

Exercise and MS



ANGELI MAYADEV MD

Outline



- Exercise Guidelines
- Types of Exercise Recommended
- Exercise Issues specific to MS
- Compliance
- Tracking devices
- Practical Clinical Recommendations

General Exercise Guidelines



- Guidelines from the AHA and the ACSM :
- -A minimum of 30 minutes of moderate-intensity aerobic activity on five days each week, or a minimum of 20 minutes of vigorous-intensity activity on three days each week, or some combination of the two [18]. Exceeding the recommended minimum amount of physical activity will lead to greater health benefits.
- Muscle strengthening
 - A minimum of two non-consecutive days of the week and should target 8 to 10 major muscle groups (abdomen, bilateral arms, legs, shoulders, and hips).
 - Individuals should strive to perform 10 to 15 repetitions of each exercise at a moderate to high level of intensity and gradually increase resistance over time.

- Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. AUNelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, Macera CA, Castaneda-Sceppa C, American College of Sports Medicine, American Heart Association SO. *Circulation*. 2007;116(9):1094. Epub 2007 Aug 1.

Guidelines Con't



- Flexibility Training
- Flexibility exercises should be performed twice a week for at least 10 minutes

- Balance Training

Balance training may involve activities that challenge gait patterns, such as heel-to-toe walking; increase awareness of use of the center of gravity for basic movements; and augment different sensorial systems involved in balance maintenance

Measurement of Intensity



- MET:

A metabolic equivalent (MET) is an estimate of oxygen consumed at rest. A three-MET activity would be an activity that utilizes roughly three times the amount of resting energy expenditure. Activities between three to six METs are considered moderate, and activities greater than six METs are considered vigorous

- (3.5 mL O₂ uptake/kg per min).
- Borg Rating of Perceived Exertion

Max and Target HR



- For moderate-intensity physical activity, a person's target heart rate should be 50 to 70% of his or her maximum heart rate. This maximum rate is based on the person's age. An estimate of a person's maximum age-related heart rate can be obtained by subtracting the person's age from 220.

For example, for a 50-year-old person, the estimated maximum age-related heart rate would be calculated as $220 - 50 \text{ years} = 170$ beats per minute (bpm). The 50% and 70% levels would be:

- 50% level: $170 \times 0.50 = 85$ bpm, and
- 70% level: $170 \times 0.70 = 119$ bpm
- For vigorous-intensity physical activity, a person's target heart rate should be 70 to 85% of his or her maximum heart rate

For example, for a 35-year-old person, the estimated maximum age-related heart rate would be calculated as $220 - 35 \text{ years} = 185$ beats per minute (bpm). The 70% and 85% levels would be:

- 70% level: $185 \times 0.70 = 130$ bpm, and
- 85% level: $185 \times 0.85 = 157$ bpm

Guidelines for Exercise in MS



- 2013 Consensus

Canadian Society of Exercise Physiology

MS Society of Canada

Canadian Institutes of Health Research

Guidelines for Exercise in MS



- Researchers reviewed all literature
- Consensus panel met to review research
- Consensus panel developed Guidelines based on research
- Guidelines circulated to experts for review and feedback

Canadian Physical Activity Guidelines for Adults with Multiple Sclerosis

	Aerobic Activity	Strength Training Activity
How often?	Two times per week <ul style="list-style-type: none">• Aerobic and strength training activities can be done on the same day• Rest your muscles for at least 1 day between strength training sessions	Two times per week
How much?	Gradually increase your activity so that you are doing at least 30 minutes of aerobic activity during each workout session.	Repetitions are the number of times you lift and lower a weight. Try to do 10 to 15 repetitions of each exercise. This counts as one set. Gradually work up to doing two sets of 10 to 15 repetitions of each exercise.
How hard?	These activities should be performed at a moderate intensity. Moderate-intensity physical activity is usually a 5 or 6 on a scale of 10, and causes your heart rate to go up. As a general rule, if you are doing moderate-intensity activity you can talk, but not sing a song, during the activity.	Pick a resistance (free weights, cable pulleys, bands, etc.) heavy enough that you can barely, but safely, finish 10 to 15 repetitions of the last set. Be sure to rest for 1 to 2 minutes between each set and exercise.
How to?	Some options for activity include: Aerobic activities <ul style="list-style-type: none">• Upper body exercises: arm cycling• Lower body exercises: walking, leg cycling• Combined upper and lower body exercises: elliptical trainer	Strength training activities for the upper and lower body <ul style="list-style-type: none">• Weight machines• Free weights• Cable pulleys

Guidelines for Exercise in MS



- American Academy of Neurology (AAN) systematic review on rehabilitation in multiple sclerosis (MS) 2015:
 - Comprehensive multidisciplinary outpatient rehabilitation (six weeks) is possibly effective for improving disability/function as measured by functional independence measure (1 Class II study).
 - Weekly home PT or outpatient PT (eight weeks) is probably effective for improving balance, disability, and gait. (1 Class I study)
 - Motor and sensory balance training or motor balance training (three weeks) is possibly effective for improving static and dynamic balance.
 - Motor balance training (three weeks) is possibly effective for improving static balance (1 Class II study).

