

A RESOURCE FOR HEALTHCARE PROFESSIONALS

# Physical Therapy in Multiple Sclerosis

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**National  
Multiple Sclerosis  
Society**

# The National MS Society's Professional Resource Center provides:

- Easy access to comprehensive information about MS management in a variety of formats;
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- Clinical information to support high quality care; and
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## Introduction

Rehabilitation is an essential component of comprehensive care for persons with multiple sclerosis (MS). MS is an unpredictable, fluctuating disease that progresses over time. Therefore, the rehabilitation team must be knowledgeable about the range of symptoms that can occur and be responsive to their variability from one person to another. Unlike most other neurological disorders, including spinal cord injury, traumatic brain injury, and stroke, there is no “fixed deficit” in MS; symptom profile, disease activity and MRI burden are all variable. Therapists must be prepared to treat each MS patient individually, with flexibility, throughout the disease course.

The majority of people with MS are diagnosed between the ages of 20 and 50, at the peak of their career and childrearing years; however, MS can also occur in children, teens and older adults. Although there is a slight reduction in life expectancy for people with MS, rehab professionals will often attend to the needs of an older population with MS.

In the treatment of people with MS, there are no protocols or time limits – just a unique opportunity to employ numerous problem-solving skills, interventions, and resources. And because MS affects not just an individual, but a whole family, it is a disease that benefits from a team approach—making coordination and communication with other health care providers extremely important.

## MS Overview

MS is a chronic, immune-mediated disease of the central nervous system (brain, spinal cord and optic tracts) that is characterized in the majority of people by relapses (also known as exacerbations) and remissions of neurological symptoms, and variable progression of disability over time. In addition to relapsing forms of MS, a small subset of people have a disease course that is progressive from onset – with few or no clinical relapses over time (known as primary progressive MS).

In MS, the body’s immune system directs repeated inflammatory attacks on the central nervous system, which cause damage to the myelin covering on nerve fibers, the nerve fibers themselves and the cells (oligodendrocytes) that make myelin. Symptoms of MS are highly variable, but commonly include fatigue, mood and cognitive changes, vision problems, sensory loss, pain, coordination problems, impaired ambulation, and elimination dysfunction.

The cause of MS is not known, but current research points to an interaction of genetic, lifestyle and environmental factors.

Treatments for MS, known as disease modifying therapies, may reduce the number of relapses, delay the accumulation of disability and limit the development of new areas of damage in the brain and spinal cord.

### Exacerbation versus Pseudo-Exacerbation:

- Exacerbation (also referred to as a relapse, flare or attack):
  - New or worsening symptoms lasting at least 24 hours
  - Usually associated with inflammation and demyelination in the central nervous system (CNS -- brain, spinal cord and optic nerves)
  - Separated from the last exacerbation by at least 30 days
- Pseudo Exacerbation:
  - Temporary flare-up of symptom(s) lasting less than 24 hours
  - Symptoms not associated with CNS inflammation or damage
  - Possible triggers: increase in core body temperature due to infection, heat or humidity, exercise, bladder or bowel fullness and/or stress
  - Symptoms return to baseline when trigger is minimized/eliminated

## Resources

### For patients

- [nationalmssociety.org/What-is-MS](https://www.nationalmssociety.org/What-is-MS)
- [nationalmssociety.org/What-is-MS/Types-of-MS](https://www.nationalmssociety.org/What-is-MS/Types-of-MS)
- [nationalmssociety.org/Treating-MS/Managing-Relapses](https://www.nationalmssociety.org/Treating-MS/Managing-Relapses)
- [nationalmssociety.org/Treating-MS/Medications](https://www.nationalmssociety.org/Treating-MS/Medications)
- [nationalmssociety.org/Treating-MS/Rehabilitation](https://www.nationalmssociety.org/Treating-MS/Rehabilitation)

### For clinicians

- MS Coalition Consensus Paper – [The Use of Disease-Modifying Therapies in Multiple Sclerosis: Principles and Current Evidence](#)

## The Role of Physical Therapy on The MS Team

A multidisciplinary team provides [comprehensive care](#) for the person living with MS as well as the family and caregivers. People living with MS can create their team by using the [Partner in MS Care resource](#) and/or by calling an MS Navigator at 800-344-4867 to ask for referrals.

