



# Rehabilitation for the Older Adult with MS

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## + Objectives

- Identify physical changes seen with aging
- Appreciate the need for future clinical research for the aging adult with MS
- Identify fall risk factors of older pwMS
- Identify treatment strategies for patients focused on the elements of their balance deficits
- Present video case studies to best promote clinical application of these concepts





## Aging and MS

- 50% of individuals live over 30 yrs after MS diagnosis. ref: Gray
- 45% of people with MS (pwMS) are over 55 y/o ref: Minden
- However aging with MS remains an understudied area
- Possibly due to complicated nature of differentiating age - related vs MS-related processes



## Aging with MS

- The clinical course of MS and neurological symptoms are age related. ref: Trojano
- Symptoms such as gait disability, B&B dysfunction and cognitive decline do increase in prevalence and severity as a function of disease duration
- 65% of pwMS are still walking after 20 yrs ref: Shapiro
- 50% will need an assistive device to ambulate within 10 years of diagnosis. ref: Weinschenker



## Changes seen with normal aging

- Loss of muscle mass (sarcopenia) due mostly to a decline in # of MM fibers
- Slowed conduction velocity of NS due to age-associated loss of motor neurons
- Reduced cardiopulmonary reserve
- Impaired temperature regulation
- Increase in co-activation of antagonist MM during voluntary contraction



## Benefits of Exercise for individuals with MS

- Improvement of function while lessening disability
- Enhancing quality of life
- Improvement in muscle power & exercise tolerance
- Improvement in emotional mood
- No adverse effects on fatigue

Limited research on effect of exercise with older individuals with MS



## Inactivity in MS vs Axonal Loss

- Much of the weakness and lack of cardiorespiratory fitness noted in MS is caused by inactivity and disuse rather than primary effects of the disease ref: Tantucci, Kent-Braun, Sandoral
- Impairments from disease process (demyelination & axonal degeneration) are probably not reversible with exercise. Impairments from deconditioning probably are reversible.



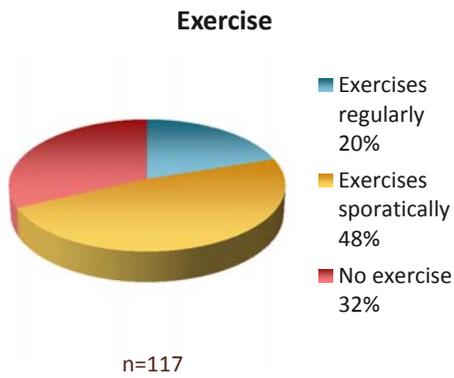
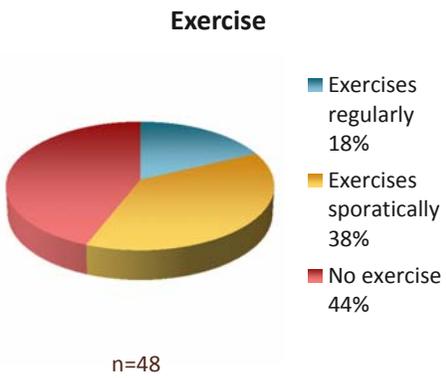
## Who is exercising?

- An alarming rate of physical inactivity among older adults, particularly those aging with a disability. ref Motl
- Canadian survey:
  - Older adults with MS were less likely to engage in regular activity (26.7%) vs older Canadians (45.2%)
  - Mean age: 64.6 yrs/old
  - Average length of diagnosis: 32.9 yrs (ref: Ploughman)

# Who is exercising?

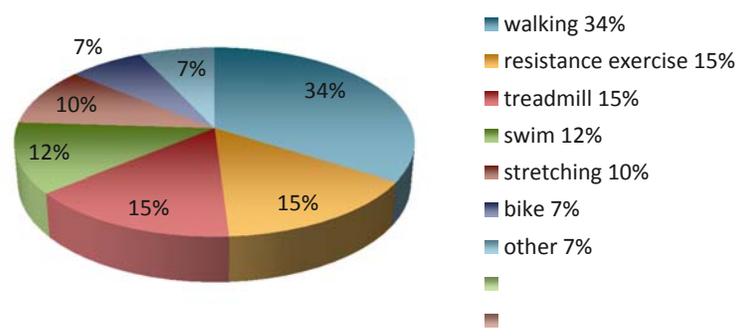
Older Adults with MS  
55 – 75 y/o

Younger Adults with MS  
18 – 54 y/o



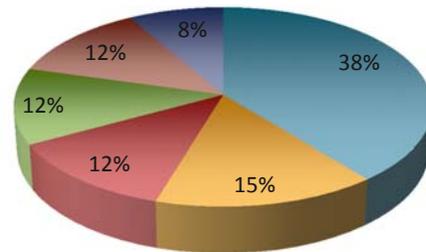
# Types of Exercise

Types of Exercise with Older pwMS





## Challenges to exercise for older pwMS



- fatigue 38%
- weakness 15%
- time restraints 12%
- pain 12%
- other 12%
- not sure what kind of exercise to do 8%



