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Health

Preserving a Fundamental Sense: Balance

By JANE E. BRODY

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Scott McCredie is a Seattle-based health and science writer who says he “discovered” what he calls “the lost sense” of balance after he watched in horror as his 67-year-old father tumbled off a boulder and disappeared from sight during a hike in the Cascades.

Though his father hurt little more than his pride, Mr. McCredie became intrigued by what might have caused this experienced hiker, an athletic and graceful man, to lose his balance suddenly. His resulting science-and-history-based exploration led to a book, “Balance: In Search of the Lost Sense,” published last June by Little, Brown.

Noting that each year one in three Americans 65 and older falls, and that falls and their sometimes disastrous medical consequences are becoming more common as the population ages, Mr. McCredie wonders why balance is not talked about in fitness circles as often as strength training, aerobics and stretching. He learned that the sense of balance begins to degrade in one’s 20s and that it is downhill — literally and figuratively — from there unless steps are taken to preserve or restore this delicate and critically important ability to maintain equilibrium.

Vertigo, which can be caused by inner ear infections, low blood pressure, brain injuries, certain medications and some chronic diseases, is loss of balance in the extreme. Anyone who has experienced it — even if just from twirling in a circle — knows how disorienting and dangerous it can be. Really, without a sense of balance, just about everything else in life can become an insurmountable obstacle.

One normal consequence of aging is a steady decline in the three main sensory contributors to good balance — vision, proprioceptors on the bottoms of the feet that communicate position information to the brain, and the tiny hairs in the semicircular canals of the inner ear that relay gravity and motion information to the brain. Add to that the loss of muscle strength and flexibility that typically accompany aging and you have a fall waiting to happen.

But while certain declines with age are unavoidable, physical therapists, physiatrists and fitness experts have repeatedly proved that much of the sense of balance can be preserved and even restored through exercises that require no special equipment or training. These exercises are as simple as standing on one foot while brushing your teeth or walking heel-to-toe with one foot directly in front of the other.

Testing for Equilibrium

Marilyn Moffat and Carole B. Lewis, physical therapists in New York and Washington, respectively, agree with Mr. McCredie that “balance is an area of physical fitness that is often overlooked,” but they seek to correct that in their recent book “Age-Defying Fitness” (Peachtree Publishers). They define balance as “the ability of your body to maintain equilibrium when you stand, walk or perform any other daily activity” like putting on pants, walking on uneven ground or reaching for something on a shelf.

Dr. Moffat and Dr. Lewis suggest starting with a simple assessment of your current ability to maintain good balance. With a counter or sturdy furniture near enough to steady you if needed, perform this test:

1. Stand straight, wearing flat, closed shoes, with your arms folded across your chest. Raise one leg, bending the knee about 45 degrees, start a stopwatch and close your eyes.

2. Remain on one leg, stopping the watch immediately if you uncross your arms, tilt sideways more than 45 degrees, move the leg you are standing on or touch the raised leg to the floor.

3. Repeat this test with the other leg.

Now, compare your performance to the norms for various ages:

¶ 20 to 49 years old: 24 to 28 seconds.

¶ 50 to 59 years: 21 seconds.

¶ 60 to 69 years: 10 seconds.

¶ 70 to 79 years: 4 seconds.

¶ 80 and older: most cannot do it at all.

If you are wise, whatever your age, you will want to strive for the norm of those younger than 50. To increase stability and strengthen the legs, stand with feet shoulder-width apart and arms straight out in front. Lift one foot behind, bending the knee at 45 degrees. Hold that position for five seconds or longer, if possible.

Repeat this exercise five times. Then switch legs. As you improve, try one-leg stands with your eyes closed.

You can also incorporate one-leg stands into daily routines — while on the telephone, for example, brushing your teeth, waiting in line or for a bus, or cooking and washing dishes.