## The Role of Physical Therapy Role in MS Comprehensive Care

Physical therapists play an integral role in the management of MS throughout the disease course – at diagnosis, during and after relapses, during periods of progression as well as periods of stability, and when the disease becomes more advanced. Key elements and priorities of a physical therapy interaction for different disease phases are highlighted below.

### At the Time of Diagnosis

- Education- Explaining the role of PT in helping people stay active, mobile, safe and comfortable

- Offering [educational resources](#) for the person with MS and her or his family members
- Thorough physical therapy examination and evaluation to establish baselines
  - Identifying areas of physical abilities and areas for improvement
  - Setting realistic goals and expectation while providing emotional support
  - Initiating care may involve evaluation and a few follow-up visits. Follow-up visits are infrequent (i.e. 1 session/week or 1 session/month for total of 3-5 visits) for exercise monitoring, assurance of adherence, and exercise progression.
- Exercise and physical activity program
  - Establishing an evidence-based exercise and physical activity program for the person with MS based on the patient’s physical therapy evaluation, interests, and access.
  - Emphasizing the importance of regular exercise for successful disease management and optimizing health.

### **During Periods of Stability**

- Physical therapists should monitor the mobility of people with MS even during periods of no clinical or radiographical disease changes/progression.
- The patient may consult with physical therapy every 3-6 months to assure adherence to exercise and physical activity recommendations, as well as to make appropriate modifications to the program. Similar to medical “check-ups,” the patient can participate in rehabilitation “tune-ups.” A physical therapy session may include assessment of strength, balance, flexibility, and cardiorespiratory abilities. These objective measures may be used as a comparison in the future.
- The physical therapist helps to maintain patient motivation during such a time, as the person may be less consistent with exercise when all is “good.”

### **During and After a Relapse**

- The primary goal for physical therapy during and after a relapse is to regain the previous level of function.
- The timing of physical therapy during and/or after a relapse can vary depending on the severity of the attack, influence of corticosteroids (the usual treatment for a severe relapse), and the level of function prior to the relapse.
- The initial examination/evaluation may be abbreviated as fatigue will likely impact participation.
- Safe mobility, optimal functioning, and personalized exercise plans geared to the person’s changing needs are key treatment goals. Implementing the use of adaptive equipment and assistive devices, both temporary and permanent, may be necessary.
- Patients and families are understandably fearful of the impact the relapse may have on their lives in the home, at work, and in the community. The physical therapist needs to be supportive and encouraging, while providing realistic hope and optimism.

## **With Disease Progression**

- With disease progression, the patient may have an increasing need for adaptive equipment (e.g. grab bars, shower chairs, etc.) and mobility equipment (e.g. walkers, scooters, or wheelchairs). Patients and family members may react negatively to these devices. The physical therapist must help to persuade and encourage the safe, appropriate, and timely use of these aids for the benefit of the patient and family. They are “tools” to mobility, not “obstacles” – allowing safe participation in activities at home, at work and in the community.
- The physical therapist continues to emphasize the importance of exercise and physical activity, re-prioritizing exercises in a manner that accommodates the evolving ability level of the patient, taking into account the ongoing issue of MS fatigue. The physical therapist must be sensitive to the emotional and social impact of the physical changes on the patient as well as on the family and caregivers.
- Cognitive challenges, while possible at any point in the course of MS, are often a more prominent feature as the overall disease progresses. Cognitive changes can impact the ability of the individual to process information and learn and remember new information, including treatment plans and instructions. Providing instructions in writing, using technology (e.g. smart phone apps, calendar appointment reminders) and including a care partner may be strategies to use when there are cognitive issues.
- The episodes of care may vary from more intense periods of 1-2 times/week, to less frequent interactions when equipment needs and exercise modifications have been addressed.

