Well Balanced

The Mechanics of Staying Steady While Living with Parkinson’s Disease

Tricia H. Creel, PT, DPT, NCS

We are going to talk about…

The mechanics of balance

How Parkinson’s impacts balance

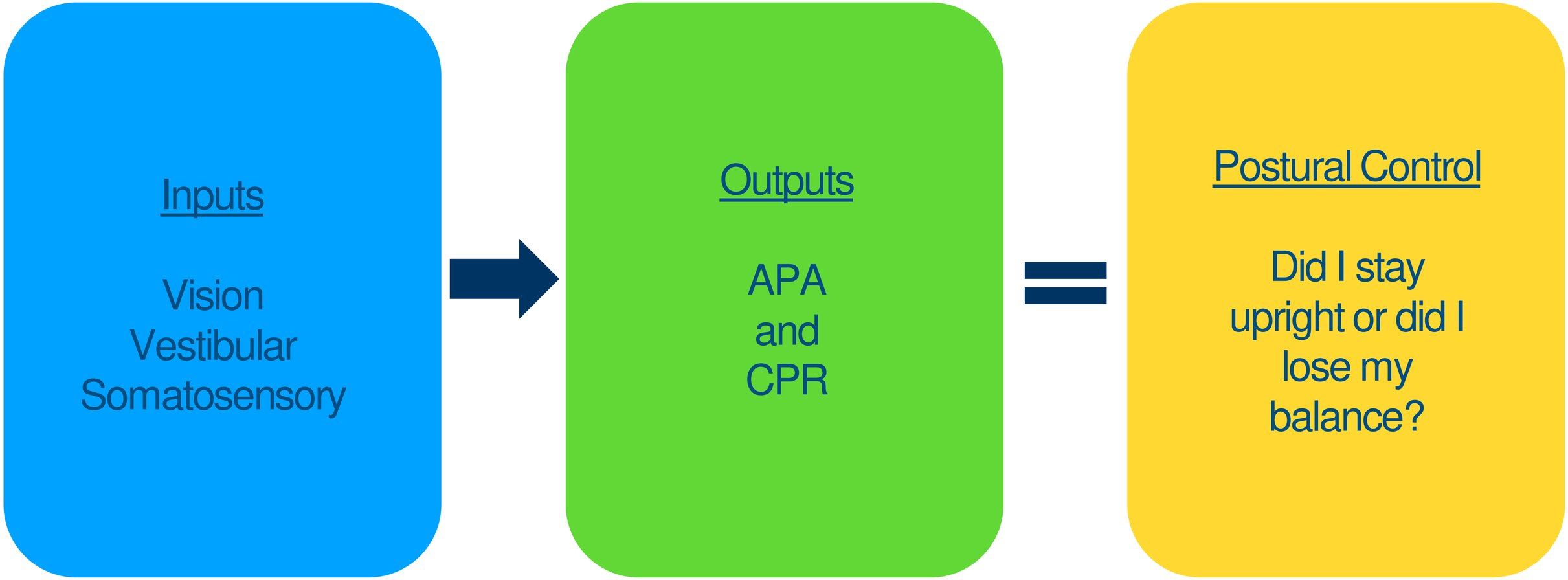
Practical steps for improving balance and decreasing fall risk

What to do if a fall occurs

The Mechanics of Balance

“The ability to maintain a stable, upright stance depends on a **complex integration** of somatosensory, vestibular, and visual stimuli with the motor, premotor, and brainstem systems.”

Hasegawa et al., Gait & Posture, 2021


Inputs
Vision
Vestibular
Somatosensory
Outputs
APA
and
CPR
Postural Control
Did I stay upright or did I lose my balance?

