



# *The Foundation for Peripheral Neuropathy* Patient Education Webinar Series

## Welcome!

### **A Sense of Balance**

Wednesday, September 23, 2020



We will begin our presentation shortly.



# *The Foundation for Peripheral Neuropathy* Patient Education Webinar Series

## Before We Begin



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Submit your questions anytime. We will answer them in the Q&A session at the end of the presentation.



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# *The Foundation for Peripheral Neuropathy* Patient Education Webinar Series

## **Today's Moderators:**



Lindsay Colbert  
Executive Director



Nancy Frohman  
Director of Development & Marketing

# Today we are here with...



*Lars Oddsson, PhD  
Chief Technology Officer*



*Laura Jacobs, PT, DPT  
Clinical Services Specialist*

# A Sense of Balance

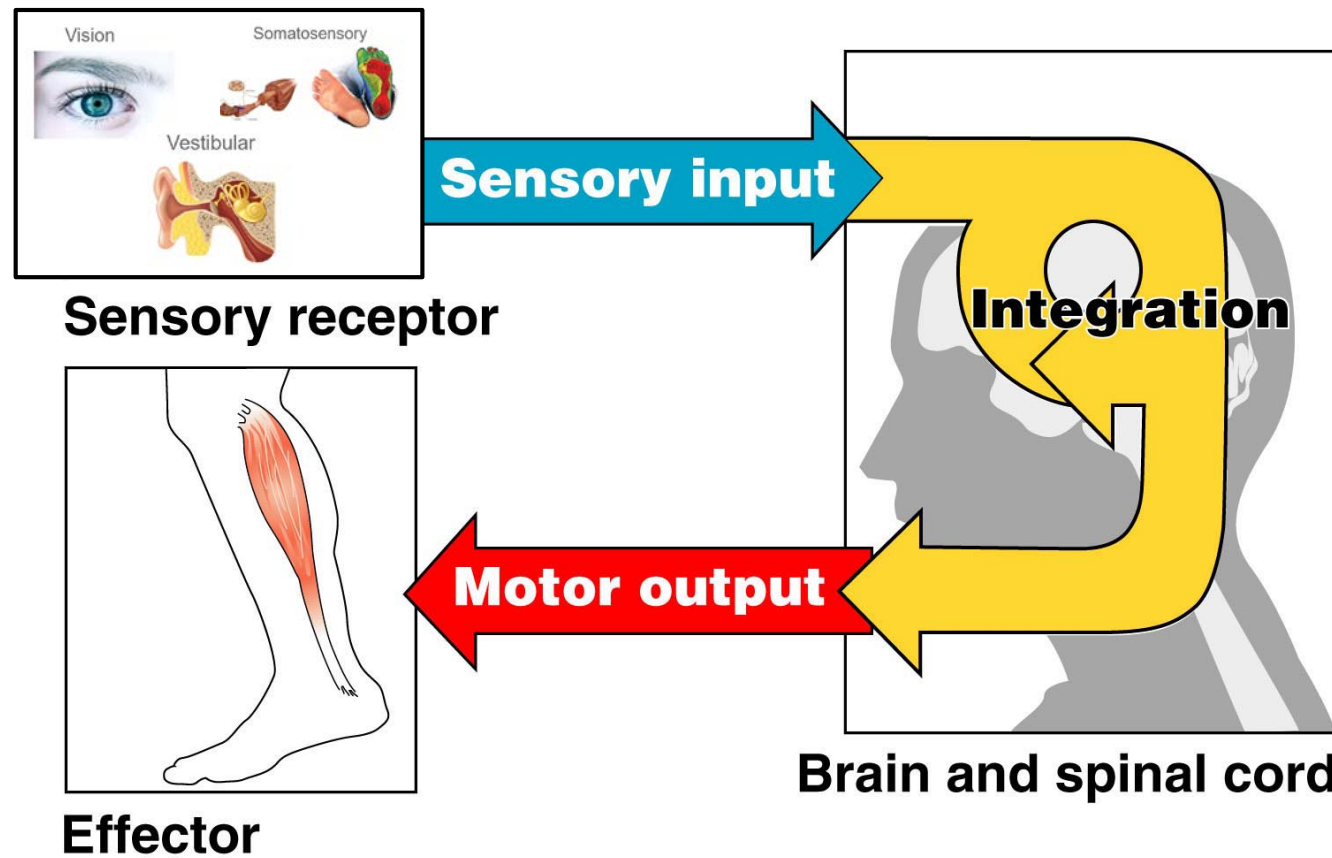
**Balance. Mobility. Confidence.**

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# Today we will cover:

- ✓ How does the body use sensation to maintain balance?
- ✓ What is peripheral neuropathy?
- ✓ What is the link between peripheral neuropathy and falls?
- ✓ What does research tell us about sensation for balance?
- ✓ A new balance solution

# How Does the Body Maintain Balance?



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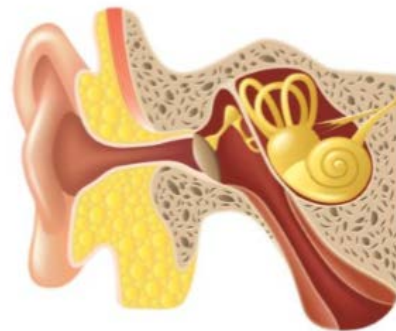
# What are the Sensory Inputs?

