

A REVIEW OF LITERATURE WITH TREATMENT OPTIONS FOR SOME MULTIPLE SCLEROSIS PATIENTS

In the United States it is estimated that there are 400,000 people with multiple sclerosis. Multiple Sclerosis is a progressive demyelinating disease that produces lesions in the white matter of the central nervous system. More common in women than men, multiple sclerosis is most often diagnosed between the ages of 20 to 50 years old. There are 4 types of multiple sclerosis. Relapsing-remitting type of MS means patients have exacerbations in which they develop new symptoms and then have periods of remission where the symptoms fully or partially resolve. Patients diagnosed with primary progressive MS experience a slow but steady decline. In secondary-progressive multiple sclerosis, patients who were initially diagnosed with relapsing-remitting no longer have periods of remission and now are experiencing a slow and steady decline. Patients with progressive-relapsing MS have a steady worsening of symptoms with exacerbations.

Multiple Sclerosis is characterized by fatigue, numbness, spasticity, weakness, as well as gait and balance deficits. In addition patients with MS often report, "increased fatigue, visual disturbance, increased sensory symptoms, and/or reduced physical function" when exposed to heat or during physical exercise. As a result physicians previously recommended that patients with

multiple sclerosis avoid physical activity. Currently, however, doctors recommend that patients perform some exercise to combat the effects of deconditioning and atrophy.

A pilot study by Smith et al.¹ investigated the length of time that MS patients had an increase in symptoms following exercise. In this study, 34 subjects with multiple sclerosis and low to moderate disability on the Barthel Index performed a commencement level exercise program that included strengthening, stretches and fitness exercises. The subjects exercised an average of 18 minutes and the effects of the exercise session were recorded immediately following the session and then again at 24 hours. "For 56% of subjects, a single exercise session at a low to moderate level of exertion resulted in a temporary increase in the number and/or severity of sensory symptoms."¹ In 85% of subjects their symptoms returned to baseline in less than 30 minutes. Two subjects reported a return to baseline in three hours and one subject in 24 hours.¹ In a study by Nelson et al.², 14 subjects with multiple sclerosis had their body temperatures raised by two different methods. The study found that the specific temperature that leads to increased symptoms varies between individuals. In this study the subjects' temperatures were raised 1 to 4.7°F prior to

the onset of new symptoms. The symptoms resolved at a temperature above the initial temperature that caused the onset of new symptoms.²

Aerobic, aquatic, resistance, balance, stretching and combination programs have been investigated to determine their effects on patients with multiple sclerosis. Many of these studies were performed in the 1990's and there is a need for updated randomized controlled trials. Authors of these studies have reported many of the same limitations in their studies. Researchers report sample sizes too small to determine significance, lack of control groups, difficulty keeping the studies blinded, and the lack of studies of patient who are more than mild to moderately disabled. Reviewers have criticized investigators lack of detailed intervention descriptions to allow the studies to be reproduced.³

Aquatic therapy has been recommend for patients with multiple sclerosis in the Guide to Physical Therapist Practice.⁴ "The buoyancy of water makes movement easier for individuals with weakness or muscular spasticity. Also, heat dissipation properties of water may minimize exercise-induced elevations in body temperature."⁵ The National Multiple Sclerosis Society recommends a water temperature less than 85°F. They cite a case study by Pariser et al. of two female subjects with multiple sclerosis

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Welcome

Deborah Jackson has joined the Board of Physical Therapy effective July, 1, 2009.

She will serve as a secretary and will scan records in order to make the Board more technologically advanced as well as performing general secretarial duties serving as back-up to our current secretary, Sandy Kurland. Deborah comes to the Board from the Baltimore County School system. She had prior experience working for a printing company. Join us in welcoming the newest member of the staff.

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as a reference for this recommended temperature.⁶ However, Pariser et al. does not discuss the pool temperature used in his study.⁵ The American College of Sports Medicine recommends a water temperature of 89 to 91°F for moderate intensity exercise which they report, "is sufficiently comfortable and offers significant heat-dissipating potential."⁷ The ACSM also does not provide any references for this temperature recommendation.

Gehlsen et al.⁸ studied 10 subjects with multiple sclerosis who completed a ten week aquatic exercise program that consisted of freestyle swimming and shallow water calisthenics. The water temperature was maintained at 77-81°F for the three one hour sessions each week. The training intensity was 60-75% of the subjects' estimated maximum heart rate. The subjects were assessed pre, mid and posttrial for upper and lower extremities' muscular torque, force, fatigue, work and power. "Peak torque measurements for the knee extensor muscles indicated significant improvement from pretrial to midtrial for all designated angular velocities except 0°/sec."⁸ The investigators found nonsignificant difference in peak torque for the knee flexors from pretrial to midtrial and from midtrial to posttrial for the knee flexors and extensors. They also found a significant increase in all measurements for the upper extremities from pretrial to posttrial and increases in power and total work. Gehlsen et al.⁸ found fatigue and work values improved in the lower extremities but found no significant difference in fatigue for the upper extremities. Investigators cite difference between training and testing methods as a limitation in their study.⁸ Ponichtera et al.⁹ reports lack of control group and lack of classification of MS patients by Expanded Disability Status Scale as limitations in this study.



