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Our balancing act

A number of conditions can rob you of your equilibrium. But you can often get it back with activity and exercise.

You probably have a pretty good idea of your health status. You may be able to reel off your blood pressure and cholesterol levels and maybe even your body mass index. But have you had your balance checked lately?

Try this. Put on a pair of comfortable shoes. Then stand with your arms relaxed at your sides. Lift one foot about six inches off the floor and hold that pose for 30 seconds.

If you felt a little wobbly, you're not alone. Balance tends to erode with time. For weekend athletes, lost equilibrium can mean more spills on the slopes or wipeouts in the surf. For the sedentary, it can bring a surprise encounter with the sidewalk.

Even if a fall doesn't injure much more than your pride, it sets the stage for subsequent stumbles. One fall increases the chance of the next, as does the mere fear of falling. Every year, more than a third of people over 65—and half of those over 75—take a tumble. Falls account for about 300,000 hip fractures annually. For older people, they're the leading cause of death from injury and a major cause of disability.

Yet falls aren't an inevitable consequence of growing older. It's possible to regain equilibrium and compensate for permanent balance deficits.

Life in the balance

Our eyes, ears, and central nervous system are key to maintaining stability.

Vision immediately tells us where we are in relation to the rest of the world. To get an idea of how important it is for balance, try standing on one leg with your eyes closed. And, of course, visual cues allow us to adjust

our body's position so we can steer around obstacles in our path.

Another important source of our sense of balance is the inner ear, with its three fluid-filled semicircular canals and two other chambers, the otolithic organs (the utricle and saccule). Nerve receptors in the semicircular canals are sensitive to rotation



and sense when you turn your head to one side or another; those in the otolithic organs register changes in vertical and horizontal position and sense when you tilt your head up and down. Wherever you move your head, the vestibular nerve relays its precise position to the central nervous system.

The central nervous system also gets information from nerve receptors embedded in muscles and tendons. These proprioceptors (pronounced PRO-pre-oh-SEP-ters) respond to muscle contractions throughout the body, and the brain uses the information they convey to create a constantly changing map of your position. When you lift your right leg, for example, the map is revised, and you maintain your balance by subconsciously shifting your weight to your left leg.

Enemies of equilibrium

Conflicting reports from the three systems can set our heads aswim. In fact, seasickness is a prime example—the eyes say the cabin is steady, but the inner ear says you are rolling back and forth, up and down.

Balance can also suffer from malfunctions of a single system. These may be caused by a number of disorders:

Neurological conditions like Parkinson's disease, multiple sclerosis, and strokes can affect balance. The reasons vary. Parkinson's disease, for example, leads to slow, stiff ▶▶

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WHO WE ARE

Editor in Chief Anthony L. Komaroff, M.D.
Editor Peter Wehrwein
 peter.wehrwein@hms.harvard.edu
Writers Joanna Mimi Choi, Beverly Merz,
 James Selman
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 jtmitchell@swchp.com

Editorial Correspondence

E-mail health_letter@hms.harvard.edu

Letters Harvard Health Letter
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CIRCULATION DEPT., 1415 JANETTE AVE., WINDSOR, ON N8X 1Z1

E-mail: ddewitt@swchp.com

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movement, so people lose the ability to make the many small adjustments necessary to stay on their feet. Physical therapy for neurological conditions can help to maximize balance and minimize the risk of falls.

Diabetes causes nerve damage in the feet, making it more difficult not only to walk properly but also to sense the terrain underfoot. Meticulous foot care, including medical pedicures and attention to sores, can help prevent toe amputations that may affect balance.

Vertigo has several causes. Ménière's (pronounced men-YAIRS) disease is a result of excess fluid in the inner ear that distorts signals from the semicircular canals. Sometimes it can be controlled with dietary changes—such as avoiding salt, caffeine, and alcohol—that reduce how much fluid the body retains. Other cases require medication or even surgery. Benign positional vertigo (BPV) is caused by calcium chloride crystals dislodged from the otolithic organs that are afloat in the semicircular canals. As they are buoyed along, they occasionally brush against nerve endings and transmit the erroneous report that the head is rotating. BPV can be treated by Epley maneuvers, which involve moving the head in a sequence of positions that directs the floating crystals into a part of the inner ear with fewer nerve endings. We've posted some additional information about Epley maneuvers on our Web site at www.health.harvard.edu/healthextra. Finally, perhaps the most common cause of vertigo—and perhaps loss of balance over all—is the aging of the vestibular system. They do their best, but old eyes, ears, hearts, and livers don't work as well as younger ones, and the same is true for the inner ear's vestibular apparatus.

Postural hypotension—a drop in blood pressure when rising from a chair or bed—can cause lightheadedness or even fainting. It's very common and has many causes: dehydration, anemia, medications, or abnormalities of the autonomic nervous system, which monitors and controls blood pressure. If you repeatedly feel lightheaded when getting up out of bed or from a chair, check with

your doctor. If you faint even once, it's also important to check with your doctor, because dangerous heart and brain conditions also cause fainting. If you have been diagnosed with benign postural hypotension (blood pressure drop with no apparent cause), wearing pressure stockings may help. Even if you don't have such a diagnosis, particularly if you're older it's a good idea to sit for a few seconds on the edge of the bed before getting up. That pause gives your circulatory system time to adjust and pump some blood up to your brain.