## Three Sensory Systems

Vision



Vestibular



Somatosensory





# Visual System

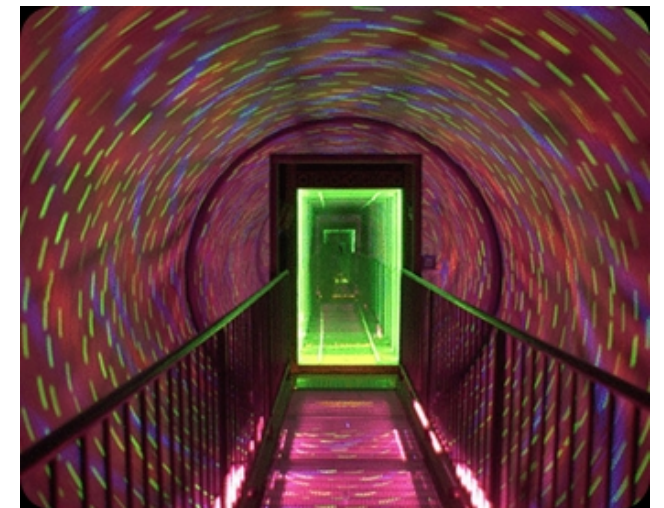
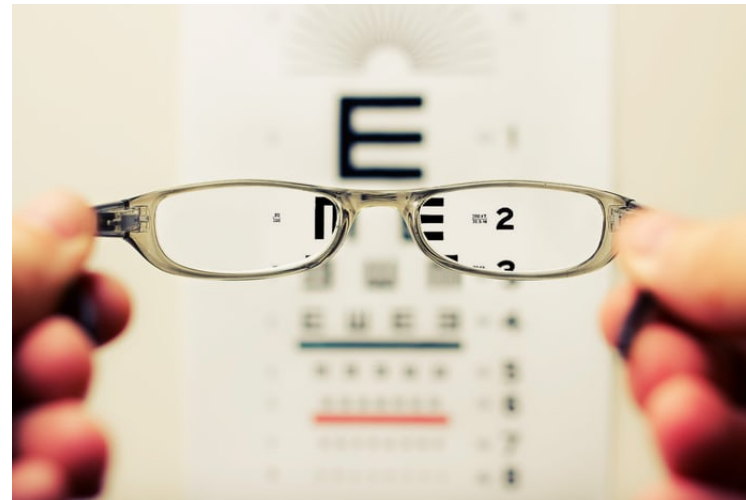
Helps us maintain upright body position

Where?

**Our eyes**

What information?

**Body orientation relative to our environment**



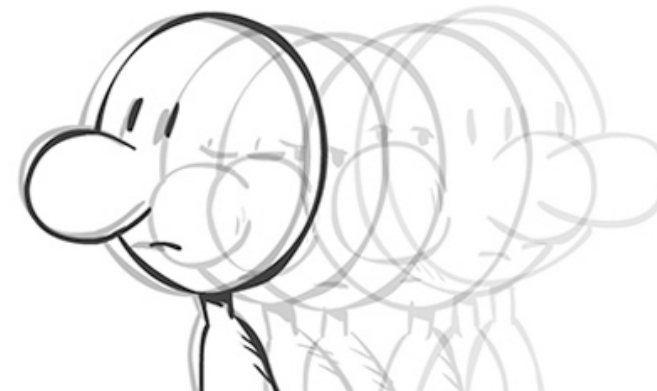
Ref 4

# Vestibular System

Gives us a sense of how we are oriented in space

Where?

**Our inner ear (left and right)**



What information?

**Head movement based on gravity  
and acceleration**



Ref 4



# Somatosensory System

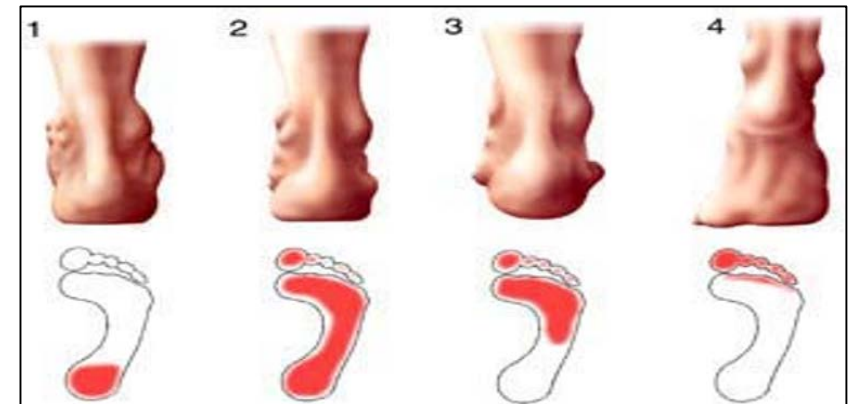
Tells us about body sway and foot contact to the ground

Where?

