Balancing Act

Unsteadiness is a common symptom of many neurologic conditions, causing falls and injuries. These strategies can help boost your balance—and your brain health.

BY AMY PATUREL, MS, MPH

In December 2009, Adrienne Preuss, 24, went skiing in Vermont with friends, then drove six hours to her home in New York City. When she woke up the next morning, she couldn’t see straight and her balance was off. She felt like she was bobbing on a boat. She immediately saw her primary care physician, who, in turn, sent her to a neurologist.

She went through months of testing, doctor visits, and medication trials for what doctors were calling migraine or vertigo. Finally, a year later, an otologist—a doctor who specializes in diseases of the ear—diagnosed Preuss with mal de debarquement syndrome (MdDS), which is French for “bad disembarkment.” Six years later, she is still unsteady. “I feel almost like Alice in Wonderland. The world is very dizzying,” says Preuss.

LITTLE-KNOWN SYNDROME

Considered a rare disorder—exact figures are hard to come by, but women are more often affected than men—MdDS typically develops after travel on a cruise ship, an airplane, or an extended road trip. The most common symptom is a chronic sensation of motion (rocking, swaying, bobbing, tumbling), which is often accompanied by fatigue, imbalance, and trouble concentrating. The symptoms, which can vary in frequency and intensity and can be disabling, are often eased by passive motion such as being in a moving car, airplane, or train, says Yoon-Hee Cha, MD, assistant professor at the Laureate Institute for Brain Research in Tulsa, OK. In fact, some people with the syndrome will get in a car and drive just to get temporary relief from the rocking feeling, she says. Remission from symptoms is possible, Dr. Cha says, but recurrence rates are high and symptoms are usually more severe during a relapse.

“MdDS symptoms may become more or less intense based on factors such as visual stimulation, emotional stress, lack of sleep, cognitive load, and menstrual cycles,” says Dr. Cha. Even the weather can influence a person’s feeling steady or off balance, she adds.

Unfortunately, the condition may last for years. It’s also often misdiagnosed or not diagnosed at all, and the cause remains unknown.

STEADY ON

Your brain and body rely on a complex set of sensory and motor movement systems to balance properly. Your eyes—part of the vision system—tell you whether you’re on slippery ice or a rocky beach. Balance sensors in your inner ear—part of the vestibular system—help you maintain your equilibrium. And sensors in your feet, joints, and muscles—part of the proprioceptive system—track the changing position of your limbs, according to the Vestibular Disorders Association.

Each of these systems sends information to the brainstem, where it gets sorted out and integrated with learned information from the cerebellum, the coordination center of the brain, and the cerebral cortex, the locus of decision making and memory, says Mark Hallett, MD, FAAN, chief of the Human Motor Control Section at the National Institute of Neurological Disorders and Stroke (NINDS).

“If any of these systems is off, the results can be catastrophic,” he says, adding that difficulty with balance is one of the most common neurologic symptoms. Balance and coordination rely on high-level thinking, including learning, memory, and response time. As that declines with age, or because of a neurologic condition, balance becomes even more compromised. It’s not surprising, then, that one in three older Americans experiences a fall each year, resulting in 250,000 hip fractures and more than 25,000 deaths, according to the US Centers for Disease Control and Prevention.

But poor balance isn’t inevitable. Even with a diagnosed neurodegenerative condition, you can improve it. Here’s what the experts recommend.

GET A FULL CHECKUP

Like many patients struggling with balance, Preuss bounced from doctor to doctor and tried countless drug cocktails—everything from migraine and vertigo drugs to nausea medications—before a neurologist referred her to an otologist. “I had tests to rule out everything from multiple sclerosis to a brain tumor,” says Preuss. “No one could give me an answer. They
all said, “You’re fine, everything looks good; but I didn’t feel fine.”

After undergoing imaging tests with no significant results, Preuss took a balance test. Called computerized dynamic posturography, the test assessed her ability to maintain her balance under various conditions. The results showed her eyes were doing 85 percent of the work of her vestibular system—normally, sensors in the inner ear, feet, limbs, and even the brainstem share the load. Doctors diagnosed her with an unknown vestibular disorder in July 2013, citing migraine and MdDS as the diagnoses that most closely matched her symptoms.

The cause of poor balance can be related to any one of several systems in the brain or even the spinal cord, so a neurolgist’s first challenge is identifying, and diagnosing, the problem. That requires more than just watching a patient walk across a room or seeing how long he or she can balance on one foot. Neurologists must conduct a complete medical history, cognitive assessment, and a thorough physical examination, including tests of balance and coordination.

“There are types of postural sway and speed of sway that are common among patients with certain neurologic conditions, but those characteristics aren’t always something you can see,” explains Fay Horak, PhD, director of the Balance Disorders Laboratory at Oregon Health & Science University in Portland.

Instead, doctors rely on accelerometers to measure a person’s speed and movement monitors to detect subtle changes in posture and movement. Once they identify the problem and the cause, they can target treatment.

