibular system*, located in the inner ears, which provides information about head movement and the body's position in space; and
- The *somatosensory system*, which monitors the body's position and contact with other objects (including the floor) using muscle receptors that detect limb and body movement and skin receptors that relay information about touch and vibration.

Based on input from these systems, the brain sends signals to muscles that make the necessary corrections to maintain balance. If any of these systems is impaired, the body's ability to maintain balance diminishes and the risk of falls increases.

With advancing age, muscle strength and sensory function decrease, contributing to losses of balance and greater risk for falls. Based on the principle of exercise specificity and the multidimensional aspects of balance, training programs should target the systems involved in balance control, particularly the muscular, visual, vestibular and somatosensory systems. One challenge in developing such programs is identifying safe and effective exercises that target these multiple systems.

### **Combining balance and strength exercises**

A program developed by researchers at the Center for Physical Activity and Aging at Wichita State University, Kansas, combines strength training with balance-specific exercises to target the muscular system, as well as the three major sensory control systems that control balance. (See "Strength and balance training: a program for older adults" on page 27 for specific exercises.) Implemented in several senior centers, this program has been shown to improve strength and balance significantly.<sup>3</sup> After just three months of performing these exercises three times a week, participants improve both their strength and balance by approximately 20%.

Essentially, the program utilizes five-foot long elastic resistance bands and foam pads. The bands are used to enhance strength and to incorporate dynamic movements into the training program. The 16" x 9" x 2" foam pads provide an unsteady surface that challenges the body to maintain balance.

Older adults find the exercises challenging but enjoyable to perform. And they immediately see how the exercises relate to daily activities, providing an impetus to participate. Among the program's advantages, the exercises can be conducted in

community senior centers or wellness facilities as group-oriented programs, providing older adults with the opportunity to socialize. This factor may help maintain long-term participation. Additionally, the equipment is inexpensive, easy to store and portable, allowing older adults to exercise at home during bad weather or on the road when visiting grandchildren. Also important, older adults can perform the exercises at a level suitable to their individual ability and progress at their own rate.

Bands are available in color-coded levels of resistance: yellow (easiest), red, green, blue, black, gray and gold (most difficult). The foam pads also come in color-coded levels of firmness: green (intermediate challenge) and blue (advanced challenge). Participants choose a band and a foam pad that adequately challenge them, yet permit proper technique. Everyone performs the same activity during a class, but at their own level, allowing newcomers to use low resistance yet participate alongside those exercising at higher intensity. As participants improve in strength and balance, they increase the intensity by advancing to the next level (color) of challenge.

Given that some muscles are stronger than others, this progressive system enables participants to use a suitable level of challenge for a particular body part. For example, since the legs tend to be stronger than the arms, participants may use a green band (higher resistance) for the leg press and a red band (lower resistance) for the arm curl. When using foam pads, they may choose a less stable surface when standing in a semi-tandem position and a more stable surface when standing in a more difficult position. Finally, the color-coding helps participants easily identify

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the appropriate piece of equipment for each exercise and switch quickly from one to another.

### Ensuring fall-free programs

In a program aimed at reducing the risk of falls in older adults, the last thing anyone wants is for a participant to fall while performing exercises. Facility staff must take many precautions to prevent such accidents.

Health and wellness professionals should assess each participant's deficits or risks prior to the individual engaging in an exercise program. In relatively low-risk older adults, a simple assessment process may identify any unsteadiness, i.e. a staff member

observes the person rising from a chair without using the chair's arms, walking several steps and returning to the chair. But for participants at higher risk, including those with observed unsteadiness or who fall frequently, staff should have additional assessments performed, and these might include referral to a specialist, such as a geriatrician.<sup>6</sup> Based on the results of these tests, professionals can modify the program as necessary, e.g. avoiding head movements for those with vestibular disorders.

When leading a group class, health and wellness professionals should place a chair or other sturdy object as a stability aid near each participant before any activity performed in a standing position, including each and every balance exercise. The program should also be conducted on a nonskid floor that is dry and free of clutter. To ensure safety, the class leader should inspect the room before the start of each class and keep a sharp eye for potential hazards during the class. Also, participants should wear shoes with good traction. Although participants can perform the exercises without shoes to eliminate the stabilizing components of footwear, they often find it cumbersome to remove their shoes. In the program developed by the Center for Physical Activity and Aging, participants typically perform the exercises while wearing shoes.

Finally, professionals should often remind participants to progress gradually, and they should also closely observe each participant's technique. These actions will help guarantee that participants do not take undue risks during exercise.

### Providing effective exercise

Older adults who perform exercises with elastic bands in tandem with balance-specific tasks can improve their strength and balance—two of the most

important physical risk factors contributing to falls in this age group. Although further research is needed to establish the optimal amounts and combinations of exercise to reduce falls, the program developed by the Center for Physical Activity and Aging provides a simple, effective and enjoyable opportunity for older adults to participate in exercises that may prevent falls and keep them active longer. ▼

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# Strength and balance training: a program for older adults



*Accompanying figures appear on pages 28, 30 and 32.*

The Center for Physical Activity and Aging's strength and balance exercise program starts with a 10-minute warm-up, which includes flexibility exercises performed in seated and standing positions. Thirty minutes of band and balance training follows, then five minutes of cooldown and relaxation activities.

The balance exercises start with placing the feet in a series of positions that gradually reduce the base of support, holding the stance for 10–30 seconds (Figure 1):

- Semi-tandem (one foot ahead of the other as if taking a step);
- Full tandem (heel of one foot directly in front of the toes of the other foot);
- Standing up on the toes; and
- Standing on one foot.