**Skin, muscles, tendons, and other tissues**

What information?

**Touch, vibration, temperature, pressure, and more**



Ref 4

# Peripheral Neuropathy is Common

## What is Peripheral Neuropathy (PN)?

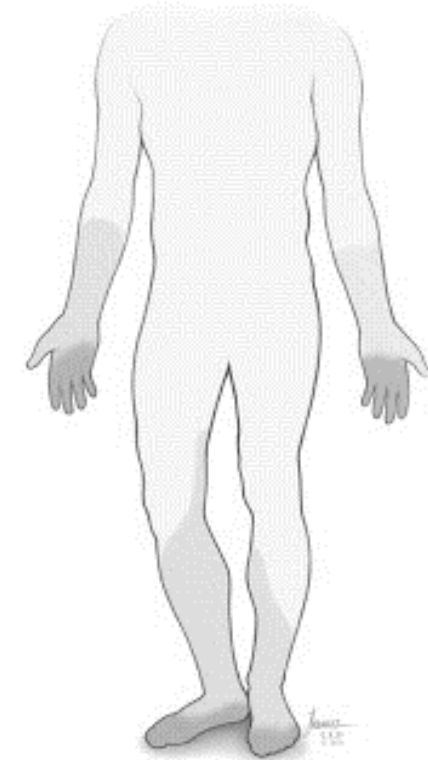
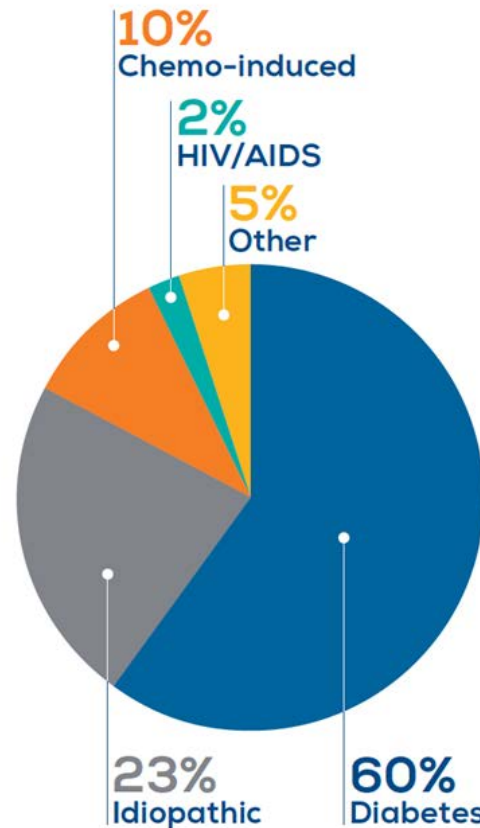
- Damage to nerves of the peripheral nervous system that communicate messages to and from the brain and spinal cord
- Commonly leads to numbness, tingling, pain, loss of balance<sup>1</sup>

## Prevalence...

- More than 20 million Americans are affected<sup>1</sup>
- 8% of individuals over the age of 55 display symptoms and sensory loss<sup>2</sup>

## Etiology

Ref 3



## Presentation...

- Typically begins with changes to feeling and sensation
- Starts in the feet and progresses up the legs
- Usually both legs are affected equally

# Research Links Peripheral Neuropathy to Falls

PN

- Peripheral Neuropathy linked to increased risk of falling<sup>6,7,8</sup>.

DPN

- Diabetics with peripheral neuropathy are at a 5x increased risk for falling compared to diabetics without peripheral neuropathy<sup>8</sup>.

CIPN

- Chemo-induced peripheral neuropathy linked to increased risk of falls<sup>9</sup>.

Fall Injuries

- Fall-related injuries including hip fractures are up to 15x more likely in patients with peripheral neuropathy compared to a healthy individual<sup>10</sup>.

Quality of Life

- Older adults with a fear of falling limit activities and social engagements resulting in further physical decline, depression, social isolation, and feelings of helplessness<sup>17</sup>.

Economics

- One in four Americans aged 65 and older fall each year, costing the US healthcare system over \$50 billion annually<sup>18</sup>



## Poll Questions:

- Do you have numbness in your feet?
- Do you have difficulty with your balance?

# Reduced Sensory Input with Peripheral Neuropathy

Damage to the somatosensory system.

Decreased ability to detect body sway.

