

Balance After Neurologic Injury

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Webinar Transcript*

Understanding Balance

Hi everyone. Thank you so much for being here today. My name is Rachel and I'm one of the neurologic physical therapists with Flint Rehab's remote recovery program. One of the most common questions I get and one of our most requested topics is what actually keeps you balanced.

Today we're going to break that down in a clear evidence-based way so that you can understand what's happening in your body and what you may be able to do to improve it. So balance is not just about being steady. It's a complex multi-system process that can be trained, strengthened, and improved even after neurologic injury. My goal today is to help you understand why balance changes, what systems are involved, and what you can do at home to hopefully improve it safely.

The Three Systems of Balance

Keep in mind that balance is not just one thing. It's a three-system model. Research consistently shows that balance depends on sensory input, motor output, and cognitive processing working together. So if one of these systems is disrupted, the others may have to compensate.

That's why someone with neuropathy or numbness in their legs may heavily rely on their vision and therefore might have difficulty walking at night when they don't have as much of that visual input. Understanding which system is affected helps us target the right exercises to help you improve.

Vision

We'll dive into the sensory system first, which gets information from your vision, your vestibular system, and your somatosensory system. Vision is your brain's fastest and most reliable source of balance information. Studies show that when vision is removed, for example, if you're standing with your eyes closed, your sway increases significantly, especially in people with neurologic conditions. After a stroke or a diagnosis of MS or Parkinson's, people often experience visual changes.

That may be difficulty in scanning with reading, reduced contrast sensitivity, or even double vision. And these aren't just vision problems. They directly affect balance because your brain is getting incomplete or even distorted information. So at home to compensate for this loss, try improving your lighting, reducing glare, and using high-contrast objects or signs.

These can immediately improve your stability. These strategies are very simple but backed by strong evidence in fall prevention research.

The Vestibular System

Next is the vestibular system which is deep in your inner ear and known as your internal motion sensor. It tells your brain how fast your head is moving and helps keep your eyes stable when you turn. So when this vestibular system is impaired, whether from concussion, stroke, even aging, people often describe this as a feeling of dizziness, imbalance, sometimes rocking or swaying, or just feeling off, especially when moving or turning. Impairment to the system significantly increases the risk of falls because your brain loses accurate movement information.

Vestibular rehab is one of the most evidence-supported treatments in neuro PT. However, these treatments highly depend on your specific diagnosis and condition. If you start noticing these dizziness-type symptoms, I recommend being evaluated by a vestibular therapist prior to starting these exercises to ensure that you're performing the right ones when it comes to your dizziness. Common exercises that you may do as part of this program might be head turns or gaze stabilization exercises.

That means moving your head while keeping your eyes fixed on a target. And controlled positional changes can help retrain the system through adaptation and habituation exercises, also known as getting the brain used to those particular movements without feeling extra sensitive to those movements.

Sensation and Proprioception

And then that third part of the sensory system is known as your somatosensory system. And this input includes your sensation. That includes feeling the ground, for instance, as well as your proprioception, or telling your brain where your body is in space. When the sensation is reduced like let's say in diabetic neuropathy or maybe after stroke you might notice you have numbness tingling pins-and-needles feelings and the brain loses that positional feedback.

So people with impaired somatosensory input rely heavily typically on their vision which works well indoors usually but becomes more challenging in low light or uneven environments. So some things that you can do are exercises like weight shifting, maybe tapping the feet, or practicing walking barefoot on safe surfaces. And these can help increase sensory awareness and possibly improve the brain's ability to interpret feedback.

How the Brain Reweights Sensory Information

One of the most fascinating things about the brain is the ability to reweight sensory information. If one system is weak, the brain automatically leans on the others. For instance, if vision is impaired, the brain is going to rely more on proprioception. If vestibular input is weak, the brain may avoid certain movements such as not doing quick head turns that make you feel more dizzy.

And this is why targeted exercises work. They help the brain redistribute that sensory load to compensate and/or strengthen the systems that are still intact. It also matters how much is still intact. So for instance, if you still have a part of a working vestibular system, but let's say it was injured after a brain injury, your brain may be automatically telling you to rely more on vision and somatosensory input to keep you safe.

While in therapy, you might be working to recover and actually uptrain the vestibular system to get even stronger as a part of your recovery process. This is that neuroplasticity in action.

Muscle Strength and Postural Control

Now, even if your sensory systems are working well, your muscles must be able to respond quickly and accurately to keep you balanced. When the muscles in your thighs, your hips, your calves, your core are weak, your body cannot react quickly enough to keep you upright. These muscles are responsible for those automatic corrective reactions your body uses to stop a fall. Things like catching yourself when you sway, taking a quick step if you start to lose your balance, or even tightening your trunk so you don't lean too far forward.

Coordination is also going to matter. So those stepping reactions need to be fast and need to be accurate. Postural control relies on anticipatory adjustments, meaning that your body prepares before you move. Your brain predicts what's about to happen and prepares your muscles so that you stay steady.

