

Rehabilitation and Exercise for the Treatment of Postural Instability, Falls, and Gait Freezing

Presented By:

Jared C. Braden PT, DPT, NCS

July 17th, 2021



THE OHIO STATE
UNIVERSITY

WEXNER MEDICAL CENTER

Cardinal Symptoms of Parkinson disease

- “TRAP”
 - Resting **T**remor
 - **R**igidity
 - **A**kinesia/Bradykinesia
 - **P**ostural Instability

Our Focus for Today...

1. Postural Instability
2. Falls
3. Freezing of Gait

Postural Instability

- Postural Instability
 - Begins early after disease onset with 1/3 patients developing postural instability within 2 years of diagnosis¹
 - Reduced limits of stability
 - Slowed postural reactions
 - Late and small stepping pattern initially, progressing to “falling like a tree” in advanced stages
 - Impaired postural adaptation when changing surfaces or base of support.
 - Altered anticipatory postural adjustments when preparing to complete a sit to stand or when ambulating

Postural Instability

- Postural Instability
 - Affects balance control in 4 domains¹
 1. Balance during quiet stance
 2. Reactive postural adjustments to external perturbations
 3. Anticipatory postural adjustments
 4. Dynamic balance

Rehabilitation and Exercise Interventions for Postural Instability

- Preliminary CPG states that balance training improves postural control impairments, balance outcomes, mobility, gait outcomes, fear of falling, and QoL²
 - Mixed evidence regarding fall prevention
 - 2-3x/wk, 5-10wks, challenging intensity with direct PT supervision
 - Multisystem balance training includes sensory integration, anticipatory and reactive postural adjustments, strengthening, gait and functional task training, motor agility, and multidirectional stepping
 - Technology (even simple technology) enhanced interventions are more effective than standard interventions

Meta Analysis on Balance Training

- To be beneficial, exercises must incorporate components of balance dysfunction¹
- Interventions not specifically targeting postural instability have limited effect on improving balance¹... We as PTs need to work on balance!

Subgroup	Effect Size
Exercise with balance component (interventions incorporating balance challenges i.e. tai chi and dancing)	High
Balance specific exercise (conventional balance focusing on all 4 domains)	Mod-high
Exercise without balance component (aerobic, strength, walking, cycling, yoga)	None

Treating the Domains of Balance

- Reactive Balance³:
 - Ability to respond effectively to unexpected losses of balance or perturbations. Patient is not aware and cannot plan for the upcoming disturbance.
- Anticipatory Balance³:
 - Feedforward mechanism where postural core muscles stabilize the spine against internal and external forces imposed on body during voluntary limb movements.
 - Subconscious pre-activation of postural core muscles prior to shoulder or hip movements.

Treating the Domains of Balance

- Fixed Support³
 - Ankle: small range, low velocity perturbation
 - Hip: high force through pelvis/hips
 - Arm reach
- Change in Support³
 - Step
 - Grasp