Foot problems, such as corns, bunions, and hammertoes, are both a cause and a result of uneven balance. A little sole-searching can indicate whether your feet are throwing you off kilter. If your shoes show uneven wear, a podiatrist may be able to treat the underlying problem and fit you with orthotic shoe inserts that put you on firmer footing.

Eye diseases such as cataracts and glaucoma are stealthy thieves of sight—and balance. Regular eye exams are the best answer. Balance nearly always improves after successful cataract surgery.

Medications that can cause dizziness or lightheadedness include sedatives, antihypertensives, antidepressants, and antihistamines. Some antibiotics are associated with inner-ear damage. If you suspect your medication is upsetting your balance, discuss alternatives with your doctor.

Alcohol to steady the nerves can have the opposite effect on one's gait. Tippling begets toppling.

Retaining and regaining

Alas, there's no resting on your laurels when it comes to health maintenance. Balance is another one of those use-it-or-lose-it propositions. Sedentary people don't just get flabby. They also lose some of the neural connections necessary for good balance. Getting off your duff will help you stay on your feet.

Bad posture causes bad balance. Research supports generations of naggers: Rounded shoulders and sagging spines not only look bad, but set you up for a fall by pitching your weight forward. You

can't go wrong following the ancient alignment mantra: Head erect, shoulders back and down, stomach and buttocks tucked in, knees relaxed, and feet planted firmly, hip-width apart.

Some strength is also essential. Like a skyscraper built on a fault line, weak muscles will put you on shaky ground. Strong hip, knee, and ankle muscles will give you a solid foundation and help you stay upright. For the fairly fit, there's a wide range of equipment designed for equilibrium-improvement exercises, including simple rocker boards, rotation disks, and balance balls.

If you'd rather work out on solid ground, tai chi has been firmly established as *the* exercise routine for balance. The flowing, controlled movements are

a great way to build body awareness, improve stability, and reduce the fear of falling. Numerous studies have proved it. For example, last year researchers at the Centers for Disease Control and Prevention (CDC) reported the results of a study comparing a year's worth of tai chi to a regular wellness program. The study volunteers were people ages 70 to 97 who had fallen and were likely to become frail. Most were women. The CDC researchers found that the people who did tai chi were much less afraid of falling than those in the wellness program, and the difference increased as the year went on.

There are also a few simple exercises that have improved strength and balance even in frail nursing-home

patients. You can do them at home in a few minutes (see illustration below).

When you need a little help

We all need a little help from our friends, but if balance is a problem, we may need something more.

If you're considering using an assistive device—or if your doctor has recommended one—a wide array of canes, walking sticks, staffs, and walkers awaits. As you make your pick, there are several factors to consider, including your height, strength, posture, and daily activities. Don't settle for something that makes you uncomfortable or is awkward to use. It may take some trial and error. Make sure you get the aid that's the best fit for you. ♥

Balance exercises

Plantar flexion

Stand straight, holding on to a table or chair for balance. Slowly stand on tiptoe, as high as possible. Hold position. Slowly lower heels to the ground. Repeat 8 to 15 times. Rest a minute, then do another 8 to 15 repetitions. Add modifications as you progress. (Hold chair with one hand, then one fingertip, then no hands; then, if steady, do exercise with eyes closed.)



Knee flexion

Stand straight, holding on to a table or chair for balance. Slowly bend knee as much as possible so foot lifts up behind you. Hold position. Slowly lower foot all the way back down. Repeat 8 to 15 times on each leg. Rest a minute, then do another 8 to 15 repetitions. Add modifications as you progress (same as those for plantar flexion).



Side leg raise

Stand straight with feet slightly apart, holding on to a table or chair for balance. Slowly lift one leg to side, 6–12 inches. (Keep back and knees straight throughout the exercise.) Hold position. Slowly lower leg. Repeat 8 to 15 times on each leg. Rest a minute, then do another 8 to 15 repetitions. Add modifications as you progress (same as those for plantar flexion).



Hip flexion

Stand straight, holding on to a table or chair for balance. Slowly bend one knee toward chest, without bending waist or hips. Hold position. Slowly lower leg all the way down. Repeat 8 to 15 times on each leg. Rest a minute, then do another 8 to 15 repetitions. Add modifications as you progress (same as those for plantar flexion).



Hip extension

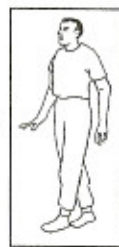
Stand 12–18 inches from table or chair. Bend at hips and hold on to chair. Slowly lift one leg straight behind you, keeping leg straight. Hold position. Slowly lower leg all the way down. Repeat 8 to 15 times on each leg. Rest a minute, then do another 8 to 15 repetitions. Add modifications as you progress (same as those for plantar flexion).



Anytime, anywhere

These types of exercises also improve your balance. You can do them almost anytime, anywhere, and as often as you like, as long as you have something sturdy nearby to hold on to if you become unsteady.

- Walk heel-to-toe. Position your heel just in front of the toes of the opposite foot each time you take a step. Your heel and toes should touch.
- Stand on one foot (while waiting in line at the grocery store or at the bus stop, for example). Alternate feet.
- Stand up and sit down without using your hands.



Source: *Exercise: A Guide from the National Institute on Aging*