

# **Standing Strong: A Program to Improve Strength and Balance in Older Adults**



## **Michael E. Rogers, PhD, CSCS, FACSM**

Center for Physical Activity and Aging  
Department of Human Performance Studies  
Wichita State University  
Wichita, Kansas, 67260-0016 USA

## **Phil Page, PhD, PT, ATC, MS, CSCS**

Director of Clinical Education and Research  
The Hygenic Corporation  
1245 Home Ave.  
Akron, OH 44310

Dr. Rogers is an exercise physiologist. He is a professor of exercise science and chair of the Department of Human Performance Studies at Wichita State University in Wichita, Kansas, USA. He also serves as the Research Director of the Center for Physical Activity and Aging at WSU.

Dr. Page is director of clinical education and research for Performance Health products. He is a licensed physical therapist and certified athletic trainer. He has a master degree in Exercise Physiology and a PhD in Kinesiology.

**Photos courtesy of Hygenic Corporation, Akron, OH**

Falls are not only the leading cause of injury-related deaths in older adults, but they're also a significant cause of morbidity and disability. Falls are debilitating phenomena that have become a major public health problem that will continue to worsen. The acute care costs of fall-related fractures are \$10-\$20 billion (Tinetti et al., 1994). An additional \$7 billion in health care costs are the result of insufficient muscle strength and endurance, which contributes to falls and a lower quality of life. Moreover, falls have been implicated as a major factor contributing to nursing home placement (Simonsick et al., 1993). As the older adult population continues to grow and is expected to double by the year 2030, the cost for hip fractures is expected to exceed 240 billion dollars annually in the United States (Lindsay, 1995).

In many cases, falls are caused by a loss of balance (Tinetti & Speechley, 1989). Therefore, one of the most commonly identified risk factors for falling and thus, subsequent injury, is impaired balance. Assessing and treating balance disorders is a complex task because balance is controlled via the integration of the muscular system and several sensory systems, and is also affected by a variety of other factors (Rogers et al. 2003).

### **Balance**

Balance is described as the ability of an individual to maintain his or her body's center of gravity over the base of support, whether that base of support is stationary or moving. Balance is sometimes difficult to define and measure, but it is basically the ability to maintain the body's position over its base of support, whether the base is stationary or moving (Rogers et al., 2003). There are two types of balance: static and dynamic. Static balance is the ability to control postural sway during quiet standing. Dynamic balance is the ability to react to changes in balance and to anticipate changes as the body moves. This would include maintaining balance while walking and stepping over or around objects. Static balance is maintained in the elderly until significant functional declines occur, while losses in dynamic balance are evident much earlier (Hageman et al., 1995). Based on the importance of strength and dynamic balance, training of postural muscles along with dynamic balance training has been recommended as a means to reduce the risk of falls in older adults (Skelton & Dinan, 1999).

Balance is a complex process controlled by three sensory systems: the visual, somatosensory, and vestibular systems. Decreases in one system may be compensated by increased sensory input from another system but the information provided by each system is not completely redundant. With increasing age, there is a decrease in sensory function (Era et al., 1996). Thus, diminished balance capabilities in the elderly would be expected with diminished responses of these sensory systems. Muscular strength is another important factor since all body movements are produced via contraction of skeletal muscles. Muscular strength and mass have been shown to decrease with age (Porter et al., 1995). Changes in these control systems with age contribute to impaired balance and increased incidence of falling in older adults.

### **Visual System**

The visual system is a major contributor to balance, providing information about the environment, the location of the individual, and the direction and speed of movement of the individual within the environment. The visual system provides information through visual acuity, the clarity with which it sees, and via information that is created by a person's motion through space. Several age-related changes within the visual system have been observed in the elderly. Visual acuity, depth perception, peripheral field, and sensitivity to low spatial frequencies have

all been shown to decrease with age (Wade & Jones, 1997). Older adults are also more susceptible to glare and have more restrictions of the visual field compared to young adults (Wade & Jones, 1997). As a result of diminished sensitivity to low spatial frequencies, older adults need more contrast to detect spatial differences. Elderly individuals also need approximately three times more contrast to see some objects at low spatial frequencies (Sekuler et al., 1980). These reductions in the visual system with age lead to increased risk of suffering from a fall.

### **Vestibular System**

The vestibular system, located in the inner ear, provides information about movement of the head, independent of visual cues. The otoliths and semicircular canals are two types of sensory organs found in the inner ear. The otoliths are responsible for detecting head movement with respect to gravity, such as degree and direction of head tilt. The semicircular canals are fluid filled canals composed of three half circles positioned in the frontal, sagittal, and horizontal planes of the body. As the head moves, fluid in the canals triggers receptors and this information is sent to the brain where it provides information about the turning of the head. After about the age of 40, the number and size of vestibular neurons decrease (Rosenhall & Rubin, 1975). It has been estimated that individuals over the age of 70 may have already lost 40% of their vestibular sensory cells (Spirduto, 1995). This phenomenon partially explains reduced postural stability in older adults.

### **Somatosensory System**

The somatosensory system provides information about the body's position and contact from the skin through pressure, vibration, and tactile sensors and muscle proprioceptors. Skin receptors are important in all dynamic activities. For example, loss of these receptors is observed when an individual sits in the same position for a long period of time and his or her leg and foot start to feel numb. This lack of input from tactile, pressure, and vibration receptors make it very difficult to stand up and even walk. These inputs are important in detecting changes in heel-to-toe body weight shifts, which are very important in maintaining balance. Skin sensation sensitivity is reduced with increasing age (Spirduto, 1995). Skin sensation via tactile, vibration, and pressure sensors is important in all activities of daily living, especially those involving dynamic movements.

### **Muscle Strength**

Strength deficits are associated with the risk for falling in the elderly (Lord et al., 1992). Although many activities of daily living require minimal levels of strength, performing house work, shopping, carrying groceries, climbing stairs, and standing from a chair are only a few examples of activities that may be impossible to perform when strength is compromised. Deficits in leg strength are also related to diminished gait velocity, stride length and balance (Sandler et al., 1991). In addition, hip extensor power is significantly related to the ability to rise from a chair, climb stairs and walk (Basse et al., 1992).

Jette and Branch (1981) reported that 23% of older adults aged 75-84 years had difficulty walking, while 55 % had trouble crouching, kneeling, and stooping. Further evidence regarding the association between strength and fall risk is provided by Wolfson et al. (1995) who reported that lower extremity strength of elderly individuals who suffered a fall was 47.9 to 61.3% less than in older adults who had not fallen. It has also been reported that lower leg and ankle

dorsiflexor strength were 30% and 39% lower, respectively, in those who suffered five or more losses of balance during dynamic platform tests compared to those who lost their balance fewer than five times (Judge et al., 1995). In the same study, greater muscle strength was associated with a 20% decrease in the odds of suffering a loss of balance while performing dynamic balance tests (Judge et al., 1995). Increasing strength may offset some of the contraction speed-associated deficits in the elderly. It also may further modify other factors (e.g., postural control, proprioceptive input, range of motion, etc.).