A randomized controlled trial by Sutherland et al.¹⁰ investigated the effects of aerobic exercise on psychological well being and health related quality of life (HRQOL). Twenty-two mild to moderately disabled subjects with MS were divided into two groups, a no special activity group and an experimental group. The experimental group completed three supervised training sessions a week for ten weeks in the water except five sessions in weeks five and six which were completed on land. Each 45 minute session consisted of a five minute warm up and cool down, as well as stretching and water aerobics, water jogging, and deep water running. The experimental group had a non-significant improvement in physical fitness; however, they experienced improvement in physical, social and mental health as well as decreased bodily pain and increased energy. All aspects of mood except confusion also improved. Investigators cite small sample size and inability to apply results to more disabled MS patients as limitations in their study.¹⁰

Peterson¹¹ performed a single case study of a 33 year old woman with multiple sclerosis. Initially the patient participated in inpatient therapeutic exercise and functional mobility training 1.5 hours a day Monday thru Friday and .5 hour on Saturday. Aquatic therapy started on week two and the patient participated in 45 minute aquatic sessions two times a week. The patient's vital signs were monitored including tympanic temperature during exercise. The subject did not experience any heat related issues and had increased functional mobility and increased patient satisfaction. The author does report that each patient's heat sensitivity needs to be addressed.¹¹ Debolt et al.¹² used a randomized controlled trial to investigate the effects of an eight week home



based resistance program on balance, power and mobility of 37 subjects with multiple sclerosis. Subjects were divided into a control group and an experimental group. The control group retained their

current level of physical activity while the experimental group performed lower extremity resistance training at home three times a week. Prior to the home based program the experimental group participated in six instructional sessions to ensure proper performance of the home exercise program. The subjects performed a five to ten minute warm up, 25 minutes of strengthening including chair raises, forward lunges, step-ups, heel-toe raises and leg curls. The subjects wore weight vests during the eight week program. The weight of the vests and the number of sets of each exercise performed were gradually increased. The results showed no significant difference in balance measurements and mobility following the resistance program; however, leg extensor power increased significantly in the exercise group. The investigators cite sample size and duration as limitations in their study.¹² Dalgas et al.¹³ feels another limitation of this study lies in the lack of control by the investigators over a home based program.

Harvey et al.¹⁴ studied the effects of eight weeks of leg raises, exercises prescribed by a physical therapist or no intervention on patients with multiple sclerosis. In the randomized controlled trial, 19 subjects were divided into three groups. In Group A, the no exercise group, five subjects were

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instructed not to change their daily routines. In group B, seven subjects performed individualized programs designed to address individual functional limitations. Seven subjects in group C performed five sets of ten repetitions of seated knee extension two times



a day. No significant difference was found in maximal volitional contraction of the quadriceps, EMG, or walking speed in the three groups. Chair transfers were faster in the leg raise group while walking speed was faster in the group with the individualized physical therapy programs. Groups B and C both improved in muscle recruitment. The researchers cite small sample size as a limiting factor in their study.¹⁴

In 2004 Romberg et al.¹⁵ conducted a randomized controlled trial on the effects of a 6 month exercise program on patients with multiple sclerosis. 95 patients were divided into an exercise and a control group. The exercise group completed a three week inpatient rehabilitation program followed by a 23 week home exercise program. During inpatient rehabilitation the exercise group completed five strength training sessions and five aerobic training sessions. Patients were given individualized home exercise programs which consisted of three strength training and one aerobic training session per week during weeks four thru 20. During weeks 20 thru 26 subjects completed three strength training and two aerobic sessions per week. Strength training programs consisted of upper and lower extremity exercises as well as core exercises. During inpatient rehabilitation patients completed an aquatic program and while at home patients could continue with the aerobic means of choice. Both groups demonstrated a decrease in

7.62 meter walk test time, with the exercise group having the greatest decrease. The exercise group also showed a decrease in 500 meter walk time while the control group did not. The exercise group had a significant increase in their knee flexion strength while the control group's increase was only on one side. Upper extremity endurance increased significantly in the exercise group. Manual dexterity improved in both groups while static balance and VO₂ peak did not change. Investigators cite

lack of control over home exercise program adherence as a limitation as well as the investigator not being blinded to subjects groups. They also feel that the difference between exercise method and test method may have affected results.¹⁵ Another limitation of this study for the physical therapy field is the inability to reproduce this study due to the lack of specific details on the exercise programs. No mention was given to the aquatic exercises performed or the water temperature nor the exact strengthening exercise completed.