Brain receives less balance information.

Poor or staggered gait, with increased risk for falls and injury.

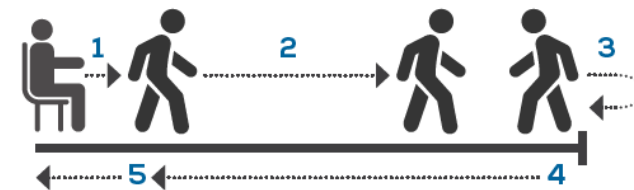


# Balance Assessments in the Clinic

"How confident are you that you will not lose your balance or become unsteady when you ..."

- Healthcare providers can complete balance assessments in the clinic with the patient to:
  - Track patient progress
  - Determine fall risk
  - Create a plan of care
  - Create mobility goals
  - Refer to other providers
  - Provide treatment and interventions
- Physical therapists often evaluate and treat balance impairments through balance training and interventions

Timed Up and Go (TUG) Test:

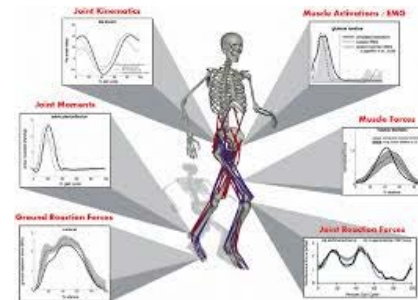
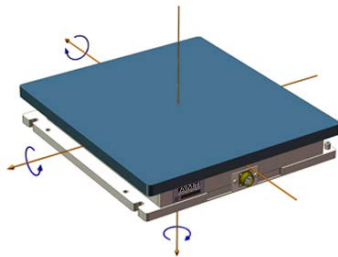
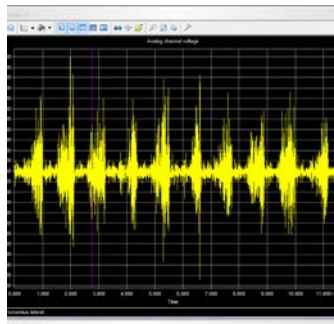


# How do we know what we know about balance?

# Common Tools in the Research Lab

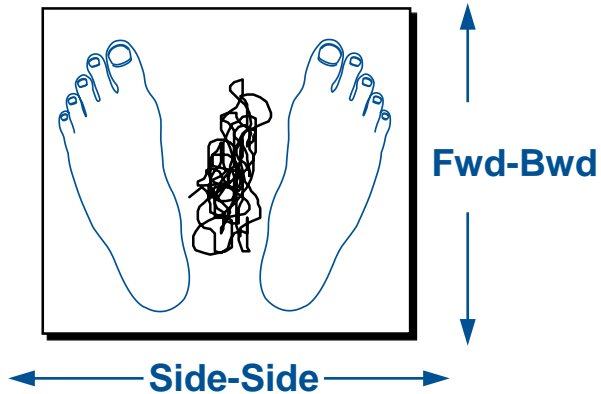
- Electromyography (EMG) – measures when muscles are active
- Force plates – measures ground reaction forces and center of pressure
- Motion capture systems – measures movement
- Biomechanical modeling – to simulate and understand complex systems

Ingenuity of the Scientists asking the right questions in thousands of research studies!