## **National MS Society Resources for Patients:**

- [How to Choose a Mobility Device that is Right for You](#)

## **National MS Society Resource for Clinicians**

- Talking about Difficult Topics with your patients- [The Role of Rehabilitation](#)

## **When the Disease Becomes More Advanced**

- Patients in advanced stages of MS have significant disease burden, with progression of physical, emotional and cognitive issues. They are often non-ambulatory and at increased risk for other secondary health conditions.
- Physical therapy intervention may include seated trunk positioning and control, stretching and range of motion activities, upper extremity strengthening, respiratory function activities, equipment needs (i.e. power mobility and standing frames), and transfer training for caregivers.
- The physical and emotional demands on family and caregivers are significant in this phase of the disease. The physical therapist should encourage the family and primary caregiver(s) to engage in their own exercise, physical activity and other wellness strategies – discouraging caregiving from becoming a “full time job.” The role of the physical therapist may extend more to the caregiver during this stage. The physical

therapist may need to provide extensive education about use of a gait belt for safe lifting and transferring.

#### **National MS Society Resources for Clinicians:**

- [Seating and Mobility Evaluations](#)
- [Customized Wheeled Mobility Options for Patients with MS](#)

#### **National MS Society Resources for Families:**

- [A Guide for Caregivers](#)

## **The Role of Physical Therapy in Health and Wellness**

Although a physical therapist's primary role in helping a person with MS is optimizing his/her mobility, function, and quality of life with respect to the disease, the physical therapist has the opportunity to influence individuals' and families' efforts to optimize overall health and wellness in every aspect of life.

#### **National MS Society Wellness Resource:**

- [Living Well with MS](#)

## **Evolution of the Role of Exercise and Physical Activity in People with MS**

### **History**

- Exercise was discouraged for people with MS as the medical community feared the negative impact of fatigue and overheating; they felt exercise could not be tolerated by people challenged with MS.
- [Petajan and colleagues published a pivotal study in 1996](#) that demonstrated the tolerance for, and benefits, of aerobic training for some individuals with MS.
- While exercise is safe and encouraged for most people with MS, it is important to note that exercise can increase core body temperature and provoke a temporary worsening of symptoms (see pseudo-exacerbation). Additionally, during an exacerbation, vigorous exercise should be avoided.
- [Research](#) suggests that exercise may promote neuroprotection, neuroregeneration and neuroplasticity, thereby reducing long-term disability.



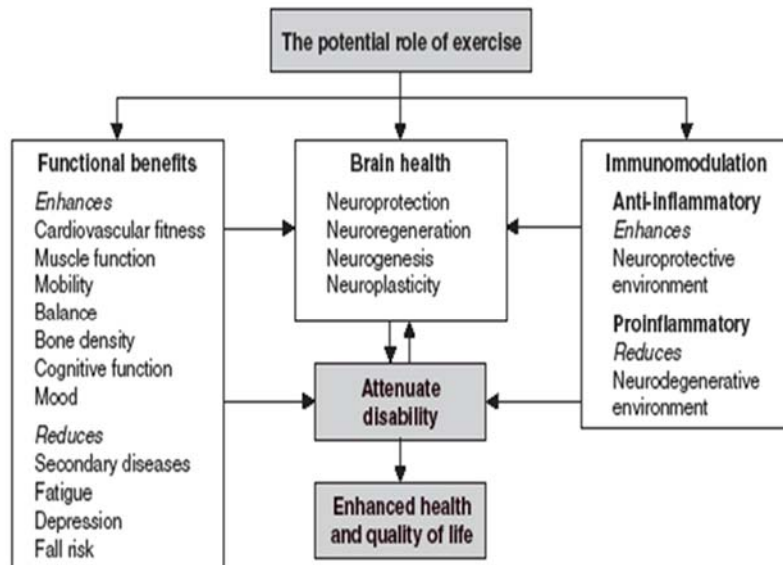


Fig. 1. A conceptual model highlighting the hypothetical effects of exercise in improving health, mobility and modulating disease activity in multiple sclerosis.