Exercises to Build a Motor Skill

“Remember, balance is a motor skill,” Dr. Moffat, professor of physical therapy at New York University, said in an interview. “To enhance it, you have to train your balance in the same way you would have to train your muscles for strength and your heart for aerobic capacity.”

Dr. Moffat pointed out that balance is twofold: static while standing still and dynamic when moving, as in walking and climbing stairs. Two main routes improve balance — exercises that increase the strength of the ankle, knee and hip muscles and exercises that improve the function of the vestibular system.

Like one-leg stands, many can be done as part of a daily routine. Dr. Moffat recommends starting with strength exercises and, as you improve, adding vestibular training by doing some of them with closed eyes.

Sit-to-stand exercises once or twice a day increase ankle, leg and hip strength and help the body adjust to changes in position without becoming dizzy after being sedentary for a long time. Sit straight in a firm chair (do not lean against the back) with arms crossed. Stand up straight and sit down again as quickly as you can without using your arms. Repeat the exercise three times and build to 10 repetitions.

Heel-to-toe tandem walking is another anytime exercise, resembling plank walking popular with young children. It is best done on a firm, uncarpeted floor. With stomach muscles tight and chin tucked in, place one foot in front of the other such that the heel of the front foot nearly touches the toe of the back foot. Walk 10 or more feet and repeat the exercise once or twice a day.

Also try walking on your toes and then walking on your heels to strengthen your ankles.

Another helpful exercise is sidestepping. Facing a wall, step sideways with one leg (bring the other foot to it) 10 times in each direction. After mastering that, try a dancelike maneuver that starts with sidestepping once to the right. Then cross the left leg behind, sidestep to the right again and cross the left leg in front. Repeat this 10 times. Then do it in the other direction.

In addition, the slow, continuous movements of tai chi, that popular Chinese exercise, have been shown in scientific studies to improve balance and reduce the risk of falls.

This is the first of two columns. The second looks at the vestibular syste; see below.

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PERSONAL HEALTH

A Stable Life, Despite Persistent Dizziness

By JANE E. BRODY
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On the subway, children twirl themselves around the poles in the cars until they are so dizzy I'm ready to catch them. The young seem to delight in making the world spin out of control for a few moments, causing them to flop about like drunks.

But when dizziness, vertigo or loss of balance is neither self-imposed nor short lived, it is anything but fun. It can throw one's whole life out of kilter, literally and figuratively.

This is what befell Cheryl Schiltz in 1997, when long treatment with the antibiotic gentamicin permanently damaged the vestibular apparatus in her inner ear. For three years, said Ms. Schiltz, of Madison, Wis., her world seemed to be made of Jell-O. Lacking a sense of balance, she wobbled with every step, and everything she looked at jiggled and tilted.

Unable to work, Ms. Schiltz became increasingly isolated and struggled to perform the simplest household tasks.

Lisa Haven, executive director of the Vestibular Disorders Association, reports that "the risk of falling is two to three times greater in people with chronic imbalance or dizziness." Nearly 9 percent of Americans 65 and older have balance problems, the prevalence of which is likely to increase as the 78 million baby boomers age.

Four Types of Dizziness

The job of the vestibular system is to integrate sensory stimuli and movement for the brain and keep objects in visual focus as the body moves. When the head moves, signals are sent to the inner ear, an organ consisting of three semicircular canals surrounded by fluid. It in turn sends movement information to the vestibular nerve, which carries it to the brainstem and cerebellum, which control balance and posture and coordinate movement. Disruption of any part of the system can result in dizziness.

These are four types of dizziness, all of which are more common with increasing age:

Faintness, the feeling of being about to black out when upright. This can result from dehydration, abnormal heart rhythms, overmedication with blood pressure drugs and disorders of the autonomic nervous system.

Loss of balance, feeling unsteady and about to fall even though muscle strength is normal. This can be caused by disorders of the inner ear; the cerebellum because of stroke or chronic alcoholism; or the basal ganglia, because of Parkinson's disease, for example. It can also result from overmedication with drugs like sedatives and anticonvulsants, vision disturbances and neuropathy or spinal cord disease that causes a loss of position sense in the legs.

