Objectives

- Overview of basic balance physiology
- Discuss factors that contribute to balance issues in individuals with CMT
- Discuss balance strategies and need for individualized physical therapy and exercise recommendations

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What is Balance?

- The “ability to maintain the center of mass within the base of support” (stability limits-boundaries)
- Also referred to as postural stability
- Instability → FALLS
- Intrinsic
- Extrinsic
Factors Contributing to Instability and Falls

**INTRINSIC**
- Strength
- Sensation
- Confidence
- Cognition
- Medications
- Blood Pressure

**EXTRINSIC**
- Slippery or uneven surfaces
- Poor lighting
- Clothing/footwear
- Stairs
- Pets

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Consequences of Instability and Falls

- Injury
- Loss of functional abilities
- Fear of falling
- Self-restricted activity levels
- Decreased QOL

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Systems Contributing to Balance

- Sensory
  - Vision
  - Vestibular
  - Somatosensory

- CNS

- Motor
  - Range of motion
  - Strength

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Example

- Center of Mass (COM) moves forward. Sensory systems activated
- CNS processes information
- CNS generates and sends out message to motor systems to activate - in this case, the plantar flexors are activated to return the COM back to neutral
- Glutes, hamstrings and paraspinal muscles are also activated.
Ankle strategy

Ankle strategy - postural adjustments are made around the ankle joint.

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If perturbation is too great or too fast, or if the muscles necessary to make postural adjustments are too weak, use hip strategy or stepping strategy.
Balance and CMT

- Changes in sensory
  - Sensory nerves
- Changes in motor abilities
  - Nerve-muscle junction
  - Muscle

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Literature Review

- 66 individuals with NMD (Pieterse, 2006)
  - 31% PN
  - 14/17 sustained a fall
  - Fear of falling, self-imposed activity restriction

- N=94 individuals with CMT (Ramdharry, 2011)
  - 89% reported falls
  - While walking- legs gave out, tripping, uneven surfaces, loss of balance

- N= 27 individuals with CMT (Eichinger, unpublished)
  - 48% fell
  - Balance confidence=57.2% (47.2%; 66.5)
Intervention

- Address intrinsic and extrinsic factors
- Individualized
  - Many different types of CMT
  - Team approach
Intervention

- CMTA Centers of Excellence
- Advisory Board

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Intervention

Find a PT  www.apta.org

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Find a PT

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Interventions to Address Intrinsic Factors

- Strengthening
- Stretching
- Multi-sensory balance training

Physical Activity and Exercise!
Literature Review

- Challenges of producing evidence
  - Rare condition
  - Heterogeneous population
  - Intervention variability (type, dose)

- James Nussbaum, PT - CMTA webinar
  12/19/13

- Benefits vs. overwork weakness

- Evaluation of healthcare team and CMT experts
Physical Activity Guidelines

http://www.health.gov/PAGuidelines/guidelines

Guidelines for children, adolescents, adults and older adults

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Individuals with chronic conditions that aren’t able to follow the guidelines are recommended to perform as much activity as their condition allows and to AVOID INACTIVITY.
Cardiovascular/Aerobic

- 150 minutes (30 min, 5x/week) of moderate intensity
- Episodes of at least 10 minutes
- Moderate intensity activities:
  - Walking briskly, biking on level ground or on a stationary bicycle, using hand cycles, ballroom and line dancing, lawn mowing, snow shoveling, general gardening and household activities
  - Can talk/carry on conversation; but can’t sing

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Strengthening

- 2x/week
- All major muscle groups
- Functional strengthening vs. machines
- Moderate intensity = 12-15 repetitions
- Types of resistance:
  - Gravity
  - Aquatic
  - Elastic bands
  - Free weights
Stretching

- 3x/week or Daily
- Hold static stretches for 10-30 seconds and repeat 2-4 times to attain 60 seconds of stretch
- Perform when muscle is warm
  - Light cardiovascular activity
  - Hot bath or shower
- Dynamic stretching such as yoga may also be beneficial
Safety

- Choose activities appropriate for fitness level and health goals
- Increase physical activity/exercise gradually
  - “start low and go slow”
- Protective equipment
Getting Started

- Baseline evaluation
  - Strength
  - Function
  - Exercise capacity
- Daily activities (family/work)
- Leisure interests
- Goals

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Interventions to Address Extrinsic Factors

- Bracing
- Assistive Devices
- Environmental
Bracing

- Foot-Orthosis
- Ankle-Foot-Orthosis
- Semi-Rigid

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Armac.us
Allardusa.com
Braceshop.com
Assistive Devices

- Canes, walkers, walking stick
  - Adds sensory input
  - Widens base of support
- Wheelchairs/scooters
Environmental Considerations

- Non skid surfaces
- Lights
- Grab bars/ handrails
- Supportive footwear
Questions?

General Exercise Recommendations?
- Consult MD prior to engaging in new activity
- Minimize disuse weakness, age related weakness
- Proximal muscles- hip/quads/core
- Focus on muscles that are able to move against gravity

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Questions?

General Exercise Recommendations?
- Biking/elliptical over treadmill/walking
- Balance activity level/fatigue
- Stretching
- CMTAthletes
Questions?

- Physical Therapy?
  - Evaluation of strength, function
  - Make recommendations regarding physical activity/exercise, bracing, assistive devices, environmental modifications, energy conservation
    - To maintain optimal health
    - To prevent/delay secondary complications
    - To maximize functional abilities
    - To maintain or improve quality of life
Questions?

- Assistive Devices? Help or hinder?
  - Improve sensory input
  - Increase base of support
  - When?