Balance Training for Older Adults

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Fifty-four percent of commercial fitness center participants are age 35 and older.[1] The data available from the Medical Fitness Association shows figures that are slightly higher, as that organization and its member facilities attract a slightly older member base. As our society ages, so does our workforce, making it all the more important to develop fitness programs to keep older adults healthy and productive.

Physical changes in older adults

As people enjoy longer lifespans and improve their quality of life, it is incumbent upon the fitness industry to provide appropriate, age- and condition-specific programming for this population. Despite their enthusiasm and performance abilities, marked declines do occur with age in the cardiovascular, respiratory and musculoskeletal systems. VO_2 max declines at a rate of approximately 10 percent per decade after the age of 25; the selective loss of specific (type II) muscle fibers results in a loss of speed, absolute strength and muscle power; and a higher incidence of both acute and overuse injuries are evident among older adult athletic enthusiasts.

While little is known about how the multiple dimensions of balance change, a number of age-associated changes have been documented in healthy and/or physically active groups of older adults in a number of body systems known to contribute to balance. While many of the changes may have no observable effect on behavior, all changes will contribute to a general lowering of the older adult's physiological reserve. Specifically, the sensory, motor, cognitive and musculoskeletal systems have all been shown to demonstrate altered function with age.

A decrease in visual acuity, depth perception and contrast sensitivity, and a narrowing of the peripheral field of view have been documented in the older adult population. Although visual acuity is often correctable, people can't avoid the narrowing of their peripheral field of view, changes in their ability to perceive depth, and/or rapidly adjust visually to changes in lighting. If large enough, these changes are most likely to affect an older adult's ability to consistently judge the speed and location in space of an oncoming ball, rapidly move into and out of shadows on a sports floor/field/studio, or respond to events occurring in more peripheral parts of the viewing field. To say nothing about the inability to see a heart rate monitor in a dimly lit group cycling studio.

Age-associated changes in vibration thresholds also lead to delayed motor responses triggered by somatosensory inputs and/or an overdependence on vision to control balance. A reduction in hair cells within the vestibular system results in reduced sensitivity to head motion and a lower gain in the vestibular ocular reflex. (The vestibular ocular reflex helps to stabilize the eyes during rapid movements of the head to quickly ascertain that it is the body, not the world, that is moving.)

Consider these facts when developing an exercise prescription or choreographing a class for older adults.

Assessment of balance in active older adults

Even healthy, physically active older adults exhibit delayed muscle response to an unexpected loss of balance. While the average time to react to the loss of balance does not differ appreciably, the average speed at which the compensatory stepping response is executed is significantly different, particularly when the time available for recovery is short. For the older active adult, this change is most likely to affect overall movement speed in reactive situations, such as those encountered when attempting to return a ball that has tipped the net during a tennis match, field a sharply hit ball during a softball game or intercept a pass during a basketball game.

Senior Fitness Test. Although few tools are yet available to assess changes in the multiple dimensions of balance in higher functioning older adults, a number of relatively simple tests can be used to monitor changes in many of the systems known to contribute to postural control. The Senior Fitness Test is one such tool that is designed to assess age-associated changes in the physical parameters underlying fitness in adults between 60 and 90 years old. The test includes six items that measure upper- and lower-body strength and flexibility, cardiovascular endurance, and dynamic balance and agility. This is a highly valid and reliable test that has national norms based on the assessment of more than 7,000 older Americans.

One-legged stance. One commonly used test of static balance that appears to be sensitive to early changes in postural control is the one-legged stance. An inability to maintain balance in this reduced base-of-support position for at least 30 seconds indicates subtle changes in one or more systems contributing to balance. This test can be made more challenging for the older adult fitness enthusiast by requiring that the position be maintained with the eyes closed, which also serves as a good measure of somatosensory use. Testing both legs can also be helpful in identifying asymmetries.

Two-footed jump. More dynamic tests of balance that may be well-suited for assessing the abilities of older adults include the two-footed jump for distance, the rapid and maximal stepping test, and tandem walk with eyes open and closed. The two-footed jump for distance can be used not only as a simple measure of lower-body power, but also as a general indication of upper- and lower-body motor coordination. The distance jumped is recorded if the subject correctly initiates and completes the jump using both feet.

Rapid and maximal stepping. The rapid and maximal stepping test is a relatively new clinical test that measures both how far and how quickly healthy young, as well as older, adults are able to step in multiple directions. Given the number of times an older adult is likely to be off-balance and/or experience near loss of balance during fitness activities, a complex and challenging test such as this one may yield meaningful information about subtle changes occurring in dynamic balance.

Tandem walk. A tandem walk (heel-to-toe) test is another higher-level test of dynamic balance that can be used to measure motor function within a balance-challenged environment. The individual is instructed to walk as quickly and accurately as possible along a 10-foot line as the time to complete the distance is recorded. The number of times an individual steps off the line or does not follow a heel-to-toe foot pattern is also recorded. This test can be made even more challenging and reveal more about the interaction between the sensory and motor systems when performed with the eyes closed. This more difficult version should not be undertaken, however, unless the eyes-open trial was successfully performed.

