

# THE PROMOTION OF EXERCISE FOR MULTIPLE SCLEROSIS

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## INTRODUCTION

There are almost one million people in the United States living with multiple sclerosis (MS), and about 2.3 million globally (5). Research supports the benefits of a comprehensive exercise program that includes hydrotherapy exercises, resistance training, flexibility, and cardiorespiratory activities for those living with MS (2,3,4,6,7). This article aims to provide personal trainers with ideas for exercises to meet the needs of individuals with MS.

## EXERCISE AS TREATMENT

Research has shown that chronic pain experienced from MS is primarily due to muscle spasticity, weakness, or imbalance (5). Muscle spasticity is a condition that causes the muscles to contract continuously, and the prolonged contraction can cause stiffness and loss of flexibility (5). An option to help reduce pain from muscle spasticity, weakness, and imbalance is the use of hydrotherapy-based exercises. Hydrotherapy is the use of a water environment for exercise that creates physiological responses (vasoconstriction or vasodilation) to cold or warm temperatures.

Research has shown participants who participated in hydrotherapy exercises experienced relief of pain, spasms, and fatigue by exposure to a cooler environment (3). Results suggest that the cooler temperatures and pressure of the water block nociceptors and effect the thermal receptors and mechanoreceptors to produce a positive effect on spinal segmental mechanisms, and therefore, reduce pain (5). Further, participation within an eight-week hydrotherapy program may increase neural adaptations, improving overall muscular function (5).

## APPLICATION OF EXERCISE EXPOSURE AND PRESCRIPTION

### HYDROTHERAPY-BASED EXERCISES

Exercise in a cooler or warmer water environment may allow for greater ROM and flexibility with less negative symptoms versus exercises that are land-based, especially in MS clients just beginning an exercise program. The necessity of two separate aquatic temperatures results from thermoregulation complications that many MS clients face. Due to the thermoregulation limitations,

TABLE 1. SAMPLE HYDROTHERAPY EXERCISES FOR MS CLIENTS

EXERCISE PURPOSE	EXERCISE DESCRIPTION	BENEFIT FOR MS	MODIFICATIONS
<b>Marching/Alternating Knee Lifts</b> <i>Strengthens hip flexors, increases ROM, engages abdominals, and provides functional movement for walking.</i>	While chest-deep in water, march forward using arms in opposition of knees. Knees rise to close to hip height. Focus foot placement on heels.	The slight resistance of the water allows clients to strengthen their hip flexors and increase their range of motion. This exercise also engages their core, which is pertinent to multiple daily activities.	For balance concerns, use pool wall for stability if necessary.
<b>Side Steps</b> <i>Strengthens abductors and adductors and improves balance when moving laterally in frontal plane.</i>	While chest-deep in water, step to the right and left while keeping legs straight and knees soft. Trailing leg taps before moving to opposite direction.	Incorporates balance, often compromised from MS. Strength assists with agility, balance, and fall prevention.	For balance concerns, use pool wall for stability if necessary.
<b>Cross Country Ski</b> <i>Strengthens muscles around hip joint and improves endurance and flexibility.</i>	Stand with one leg forward. Place arms opposite of legs, similar to a jogging motion. Quickly switch leg and arm positions and repeat.	This exercise assists with hip and shoulder ROM, potentially reduced from MS, and improves muscular endurance.	To modify intensity, hold onto a floatation device instead of moving arms.
<b>Butterflies</b> <i>Strengthens muscles around shoulder joint, especially within the transverse plane.</i>	Starting with arms by sides at shoulder height, bring hands horizontal to the side of the body. Move the arms forward in front of the chest. Return and repeat.	Butterfly movements will improve strength and flexibility in chest, back and shoulders. The water provides resistance and allows clients to increase strength and ROM.	To modify the intensity, incorporate sagittal plane shoulder movements of flexion and extension.
<b>Water Punches</b> <i>Improves cardiorespiratory endurance and strengthens arm muscles.</i>	Hands in a fist, alternate arms punching through the water. Push arms to full extension.	Strengthens the wrist and hands, which typically is one of the first areas affected by MS. Also provides a cardiorespiratory effect.	To help with balance, lean against the pool wall. Reduce the repetitions or time if client becomes too fatigued.

the temperature should not be so cold that the client begins to feel pain, nor so warm that the client becomes overheated. For increases in ROM and flexibility, clients should perform slow exercise movements in warmer water temperature between 86 – 92 degrees. To ensure comfort, it is pertinent that the client only engage in slower ROM movements in warmer water to prevent overexertion and fatigue. For improvements in balance, strength, and coordination, the ideal water temperature is slightly cooler at 80 – 85 degrees (3). The neurological adaptations from exposure to the aquatic-based program can improve muscular strength and performance of daily activities, and potentially lead to a more effective transition for the client to land-based exercises. Table 1 details sample hydrotherapy exercises for MS clients.