## Current Evidence: Symptom Assessments, Interventions, and Management Strategies

The primary roles of physical therapists involve the examination, evaluation, assessment, plan of care, and treatment interventions and strategies of patient's symptoms. Common symptoms managed by physical therapists include, but are not limited to: gait, balance, spasticity and flexibility, weakness, coordination/ataxia, aerobic endurance, respiratory function, and fatigue.

### Gait

- Common Gait Deviations
  - Hip hiking
  - Circumduction
  - Foot drop/slap
  - Shuffling/poor heel strike
  - Vaulting to clear involved leg
  - Shortened step length
  - Knee recurvatum/hyperextension
  - Knee buckling
- Assessment Measures
  - Multiple Sclerosis Walking Scale – 12 (MSWS-12)
  - 10 Meter Walk
  - 25 Foot Walk
  - 2 Minute Walk
  - 6 Minute Walk

- Timed Up and Go
- Interventions (some examples beyond exercise intervention)
  - Functional Electrical Stimulation
  - AFOs
  - Hip Flexion Assist Device

## Balance

- [Fall rates for adults with multiple sclerosis](#) are greater than 50%.
- [Risk of falls](#) increases with:
  - Use of a walking aid
  - Decreased proprioception
  - Increased degree of spasticity
  - Increased severity on EDSS
  - [Cognitive impairment](#)
  - [Cognitive dual task impairment](#), which may be present in all disease stages
  - Continence challenges
  - Gait Issues
  - Fear of falling
  - [Sedentary behavior](#)
- Measures to Assess Balance:
  - Multiple Sclerosis Walking Scale (MSWS-12)
  - Timed Up and Go – Cognitive
  - Sensory Testing
  - Sensory Organization Testing/Posturography
  - Berg Balance Assessment
  - Four Square Step Test
  - Dynamic Gait Index
  - Functional Gait Assessment
  - Activities Balance Confidence Scale
- Intervention Strategies:
  - Tai Chi
  - Yoga
  - Aquatics
  - Core strengthening
  - Pilates
  - Vestibular exercises
  - Progressively challenging manipulation of somatosensory input during sitting, standing, and walking
  - Cognitive dual task added to traditional balance exercises
  - National MS Society [Free from Falls Program](#)
- Management Strategies:
  - Environmental modifications to reduce fall risk

- Lighting, removing rugs, minimizing distraction, etc.
- Assistive devices
  - Canes, walkers, etc.
  - Strategic use during times of day (i.e. when fatigue more pronounced) or environment is challenging (i.e. crowded shopping store)

## Spasticity and Flexibility

- Potential Impact:
  - Increased energy-cost of movement
  - Impact on gait and transfers
  - Poor posture/ positioning
  - Safety issues
  - Contractures
  - Pain/discomfort
  - Sleep interruption
  - Skin breakdown /sheer
  - Interference with self-catheterization, sex/intimacy, and hygiene
  - Interference with breathing
- Potential Benefits of Mild Spasticity:
  - Circulation
  - Balance and stability with standing and transfers
  - Maintain muscle bulk/tone
- Assessment:
  - Subjective description
  - Deep Tendon Reflexes
  - Passive Range of Motion
  - Modified Ashworth Scale
  - Observation of spasticity in a variety of positions, both statically and dynamically
- Intervention/Management Strategies:
  - Optimal [spasticity management](#) includes rehabilitation strategies as well as medication.
  - Stretching/Range of Motion Activities
    - [Stretching for People with MS](#)
  - Strengthening opposing muscle groups to counteract the spastic muscles
  - Neuromuscular electrical stimulation devices
  - Positioning/posture

## Weakness

- Primary weakness versus secondary weakness

- Primary weakness is likely caused by demyelination and typically is present in antigravity muscles such as tibialis anterior or iliopsoas
- Secondary weakness may be caused by disuse, deconditioning, pain, compensatory movement patterns, spasticity, muscle imbalances, or ataxia
- Assessment:
  - Manual Muscle Testing
  - Trunk Impairment Scale
  - 5 times sit to stand
- Interventions:
  - Resistance training general [guidelines](#)
    - Frequency: 2-3 sessions/week
    - Intensity: 1-3 sets, 8-15 repetitions at 60-80% 1 repetition maximum
      - Strength training may be better tolerated with less fatigue if completed intermittently through the day and alternating between upper and lower body muscle groups.
      - Increase resistance 2-5% once 15 repetitions is consistently achieved
      - 2-4 minutes rest is advised
      - Prioritize large, multi-joint muscle groups
    - Modes of resistance training: body resistance, free weights, weight machines, resistance bands.