So let's break that down. What does that mean? For example, if you are about to stand up from a chair, your core and your leg muscles activate a split second before you lift off the seat. If you're about to reach for something on a shelf, your body tightens your trunk and shifts your weight slightly so that you don't tip forward.

These adjustments happen so fast you usually don't notice them. But they're essential for staying upright. Exercises like sit-to-stand, heel raises, marching, core activation, all of those foundational exercises are important and directly improve these motor responses.

Again, these are just some examples of the foundational exercises that your PT or your neuro coach might be having you complete for proximal strengthening of the core and hips.

Cognitive Processing and Dual Tasking

Now, balance is also cognitive. The brain must be able to process information, provide that attention, and make quick decisions. Usually, this is noted perhaps after a brain injury and people may say they're fine walking around at home, but when they walk in a parking lot or go to the grocery store, they feel a little bit more off and less confident with their balance. This is often one of the later things that we target in therapy.

After you're back walking and out in the community a bit more, we want to target more of the dual tasking. This is walking while talking, holding conversations, or carrying groceries while thinking, and it's one of the strongest predictors of falls risk in the neuro populations. So when cognitive load increases, you have to think about more things. Typically your walking speed decreases and your sway can also increase.

Some exercises that you can do to target this at home involve adding in some cognitive tasks to movement like counting or naming categories while walking. All of these things can help improve real-world safety by training the brain to handle this kind of divided attention.

Safety and Fall Prevention

As always safety first. So before doing any balance training, safety is the priority. Even though dizziness and weakness are part of some of your symptoms that you may have, sudden dizziness, any kind of new onset of weakness, a severe headache, or sudden onset of numbness are all red flags to watch for. If you start to notice these as you're going through your exercises, make sure you're seeking medical care immediately and inform your medical team.

Now, at home, some strategies that you can use include making sure that you are practicing near a stable surface, in front of a countertop, maybe a chair behind you, in a corner, something where you don't have a lot of clutter near you. Perhaps increase the lighting if you know that you're a little off in those low-light environments. Avoid multitasking unless that's one of your goals that you are targeting and working on. And doing any of these environmental modifications can reduce your fall risk by up to 40%.

Building a Balance Program

Some effective balance programs are going to target these task-specific things that you have difficulty with. That means practicing the exact tasks that you want to improve. If you're feeling unsteady on the stairs, you're practicing the stairs. In terms of strengthening, as we talked about, you want to strengthen anything in the middle of your body.

Your core, your quads, your glutes, even your shoulders if you're targeting more of your upper body. Then you want to change some of the sensory parts. Close your eyes, reduce that vision, maybe stand on things that are not as stable, such as foam or pillows. Bring your feet closer together.

This is when you certainly want to have supervision or someone nearby, especially if you're trying it for the first time. These are things that you want to talk through with your neuro coach. And then as things start to get better, start to add in those cognitive components. So dual tasking, combining the motor with the cognitive.

Training Frequency and Progress

How much should you be doing that? These are common questions that we get all the time. Research does support training balance for 10 to 20 minutes, four to six days per week. That's a little bit more than just your regular strengthening exercises.

Consistency is going to matter here a lot more than intensity. We want to make sure that you're tracking your progress. How long you're able to hold a certain position, how many reps you're doing, how steady you feel, as well as how confident you feel with all of these. Wherever you're working on them, either with a caregiver at home or with a neuro coach, you want to make sure that you are adjusting the difficulty gradually over time and communicate any changes to your specialist so that your program continues to stay targeted and safe.

Balance, as you can see, is complex, but it's absolutely trainable. And with the right strategies and exercises, you can improve your stability, your confidence, and your independence. That was a very brief overview of kind of all of the things that can impact your balance. And I want to get into some of your questions about your balance. So feel free to write them in the Q&A section.

Remote Recovery Support

And then as a reminder, we'll send this out after. This is our special offer for our remote recovery program that we have where you are matched up with a neuro coach to provide you some exercises that can help with your balance as well. I'll give people a moment to write down their questions in the Q&A.

Q&A

Are there specific things you recommend for home such as a balance pad?

And it's really going to depend on where your balance impairments are. So if you do notice that you have difficulty staying balanced on uneven surfaces, then perhaps using a foam pad, sometimes it's called an Airex pad, can be helpful. But many people find the exact benefits with standing on a pillow, a couch cushion, something like a yoga mat or a towel that gives you that same kind of change.

What can help when my pelvis sways while standing and I feel weak?

Someone is noticing that their pelvis sways too much when they are standing and they're feeling weak. That's something that you can target a bit more with the strengthening exercises. Maybe some glute exercises, both glute max or glute med that your neuro coach could certainly assist you with providing some examples for. And then just working on static standing.

That means standing and then trying to activate your core such that it helps to reduce sway. An important part to note with this is that it's not a bad thing to utilize assistive devices to help keep you independent and stable in standing as you're starting to recover. Many people see assistive devices as a step back, but really if it's helping you be more independent and more stable, it's better to actually use something like a walker or upper body support on a cane, something to keep you active and walking or standing a bit more and then work towards weaning off of it.