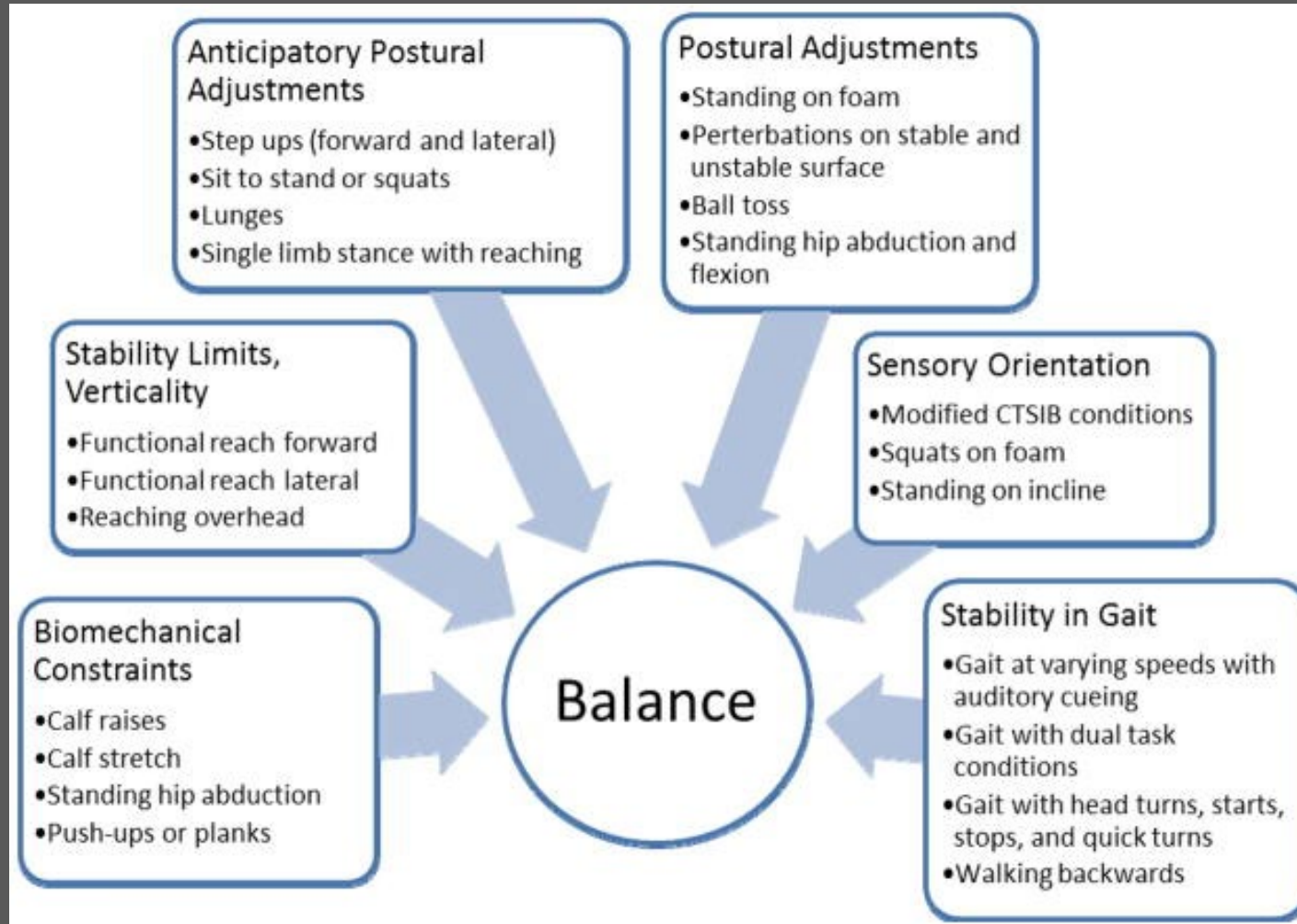
Poll Question 1

Imbalance and Falls in People with Parkinson disease

- Falls occur in about 50% of people with Parkinson disease⁴
 - About 30% of falls are injurious
 - Postural instability is an independent predictor of falls
- Current evidence for exercise interventions is actually mixed for fall prevention⁵:
 - Why?
 - Falls are complex and need to be individually investigated for causes
 - Most studies are looking at short term effects of exercise on falls
 - Long term exercise appears to be more beneficial and most studies have not investigated later stages of PD.
 - Review of literature suggests low dosage of exercise limits effect

Highly Challenging Balance Program Reduces Fall Rate in Parkinson Disease

[David Sparrow](#), DSc,^a [Tamara R. DeAngelis](#), PT, DPT, GCS,^b [Kathryn Hendron](#), PT, DPT, NCS,^b [Cathi A. Thomas](#), RN, MS, CNRN,^c [Marie Saint-Hilaire](#), MD, FRCPC,^c and [Terry Ellis](#), PhD, PT, NCS^{b,*}



Additional exercise interventions targeting balance

- Anticipatory Balance
 - Tai chi, dance, reaching, kicking, stepping
- Reactionary Balance
 - External perturbations, balance board, foam pad, rebounder, throw and catch

Poll Question 2

Freezing of Gait (FOG)

- FOG is defined as brief episodes of inability to do steps or by sudden, short stepping that typically occur when initiating gait, walking and turning⁵
- People freeze typically when initiating gait, walking, turning, while dual tasking, and in changing environment and circumstances such as when crossing a doorway or a narrow space, a change of luminosity, or in unusual situations. Moments of stress or anxiety can provoke FOG especially when one needs to move fast⁵
- FOG frequently results in falls, and a fear of falling, both resulting in a decrease of functional independence and reduced quality of life. Social consequences go along with embarrassment and frustration provoked by freezing in society and contributes to social stigmatism⁵