### **Attentional Capacity**

The ability to allocate sufficient attentional resources during walking or standing has been associated with balance performance. Several studies have suggested that highly practiced, seemingly automatic postural tasks such as standing and walking require some attention and cognitive processing (Shumway-Cook et al., 1997). It appears that the degree of attentional demand depends on a number of factors including the complexity of the postural task. Therefore, attentional demands are greater for walking than for standing quietly or sitting. A study by Brown et al. (1999) also indicated that the ability to recover a stable posture after a perturbation is more attentionally demanding for older adults compared to younger adults. Therefore, it is likely that declines in cognition contribute to falls with advancing age.

### **Disease**

In addition to the normal changes associated with aging, several diseases interfere with balance by affecting the sensory, neurological, cognitive, and musculoskeletal functions of the elderly. For example, neurologic pathologies such as stroke with hemiparesis, Parkinson's disease, dementia, seizures, peripheral neuropathies, and vestibular dysfunction can predispose older adults to falls. Muscular skeletal disorders, including arthritic conditions that weaken muscles or bones and joints affecting their stability (Nelson & Amin, 1990) along with metabolic conditions of hypothyroidism, hypoglycemia, and diabetes, also increase the risk for falls.

### **Polypharmacy**

Polypharmacy, or the use of four or more prescription medications, is a common cause of falls (Svensson et al., 1991). Many of the most commonly prescribed drugs for older people can contribute to falls. The use of drugs such as sedatives, hypnotics, anxiolytics, antidepressants, and tranquilizers that can cause confusion and sedation have been identified as contributors to falls. In addition, antihypertensive drugs and cardiac medications often produce postural hypotension and fatigue (Wells et al., 1985). Tinetti and Speechley (1989) have proposed a direct relationship between the number of drugs an older person takes and the frequency of falls.

## **Interventions**

Traditional exercise programs consisting of general stretching and strengthening activities have typically failed to demonstrate a great effect on balance (Brown & Holloszy, 1991; Lichtenstein et al., 1989; Jirovec, 1991). Therefore, based on the physiology of balance control, it has been recommended that training programs be customized to target the specific physiological systems involved in balance control, specifically the visual, vestibular, somatosensory, motor, and musculoskeletal systems (Woolacott, 1993). However, little information is available on the effectiveness of exercise programs specifically designed to improve balance and mobility.

Although the reasons explaining why older adults often fall can be complex, the interventions to prevent such accidents can be relatively simple. The following sections describe exercises designed to improve both strength and balance that can be easily performed in group settings at community centers with very little cost or space requirements. In addition, older adults can perform the exercises at home or while traveling, allowing them to maintain a regular exercise program during their active lifestyle.

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

Poor strength and balance can lead to falls, a common accident in older adults. One-third of community-residing adults over 65 years of age suffer a fall each year. With over 35 million older adults in the USA, this 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 health-care costs. In 2000, 1.8 million falls in the USA 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 (Kochera, 2002).

A variety of issues can contribute to falls including the effects of diseases and medications, environmental factors such as slippery floors and poor lighting, and many physical factors including poor strength and balance (Tinetti et al., 1998). Many studies have shown that strength can be improved in older adults using different types of resistance training. Although strength and balance are related, resistance-training alone has been shown to have only a modest effect on improving balance. This is likely due to the fact that the ability to maintain balance involves a complex set of processes that require the successful integration of multiple components including several sensory systems that are not typically affected with resistance training. These sensory systems include the visual, vestibular, and somatosensory systems. The visual system provides information about a person's position and movement through the environment, and identifies objects on the floor to step around or over. The vestibular system, located in the inner ears, provides information about head movement and the body's position in space. The somatosensory system 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 is diminished and the risk of falls is increased.

With advancing age, muscle strength and sensory function decrease, contributing to losses of balance and a greater risk for falls. Based on the principle of exercise specificity and the multi-dimensional aspects of balance, training programs should be customized to 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.

### **Standing Strong**

A program developed by researchers at the Center for Physical Activity and Aging at Wichita State University combines strength training with balance-specific exercises to target the muscular system as well as the three major sensory control systems that control balance (Rogers et al., 2001a; Rogers et al., 2001b; Rogers et al., 2003). This program has been implemented in several senior centers and has been shown to significantly improve strength and balance. A recent study (Rogers et al., 2002) of older adults participating in the program at a local community center indicated that after only three months of performing these exercises three times per week, participants improve both their strength and balance by approximately 20%. Improvements are also observed for the Limits of Stability in the directions that are most associated with falls that result in hip fracture, namely the right, left, and back directions. In the right/back direction, the end-point excursion improved by 67.2% and the maximum end-point excursion improved by 27.8%. In the left/back direction, the end-point excursion improved by 66.7% and the maximum end-point excursion improved by 23.4%. In the back direction, the end-point excursion improved by 77.1% and the maximum end-point excursion improved by 63.4%. In addition, upper and lower body strength improved. The number of times a person could stand from a chair in 30 seconds increased by 17.1% (from 10.5 to 12.3 repetitions).

Essentially, the program utilizes five-foot long elastic resistance bands (Thera-Band® Exercise Bands) and foam pads (Thera-Band® Stability Trainers). 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.

Unlike many programs, older adults find the exercises challenging but enjoyable to perform, and can immediately see the relevance of the exercises to daily activities, providing an impetus for participation. A major advantage of the exercises is that they can be conducted in community senior centers as group-oriented programs that allow older adults the opportunity to socialize, which may help maintain long-term participation. Additionally, the equipment used is inexpensive and easy to store. Therefore, senior centers (or older adults) don't have to purchase dumbbells, barbells, and weight machines, nor do they have to find space to keep this equipment. The equipment is also portable which allows older adults to perform the exercises at home or on the road, presenting opportunities to continue their exercise program during times of bad weather or when traveling to visit grandchildren.

Another important aspect is that older adults can perform the exercises at a level suitable to their individual level of ability and progress at their own rate. Bands are available in several color-coded levels of resistance: yellow (easiest), red, green, blue, black, gray, and gold (most difficult). The foam pads are available in two color-coded levels of firmness: green (intermediate challenge) and blue (advanced level of challenge). This allows each participant to use a band and foam pad that provides adequate challenge, yet permits proper technique. In a group setting, it is a great advantage to have everyone performing the same activity during a class, yet have each person performing the activity at their own level. It also allows newcomers who join the program to use low levels of resistance yet participate alongside others who may be exercising at a higher level of intensity. As each participant improves their strength and balance abilities, it is very simple to increase the intensity by advancing to the next level (color) of challenge. Also, given

that some muscles are stronger than others, this progressive system allows participants to use a suitable level of challenge for a particular body part. For example, participants may use a green band (higher resistance) for leg press and a red band (lower resistance) for the arm curl since the legs tend to be stronger than the arms. 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 allows participants to easily identify the appropriate piece of equipment to use for each exercise, and to quickly switch from one to another.

### **Strength in Balance**

The Standing Strong program itself starts with a 10-minute warm-up that includes flexibility exercises performed in seated and standing positions, followed by 30 minutes of band and balance training, and five minutes of cool-down 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. These positions include 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 are designed to provide subtle changes in balance that are similar to the challenges experienced in everyday life, and allow the body to learn how to make appropriate responses to maintain balance while standing still.