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Training considerations

Incorporating a variety of balance activities into the older population's training program can improve the functioning of multiple systems, and/or delay the onset of significant changes likely to affect performance. Incorporating in-place and dynamic balance activities that vary the task demands and the sensory information available provides an excellent formula for improving the multiple dimensions of balance.

Improved use of the sensory system that contributes to improved postural control can be accomplished using a variety of specific balance activities in altered sensory environments. For example, to remain informed about position in space during activities performed on a firm, broad surface with reduced or absent vision requires a greater contribution from the somatosensory system. Alternatively, performing activities while vision is occupied with a second task, such as catching a ball or tracking an object in space, also provides opportunities for enhancing the somatosensory system and improving the adult's use of ground cues.

Improving the use of vestibular inputs can be accomplished by engaging in similar activities on altered surfaces as a means of distorting and/or reducing the availability of ground cues. Performing activities while standing or moving on compliant or moving surfaces with reduced, absent or engaged vision more thoroughly engages the vestibular system. Performing movements that require high-velocity head and trunk movements in the vertical, horizontal and/or rotational plane can also enhance the sensitivity of the vestibular system.

Examples of activities designed to start up the sensory system of the vestibular system include weight-shift and/or walking while turning the head from side to side or up and down, changing directions during movements, jumping on and off boxes while performing plyometric exercises, and/or jumping on mini trampolines while catching or tracking objects.

Performing multiple tasks. Requiring that multiple tasks be performed during the training session, demanding that attention be distributed, can offset age-associated changes in the allocation of attention. The act of balancing, by default, must be controlled more subconsciously. Engaging in balance activities while continuously (e.g., throwing a ball from hand to hand) or intermittently (e.g., catching a ball thrown at irregular intervals) performing a second task also prepares the individual for the types of situations that occur in many sports/activity settings.

Using free weights. Another way to positively influence the postural control system during a given training session is by using free weights during the strengthening component of the program. Unlike multi-station circuit units and selectorized machines, using free weights requires the core stabilizing muscles of the trunk to resist the pulling, pushing and/or lifting motions of the weights. Good postural alignment and body form throughout the motion are important when using free weights. Taking the additional time to learn the correct form is important to prevent injury, and free weights may not be appropriate for older adults with a history of back and/or cervical problems. Strength equipment that provides better trunk stabilization may be preferable for these individuals, initially.

Using cable systems and accessories. Cable and pulley systems also provide a unique opportunity for older individuals to strengthen key muscle groups while challenging the balance system. Performing unilateral and bilateral strength exercises while

seated on a fit-ball or standing on an unstable surface (rocker or multi-planar board, core board, etc.) simultaneously exercises multiple body systems. However, a logical progression is necessary to provide appropriate stress, disallow substitution and prevent injury. Training with these systems also tends to be more functional and mimic various types of sport-specific/activity-specific movements.

Stability tests

Here are some lower-extremity stability tests that will assist trainers in assessing their clients and providing an appropriate multi-stage exercise prescription.

Bilateral squats. With feet shoulder-distance apart, arms out in front and hips level, have client squat up and down to about 90 degrees of knee flexion for 30 seconds to one minute. Note compensatory patterns, stability, knee angles and ability of trunk to hinge forward at the hips vs. increased thoracic rounding.

Unilateral squats. Without assistance of hands, have client squat up and down for 20 seconds. Note compensatory patterns and body position. Compare bilaterally.

High step-ups. On a workout bench with hands on hips, have client perform step-ups for 20 seconds on each side. Note trunk rotation and stability, and compare bilaterally.

Jumping/landing. Have standing client jump up and down for 30 seconds, taking off and landing on both legs. Note foot position, trunk rotation, upper torso's ability to flex forward and hip angles.

Single-leg balance. Have client balance single-legged with knee just unlocked, hands behind back, eyes closed and opposite knee bent to 90 degrees, holding as long as possible (up to 30 seconds). Note trunk rotation, hip angles and lower extremity stability. Compare bilaterally.

Single-leg balance flexion. Have client balance single-legged with knee flexed 30 to 40 degrees, hands behind back and eyes closed, holding as long as possible (up to 30 seconds). Compare bilaterally. Note trunk rotation and ankle stability.

Importance of balance training

It is clearly important for older fitness participants to spend as much time training their balance systems as exercising their cardiovascular, respiratory and musculoskeletal systems. Because balance is multidimensional, age-associated changes are likely to be subtle and, therefore, difficult to detect. In fact, it has often been remarked in the literature related to falls that changes in balance are rarely observed by the older adult until an actual fall occurs. In light of the fundamental and essential contribution of good balance to high-level fitness performance, it is important that adequate time be specifically devoted to its preservation. Thinking in these terms will keep the fitness professional fresh and clients safe, while prolonging those inevitable age-related changes. **FOS**

1. International Health, Racquet and Sportsclub Association (IHRSA)/American Sports Data *Health Club Trend Report, Profiles of Success*, 2002.

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