Treating Freezing of Gait

PM R 12 (2020) 1140-1156

Analytical-Systematic Review

Physical Therapy for Freezing of Gait and Gait Impairments in Parkinson Disease: A Systematic Review

Dionys G. Rutz, PT, BSc , David H. Benninger, MD, PD

- 20RCTs, n=762
- FOG-Q and NFOG-Q most commonly used outcome measures

Interventions for treating Freezing of Gait

- Generally thinking⁵:
 - Attention to each individual step and interventions that promote this are the major focus of treating freezing of gait.
- Most effective⁵:
 - Treadmill training
 - Rhythmical external cues: visual, auditory, tactile cueing to promote stepping
 - Balance and coordination exercises
 - Aquatic therapy focused on gait training

Interventions for treating freezing of gait

- There is no simple explanation for how external cueing works for freezing of gait but it appears that conscious attention to individual steps bypass the automaticity of gait (basal ganglia circuit) and allow more cortical control of gait⁷⁻⁸
 - Temporary bypass the reliance on the dysfunctional portion of the brain.
- Improving may postural stability and balance allows increased focused on individual steps without such attention on imbalance
- The emergence of freezing is closely associated with cognitive decline, in particular of executive function⁹
 - This may make people with cognitive impairment more susceptible to decreased attention to gait, distraction, and difficulty using external cues

Some ideas to incorporate external cueing

- Auditory:
 - Counting steps while walking
 - Walking to the beat of music
 - Stepping to metronome
- Visual:
 - Lines on floor
 - Laser light on walkers or canes

Break the freeze

- What I teach for breaking the freeze: **It's a compensation but make it a habit**
 - 1. STAY CALM: anxiety increases the duration
 - 2. FOCUS on a single leg to initiate the step (don't switch back and forth)
 - 3. VISUALIZE a garden hose (allow yourself to buy into the visualization) and step big over the garden hose
 - 4. COUNT your first couple
 - 5. If freezing continues to be a major contribution to falls and gait dysfunction we may need to transition to a rollator walker and specifically one that provides a laser light cue or we think up some visual cue that draws attention to your steps

References

1. Klamroth S, Steib S, Devan S, Pfeifer K. Effects of Exercise Therapy on Postural Instability in Parkinson Disease: A Meta-analysis. *J Neurol Phys Ther.* 2016;40(1):3-14.
doi:10.1097/NPT.0000000000000117
2. Osborne J, Kosakowski H, Readinger J, et al. Clinical Practice Guideline for Physical Therapist Management of Parkinson's Disease: Development and Drafted Recommendations. Virtual presented at the: APTA Combined Sections Meeting; February 2021. Accessed March 15, 2021.
<https://apta.confex.com/apta/csm2021/meetingapp.cgi/Session/6396>
3. Larsen D, Kegelmeyer D, Buford J, Kloos A, Heathcock J, Basso M. *Neurologic Rehabilitation: Neuroscience and Neuroplasticity in Physical Therapy Practice.* 1st ed. McGrae Hill Education; 2016.
4. Balance and falls in Parkinson's disease: a meta-analysis of the effect of exercise and motor training. Allen NE, Sherrington C, Paul SS, Canning CG *Mov Disord.* 2011 Aug 1; 26(9):1605-15.
5. Weiss D, Schoellmann A, Fox MD, et al. Freezing of gait: understanding the complexity of an enigmatic phenomenon. *Brain.* 2020;143(1):14-30.
6. Rutz, D.G. and Benninger, D.H. (2020), Physical Therapy for Freezing of Gait and Gait Impairments in Parkinson Disease: A Systematic Review. *Journal of Injury, Function and Rehabilitation,* 12: 1140-1156.
<https://doi.org/10.1002/pmrj.12337>

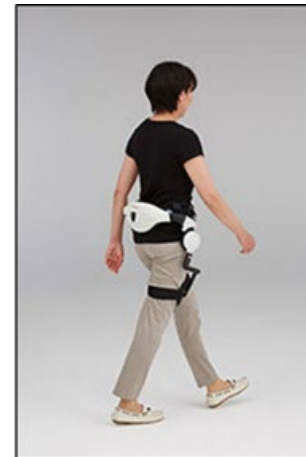
References

- 7. Nutt JG, Bloem BR, Giladi N, Hallett M, Horak FB, Nieuwboer A. Freezing of gait: moving forward on a mysterious clinical phenomenon. *Lancet Neurol.* 2011;10(8):734-744.
- 8. Nonnekes J, Ružicka E, Nieuwboer A, Hallett M, Fasano A, Bloem BR. Compensation strategies for gait impairments in Parkinson disease: a review. *JAMA Neurol.* 2019;76:718-725.