Gradually, additional exercises are introduced that add dynamic movements to perturb the center of gravity such as leaning or stepping in different directions, lateral and forward reaching, picking an object up from the floor, and tandem walking; 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 (standing on foam pads in the tandem position, standing on foam pads and moving the head, stepping on to a foam pad, etc.).

Strength exercises using bands are added to strengthen each of the major muscle groups in the upper- and lower-body. Special emphasis is given to those 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, and eventually performed for two or three sets. Initially these strength exercises are performed in an alternating fashion with the balance exercises, and eventually they are performed in tandem with the balance exercises. For example, participants may perform the chest press while standing in a semi-tandem position, lat pull-downs standing in a full-tandem position, chair squat, leg press standing on one leg, and leg kicks in different directions. Strength exercises can also be performed with a partner and combined with additional balance activities.

### **Fall-free Programs**

One of the last things that anyone wants to happen in an exercise program that is designed to reduce the risk of falls, is for a participant to suffer a fall while performing the exercises. Therefore, many precautions are taken to prevent such accidents. Prior to any exercise program like this, an assessment of deficits or risks should be performed for each individual. With relatively low-risk older adults, this assessment process can be quite simple, and may consist of observing an individual rising from a chair without using the arms, walking several steps, and returning to the chair to identify any unsteadiness (American Geriatric Society et al.,

2001). For those at higher risk, including those who fall frequently, additional assessments should be performed. Based on the results, program modifications, such as avoiding head movements for those with vestibular disorders, may be made.

Before performing any activity in a standing position, including each and every balance exercise, a chair or other sturdy object should be placed near each person in case they need to touch or grab something to aid stability. It is also important that the program be conducted on a non-skid floor that is dry and free of clutter. A simple inspection before the start of each class, and a sharp eye during the class, helps to assure this. Participants should also be wearing shoes that have good traction. While the exercises can be performed without wearing shoes to eliminate the stabilizing components of footwear, we have found that it is often cumbersome for some older adults to remove footwear thus we typically perform the exercises while wearing the shoes. Finally, regularly reminding participants to progress gradually, and closely observing the technique of each participant, will help guarantee that they are not taking undue risks during the exercise program.

### **Summary**

Impaired balance is a major risk factor leading to a subsequent fall. Balance depends on sensory (visual, vestibular, somatosensory) input, muscle strength, attentional capacity, disease, and medication. The extent to which specific facets of balance diminish with age and lead to a greater incidence of falls has yet to be completely determined in older adults. Traditional intervention programs have had little success in improving the balance of older adults and thus, decreasing their risk of falling. Alternative exercise programs that specifically train the control systems involved in balance may lead to improvements in the balance of the elderly and reduce their risk of falling.

Performing exercises with elastic bands in tandem with balance-specific tasks has been shown to improve strength and balance, two of the most important physical risk factors contributing to falls in older adults. Furthermore, these exercises can be easily performed in group settings at senior centers, as well as by older adults at home, for very little cost. Although further research is needed to establish the optimal amounts and combinations of exercise to reduce falls, the program described in this article provides a simple, effective, and enjoyable opportunity for older adults to participate in exercises that may prevent falls, and keep them active longer.



## References

- American Geriatric Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons. (2001). Guideline for the prevention of falls in older persons. *Journal of the American Geriatrics Association*, 49, 664-672.
- Bassey, E.J., M.A. Fiatarone, E. F. O'Neill, M. Kelly, W. J. Evans, & A. Lipsitz. (1992). Leg extensor power and functional performance in very old men and women. *Clinical Science* 82:321-327.
- Brown, M., & J.O. Holloszy. (1991). Effects of a low intensity exercise program on selected physical performance characteristics of 60- to 70-years olds. *Aging* 3:129-139.
- Era, P., M. Schroll, H. Ytting, I. Gause-Nilsson, E. Heikkinen, & B. Steen. (1996). Postural balance and its sensory-motor correlates in 75-year-old men and women: a cross-national comparative study. *Journal of Gerontology Series A: Biological Sciences and Medical Sciences* 51:M53-M63.
- Fortin, J.D, E.M. Yeaw, S. Campbell, & S. Jameson. 1998. An analysis of risk assessment tools for falls in the elderly. *Home Healthcare Nurse* 16:624-629.
- Hageman, P.A., J.M. Leibowitz, and D. Blanke. (1995). Age and gender effects on postural control measures. *Archives of Physical Medicine and Rehabilitation*, 76, 961-965.
- Jette AM, Branch LG. The Framingham disability study: II. Physical disability among the aging. *Am J Public Health* 1981;71:1211-1216.
- Jirovec, M.M. (1991). The impact of daily exercise on the mobility, balance and urine control of cognitively impaired nursing home residents. *International Journal of Nursing Studies* 28:145-151.
- Judge JO, King MB, Whipple R, Clive J, Wolfson LI. Dynamic balance in older persons: effects of reduced visual and proprioceptive input. *J Gerontol Med Sci* 1995;50A:M263-M270.
- Kochera, A. (2002). Falls among older persons and the role of the home: An analysis of cost, incidence, and potential savings from home modification. AARP Public Policy Institute Issue Brief #56. Washington, DC: AARP.
- Lichtenstein, M.J., S.L. Shields, R.G. Shiavi, & M.C. Burger. (1988). Clinical determinants of biomechanics: platform measures of balance in aged women. *Journal of the American Geriatric Society* 36:996-1002.
- Lindsay, R. (1995). The burden of osteoporosis: cost. *American Journal of Medicine* 98:9S-11S.
- Lord, S.R., D. McLean, & G. Stathers. (1992). Physiological factors associated with injurious falls in older people living in the community. *Gerontology* 38:338-346.
- Nelson, R.C., & M.A. Amin. (1990). Falls in the elderly. *Emergency Medical Clinics of North America* 8:309-324.
- Porter, M.M., A.A. Vandervoort, & J. Lexell. (1995). Aging of human muscle: structure, function, and adaptability. *Scandinavian Journal of Medicine Science and Sports* 5:129-142.
- Rogers, M.E., N.L. Rogers, N. Takeshima, and M.M. Islam. (2003). Methods to evaluate and improve the physical parameters associated with fall risk in older adults. *Preventive Medicine*, 36, 255-264.
- Rogers, M.E., J.E. Fernandez, & R.M. Bohlken. (2001a). Training to reduce postural sway and increase functional reach in the elderly. *Journal of Occupational Rehabilitation* 11:291-298.
- Rogers, M.E., J.D.F. Shores, & M.M. Taylor. (2001b). Addressing fall risk in older adults: the challenge for exercise science. *Journal of Critical Inquiry into Curriculum and Instruction* 3(3):31-33.