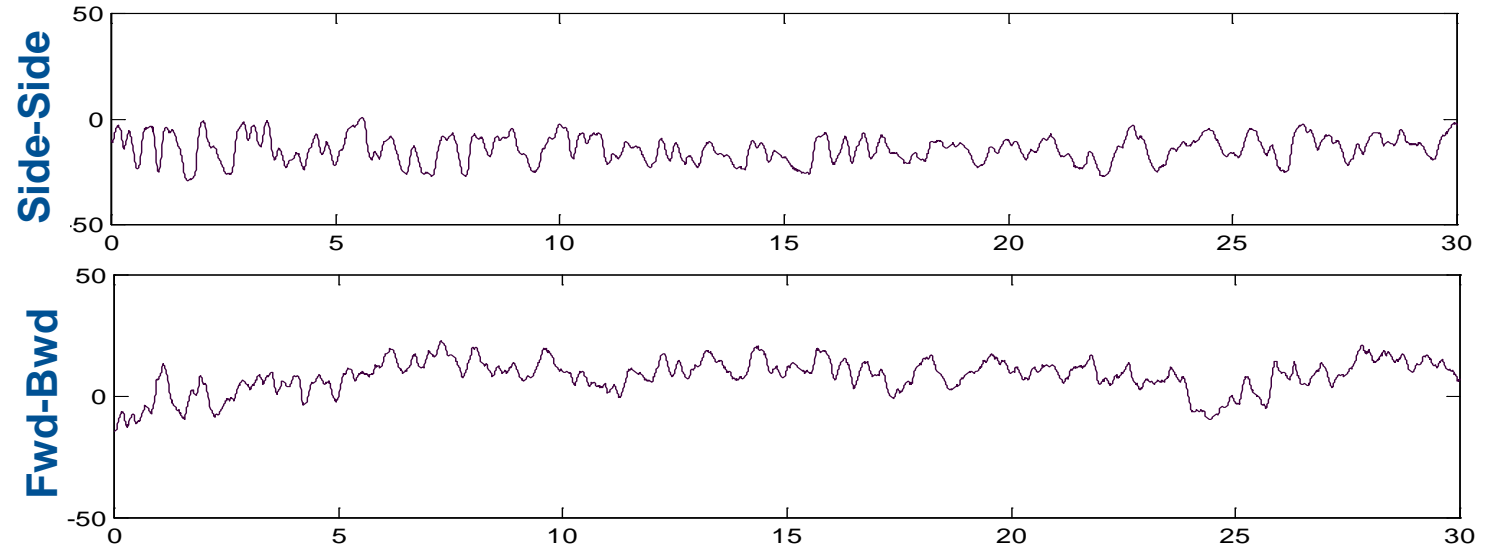


# What does “Balance” look like?

## Stabilogram



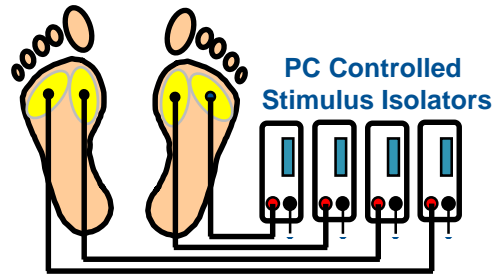
## CENTER OF PRESSURE DURING STANDING



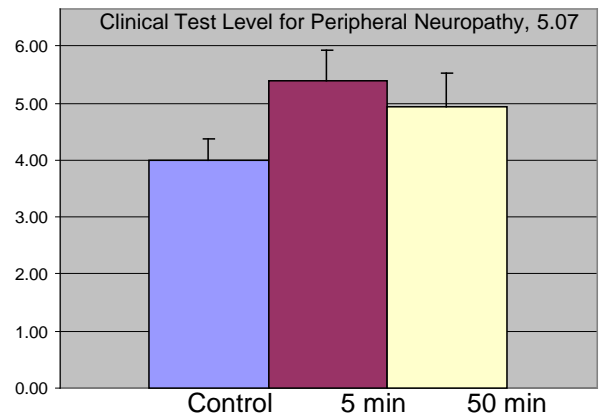
# The Role of Foot Sensation for Balance