Speaking of External Cues

Study examining use of a robotic walking assist device in PD

- We need participants!
- If randomized into the treatment group you get training in your home with a Physical Therapist 2x a week for 8 weeks.
- Call or email Raquel Minarsch Raquel.Minarsch@osumc.edu
- (614) 685-5399



Spring/Summer 2021: FREE Live Well with Parkinson's Community Classes

Rolling admissions! Register any time- visit: wexnermedical.osu.edu/PDfitness

Moving with Purpose- New Albany:

This group exercise class is instructed by a licensed Exercise Physiologist in collaboration with a Physical Therapist. The classes are offered for Intermediate and Advanced levels of function. This 60 minute class includes stretching, education, increased amplitude functional exercises and more.

Location: The Philip Heit Center for Health New Albany
150 W. Main St., New Albany, OH 43054

Sessions: July 7th - November 17th

Times: Wednesdays 1:00 - 2:00 pm -Intermediate Level | 2:00 – 3:00 pm - Advanced Level

Cost: FREE | **Questions:** Email zoe.hopkins@osumc.edu

Forced Effort Aerobics- New Albany:

The Forced Effort Aerobic class is instructed by a licensed Exercise Physiologist with specialized training with guidance by a Physical Therapist. This class includes stretching, 30-35 minutes of forced exercise and education. Forced Effort Exercise has shown to challenge individuals with Parkinson's disease beyond their self-selected effort and improve motor symptoms such as bradykinesia, rigidity, and tremor.

Location: The Philip Heit Center for Health New Albany
150 W. Main St., New Albany, OH 43054 Every

Sessions: Mondays from July 12th to November 15th

Times: 2:00- 3:00 pm

Cost: FREE | **Questions:** Email zoe.hopkins@osumc.edu



Exercise with Purpose- Upper Arlington:

This group exercise class is instructed by a licensed Exercise Physiologist in collaboration with a Physical Therapist. The class is 60 minutes and includes a variety of activities including: stretching, patient education, increased amplitude functional exercises, forced effort exercise, motor-cognitive and motor-motor dual tasking, boxing and more.

Location: OSU Outpatient Care Upper Arlington 1800 Zollinger Rd.
Columbus, Ohio 43221

Sessions: Every Thursday: July 8th- November 25th

Times: 2:30-3:30 pm

Cost: FREE

| **Questions:** Email zoe.hopkins@osumc.edu

FOUR WEEK Nordic Pole Walking Class:

Outdoor Nordic Pole Walking is a four week fitness walking class instructed by a licensed physical therapist that involves two specially designed poles. The poles provide additional stability during walking, increased upper body muscle activation, increased total body energy expenditure, and provide support compared to traditional walking. Poles provided.

This class will resume in the Fall: Stay tuned

Walking Club:

If you've previously taken an OSU Nordic Pole Walking Class- this FREE Walking club is for you! This club will meet throughout the city at various City Parks in Columbus for 1 hour each month. Led by a Physical Therapist, this walking club will help you maintain amplitude walking skills where you can socialize with others.

Location: Blendon Woods Metro Park

Sessions: Last Wednesday of each month: 6/30, 7/28, 8/25, 9/29

Times: 2:00-3:00 pm

Cost: FREE

| **Questions:** Email jared.braden@osumc.edu

This program is supported by a community grant by the Parkinson's Foundation.



Columbus Dance for Parkinson's- Columbus:

Columbus Dance for Parkinson's is a total body dance exercise class that promotes increased mobility, artistry, friendship among participants, and an enhanced appreciation for local dance.

This class will resume soon: Stay tuned

Questions: Visit www.columbusdanceforparkinsons.org

To register for any of these classes- please visit our
website at: wexnermedical.osu.edu/PDfitness



THE OHIO STATE UNIVERSITY

WEXNER MEDICAL CENTER