- Rogers, M.E., J.D.F. Shores, & N.L Rogers. (2002). Use of foam balance pads to improve limits of stability in community dwelling-older adults. Effects of a community-based intervention using elastic bands on strength in older adults. *Medicine and Science in Sports and Exercise* 5(suppl):S268.
- Rosenhall, U., & W. Rubin. (1975). Degenerative changes in the human vestibular sensory epithelia. *Acta Otolaryngologica* 79:61-81.
- Sandler, R.B., R. Burdett, M. Zaleskiewicz, C. Sprowls-Repcheck, & M. Harwell. (1991). Muscle strength as an indicator of the habitual level of physical activity. *Medicine and Science in Sports and Exercise* 23:1375-1381.
- Sekuler, R., L. Hutman, & C. Owsley. (1980). Human aging and spatial vision. *Science*, 209:1255-1256.
- Shumway-Cook, A., M.H. Woollacoot, K.A. Kerns, & M. Baldwin. (1997). The effects of two types of cognitive tasks on postural stability in older adults with and without a history of falls. *Journal of Gerontology Series A: Biological Sciences and Medical Sciences* 52A:M232-M240.
- Simonsick, E.M., M.E. Lafferty, C.L. Phillips, C.F. Mendes De Leon, S.V. Kasl, T.E. Seeman, G. Fillenbaum, P. Herbert, & J.H. Lemke. (1993). Risk due to inactivity in physically capable older adults. *American Journal of Public Health* 83:1443-1450.
- Skelton, D.A., and S.M. Dinan. (1999). Exercise for falls management: Rationale for an exercise programme to reduce postural instability. *Physiotherapy: Theory and Practice*, 15, 105-120.
- Spirduso, W.W. 1995. *Physical Dimensions of Aging*. Champaign, IL: Human Kinetics Publishers.
- Svensson, M.L., A. Rundgren, M. Larsson, A. Oden, V. Sund, & S. Landahl. (1991). Accidents in the institutionalized elderly: a risk analysis. *Aging (Milano)* 3:181-92.
- Tinetti, M.E., M. Speechley, and S.F. Ginter. (1988). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine*, 319, 1701-1707.
- Tinetti, M.E., & M. Speechley. (1989). Prevention of falls among the elderly. *New England Journal of Medicine* 320:1055-1059.
- Wolfson L, Judge J, Whipple R, King M. Strength is a major factor in balance, gait, and the occurrence of falls. *J Gerontol* 1995;50A:64-67.

# The Standing Strong Program: Training Techniques And Exercises

**When should balance training be performed?** Unfortunately, at this time, the specific dose-response is not clear. However, what we recommend is incorporating balance into everyday activities, as well as performing a specific program two to three days each week.

**Where can the older adult start?** Simply start by incorporating balance training in daily activities such as standing on one foot while doing dishes or brushing teeth. Having a sturdy object (e.g., kitchen or bathroom counter) in front to grab is important in case a loss of balance is felt. The older adult can begin with five balance-specific exercises, performed two times per week with one set of each exercise for 10-15 seconds each. Exercises based on needs and abilities should be selected. It is also important to remember that someone with poor balance should not perform exercises alone.

**How is an older adult to progress?** An older adult should progress by increasing the time of each exercise to 30 seconds, then by increasing to two to three sets of each exercise. They can then gradually increase the challenge of the exercise by reducing the base of support (e.g., standing on one leg), changing the base of support (e.g., stand on foam surface), performing dynamic movements that perturb the center of gravity (e.g., tandem walk), and reducing sensory input (e.g., close eyes).

**What is the goal for older adults?** The goal for healthy older adults is to perform balance exercises two to three days per week for two to three sets of 8-10 specific exercises for 15-30 seconds each.

**What are some examples of exercises that can be performed to improve balance?** There are many different exercises that can be performed. Again, many of these activities can be incorporated into daily activity patterns (e.g., standing in line at the grocery store). However, for safety reasons, it is important to have something sturdy nearby for support in case a loss of balance is felt. Some examples of basic balance exercises are provided below.

# Sensorimotor Training

- Restore normal proprioceptive information
- Increase afferent input to stimulate reflex & reactive pathways
- Re-establish normal motor patterns
- Improve muscular performance

The Standing Strong Program is based on sensorimotor training. Three systems help maintain postural stability: visual, vestibular and sensorimotor. Postural stability requires integration of the sensory and motor systems—the sensorimotor system. This system consists of sensory, or afferent, information coming into the central nervous system (CNS).

Afferent information enters the CNS from muscle receptors (muscle spindles, golgi tendon organs), joint mechanoreceptors and receptors that detect touch, pressure, temperature and pain. This information feeds into the spinal cord, where it's processed at one of three levels: the spinal cord for reflex activations; the lower and mid-brain for automatic activations; or the cortex for voluntary movements. Postural stability requires precise proprioceptive information transmission, as well as rapid and accurate information processing at each CNS level.

The other component of the sensorimotor system—the motor or efferent system—sends information down into the alpha and gamma motor neurons to stimulate or inhibit muscle activity. Those muscle activities are automatic postural reactions, or strategies, and are programmed muscle responses to changes in a base of support.

Strategies occur to the ankles, hips and step mechanism in order. The ankle musculature is dominant when small challenges are applied to the center of gravity or base of support. Greater challenges activate hip muscles. If the center of gravity can't be maintained within the base of support using these two strategies, then a patient must take a step to return the center of gravity to the base of support. Although labeled “automatic,” these strategies aren't hardwired like reflexes. Instead, they're learned responses to environmental conditions. And unfortunately, these strategies become slower or out of sequence in older adults.

A patient's limited ability to adapt to postural challenges often leads to failure, which means falling. An important goal of balance rehabilitation training is to help patients develop skills to maintain postural stability under various conditions, which allows the patient to “win” and prevent instability. However, due to inappropriate balance training progressions, many balance rehab programs unfortunately limit a patient's ability to “win.”

Often, balance exercises and devices are implemented randomly or haphazardly in an attempt to overload the balance systems. And clinicians prescribe balance exercises that are excessively challenging for clients. Patient can't learn an appropriate balance strategy, which forces them to rely on improper compensatory strategies to maintain postural stability.

Unfortunately, it's easy to "overload" the sensorimotor system beyond its needs or capacity and cause more harm than good. Ultimately, this training can increase fall risk during training facilitate improper balance strategies. For example, standing on an exercise ball may look like a tremendous feat of balance, but it doesn't serve much purpose and places a patient at risk for serious injury, even in a highly trained athlete.

Instead, balance training should use progressive physiologic challenge levels, along with appropriate, safe and effective strategies, so patients can control their center of gravity under any situation. A variety of techniques are available to accomplish this.