Input - Three Major Systems

Vision

Helps you orient relative to your environment

Vestibular

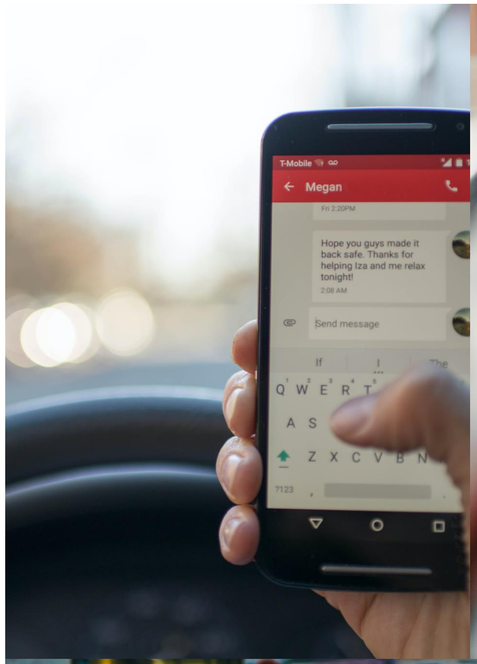
Keeps your gaze stable with movement

Somatosensory

Information about the surface and your position on it

Input - Additional Factors

- Medications
- Blood pressure
- Cognition
- Fatigue
- Depression
- Strength and range of motion
- Environment



Output - Anticipatory Postural Adjustments

Preparation in **anticipation** of an impending balance disturbance

May include things like leaning, shifting your body weight, pre-activation of muscles

Examples:

- Bracing yourself before the train moves at the airport
- Widening your stance before picking up a heavy box
- Shifting your weight to the opposite foot before walking up stairs

Output - Compensatory Postural Response

Recovery process that occurs **after** someone has already lost their balance

Includes swaying at ankles, bending at your hips, stepping, reaching

Examples:

- Steadying yourself on a counter after you turn too quickly
- Taking a large step to recover after the dog pulls you
- Rocking a little after someone gently bumps you

Impact of PD on Postural Control

Difficulty doing multiple things at the same time

Decreased foot clearance and increased step length variability

Stiffer, co-contracting muscles (rigidity)

Decreased automaticity of movements

Stooped posture with bent knees and hips

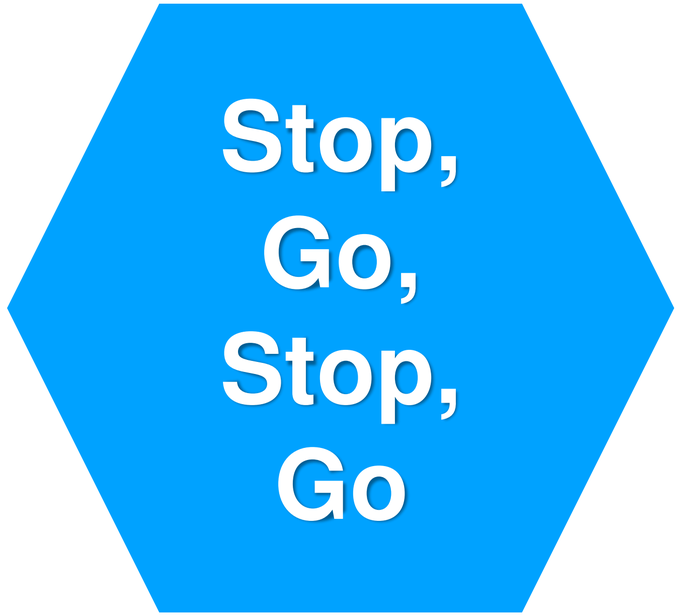
Difficulty with sensory weighting

Delayed or diminished stepping response

Fear of falling

Freezing of Gait (FoG)

- Up to 80% of people with PD
- Brief absence or reduction of forward progression of the feet despite the intention to walk
- Often occurs during gait initiation, turning, narrow spaces, or when multi-tasking
- External cues can be helpful, but also difficult to apply in the real world
- Increases risk of falls



Improving Balance and Decreasing Fall Risk

“Highest quality evidence available to date suggests significant ability to reduce fall rates for those with mild to moderate disease. In addition, those studies that are clinic-based and not home-based provide greater levels of supervision and more intensive training, and have resulted in greater reductions in fall rate”

Ellis et al., Semin Neurol, 2021

Evidence for Interventions

- Several kinds of exercise have been shown to be effective in improving balance for people with PD, including Tai Chi, dance, boxing, and yoga
- Specificity matters! If you want to improve your balance while walking, one of the best things you can do is get out and walk more.
- A physical therapist can perform an evaluation to determine your specific balance impairments and design a program to address them.

Improving Your Balance

1. **Walk More**: Set a goal and track how many steps you take every day, increasing gradually to 10,000 steps/day
2. **Walk Better**: Walk with a partner or with music to set the pace, use walking poles, walk in an open environment
3. **Exercise More**: 150 minutes per week, aiming for three days of aerobic, two days of strength, one day of balance, and one day of flexibility exercises
4. **Exercise Better**: consult with a physical therapist, join a Parkinson’s specific exercise class

“Those with more severe disease did not benefit and even appeared to have increased fall rates as a result of training. The origins of this are not clear, but may include increased gait-related mobility without improved postural competence.