These exercises provide subtle changes in balance similar to the challenges experienced in everyday life. And they allow the body to learn how to make appropriate responses to maintain balance while standing still.

Gradually, additional exercises that do the following are introduced:

- Add dynamic movements to perturb the center of gravity, such as leaning or stepping in different directions, lateral and forward reaching, picking up an object from the floor (Figure 2) and tandem walking (Figure 3);
- Reduce visual input by closing the eyes or dimming the lights;
- Challenge the vestibular system by moving the head side to side; and
- Challenge the somatosensory system by standing on foam pads.

These exercises can also be performed in a wide variety of combinations, i.e. standing on foam pads in the tandem

position, standing on foam pads and moving the head, stepping onto a foam pad, etc.

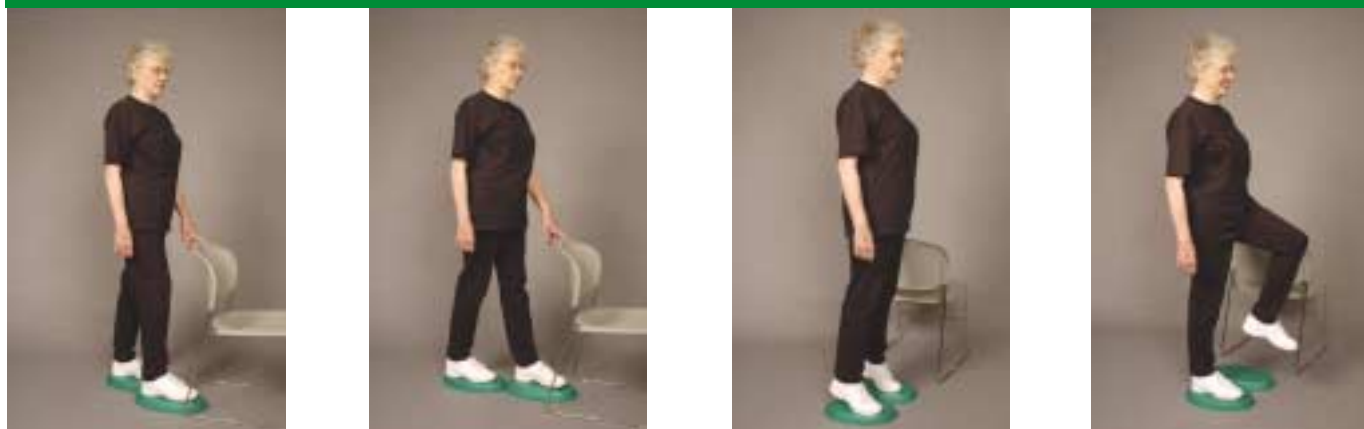
Strength exercises using bands are added to strengthen each major muscle group in the upper- and lower-body. Special emphasis is given to muscles that play an important role in the maintenance of balance, such as those of the lower leg. Each strength exercise is performed with one set of 12–15 repetitions, eventually progressing to two or three sets. Initially, strength exercises alternate with balance exercises; eventually, they are performed in tandem. For example, participants may perform the chest press while standing in a semi-tandem position (Figure 4), lateral pulldowns standing in a full-tandem position (Figure 5), chair squat (Figure 6), leg press standing on one leg (Figure 7), and leg kicks in different directions (Figure 8). Strength exercises can also be performed with a partner and combined with additional balance activities (Figure 9).

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# Strength and balance training: a program for older adults

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**Figure 1: static balance stances**



Semi-tandem

Full tandem

Up on toes

One foot

**Figure 2: center of gravity shifts**



Stepping in different directions

Reaching

Object on floor

**Figure 3: tandem walking**



Place one foot directly in front of the other, touching heel to toe, and hold. Repeat with other foot in front.

Progress to taking a step or two by placing your heel to your toe with each step. Eventually try walking across the room.

Photographs courtesy of Hygenic Corporation, Akron, Ohio

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**Figure 4: chest press in semi-tandem stance**



Start



Finish

**Start:** stand on foam with one foot in front of the other in the semi-tandem position. Put band behind back and grasp both ends close to chest.

**Finish:** slowly push forward, like a bench press exercise, and return to starting position. Repeat 12–15 times.

**Figure 5: lateral pulldowns in full-tandem stance**



Start



Finish

**Start:** stand in full-tandem position with band held above the head at shoulder width.

**Finish:** keeping elbows straight, slowly bring the arms down to the sides, stopping at shoulder-level. Slowly return to starting position and repeat 12–15 times.

**Figure 6: chair squat**



Start



Finish

**Start:** begin with center of band under feet. Grasp ends of bands with hands by sides. Keep tension in the band with elbows straight.

**Finish:** slowly bend knees while leaning forward slightly at the hips. Keep back straight. Slowly return to starting position and repeat 12–15 times.

# Strength and balance training: a program for older adults

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**Figure 7: leg press on one foot**



Start



Finish

**Start:** loop middle of band around foot with your knee bent, standing on opposite foot. Hold both ends of the band above waist.

**Finish:** slowly straighten knee to touch foot to floor. Keep back straight. Slowly return to starting position and repeat 12–15 times. Repeat on other side.

**Figure 8: leg kicks**



Start



Finish

Loop center of band around one ankle and stabilize other end under the other foot. Kick band backward 12–15 times, keeping the knee straight. Repeat on other leg. These kicks can also be performed to the front.

**Figure 9: exercises with a partner**



Start



Finish

Tie band in a loop. Wrap around one of your and your partner's ankles. Hold your partner's shoulders. Kick band backward 12 times, keeping your knee straight. Repeat on other leg.