## Balance Training Techniques

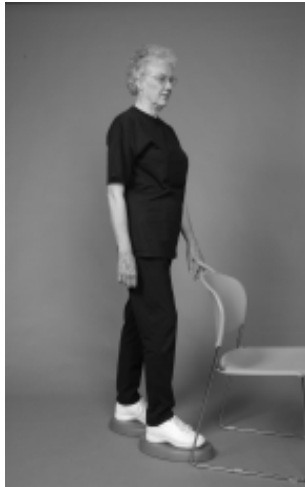
- Stimulate afferent receptors to elicit reflexes and reactions by challenging postural stability:
  - sensory
  - base of support
  - center of gravity
  - perturbation
  - oscillation
  - attention
  - partners

# Balance Training Technique: Sensory

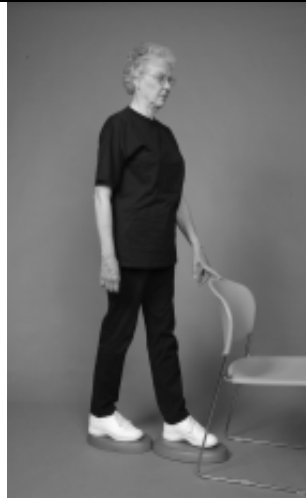
- Variables
  - visual
  - vestibular
  - somatosensory
- Tools
  - close eyes
  - move head
  - labile surface

# Balance Training Technique: Base of Support

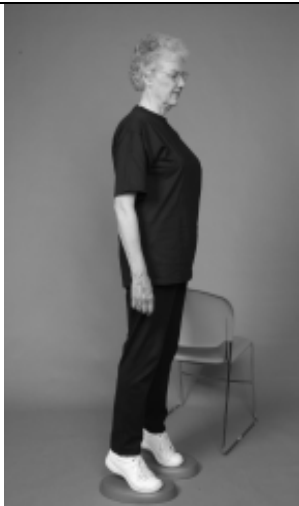
- Variables
  - width of base
  - contact area
  - unstable surface
- Tools
  - foot position
  - foam
  - wobble board
  - foam roll
  - exercise ball



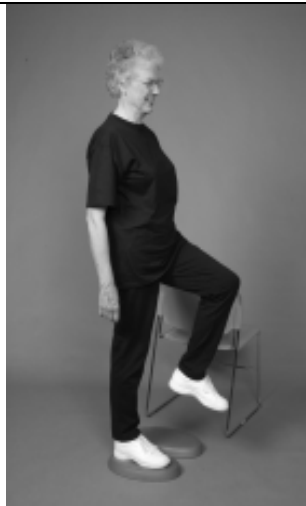
SEMI-TANDEM



FULL TANDEM



UP ON TOES



ONE FOOT



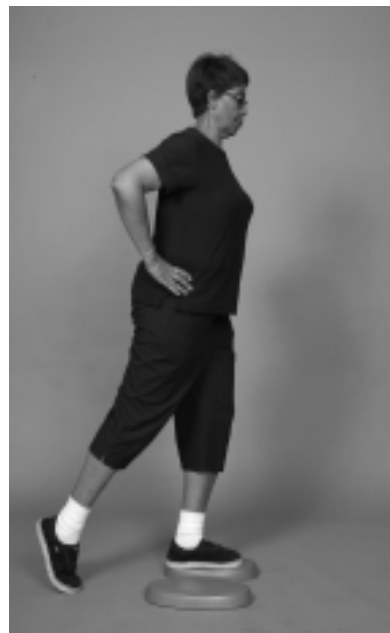
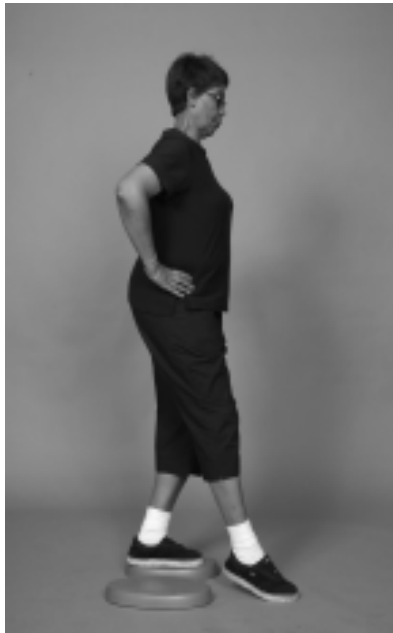
# Balance Training Technique: Center of Gravity

- Variables
  - location within base of support
  - weight shift
  - extremity movement
  - external resistance
- Tools
  - weight shift
  - resisted movement
  - exercise ball
  - bands

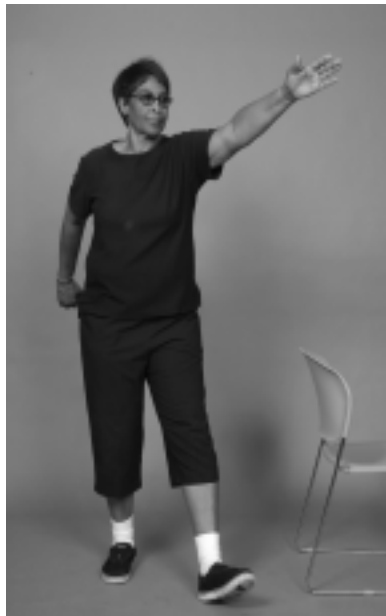


# Balance Training Technique: Center of Gravity

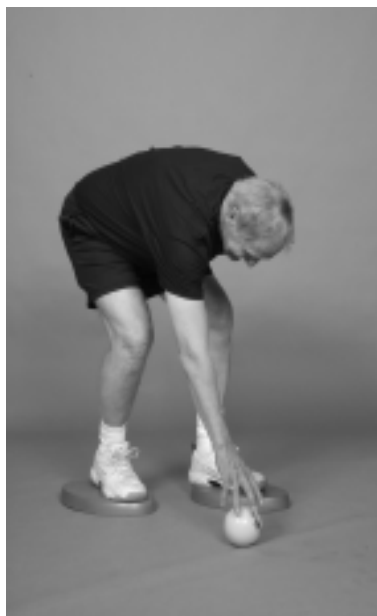
## CENTER OF GRAVITY SHIFTS



STEPPING IN DIFFERENT DIRECTIONS



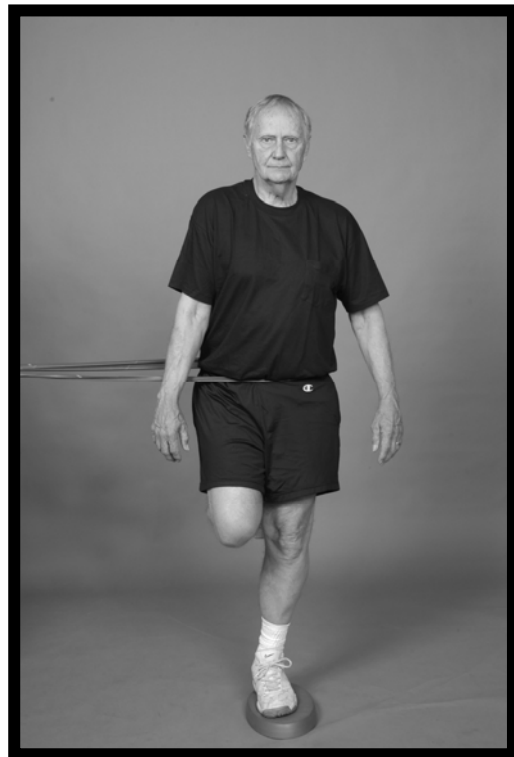
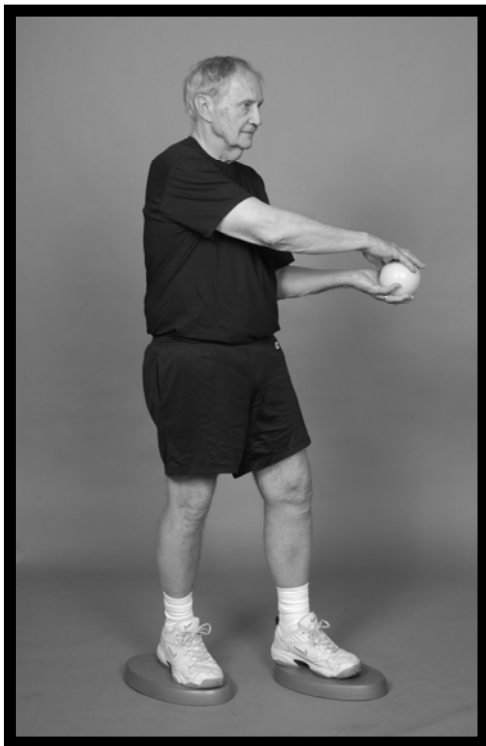
REACHING