**PRACTICE DUAL TASKING**

In a paradoxical twist, the disorders that contribute to poor balance also make it difficult to improve balance. “The worse your balance is, the more cognitive attention it requires,” says Mark Gudesblatt, MD, medical director of South Shore Neurologic Associates in Islip, NY. “Throw in dual tasking—walking and talking or chewing gum, for example—and that makes balance even harder. It’s like running too many programs on your computer.”

As it happens, the best activities for improving balance involve dual tasking. Exercising such as tennis or dancing that involve unpredictable movements and fast thinking keep the body engaged and can build brain plasticity, says Dr. Hallett.

In fact, a 2015 study of 15 athletes published in the European Journal of Applied Physiology reported that athletes who have to think to perform, such as figure skaters, gymnasts, and dancers, showed dramatically improved brain plasticity compared to runners and cross-country skiers who use muscles repetitiously. The reason? Once the brain learns a repetitive movement, it goes on autopilot, performing without even thinking about it.

Other studies suggest another activity that involves dual tasking—taï chi—is especially effective for improving balance. In a 2012 study published in the New England Journal of Medicine, researchers found that six months of twice-weekly taï chi improved balance and reduced the likelihood of falling among people with Parkinson’s disease. The one caveat goes back to the original paradox: Because the demands of balance are especially challenging for people with Parkinson’s disease, participants may fatigue more easily.

A cluster of neurons in the spinal cord serves as a control center, decoding information in the environment and making adjustments in foot position and balance so we don’t topple over, says Martyn Goulding, PhD, a professor and researcher at the Salk Institute. In a 2015 study, conducted in mice and published in the journal Cell, Dr. Goulding and his colleagues provided a blueprint of this neural circuitry in the spinal cord that processes light touch, called RORα.

In addition to receiving sensory information from the brain and light pressure sensors in the feet, RORα neurons connect with neurons in the spinal cord that control movement. They are located in the middle of a “mini control center” in the spinal cord that serves as a critical link between the brain and the feet.

“Developing a deeper understanding of these circuits could help scientists uncover new therapies for spinal cord injury and conditions that affect motor skills and balance, even to help prevent falls in the elderly,” says Dr. Goulding, who believes patients who have neuropathy or who have weak signals from their feet to their spinal cord can strengthen these circuits with practice. “Like many other systems in the body, the ‘use it or lose it’ adage applies.”

To strengthen your “control center,” shut down visual cues by closing your eyes, then try to balance on one foot for 30 seconds, suggests Dr. Goulding. Then switch sides.
Any form of physical activity that requires integrating cognitive, visual, vestibular, motor, or sensory systems can enhance well-being.

—Yoon Hee Cha, MD

CONSIDER COGNITIVE TRAINING

In 2005, researchers discovered that our ability to move through the environment is directly related to the ability to learn and remember. “If you can’t multitask or process information, or if you don’t have a sufficient attention span, you can’t adapt quickly enough to a changing environment. And that’s a huge risk factor for falling,” explains Dr. Gudesblatt. In fact, one key warning sign that you’re at increased risk of falling is if you tend to stop walking when you start talking.

A 2015 study published in Stroke reported an irrefutable link between poor balance, impaired cognition, and small blood vessel damage in the brain among people with no symptoms of neurologic disease. Participants who struggled to balance on one foot for 20 seconds or longer performed more poorly on a series of memory and spatial awareness tests than their more balanced counterparts.

Cognitive training may make a difference. In a 2016 study published in the Journals of Gerontology, researchers discovered that seniors who participated in cognitive training—computer-based programs that use games to test attention, memory, and visual and auditory processing—demonstrated significant improvements in balance, gait speed, and the ability to walk while distracted over the 10-week study period.

“Any form of physical activity that requires integrating cognitive, visual, vestibular, motor, or sensory systems can enhance well-being. It can also help with people’s perception of balance and make them less fearful of balance challenges,” says Dr. Cha.

BUILD STRENGTH

Strength is important for maintaining an upright position, and it is one reason people tend to feel off-balance as they get older. Muscle mass decreases with age, and weak muscles have more trouble holding the weight of the body upright. In addition, taking an automatic step to recover during a fall requires a quick increase in muscle force in the legs.

“The ability to generate enough force to move your body from the stepping leg to the standing leg and swing your leg forward quickly enough to recover balance becomes increasingly difficult with age or disease-related muscle weakness,” says Dr. Horak. “So when you’re in your 20s, balancing may require only 20 percent of your maximum effort, but when you’re 80 or 90, it could be 80 to 90 percent of your maximum effort.”

Several studies show that improving strength, especially in the legs, enhances balance. In a 2013 study of 51 people with Parkinson’s disease published in Movement Disorders, for example, researchers found that lifting weights had a greater impact on motor symptoms than standard stretching, balance, and strengthening exercises.

WORK WITH A TRAINER

Good balance is not simply the ability to stand on one foot. “There are different types of balance, and you have to target and train them separately,” says Dr. Horak. “If you practice standing on one foot every day, for example, you’re not going to improve your ability to respond to a push. Similarly, if you practice stepping backward, it won’t improve your ability to step sideways. So it’s important to practice the specific task that needs improvement.”