Vertigo, a false sense that the person or the surroundings are moving or spinning. This can result from motion sickness, Ménière's disease, middle-ear infections, migraines, multiple sclerosis, damage to the vestibular nerve and reduced blood flow to the brain after a stroke or transient ischemic attack. In the most common form, benign paroxysmal positional vertigo, sudden head movements cause a sensation of motion.

Vague ligh-theadedness, a feeling of giddiness or detachment from the world that can be caused by a panic attack, depression, anxiety disorders or hyperventilation.

What to Tell the Doctor

About 40 percent of people experience at least one of these forms of dizziness at some time during their lives. When dizziness persists, medical care is essential, and so is the ability to provide a detailed description of the symptoms and what provokes them.

What does the dizziness feel like -- faintness, loss of balance, lightheadedness, a sensation that you or your surroundings are spinning or moving? When did the symptoms begin? How long do they last? What provokes or relieves them? What other symptoms like headache, ringing in the ears, impaired vision, difficulty walking, weakness or hearing loss accompany the dizziness?

Diagnostic tests may include trying to reproduce the symptoms. For example, by rapidly standing and sitting, standing after lying down or lying on a tilt table while changes in blood pressure are measured.

The doctor may test heart function with an electrocardiogram or an echocardiogram, an exercise stress test or a Holter monitor to detect abnormal rhythms.

Vision tests may be performed, along with tests to evaluate balance and gait and C.T. or M.R.I. scans of the head, including noninvasive tests that check for narrowed or blocked arteries to the brain.

If no physical explanation for dizziness is found, the patient may be checked for psychological disorders like depression, panic attacks or dissociation from the world.

Treatment will depend on the cause of the dizziness. For example, for benign paroxysmal positional vertigo, a simple head-turning maneuver that repositions crystals in the inner ear may bring lasting relief. If ministrokes are the cause, the treatment may involve anticlotting drugs or opening a blocked artery with a stent. If medication is the problem, adjusting the dose or changing the drug can relieve dizziness.

If dizziness persists despite treatment, lifestyle adjustments can help like avoiding sudden movements, keeping often-used items within easy reach, standing up slowly and clenching hands and flexing feet before standing. Physical therapy can help, as can exercises that strengthen muscles and that combine eye, head and body movements.

Ms. Schiltz, whose vestibular system was damaged a decade ago, said she was told that nothing could be done about it. Nothing, that is, until she became the first patient to be treated with a device called a BrainPort invented by the late Dr. Paul Bach-y-Rita, a neurobiologist and rehabilitation medicine specialist, and his colleagues at the University of Wisconsin.

The device takes advantage of the acute sensitivity of the tongue and sends balance signals directly to the brain from the tongue, bypassing the ear's vestibular apparatus. At first, she used it a few minutes at a time, but soon found longer use kept her in balance for hours, then days, then weeks and months.

Eventually, all that was needed was 20 minutes twice a day to train her brain, and she now uses it just occasionally.

She is among more than 100 study participants who have used the BrainPort, including patients with multiple sclerosis, Parkinson's disease and stroke. The device is available commercially in Canada and is awaiting approval by the Food and Drug Administration in the United States.

Dr. Norman Doidge of the research faculty at the Columbia University Psychoanalytic Center and the University of Toronto describes Ms. Schiltz's dramatic recovery in his new book about the plasticity of the brain, "The Brain That Changes Itself." (Her case was also described in Science Times in November 2004.) With her sense of balance intact, Ms. Schiltz was able to return to school and on Dec. 20 received a degree in rehabilitation psychology.

"I feel like a restored, even enhanced, person," she said in an interview. "I'm living proof that the brain can be retrained. My goal now is to help people with acquired disabilities gain increased independence."

This is the second of two columns. The first (published Jan. 8) looked at balance problems and ways to overcome them.