Control

Let's numb the feet and test balance!

Electrical delivery of anesthesia



Effects of Iontophoretic Anesthesia



Ref 11

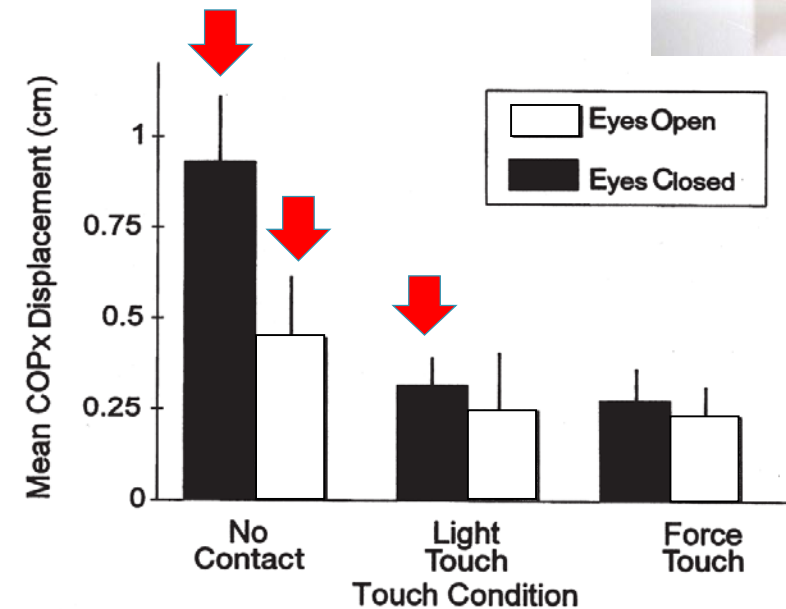
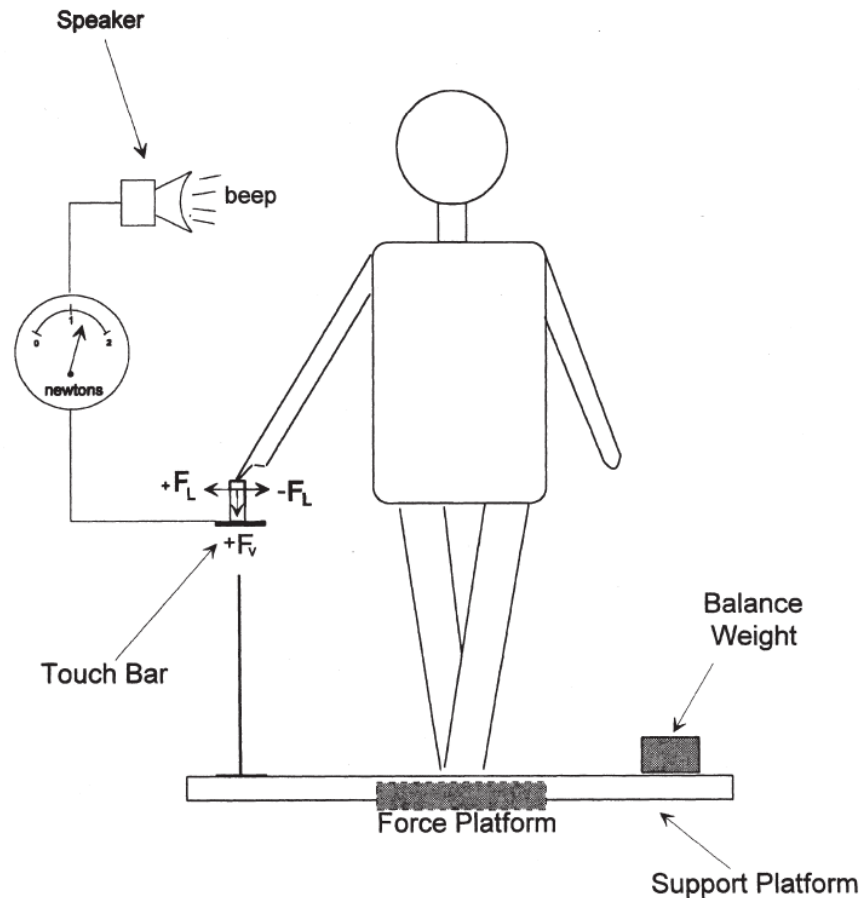
Injection of anesthesia, 8-15 locations