## LAND-BASED EXERCISES

### Flexibility

Clients with MS tend to lack ROM in their joints, which can cause musculoskeletal pain, spasticity, and muscular imbalance around a joint (6). Flexibility exercises can reduce muscular tightness, increase ROM, and potentially reduce the risk of injury. Research has supported flexibility exercises for clients with MS, as it has shown to improve residual abilities, mobility, and functional fitness (6). A six-week training protocol that included, among other modes of training, static stretching and resistance training with bands, with a minimum frequency of twice per week showed significant reductions in fatigue-related symptoms from MS (6). Table 2 provides options for flexibility exercises for MS.

**TABLE 2. SAMPLE RESISTANCE AND FLEXIBILITY EXERCISES (LAND-BASED) FOR MS CLIENTS**

EXERCISE PURPOSE	EXERCISE DESCRIPTION	BENEFIT FOR MS	MODIFICATIONS
<b>Bodyweight Squats</b> <i>Strengthens leg muscles.</i>	Have the client bend at the knees and hips, push pelvis back and squat into a seated position.	Engages muscle groups to mirror functional movements of daily activities.	Hold onto a wall or fixed device for balance. Use a box or bench to reduce ROM.
<b>Shoulder Press</b> <i>Strengthens deltoids and triceps and provides functional movement.</i>	Have client hold weights around shoulder-height with elbows close to 90-degree angle. Press weights overhead and return to starting position. Emphasize control in both eccentric and concentric phase.	This exercise is beneficial to all clients from fully mobile to wheelchair bound. Assists functional daily activities, core engagement, and proprioception of overhead movements.	Reduce resistance and ROM, have client sit with support, or instruct the movement in the sagittal plane. Use bands instead of weights.
<b>Core Twists and Planks</b> <i>Strengthens core muscles and incorporates balance.</i>	Twists—client is in a seated position, leaning back slightly with feet touching floor, moving weight from side to side. Planks—client in a prone position, balanced on forearms and knees with torso off the ground.	Incorporates core stability and balance, critical for functionality for MS, in a low-risk environment.	Twist—remove resistance or maintain both feet flat on the floor. Planks—begin holding a position on hands and knees, with hips bent at 90 degrees.
<b>Child's Pose Yoga Stretch</b> <i>Flexibility for back muscles and glutes.</i>	Have client begin on hands and knees, then lean hips back over feet while maintaining hand position.	Increases the flexibility in lower back and reduces existing tightness which can accompany MS.	Use a seated chair position with hands on a Yoga ball or perform standing holding a sturdy device.
<b>Arm Circles</b> <i>Flexibility for upper body.</i>	Have client extend arms at shoulder-height. Make 10 small circles, and reverse direction. Repeat multiple times, increasing the size of the circles each set.	Dynamically increases flexibility and ROM in shoulder joint, especially necessary for clients who are wheelchair bound.	Slow the movement and reduce ROM. Perform one section of a circle at a time.
<b>Seated Hamstring Stretch</b> <i>Flexibility for hamstring muscles.</i>	Have client sit on a slightly elevated surface, such as a six-inch step with legs extended in a V-shape. Holding onto the legs, step, or floor, lean forward slightly.	Increases hamstring flexibility, often reduced from MS.	Perform one leg at a time, or use a standing hamstring stretch with support.

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## Resistance Training

Activation of additional neural synapses may help decrease muscle spasticity and muscular imbalance through increased muscle fiber activation. Additionally, adaptations can include increased muscle fiber diameter, increased energy substrate stores, stronger muscular contractions, and reduced fatigue (7).

According to the American College of Sports Medicine (ACSM), individuals should participate in resistance training 2 – 3 days per week of 20 – 40 min per session for at least eight weeks (1). Programming for MS clients is not much different. Research suggests a resistance training focus on strength and endurance at a prescription of 8 – 12 repetitions of a moderate weight (7). However, some persons with MS may experience fatigue more quickly; therefore, it is critical for personal trainers to modify and progress the program according to the client’s ability. MS clients who have not participated in resistance training regularly, or have not completed hydrotherapy training first, may need to begin on the lower scale of the ACSM guidelines to build strength and endurance, and to prevent injury, pain, and/or overtraining. Table 2 includes sample land-based resistance exercises that are beneficial for those with MS.