OBJECT ON FLOOR

# Balance Training Technique: Perturbations

- **Perturbation**
  - brief, rapid acceleration & deceleration
  - challenge to *resume* center of gravity
  - *Stimulates mechanoreceptors & muscle spindles*
- **Variables**
  - location in base of support
  - weight shift
  - extremity movement
  - external resistance
- **Tools**
  - weighted balls
  - push-pulls



# Balance Training Technique: Oscillations

- **Oscillation**
  - constant acceleration & deceleration
  - challenge to *maintain* center of gravity
  - *Stimulates mechanoreceptors & muscle spindles*
- **Variables**
  - rate of oscillation
  - location from center of gravity
  - joints involved
- **Tools**
  - Flex Bar
  - T-Band Kicks



# Balance Training Technique: Attention

- Variables
  - single task
  - multi task
  - up/down, side to side
  - motor skills
  - cognitive skills
- Tools
  - Tossing objects
  - Playing catch
  - Math
  - Visual tracking



# Balance Training Technique: Partners



# Balance Training Progression

Clinicians should gradually alter the amount of proprioceptive information to the CNS to facilitate appropriate balance reactions. At each level, gradually increase the training stimulus with new challenges. However, the key is to provide appropriate challenges for patients to incorporate the correct strategy for postural stability.

Balance training should incorporate proprioceptive input with additional vestibular, visual and attention demands to intensify postural challenges under different conditions. This allows a patient to respond to dynamic activities and external loads. As a result, patients can adapt and modify balance control during predictable and unpredictable challenges to postural stability. The following progressions should be followed to introduce increasing levels of challenge for the older adult:

- distal → proximal
- bilateral → unilateral
- supported → unsupported
- eyes open → eyes closed
- head still → head moving
- steady surface → unsteady surface
- no implements → implements
- static → dynamic
- simple → attention demanding

Remember, you're training the person's ability to maintain the center of gravity within the base of support. You're not training people to maintain footing on an unsteady surface. Flailing the arms, rapidly bending at the waist in multiple directions, or constantly moving the body to maintain foot contact doesn't promote postural stability. You must give patients the opportunity to "win" in the clinic, at home and in life.

# The Standing Strong Program: Additional Exercises



## LEG PRESS



Start: “Begin looping middle of Thera-band around foot with your knee bent. Hold both ends of the Thera-band at your waist.”



Finish: “Keeping ends of Thera-band at your waist, extend knee to straighten leg. Slowly return to starting position. Perform 10-15 times. Repeat on other leg.”

Muscles: Quads, glutes

Tips: Keep your back straight and tummy tight. Don't lean backward as you extend the leg. Be sure that the Thera-band is placed securely under feet and held firmly in the hands. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance.

## HIP LIFT



Start: “Loop middle of Thera-band around one foot. Stabilize Thera-band under other foot and grasp both ends of Thera-band in one hand.”



Finish: “Raise your foot upward, keeping your heel on the floor. Keep your other foot flat on the ground. Slowly return to starting position. Perform 10-15 times. Repeat with other foot.”

Muscles: Quads, hips

Tips: Keep your back straight and don't twist to the side. Be sure that the Thera-band is placed securely under feet and held firmly in the hand. Remember to breathe.

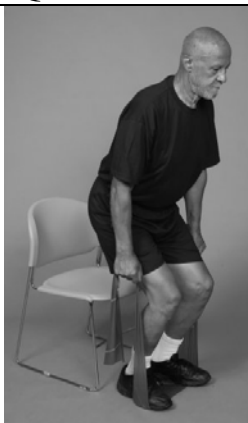
Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance. Take higher and longer steps.

## CHAIR SQUAT



Start: “Begin with center of Thera-band under feet. Grasp ends of Thera-band with hands by sides. Keep tension in the Thera-band with elbows straight.”



Finish: “Keeping your elbows straight, slowly bend your knees while leaning forward slightly at the hips. Keep your back straight. Slowly return to starting position. Perform 10-15 times.”

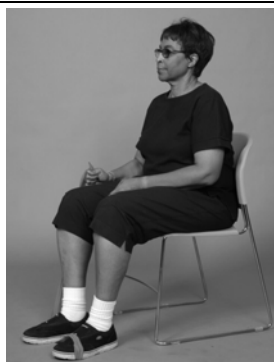
Muscles: Quads, glutes, low back

Tips: Keep your back straight and tummy tight. Keep the eyes looking forward. Be sure that the Thera-band is placed securely under feet and held firmly in the hands. Remember to breathe.

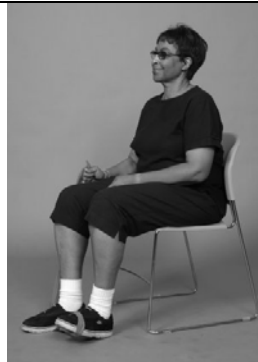
Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance. Squat lower and/or stay in the lower position for a few seconds.

## FOOT LIFT



Start: “Loop middle of Thera-band around one foot. Stabilize band under other foot and grasp both ends of Thera-band in one hand.”



Finish: “Raise your foot upward, keeping your heel on the floor. Keep your other foot flat on the ground. Slowly return to starting position. Repeat with other foot.”

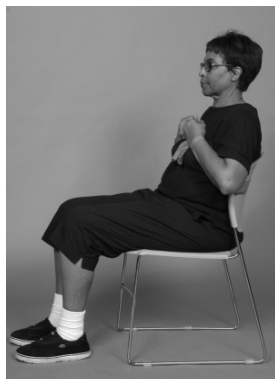
Muscles: Front of calf

Tips: Keep your back straight and tummy tight. Be sure that the Thera-band is placed securely under foot and held firmly in the hand. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance.

## CRUNCHES



Start: “Begin looping middle of Thera-band around the back of a chair. Sit all the way back. Hold both ends of the band at your chest.”



Finish: “Keeping ends of band at your chest, lean forward, bending at the waist. Slowly return to starting position. Perform 10-15 times.”