Exercises in MS



- Passive Exercise: Stretching
- Strengthening specific muscle groups: Bands or active repetitions or weights
- Aerobic Exercise
- Balance Exercise
- Core exercise

MS Benefits of Exercise



-General medicine benefits

MS specific in the literature:

-Physical fitness

-Walking mobility

-Balance

-Fatigue

-Depressive symptoms

-Quality of life

-Cognition: Ongoing Study: Study of Exercise on Impact of Cognitive Functioning in Multiple Sclerosis Patients

Processing speed: 1 outcome measure

125 pts : 50/50 aerobic exercise group compared to the stretching and toning group (attention control)

-Brain Derived Neurotrophic Factor

Brain derived neurotrophic factor (BDNF) is suggested to play a neuroprotective role in multiple sclerosis (MS)

“Brain derived neurotrophic factor in multiple sclerosis: effect of 24 weeks endurance and resistance training” Wens I1, Keytsman C1, Deckx N2, Cools N2, Dalgas U3, Eijnde BO1.

Eur J Neurol. 2016 Jun;23(6):1028-35

AEROBIC EXERCISE

- Caveats

- Keep body temperature from increasing: cooling products
- “Motor Uthoff” effect

MS persons also demonstrate a training effect- lessens as disease progresses

Aerobic exercise does not produce exacerbations

MS Exacerbations



- To speed up the recovery, the current standard of care for MS relapses calls for a course of intravenous (IV) corticosteroids. Commonly, among patients with motor relapses, this is followed by a course of physical or occupational therapy (PT/ OT). However, the optimal timing of therapies in relationship to the IV steroid treatment has not been established.
- Ferri Khan et al. Inpt rehabilitation
- Craig et al. (2003) conducted a randomized controlled trial among MS patient experiencing an exacerbation, comparing patients who received comprehensive multidisciplinary team care (including rehabilitation) to the patients who received standard therapy (intravenous steroids alone). The study showed benefit in the treatment arm. No Control Group

MS Exacerbations



- Multidisciplinary rehabilitation and steroids in the management of multiple sclerosis relapses: a randomized controlled trial

Nedeljkovic U1, Dackovic J2, Tepavcevic DK3, Basuroski ID2, Mesaros S2, Pekmezovic T3, Drulovic J2.

- Forty-nine patients were included in the study and randomized to control and treatment groups, and 37 completed the study. High-dose methylprednisolone was administered to all patients. The treatment group additionally underwent an Rehab program over a 3-week period. All outcome measures were completed at baseline and 1 and 3 months later. FIM and EDSS improved

-Research Abstract Barcelona MS Center: ECTRIMS 2016

- Current open research protocol to investigate whether physical therapy or occupational therapy concurrent with IV steroid treatment is superior to the current approach of IV steroids alone in improving the recovery following the acute motor MS relapses.
- Difficult to Recruit

BALANCE EXERCISES

- Dynamic Balance

- BEEMS paper: Neurology 2018

Efficacy of Balance and Eye-Movement Exercises for Persons With Multiple Sclerosis (BEEMS)

Jeffrey R. Hebert, PT, PhD, John R. Corboy, MD, Timothy Vollmer, MD, Jeri E. Forster, PhD, and Margaret Schenkman, PT, PhD

88 pts : BEEMS vs Control: 6 week protocol, improvement on dynamic posture

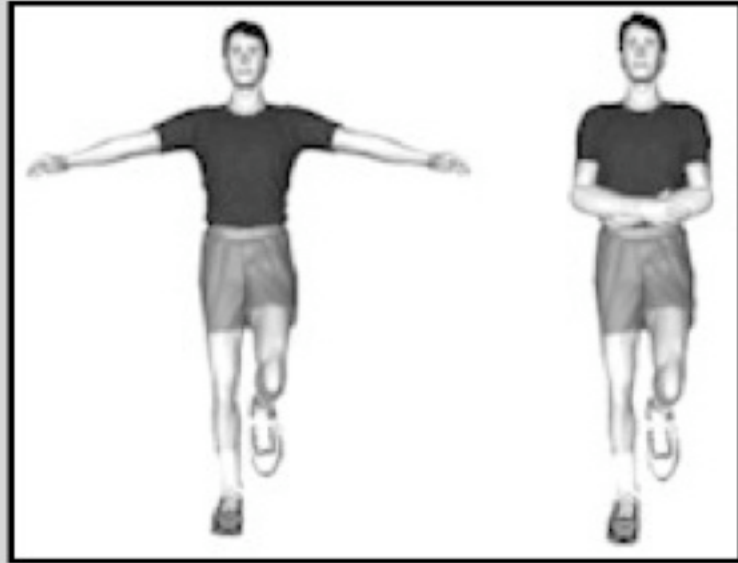
- Lunge exercise and single leg stance and squats or with props or against a wall
 - In a corner – turning head or moving eyes back and forth

- Pool:

Buoyancy allows increased functions in more severe MS

Water should not be hot ($\leq 84\text{F}$ or 29C)

Popular with patients



One Leg-Balance Progression

- While standing near a wall/chair (for safety), balance on one foot for 10 seconds (eyes open)
- When you can perform 10 seconds without wobbling, try it arms out to your side, 1 arm, then folded on your chest
- Once you mastered these exercises, try them with your eyes closed
- Progress to increased time of 20-30-60 seconds
- Incorporate wobble boards, balance disc, foam roll, or other means of balance-challenge, moving leg front and backwards.