### **Coordination/Ataxia**

- Clinically challenging symptom to manage.
- Sensory Ataxia versus Cerebellar Ataxia
  - Sensory ataxia characteristics
    - Decreased sensory awareness (i.e. vibratory sense, proprioception, 2-point discrimination, pressure, or light touch
    - “I cannot walk unless I can see where my feet are”
  - Cerebellar characteristics
    - Diplopia, intentional/movement tremor, dyssynergia, staggering, dysmetria
- Assessment:
  - 9 Hole Peg Test
  - Box and Block
- Intervention/Management Strategies:
  - Light weights on extremities
  - Bracing/splinting
  - Balanced Based Torso Weighting

## Aerobic Endurance

- Quality aerobic fitness levels may correlate with decreased lesion burden and brain atrophy.
- Good cardiovascular health may help with central nervous system neural remodeling, regrowth, and protection in people with MS.
- Frequency
  - 3-4 session/week
- Intensity
  - Rating of Perceived Exertion (RPE) Warm Up/Cool Down 1-2/10
  - Rating of Perceived Exertion (RPE) Exercise Intensity 3-5/10
- Duration
  - Goal to achieve 20-30 minutes
  - Shorter sessions, multiple times a day for a cumulative effect is acceptable and encouraged to better manage MS related fatigue.
- Modes of Exercise
  - Swimming, stationary bike, walking, NuStep, arm bike
- A randomized, controlled trial by [Feltham and colleagues \(2013\)](#) concluded that cardiovascular adaptation in people with MS following a twelve-week exercise program pointed to deconditioning rather than disease-related autonomic dysfunction.

## Respiratory Function

- Ambulatory and non-ambulatory individuals with MS have measurable [respiratory muscle weakness](#).
  - Estimated 30-80% people with MS who are ambulatory have inspiratory and expiratory muscle weakness
  - Estimated 20-70% people with MS who are non-ambulatory have inspiratory and expiratory muscle weakness
- Respiratory muscle weakness is present in both early and chronic MS.
- Assessment
  - Recommended every 1-3 years by health care professional
- Intervention/Management Strategies
  - Respiratory muscle training
    - 3 sessions/week for 30 minutes has demonstrated improvement
    - Option for “fatigue” days

## Fatigue

- Primary MS Fatigue versus Secondary Fatigue
  - Primary:
    - Probably due to impaired conduction of nerve impulses
    - Unique to MS
    - Generally worse at end of the day

- Not influenced by quality of rest at night
    - May be aggravated by heat
    - May occur suddenly and without explanation
  - Secondary:
    - May be the result of medication side effects, depression, deconditioning, inadequate sleep, or insufficient nutrition
    - Elevation of the core body temperature may contribute to fatigue and temporarily worsen other symptoms as well
      - Management strategies:
        - Cooling devices (i.e. wraps, vests, etc.)
        - Cool environment
        - Cool drinks/staying hydrated
- Assessment of Fatigue:
  - Subjective description of fatigue frequency, intensity, duration, patterns associated with activities – what precedes fatigue and how it can be minimized
  - Modified Fatigue Impact Scale
  - Fatigue Severity Scale
- Intervention/Management Strategies:
  - Energy Conservation/Management
    - 4 Ps: Pacing, planning, prioritizing, positioning
    - Task Simplification
    - Adaptive equipment/assistive devices
    - Environmental modifications
    - Strategic rest breaks

#### **National MS Society Resources for Clinicians:**

- [Assessment and Intervention](#)
- [Assessment Measures](#)
- [Management of MS-Related Fatigue](#)