That’s where working with a qualified trainer, one who is experienced with neurologic disorders, makes a dramatic difference. “If you’re experiencing neuropathy and you have no feeling in your feet, a trainer can help you focus on balance and gait training, while patients who have Parkinson’s disease might practice stepping responses,” says Dr. Gudesblatt. “These are not hardwired reflexes. They are complicated skills that can be improved with experience and practice,” says Dr. Horak. In fact, in a study published in 2015 in Frontiers of Aging Neuroscience, she and her colleagues found that people with Parkinson’s disease improved their ability to step without losing their balance with practice. “With 50 different practice steps, they got better and better with it, and they maintained the improvement the next day,” she says.

Once she was diagnosed, Preuss started 16 months of vestibular therapy. Using a balance board, she worked with a trainer to track moving targets on a computer or a television with her eyes while trying to stay upright. “The two practices converge to help you focus on something that makes you feel stable,” explains Preuss, who claims this type of training made a noticeable difference in her ability to feel stable on her feet.

“Vestibular therapy does not get rid of the constant motion sensation in MdDS, but it can help with balance perception and decrease a fear of falling. It can also strengthen muscles and increase a person’s tolerance to visual motion,” says Dr. Cha.
6 Steps to Better Balance

Whether your poor balance is due to age-related declines in strength or sensory-motor functions or a chronic condition such as multiple sclerosis or Parkinson’s disease, these exercises can help.

1 STAND ON ONE FOOT. Hold on to a sturdy chair that won’t move, or stand next to a wall and put your hand on it for support, and lift one foot. Then try standing on one foot without holding the chair. As you feel steadier, try closing your eyes. Then repeat with the other foot.

2 WALK HEEL-TO-TOE. Position the heel of one foot just in front of the toes of the other foot for each step, as though you’re walking on a tightrope.

3 LIFT YOUR ARMS. Raise your arms out to your sides at shoulder height, then choose a spot on the wall and focus on it to stay steady as you walk.

4 USE YOUR HEAD. Turn your head from side to side while walking in a straight line. Every couple of steps, look at something on the left and keep it in focus, then look at something on the right and keep it in focus.

5 KICK BACK. Hold on to a chair or stand next to a wall and put your hand on it for support, then slowly lift and extend one leg straight back without bending your knee or pointing your toe. Hold the position for one second then repeat 10 to 15 times with each leg.

6 LIFT TO THE SIDE. Hold on to a chair or stand next to a wall and put your hand on it for support, then slowly lift one leg straight out to the side with your toes facing forward. Hold the position for one second, then repeat 10 to 15 times with each leg.

PRACTICE, PRACTICE, PRACTICE

Recent studies show that both people with Parkinson’s disease and those with multiple sclerosis can improve their balance responses with practice. And since balance relies on so many systems, practicing any type of exercise will likely improve symptoms almost regardless of the deficit, says Dr. Hallett.

When babies transition from crawling to walking to standing, they rely on error messages from the brain to guide the process. Sensory receptors send impulses to the brainstem and then out to the muscles to form a new pathway. With repetition, babies learn to maintain balance during activities.

“This type of synaptic reorganization occurs throughout the lifespan, but not with the same sponge-like capabilities associated with infancy and toddlerhood,” explains Dr. Gudesblatt. In fact, the brain’s ability to refine and reorganize is the reason dancers, gymnasts, and other athletes practice so tirelessly. So even if people who sustain brain injuries have compromised learning capabilities, they can still train their brains to improve.

“People with a neurodegenerative disease can show significant improvements in balance, walking, and quality of life with rehabilitation or sustained exercise,” says Dr. Horvak. That’s why she recommends finding activities you enjoy and incorporating them into your daily life and gradually increasing the challenge. If you’re walking on a treadmill, for example, engage in a secondary task like watching television or talking to a friend. If you have difficulty standing still, practice standing on one foot to brush your teeth. Or, practice a sport like dancing, hiking, tennis, or tai chi—dynamic activities that are critical to learning balance control.

Preuss says just trying to navigate New York City is a form of balance therapy. “Visiting Grand Central Station, walking down a busy street or into a grocery store—all of these things were so visually disorienting to me at first, I could barely handle it,” she says. The more sensory information she has to process, the worse her symptoms get. “Practicing being in those environments in moderate amounts helps my brain assimilate.”

By challenging herself in small doses, Preuss is engaging in a form of exposure therapy, and she’s getting better at tuning out irrelevant visual information, explains Dr. Cha. “As she gets better at navigating challenging circumstances, the thought of entering those environments will provoke less anxiety,” Dr. Cha says.

Preuss also participates in more formal balance practices, including yoga, elliptical training, and even bicycling, which ironically can act as a trigger for MdDS. “Short-term repetitive motion such as running on a treadmill, swimming, or riding a stationary bike can temporarily worsen the sensation of MdDS,” explains Dr. Cha. Preuss certainly can attest to that. “Getting on a bike after the winter off is really visually challenging. It’s kind of like looking out on the world from a merry-go-round. But after a few weeks, my brain seems to assimilate with the motion, and I notice that I balance better during my day-to-day activities.”