CORE EXERCISES

- Strong Core contributes to better gait and WC sitting balance
- NM Scoliosis- Work on Core
- Swimming: Core Exercise

Back and Core Strength #1

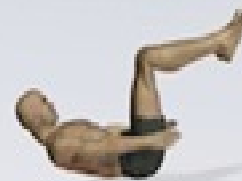
#1 Tabletop



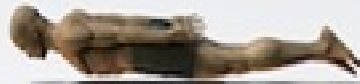
#2 Bridging



#3 Pilates Crunch



#4 The Dart



#5 Front Bridge



#6 The 100



#7 Airplaning



whyexercise.com

Body Core Exercises

Ball Push Up



Keep core (abs, glutes, legs) contracted while balancing on ball in push up position.

Push off ball into full extension. Keeping core contracted helps maintain balance and control.

Ball Knee Tuck



Place shins on ball. Maintain rigid torso parallel to ground by keeping core contracted.

Bring knees into body as the ball rolls with the feet. Maintain contraction in abs and keep back flat.

Ball Reverse Crunch



Grip ball with feet and hamstrings. Contract abs while keeping back flat.

Raise knees to chest while maintaining ball in between legs. Maintain contraction in abs while keeping back flat.

Lateral Pillar Bridge



Place elbow under shoulder. Contract core and raise torso, keeping body rigid. Hold for 10 seconds and repeat.

Pillar Bridge



Place elbows under shoulders. Contract core and raise torso, keeping body rigid. Hold for 10 seconds and repeat.

Compliance



- Ways to increase Compliance: Fewer than 20% of MS pts meet MS exercise guidelines
- Formal PT/OT sessions
- Joining a gym or asking about gym policies after therapy ends- Open Gym
- Personal Trainer
- Group exercise
- Exercise Classes
- Fitness Trackers/Apps

Measurement of Steps



- Fitbit, Pedometer, Fitness Trackers : Motivation

More accurate for distance (GPS) vs steps:

- Steps depend upon stride length

Average: Walking 20 minutes per mile (3 miles per hour): 2,250 steps per mile

- “Steps per day among persons with multiple sclerosis: variation by demographic, clinical, and device characteristics”

Sample of persons with multiple sclerosis (N=645) recruited from the general community who were ambulatory and relapse free for 30 days. Mean age \pm SD of the participants was 46.3 ± 10.6 years old. Participants were mostly women (85%), white (93%), and employed (64%). Step counts measured by a motion sensor during a 7-day period.

The average value for the entire sample was $5,903 \pm 3,185$ steps per day.

Arch Phys Med Rehabil. 2013 Aug;94(8):1534-9-Dlugonsi D1, Pilutti LA, Sandroff BM, Suh Y, Balantrapu S, Motl RW

-UCSF Study-Viable measure

“Continuous Wrist-Worn Accelerometer Captures Change in Average Daily Step Count in People with Multiple Sclerosis Over One Year”

Valerie Block et al. To measure STEPS (average daily step count) captured over 1-year in people with multiple sclerosis using a commercially-available wrist-worn accelerometer (Fitbit Flex).

96 participants (61 relapsing MS, 35 progressive MS), 79 have completed 1-year follow-up (retention 82.3%); 9

withdrew, and 8 were lost to follow-up

Clinical Implementations



- More mobile patients: Walking and Standing throughout the day

Paper on sedentary behavior in MS: (only 20% of MS pts vs 47%)controls met exercise requirements

“Objectively quantified physical activity in persons with multiple sclerosis”

Klaren RE1, Motl RW, Dlugonski D, Sandroff BM, Pilutti LA.

Arch Phys Med Rehabil. 2013 Dec;94(12):2342-8.

Sit to Stands

Less mobile patients: UE exercises, Core, Transfers, Sitting Balance

- Arm ergometer
- Vita Glide: push/pull

Cyberdyne HAL Research Study



- Swedish MS Center: Exoskeleton: 3 months, 2 hrs/ day, 4 days per week- 8 pts through
- TUG, 25ft timed walk, 2 min walk, QOL measures



Final Thoughts



- Reducing sedentary behavior
- NMSS Booklets, MS Society of Canada, Silver Sneakers Program
- MS GYM Online
- Questions