## CARDIORESPIRATORY TRAINING

Cardiorespiratory fitness is critical for all populations, and can be a major factor in overall health and daily activities. The department of labor reports that the participation of cardiovascular activities among adults with chronic or autoimmune diseases was 12% from 2009 – 2015 (8). Some common forms of cardiorespiratory exercises, such as jogging and dancing, have high-impact effect on joints, which can cause discomfort in MS clients. However, research supports the inclusion of cardiorespiratory exercise for those with MS. Specifically, a review of studies has shown that cardiorespiratory exercise at low- or moderate-intensity have positive effects on both physiological and psychological factors among people with MS (2).

ACSM recommends participation of 150 min of moderate cardiovascular exercise (40 – 60% heart rate reserve [HRR]) or 75 min of vigorous exercise (60 – 85% HRR) each week. This prescription can be challenging for some MS clients. Implementation of low-impact, and possibly low-intensity, cardio exercises with sufficient recovery time before the next cardio day is critical for those with MS. Initially, utilizing hydrotherapy as the environment for cardio exercises may be most beneficial for maximum adaptation and minimum discomfort. Once the client does not have any residual pain or discomfort from cardio exercises in hydrotherapy, incorporate land-based cardio, staying mindful of needed modifications to meet impact, intensity, or balance concerns. Table 3 provides a sample of low-impact cardio exercises and potential modifications.

**TABLE 3. SAMPLE CARDIORESPIRATORY EXERCISES FOR MS CLIENTS**

EXERCISE DESCRIPTION	BENEFIT FOR MS	MODIFICATIONS OR CONCERNS
<b>Walking</b>	Walking is a low-impact activity that can improve cardiorespiratory fitness and functional fitness.	Monitor the client closely during this exercise as MS clients might become easily fatigued.
<b>Swimming</b>	Swimming is a low-impact activity that can improve cardiorespiratory fitness.	Monitor client closely, noting water temperature to reduce risk of overheating. Encourage leisure swimming versus lap swimming.
<b>Seated Cycle</b>	Cycling is a low-impact, stationary activity that can improve cardiorespiratory fitness and increase lower body strength and endurance in a supported and stable environment.	Monitor client closely, reducing cycle resistance when necessary. Ensure correct seat height for knee and hip health.
<b>Stairmaster</b>	Stairmaster can improve cardiorespiratory fitness, increase lower body strength and endurance, and incorporates functional movements of climbing stairs.	Reserve for those cleared for more intense cardiorespiratory exercise. Reduce time and step height if possible. Monitor client closely and ensure stability through hand placements.
<b>Arm Ergometer</b>	Arm ergometer is a low-impact exercise to increase cardiorespiratory fitness, and is appropriate for clients with limited lower body mobility.	Monitor client closely, reducing cycle resistance when necessary. Ensure correct seat height for elbow and shoulder health.

TABLE 4. SAMPLE PROGRAM DESIGN FOR MS CLIENTS

WEEK	TRAINING ENVIRONMENT	TRAINING FOCUS (2 – 3 TIMES PER WEEK)
1	Warm hydrotherapy	Flexibility and ROM
2	Cool hydrotherapy	Muscular strength and endurance
3	Cool hydrotherapy/land-based cardio	Muscular strength/cardio
4	Warm hydrotherapy	Flexibility and ROM
5	Land-based resistance/cardio	Muscular strength/cardio
6	Cool hydrotherapy/land-based resistance	Hydrotherapy cardio/muscular endurance
7	Warm hydrotherapy	Flexibility and ROM
8	Land-based resistance/cardio	Muscular strength/cardio

## WEEKLY PROGRAM DESIGN

Once a foundation of the exercise intensity and impact is implemented, designing a program for MS clients can have several options. Table 4 provides a sample eight-week program for MS clients with a specific focus for each week.

## CONCLUSIONS

MS patients should also be encouraged to complete a variety of exercise types for many benefits related to symptoms and side-effects of the disease. MS clients may best benefit from an initial hydrotherapy program, then moving to land-based resistance, flexibility, and cardiorespiratory exercises. Combining these therapies will allow persons living with MS the opportunity to attain health benefits; increased muscular strength, ROM, and flexibility; and potentially decrease fatigue, pain, and risk of injury.

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