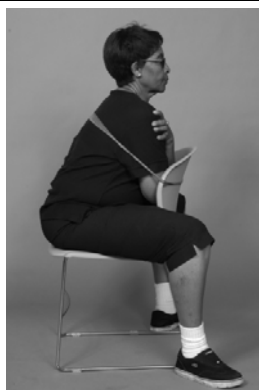
Muscles: Abdominals

Tips: Keep your back straight and tummy tight. Keep your feet on the floor. Be sure that the Thera-band is placed securely behind chair. Remember to breathe.

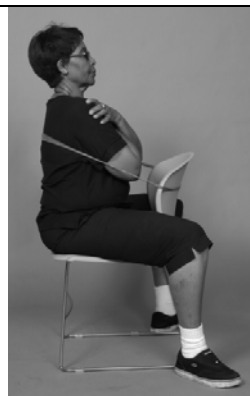
Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance.

## BACK EXTENSIONS



Start: “Tie Thera-band in a loop. Sit backwards in a chair. Place Thera-band around the back of a chair and around your back. Sit all the way forward.”



Finish: “Lean backward, bending at the waist. Slowly return to starting position. Perform 10-15 times.”

Muscles: Low back

Tips: Keep your back straight and tummy tight. Keep your feet on the floor. Be sure that the Thera-band is placed securely behind chair. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance.

## SIDE STEPS



Start: “Loop middle of Thera-band around one knee. Stabilize Thera-band under other foot and grasp both ends in one hand.”



Finish: “Raise your foot and step to the side. Keep your other foot flat on the ground. Slowly return to starting position. Perform 10-15 times. Repeat with other foot.”

Muscles: Quads

Tips: Keep your back straight and tummy tight. Don't twist to the side as you step. Be sure that the Thera-band is placed securely under foot and held firmly in the hand. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance. Take small steps.

More challenge: Increase repetitions and/or resistance. Take large steps.

## KNEE EXTENSION



Start: “Loop middle of Thera-band around one ankle. Stabilize Thera-band under other foot and grasp both ends in one hand.”



Finish: “Extend knee to straighten leg. Slowly return to starting position. Perform 10-15 times. Repeat on other leg.”

Muscles: Quads

Tips: Keep your back straight and tummy tight. Be sure that the Thera-band is placed securely under foot and held firmly in the hand. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance. Hold leg in extended position for a few seconds.

## KNEE FLEXION



Start: “Loop middle of Thera-band around one ankle. Stabilize Thera-band under other foot. Hold onto back of a chair.”



Finish: “Bend your knee so that you raise your foot upward and to the back. Keep your other foot flat on the ground. Slowly return to starting position. Perform 10-15 times. Repeat with other leg.”

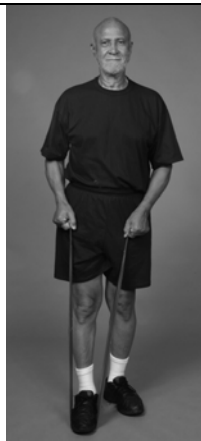
Muscles: Hamstrings

Tips: Keep your back straight and tummy tight. Don’t lean forward as you bend the leg. Be sure that the Thera-band is placed securely under foot. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance. Hold onto chair with one hand.

## LEG PRESS WHILE STANDING



Start: “Begin looping middle of Thera-band around foot with your leg straight. Hold both ends of the Thera-band at your waist.”



Finish: “Lift foot off of floor and bring knee up to hip-level. Slowly return to starting position. Perform 10-15 times. Repeat on other leg.”

Muscles: Quads, glutes

Tips: Keep your back straight and tummy tight. Don’t lean backward as you bend the leg. Be sure that the Thera-band is placed securely under foot and held firmly in the hands. Remember to breathe.

Less challenge: Decrease repetitions and/or resistance. Take small steps.

More challenge: Increase repetitions and/or resistance. Hold knee up for a few seconds.

## TOE PRESSES



Start: “Begin looping middle of the Thera-band around foot with your knee straight and your toes pointed toward you. Hold both ends of the Thera-band at your waist.”





Finish: “Keeping ends of Thera-band at your waist, point your toes away from you. Slowly return to starting position. Perform 10-15 times. Repeat on other leg.”



Muscles: Back of calf



Tips: Keep your back straight and tummy tight. Don’t lean backward as you bend the ankle. Be sure that the Thera-band is placed securely under foot. Remember to breathe.



Less challenge: Decrease repetitions and/or resistance.

More challenge: Increase repetitions and/or resistance. Perform in standing position (place band under both feet, hold ends of band, stand up on toes).



TANDEM STANDING	ONE LEG BALANCE
 <p>“Place one foot directly in front of the other, touching heel to toe and hold for 10 seconds. Repeat with other foot in front.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Use a semi-tandem stance with one foot in front and slightly to the side.</p> <p>More challenge: Close the eyes or move the head from side-to-side. Perform for a longer period of time.</p>	 <p>“Lift foot to stand on one leg. Hold for 10 seconds. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Lift only the heel while keeping the toes on the floor.</p> <p>More challenge: Close the eyes or look toward the ceiling. Perform for a longer period of time.</p>





STANDING HIP RAISE	STANDING KNEE BEND
 <p>“Lift the knee to hip-level. Perform 10-15 times. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Return foot to floor after each repetition. Can also be performed while sitting.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer.</p>	 <p>“Bend the knee, pulling the heel upward. Perform 10-15 times. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Return foot to floor after each repetition.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer.</p>



STANDING KICK	STANDING SIDE KICK
 <p>“Extend the knee and kick forward 10-15 times. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Return foot to floor after each repetition. Can also be performed while sitting.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or while standing on a Stability Trainer.</p>	 <p>“Extend the knee and kick out to the side 10-15 times. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Return foot to floor after each repetition. Can also be performed while sitting.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or while standing on a Stability Trainer.</p>


STANDING ON FOAM	ONE LEG STAND ON FOAM
 <p>“Stand with both feet on a Stability Trainer.”</p> <p>Tips: Use a sturdy chair for support as needed.</p> <p>Less challenge: Hold chair with one or both hands. Use green Stability Trainer. Can also be performed in a chair sitting on a Stability Trainer.</p> <p>More challenge: Place feet in semi-tandem or tandem position. Use blue Stability Trainer. Close the eyes or move head from side-to-side. Lean forward, backward, and to the sides without stepping.</p>	 <p>“Lift foot to stand on one leg while on Stability Trainer. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed.</p> <p>Less challenge: Raise only heel and keep toes on foam. Use green Stability Trainer. Hold chair with one or two hands.</p> <p>More challenge: Use blue Stability Trainer. Close the eyes or move head from side-to-side. Lean forward, backward, and to the sides without stepping.</p>