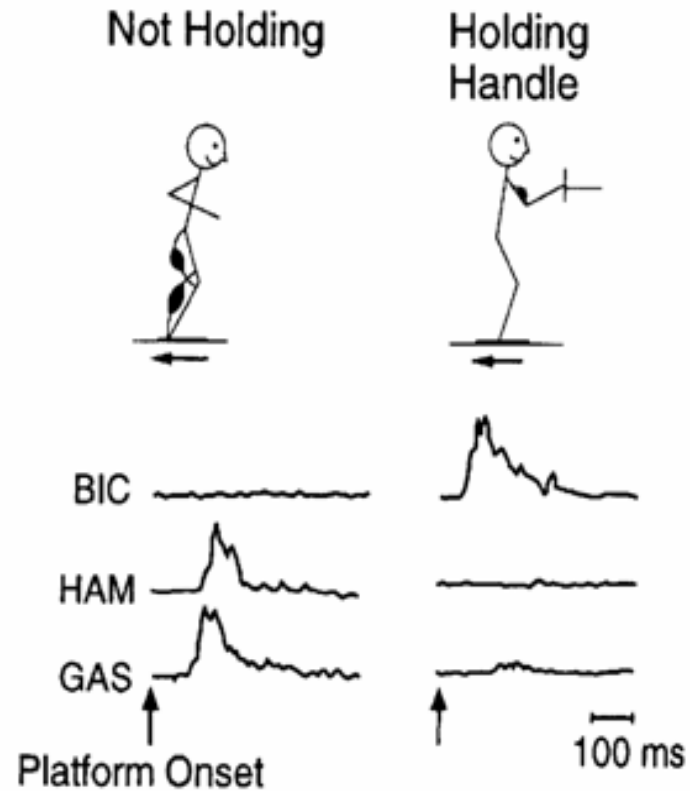
Ref 12

- Body sway is altered
- Balance corrections delayed
- Increased risk of falls

## “Light Touch” helps your Balance Even More than Vision

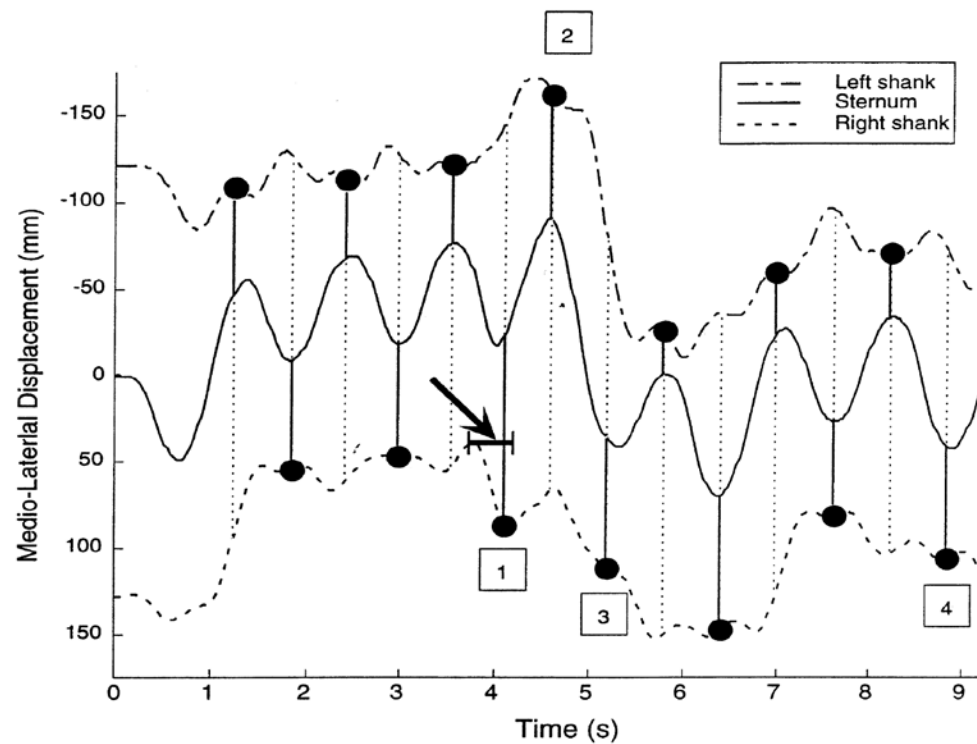


# Balance Control is Context Specific



- The brain can **very** quickly activate exactly those muscles that are able to control balance for a specific situation
- This happens **faster** than our voluntary reactions

# Balance Control During Walking



- When you walk, the brain figures out precisely where, left-right, to place an upcoming step to keep your balance.

# You Can Train Your Balance



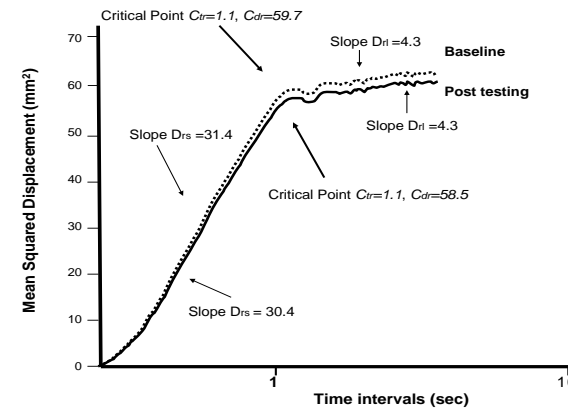
Certain principles are crucial:

- Specificity
- Progression
- Functional

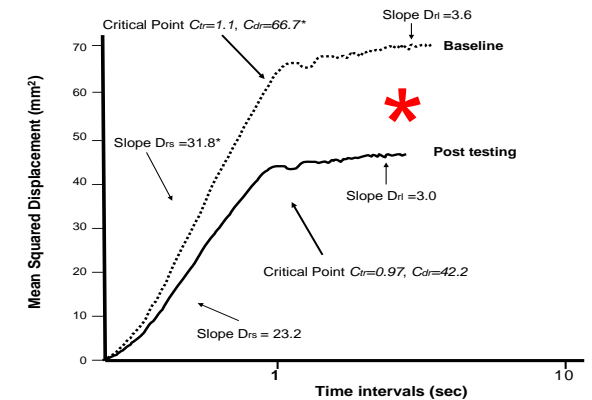
AND

- Use it or lose it....

## Control Group



## Experimental Group



Ref 16 & 17

## Poll Questions:

- Have you fallen?
- Have you had balance training or physical therapy for your balance?

# In Conclusion...

- Our brain uses sensory information to help detect and maintain our balance
  - Vision
  - Inner ear (vestibular system)
  - Feeling in our feet and legs (somatosensory system)
- Peripheral neuropathy is a condition that often results in reduced sensation in the feet → increasing risk for falls
- Healthcare providers, particularly physical therapists, can complete balance assessments and provide balance training and interventions