In addition, declining cognitive status may contribute to poor carryover of fall prevention strategies and lower adherence to the exercise program.

Finally, those with greater disease severity are likely to have more complex symptoms such as freezing of gait.”

Ellis et al., Semin Neurol, 2021

Restoration versus Compensation

Does it mean we don’t try to train balance in people with more severe PD?

No! However, over time, the focus of physical therapy switches from restoring balance to fall prevention.

Part of that is understanding when falls are likely to occur:

- Turning
- Doing multiple things at the same time
- Reaching
- Small spaces, like closets

Change How You Perform the Activity

- Widen your stance
- Sit down to put on your jacket
- Hold a sturdy surface when reaching for an object
- Have someone stand near you while you exercise

Change the Environment

Use this checklist to find and fix hazards in your home.

STAIRS & STEPS (INDOORS & OUTDOORS)

Are there papers, shoes, books, or other objects on the stairs?

- ☐ Always keep objects off the stairs.

Are some steps broken or uneven?

- ☐ Fix loose or uneven steps.

Is there a light and light switch at the top and bottom of the stairs?

- ☐ Have an electrician put in an overhead light and light switch at the top and bottom of the stairs. You can get light switches that glow.

Has a stairway light bulb burned out?

- ☐ Have a friend or family member change the light bulb.

Is the carpet on the steps loose or torn?

- ☐ Make sure the carpet is firmly attached to every step, or remove the carpet and attach non-slip rubber treads to the stairs.

Are the handrails loose or broken? Is there a handrail on only one side of the stairs?

- ☐ Fix loose handrails, or put in new ones. Make sure handrails are on both sides of the stairs, and are as long as the stairs.

FLOORS

When you walk through a room, do you have to walk around furniture?

- ☐ Ask someone to move the furniture so your path is clear.

Do you have throw rugs on the floor?

- ☐ Remove the rugs, or use double-sided tape or a non-slip backing so the rugs won't slip.

Are there papers, shoes, books, or other objects on the floor?

- ☐ Pick up things that are on the floor. Always keep objects off the floor.

Do you have to walk over or around wires or cords (like lamp, telephone, or extension cords)?

- ☐ Coil or tape cords and wires next to the wall so you can't trip over them. If needed, have an electrician put in another outlet.

KITCHEN

Are the things you use often on high shelves?

- ☐ Keep things you use often on the lower shelves (about waist high).

Is your step stool sturdy?

- ☐ If you must use a step stool, get one with a bar to hold on to. Never use a chair as a step stool.

BEDROOMS

Is the light near the bed hard to reach?

- ☐ Place a lamp close to the bed where it's easy to reach.

Is the path from your bed to the bathroom dark?

- ☐ Put in a nightlight so you can see where you're walking. Some nightlights go on by themselves after dark.

BATHROOMS

Is the tub or shower floor slippery?

- ☐ Put a non-slip rubber mat or self-stick strips on the floor of the tub or shower.

Do you need some support when you get in and out of the tub, or up from the toilet?

- ☐ Have grab bars put in next to and inside the tub, and next to the toilet.

https://www.cdc.gov/steadi/pdf/patient/customizable/CheckforSafety-Brochure-Final-Customizable-508.pdf

Fall Recovery

- Learn how to fall as safely as possible.
- Have a plan in advance. That could include working with a PT on how to safely transfer off the floor.
- Take time to make sure the person is not injured before trying to stand.
- If possible, bring a sturdy chair or a stool to the person.
- Do not lift the person by yourself. But you can use a gait belt to assist the person as they move.

Summary

- Balance is a complex interaction between multiple internal systems (vision, vestibular, somatosensory) and the environment.
- Balance responses include Anticipatory Postural Adjustments (APA) and Compensatory Postural Responses (CPR)
- Exercise is beneficial at all stages, but the focus of balance interventions may shift over time from restoration to compensation.
- A balance program must be sufficiently challenging and must be targeted to optimize benefits. Specificity matters!
- Regular visits to a physical therapist allow for reassessment of functional status and adjustments to the balance program.

References

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