Never think that an assistive device is holding you back if it is helping you stay more independent.

Does sitting in a chair involve balance and how do you help someone relearn sitting?

For people who may be right after an injury or maybe are not able to stand or walk more independently, you might be working on sitting balance. So sitting down in a chair first in comparison to laying down in, let's say, a hospital bed is going to be better. So getting upright, but then you want to target things like leaning off of the back support. So if you are in a wheelchair, let's say, the majority of the day, and you're unable to sit like on the edge of a bed where you do not have that back support, that's okay.

But even just scooting a little forward in your wheelchair where you don't have as much back support to try to target the back and the core muscles to activate can be helpful. Then once you're working on that and you're able to sit statically without that back support, you want to start reaching outside of that middle area, what we call the base of support. So this may look like reaching and then coming back to the center. Sometimes we do it as coming down to like one elbow and then returning to the center.

Anything to again try to activate the core and the back muscles for sitting balance in particular. From there, then we're going to continue to progress in the same way you would for standing. You might be sitting on uneven surfaces later on, such as a bed versus a chair. It is going to be a lot harder to maintain that sitting balance.

Does strength training help improve balance?

It really depends. If it's the weakness that's affecting your balance, it can impact it, but look at those sensory systems, too. Are you dizzy? Are you having any numbness or tingling or decreased sensation in the legs?

Are you having any of those other types of symptoms, changes in vision, etc.? Go through those first. I'm not asking any of you to self-diagnose. It's more just to be aware of it and bring it up with your healthcare provider, your neuro coach, whoever you're working with so that they can help analyze where to set up your exercises.

But yes, if weakness, especially in like the hips and the glutes is impacting your standing ability, then strengthening those can help to improve your balance by impacting those postural reactions.

What is the best way to improve balance in low-light situations?

Start to change those variables very slowly. So it might be standing with a wide base of support at a countertop. Close your eyes for let's say 3 seconds. Make sure that you have a countertop in front of you, something behind you, maybe someone nearby for safety.

Close your eyes for a little bit longer. Take away that vision such that you're trying to train your brain to rely on those other systems a bit more. So people that have a lot of trouble with balance in low light situations often rely a little too much on their vision to keep them balanced. So remove that vision as you're training it and then continue to progress that from there.

These are all things that you can work on with your neuro coach.

Will double vision at a distance ever go away and can prism glasses help?

Those types of questions are going to be better asked to your neuro-optometrist or your neuro-ophthalmologist in terms of your specific diagnosis because it really does depend on the extent of the injury. A lot of times prism glasses can help to alleviate some of the symptoms so that you can be more functional with it. But in terms of specifics for your diagnosis, definitely check in with your specialist.

What can I do for numbness and severe pain in my right leg and hand?

And I know that is going to be a topic that we are going to discuss kind of in the future for nerve-type pain, but the pain after a stroke can vary based off of what's causing the pain. It could be tightness, it could be nerve-type pain, it could be muscular pain from just spasticity. So what's helping with the pain is really going to depend on what is causing it. For more specific guidance, definitely talk with a medical professional or your neuro coach about what your symptoms specifically are.

How does strength training fit into balance recovery?

Again, it depends on whatever weakness you have and what those other factors are as well. Typically after stroke and or any neurologic injury, you may have more than one of these things impacting your balance. Very rarely is it just vestibular issues, just weakness, or just vision impacting balance. And that's why we say it's a multi-system process.

Now we want to target whatever one is the highest priority as well as the ones that we can change the most. So in terms of vision, we may or may not be able to improve that at least from a therapy standpoint. So maybe we're targeting more of the balance with strengthening to compensate for it.

Are there ways of walking that might improve my balance such as picking my feet up higher?

This person is saying that stroke mainly affected their eyesight but balance is worse still. They walk with their dogs a lot but walking on its own doesn't improve the balance. They are wondering if there are ways of walking that might help improve their balance, like picking up their feet higher. In general, shuffling the feet or having foot drop is going to increase your risk of falling.

You do want to pick up your feet, but not an excessive amount. You shouldn't need to march or lift your legs up super high. What I would say for that is again try to determine what the difficulty is with the balance. If it is affected by your eyesight, which it sounds like it is, then perhaps we're doing other things to help compensate for it.

These are all things that a neuro coach would be able to create a program for you. That may mean targeting a bit more of the proximal strengthening. Or if it's when you're walking your dogs, it might be that dual-tasking aspect. So you might be doing more cognitive tasks while walking because your focus may be on the dogs and not on lifting your feet up every step.

Is that something that you need to work on with the divided attention part? These are definitely things to discuss.

Closing and Follow Up

I see a lot of really good questions here. A lot of them are more specific. So if you have questions that you want to talk through a little bit more with me, make sure that you write down what your contact information is, preferably your email. You'll also get an email after this with a recording of the webinar.

You can always contact us there and we'll be able to get back to you for more questions. But thank you all for joining and I hope you have a great day.