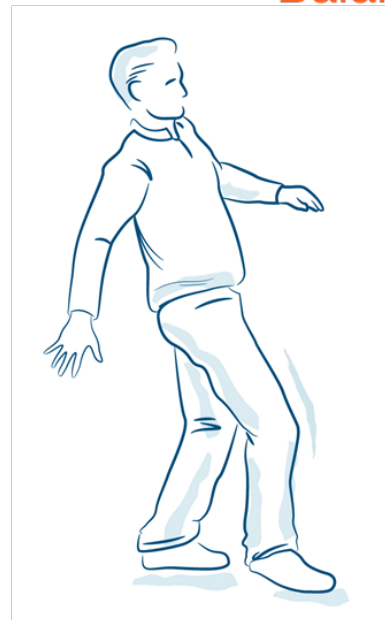




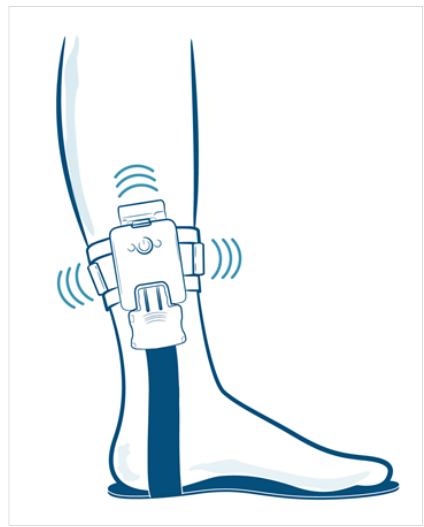
## A New Balance Solution

Lower Limb Sensory Prosthesis

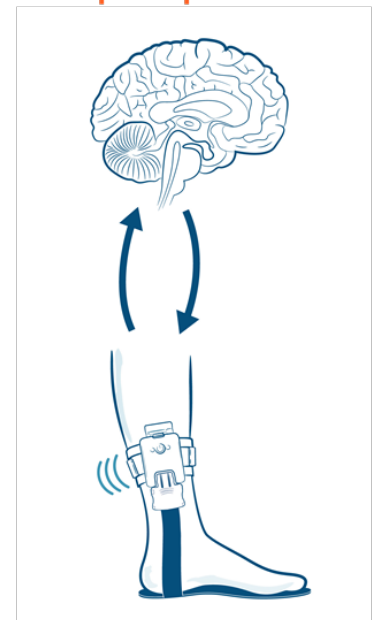
Balance and mobility for people with peripheral neuropathy



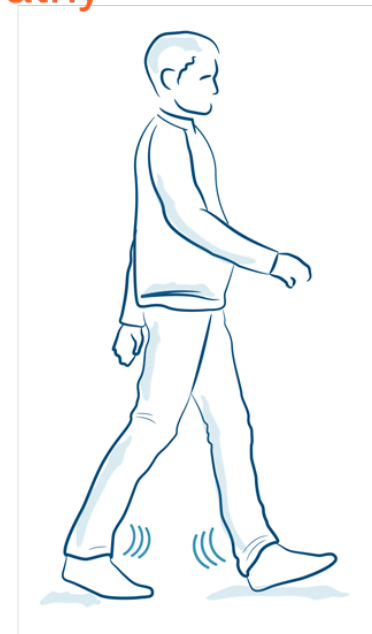
Lost foot sensation due to Peripheral Neuropathy causes unsteady walking, often leading to falls.



Walkasins® evaluates balance and delivers gentle sensory signals to functioning nerves around the lower leg.

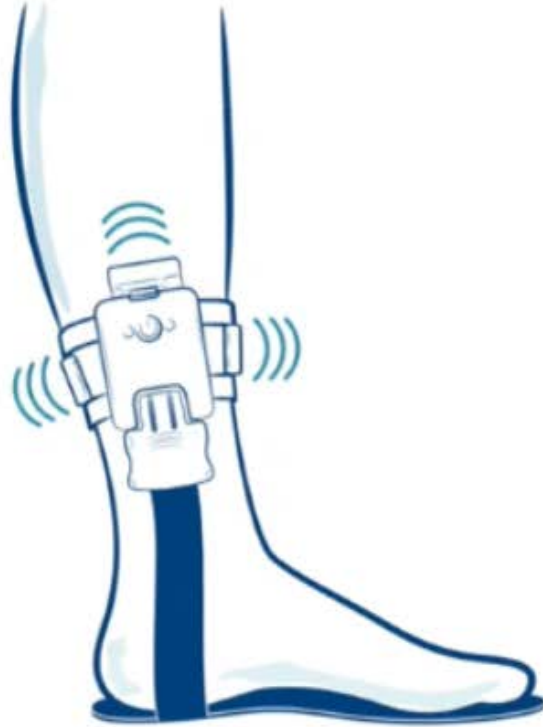


This new sensory information is integrated by the brain to help replace lost foot sensation.



Balance and gait are improved, restoring mobility and confidence.

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For Peripheral Neuropathy



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## Questions?



# *The Foundation for Peripheral Neuropathy* Patient Education Webinar Series

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**Do you like us?** Please consider supporting us so that we can continue to fulfill our mission of improving the lives of people living with Peripheral Neuropathy. You can give securely online, via mail or via phone. Every dollar matters!

**Can we help with anything else?** Call 847-883-9942 or email [info@tffpn.org](mailto:info@tffpn.org). You may also mail inquiries and donations to *The Foundation for Peripheral Neuropathy* at 485 Half Day Road, Suite 350, Buffalo Grove, Illinois 60089.