## **Prognosis, Goal Setting, and Plan of Care**

### **Physical Therapy Prognosis**

- No two persons with MS present with the same impairments and associated functional limitations; therefore, considerable variability in prognosis and rehabilitation response exists.
- Due to the fluctuating nature of the disease, physical therapists need to be prepared to face varied responses to interventions. Responses can vary from day to day or within a physical therapy session.
- Common barriers ([Beckerman et al., 2010](#); [Asano et al., 2013](#); [Learmonth & Motl, 2016](#)) to successful rehabilitation, physical activity, and exercise for people living with MS have been identified as:

- Accessibility of facilities
- Fatigue
- Weather
- Time
- Financial (insurance, co-pays, deductibles)
- Degree of disability/impairment
- Transportation
- Family and work obligations
- A discussion with the patient and family during initial therapy visits about anticipated barriers can lead to a better rehabilitation response and prognosis.

### **Guidelines for goal setting:**

- SMART goals:
  - Specific
  - Measurable
  - Attainable
  - Realistic
  - Timely
- Example of a SMART GOAL:
  - Patient will stand with walker for 5 minutes while helping husband to prepare dinner at kitchen counter, 8 weeks.
- People with MS can make progress and achieve goals; however, at times the overall pace of progress may be slower, suggesting a plan of care that may be longer (i.e. 1-2 sessions/week for 12 weeks).
- Goals generally are less aggressive than those set with orthopedic patients.
- Prognosticating rehabilitation potential can often be challenging for therapists given the fluctuating and unpredictable nature of Multiple Sclerosis. Physical therapists can and should re-examine and adjust goals throughout the episode of care to encourage appropriately challenging, yet achievable goals.
- An important piece of successful goal setting and prognosis is identifying when a patient should compensate with use of aids or adaptation of the task/environment, versus rehabilitate to improve function with use of exercise strategies (such as during a relapse or deconditioning). Most often, successful rehabilitation involves a combination of both.
- Goals should address patient and family functional challenges and concerns and be developed with collaboration and guidance of the physical therapist.

## **Summary**

### **Key Clinical Practice Points:**

A “typical” physical therapist examination, evaluation, and assessment approach for people with MS does not exist. While people living with MS may present with some similarities, each individual has unique challenges. Listening to and problem-solving with the patient and family will guide the clinician to the appropriate measures.

### **Intervention guidelines:**

- All exercises and activity should be a “challenge”, but *never* a “struggle”

- 2 Hour Rule – “If you do not feel you recovered from exercise within 2 hours, you did too much”
- More frequent rest breaks may be necessary during exercise.
- Cooling strategies may be needed during exercises and activities.
- Cognitive difficulties including learning, processing speed and recall must be considered – in any disease course of MS (relapsing or progressive forms of MS)
- Mood changes, particularly symptoms of depression, are common in MS and can significantly impact motivation and persistence
- Realistic goal setting and prognosticating for people with MS may be more challenging due to the progressive, fluctuating nature of the disease. Problem-solving barriers and SMART goal setting can be used as a guide with patients and families to encourage improvements in response to interventions.

The role of the physical therapist in MS care ultimately is to inspire hope, resilience, and happiness through movement. Physical therapists have the unique role of providing guidance for improving functional mobility through physical activity, exercise, and adaptive equipment. The proper application of physical activity and exercise can encourage resilience and help people with MS achieve what they wish, albeit at times in a different manner than before the disease. Through the use of constructive touch coupled with movement, the physical therapist can inspire health awareness, promote prevention strategies, introduce wellness concepts and assist with optimizing health care in the MS population.

#### **National MS Society Resources for Patients:**

- [Gait or Walking Problems: The Basic Facts](#) (.pdf)
- [Walking \(Gait\) Difficulties](#)
- [Fatigue](#)
- [Fatigue: What You Should Know Booklet](#) (.pdf)
- [Exercise](#)
- [Exercise as a Daily Part of Life](#) (.pdf)
- [Rehabilitation](#)
- [Managing MS Through Rehabilitation](#) (.pdf)
- [Educational Videos](#)

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