FRONT/BACK KICKS WITH BAND	SIDE KICKS WITH BAND
 <p>“Loop center of Thera-band around one ankle and stabilize other end under your other foot. Kick backward, keeping the knee straight. Slowly return to starting position. Perform 10-15 repetitions. Repeat on other leg. Perform in forward direction as well”</p> <p>Tips: Use a sturdy chair for support as needed. Be sure Thera-band is secure under the foot. Keep your back straight and tummy tight. Don’t lean to the side.</p> <p>Less challenge: Hold onto chair. Return foot to floor after each repetition. Can also be performed while sitting.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer. Increase resistance of Thera-band.</p>	 <p>“Loop center of Thera-band around one ankle and stabilize other end under your other foot. Kick to the side, keeping the knee straight, for 10-15 repetitions. Slowly return to starting position. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed.</p> <p>Tips: Use a sturdy chair for support as needed. Be sure Thera-band is secure under the foot. Keep your back straight and tummy tight. Don’t lean to the side.</p> <p>Less challenge: Hold onto chair. Return foot to floor after each repetition. Can also be performed while sitting.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer. Increase resistance of Thera-band.</p>



SQUATS ON FOAM	MARCHING ON FOAM
 <p>“Place each foot on a Stability Trainer. Bend knees and hold for 5 seconds while reaching forward.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Bend the knees less. Perform while standing on the floor or use a green stability trainer.</p> <p>More challenge: Bend the knees more. Close the eyes. Hold position for a longer time. Use a blue Stability Trainer.</p>	 <p>“Place each foot on a Stability Trainer. March in place for 10 seconds.”</p> <p>Tips: Use a sturdy chair for support as needed.</p> <p>Less challenge: Perform while standing on the floor or use a green stability trainer. Can also be performed while sitting.</p> <p>More challenge: Close the eyes. Look toward the ceiling or from side-to-side. Perform for a longer period of time. Use a blue Stability Trainer.</p>
WALK ON TOES/HEELS	TOE RAISES ON FOAM
 <p>“Walk 10 feet while standing on your toes. Repeat while standing on your heels”</p> <p>Tips: Use a sturdy chair for support as needed.</p> <p>Less challenge: Take small steps.</p> <p>More challenge: Take large steps. Sing “Mary had a little lamb” or some other song while walking.</p>	 <p>“Place each foot on a Stability Trainer. Stand up on your toes and hold for 5 seconds.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight.</p> <p>Less challenge: Perform while standing on the floor or use a green stability trainer.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer.</p>



STEPPING OVER OBJECTS	LUNGES ON FOAM
 <p>“Place one foot on a Stability Trainer and the other foot behind a Stability Trainer. Lift the foot to the front and to the back, touching the floor each time. Repeat 10-15 times. Repeat on other leg.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight</p> <p>Less challenge: Use green Stability Trainer.</p> <p>More challenge: Keep foot off floor during each repetition. Close the eyes. Perform for additional repetitions and/or on a Stability Trainer.</p>	 <p>“Step forward and place a foot onto a Stability Trainer. Bend the knee and lean forward while keeping the back straight. Return to the starting position. Alternate legs and perform 10-15 times.”</p> <p>Tips: Use a sturdy chair for support as needed. Keep your back straight and tummy tight</p> <p>Less challenge: Use green Stability Trainer.</p> <p>More challenge: Close the eyes. Perform for additional repetitions and/or on a Stability Trainer.</p>

QUADRAPED	
	<p>“While on your hands and knees, raise one arm and hold it straight for 5 seconds. Repeat on other arm. Then lift one leg and hold it straight for 5 seconds. Repeat on other leg.”</p> <p>Tips: Keep your back straight and tummy tight.</p> <p>Less challenge: Perform on exercise mat or green Stability Trainer.</p> <p>More challenge: Close the eyes. Perform for a longer period of time. Use a blue Stability Trainer. Raise one arm and one leg at the same time.</p>

FOAM OBSTACLE COURSE	REACH WITH BAND ON FOAM
 <p>“Place several Stability Trainers in a staggered line on the floor about one foot from each other. Step from one Stability Trainer to the other.”</p> <p>Tips: Be certain to walk slowly at first. Watch where you are stepping.</p> <p>Less challenge: Use green Stability Trainers and keep them close together.</p> <p>More challenge: Use blue Stability Trainers and increase distance from each other.</p>	 <p>“Stand on Stability Trainers. Wrap Thera-band around your upper back and grasp ends of with elbows bent and palms facing inward. Push forward, extending your elbows to shoulder level. Slowly return to starting position. Perform 10-15 times.”</p> <p>Tips: Keep the back straight and remember to breathe</p> <p>Less challenge: Place feet side-by-side. Perform without Thera-band. Perform while standing on the floor or use a green Stability Trainer.</p> <p>More challenge: Place feet in semi-tandem or tandem position. Perform for additional repetitions and/or on a blue Stability Trainer. Increase resistance of Thera-band.</p>

PUSH-UPS ON FOAM OR BALL	
 <p>“While on your hands and knees, place each of your hands on a Stability Trainer. Slowly bend the elbows and bring your head close to the floor. Slowly straighten your arms and return to the starting position. Repeat 10-15 times.”</p> <p>Tips: Keep your back straight and tummy tight.</p> <p>Less challenge: Perform on exercise mat or green Stability Trainer.</p> <p>More challenge: Perform with hands and knees on Stability Trainers, or with knees on an excise Ball. Perform for additional repetitions and/or on a blue Stability Trainer.</p>	

QUADRAPED ON BALL	BRIDGE ON BALL
 <p>“Lie with your stomach on an exercise ball. Place your hands and feet on the floor. Lift an arm and hold it at shoulder-level for 5 seconds. Repeat with other arm. Lift one leg and hold it level with your body for 5 seconds. Repeat with other leg. ”</p> <p>Tips: Relax and remember to breathe.</p> <p>Less challenge: Lift arm or leg only a small distance from floor and return it.</p> <p>More challenge: Close the eyes. Perform for a longer period of time. Place Stability Trainer under the hands. Raise one arm and one leg at the same time.</p>	 <p>“Lie with your back on an exercise ball. Place your fingertips and feet on the floor. Lift an arm and hold it at shoulder-level for 5 seconds. Repeat with other arm. Straighten one leg and hold it level with your body for 5 seconds. Repeat with other leg. ”</p> <p>Tips: Relax and remember to breathe.</p> <p>Less challenge: Lift arm or leg only a small distance from floor and return it.</p> <p>More challenge: Close the eyes. Perform for a longer period of time. Place Stability Trainer under the hands or feet. Raise one arm and one leg at the same time.</p>

STEPPING WHILE ON BALL	BANDS ON BALL
 <p>“Sit on an exercise ball and place your hands on the ball. March in place for 10 seconds.”</p> <p>Tips: Practice sitting on the ball first and taking small steps.</p> <p>Less challenge: Raise only the heels or toes off the floor.</p> <p>More challenge: Close the eyes. Look toward the ceiling or from side-to-side. Cross your arms on your chest. Lift the arms to the sides. Perform for a longer period of time. Place Stability Trainers under the feet.</p>	 <p>“Sit on an exercise ball and perform any of the exercises performed in a chair that are described in the strength section.”</p> <p>Tips: Practice sitting on the ball first and taking small steps.</p> <p>Less challenge: Decrease repetitions and/or resistance. Perform with both feet on the floor.</p> <p>More challenge: Increase repetitions and/or resistance. Raise the heels or toes off the floor. Place Stability Trainers under the feet. Close the eyes. Look toward the ceiling or from side-to-side.</p>