## Recommendations for Exercise Prescription

- Exercise sessions should involve discontinuous work, carefully balancing exercise with adequate rest periods
- Precautions should be taken to prevent the deleterious effects of overwork, monitor the effects of fatigue and manage core body temperatures.
- Functional training activities can be used to promote strength and functional endurance



## Fall Risk Factors for Older Adults and Individuals with MS

Community dwelling older adults ref: Rubenstein	Individuals with MS ref: Cattaneo 2012	Older adults with MS ref: Finlayson 2006
Hx of previous falls	Use of an assistive device	Fear of falling
Balance & gait deficits	Balance & gait deficits	Balance & gait deficits
Visual impairments		Deteriorating MS status
Medications		Incontinence of bladder
Cognitive deficits		Poor concentration
Use of an assistive device		

*Many of the symptoms of MS are consistent with fall risk factors among community-dwelling older adults.*



## Fall Prevalence Rates

- Community dwelling older adults: 30% fall/year ref: Hausdoff
- A study by Finlayson (2006) found that of pwMS aged 45-90 yrs old, 52% experienced a fall in last 6 months.
- Another study found 64% of pwMS ages 55-94 years old reports at least 2 falls per year. ref: Peterson 2008

## + Interventions to Reduce Fall Risk in MS

- Sensory Integration
- Perturbation-based balance training
- Core strengthening through Pilates
- Drop-foot stimulator
- Locomotion training

## + Sensory Integration

- The CNS processes multiple sensory inputs concurrently and modulates the central gain of sensory systems
- pwMS frequently have impairments in peripheral systems as well as involvement in primary regulators of central sensory integrations





## Reactive Balance Training in Older Adults

- Balance training programs may achieve greater fall reduction by targeting specific aspects of balance control that are more directly related to specific balance systems
- Perturbation-based balance training is an intervention that incorporates exposure to repeated postural perturbation to evoke rapid balance reactions
- Research has shown the “faller” require more steps to recover balance vs “non-fallers” during perturbation. ref Maki
- “Fallers” are more reliant than “nonfallers” on using arm reactions



## Reactive Balance Training in pwMS

- Although the causes of falls are complex, it is ultimately the ability to respond effectively to a sudden, unexpected balance perturbation that determines whether a fall occurs Ref: Maki
- Trips/slips while walking accounted for 48% of falls in MS. Ref: Shumway-Cook 2011
- pwMS have balance impairments characterized by delayed responses to postural perturbation. Ref: Cameron

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## Compensatory Step Training

Unsuccessful stepping



Compensated step



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## Functional Electric Stimulation for Foot Drop

- Drop foot stimulator showed improved functional mobility and was associated with fewer falls in pwMS ref: Esnouf



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## Case Study

- RB a 62 y/o male with secondary progressive MS who was referred to clinic for a Walkaide trial and balance retraining.
- Meds: betaseron, ampyra
- CC: fatigue, foot drag and falls, currently uses a toe strap.
- Fall hx: 1 x/3 mos



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## Case Study

- Clinical Assessment:
  - Left LE weakness: hip flexors 3, pf 2, df trace
  - PROM: left ankle df lacks 5 deg from neutral
  - Sensation: impaired vibration to 3 sec, mildly impaired position sense.
- Functional Assessment:
  - Velocity: 48.9 cm/sec on Gaitrite using str cane
  - 6MWT 500 ft with 10 toe drags with cane & toe strap
    - (norm 1876 ft)
  - ABC 17%
  - TUG: 16 sec with cane



## Case Study

- Interventions:
  - Gait training using Walkaide device
  - Interval TM training with cooling device during rests
  - Dynamic gait training (obstacles, head turns, multidirections)
  - Perturbation-based balance training
  - LE functional strengthening

## Case Study

- Clinical Assessment:
  - Left LE weakness: hip flexors 3/5, pf 2, df trace **hip 3+ pf 3**
  - PROM: left ankle df lacks 5 deg from neutral, **ankle to neutral**
  - Sensation: impaired vibration to 3 sec, mildly impaired position sense.
- Functional Assessment:
  - Velocity: 48.9 cm/sec **64.6 cm/sec**
  - 6MWT 500 ft with 10 toe drags with cane & toe strap **650 ft. with walkaide and no toe drags**
  - ABC 17% **53%**
  - TUG: 16 sec with cane **13 sec**
  - **No falls during 2 month period**

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## Pilates Training

- Although the scientific evidence on the benefits of Pilates is not sufficient, there is an increasing interest towards Pilates in pwMS
- Recent study following an 8 week mat Pilates program, with individuals with EDSS score of 4 -6.5 showed significant improvements in ABC scale, Berg Balance test, TUG and muscle strength.

ref: Guclu-Gunduz

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## Pilates Training





## Locomotion Training

- LT using treadmill training with body weight support (BWS) has been focus of increasing attention due to work with SCI population.
- In studies involving persons with MS using LT and BWS, improvements in MM strength, spasticity, endurance, balance, walking speed & QoL have been reported ref Glesser, Mansour



THANK YOU!



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