Bjarnadottir et al.¹⁶ conducted a randomized controlled trial on the effects of aerobic and strength exercise on 16 individual with relapsing-remitting multiple sclerosis. The subjects were divided into an exercise and a control group. The exercise group consisted of six patients with mild MS (EDSS <4) who performed 60 minutes of exercise three times a week for five weeks. The aerobic portion was performed on a cycle ergometer with a three minute warm up and cool down and 15-20 minute ride at anaerobic threshold. Resistance exercises were performed for the upper and lower extremity and core. The last five minutes of the 60 minute program consisted of stretching and relaxation. The exercise group demonstrated an increase in VO₂ peak, peak workload, and anaerobic threshold. The researchers report basing their program on the ACSM recommendations for physical

fitness in healthy individuals which suggests exercise three to five times a week for 20-60 minutes at 40-50% VO₂max. In actuality, the ACSM recommends patients with MS exercise three times a week for 30 minutes at 50-70% VO₂ peak.⁷

Rampello et al.¹⁷ conducted a randomized crossover controlled trial on 19 subjects with mild to moderate MS. Subjects participated in eight weeks of aerobic training followed by eight weeks of neurological rehabilitation. During aerobic training subjects completed three 40 minute sessions per week on a leg cycle ergometer followed by 15 minutes of stretching. During the neurological rehabilitation phase subjects completed three 60 minute sessions per week, "aimed at improving respiratory-postural and respiratory-motor synergies and of stretching exercises."¹⁷ No change in lung function or respiratory muscle strength was noted for either program. A significant change in walking distance, speed, maximum work rate, peak oxygen uptake and oxygen pulse was achieved by the aerobic training group while cost of walking and fatigue was unchanged in either group. Researches cite subject dropout, learning effect during maximal or submaximal exercise testing, and carryover effect from one type of exercise program to the other as possible limitations.¹⁷

A three month RCT was carried out by McCullagh et al.¹⁸ on 30 patients with multiple sclerosis. Subjects in the exercise group participated in an exercise class two times a week and then exercised independently one time per week. The class consisted of four ten minute stations with a five minute rest in between stations. The stations were treadmill walking/running, cycling, stair-master, arm strengthening, volleyball and outdoor walking. At home the subjects chose an activity to complete for 40-60 minutes. "Following the classes, the results showed improved exercise capacity, QOL, and fatigue, but at six months, while

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improvements in QOL and fatigue remained, the improvement in exercise capacity was lost.¹⁸ Improved exercise tolerance was also a result of the classes. "At six months, the improvement in exercise capacity was lost while QOL levels remained significantly better."¹⁸ The researchers cite small sample size and possible bias due to assessor not being blinded as limitations in their study. They also mention that the subjects used had mild MS which limits the relevance to more disabled patients.¹⁸

Newman et al.¹⁹ investigated the effects of treadmill training on 16 subjects with multiple sclerosis. The subjects completed 12 sessions of up to 30 minutes each of treadmill training at 55-85% age predicted maximum heart rate. Subjects demonstrated a significant improvement in speed and endurance following the training. Oxygen consumption at rest and stance time in weaker leg decreased while stride distance with stronger leg increased. No change in fatigue was noted. Authors cite small sample size and less power of a repeated measure analysis as limitations of their study. The authors also feel that carryover to function should be assessed.¹⁹

In 2007 Cattaneo et al.²⁰ published a randomized controlled trial on the effects of balance exercises on MS patients. Forty-four subjects were divided into two experimental groups and one control group. Group one's balance rehabilitation focused on motor and sensory strategies while group two used motor strategies only. Group three was the control group which received training not concentrated on balance. Each subject in groups one and two had 10-12 45 minute sessions for three weeks which were individually tailored to the subject. Groups one and two demonstrated a decrease in falls following the study. The experimental groups also showed a significant improvement in the Berg Balance Scale and a clinically relevant increase in Dynamic Gait Index. Self administered Dizziness Handicap Inventory and Activities Specific Balance Confidence did not show significant change.

Including sensory strategies for static balance as tested by the Berg Balance Scale did not show significance. There was no difference in the number of falls between the two experimental groups. However, the group treated with sensory strategies demonstrated a significant change in their Dynamic Gait Index. The authors cite use of the same rater to perform repeated measures of the same test as a possible limitation. They also feel ceiling effect and low number of treatment sessions may have affected their study.

Few studies have been conducted on the effects of aquatic exercise on individuals with multiple sclerosis. While aquatic therapy is recommended in the Guide to Physical Therapist Practice, no consensus exists as to the exact parameters. The National MS Society recommends a water temperature less than 85°F and the American

College of Sports Medicine suggests a temperature 89-91°F. The study by Gehlsen et al.⁸ used a water temperature of 77-81°F and the study by Sutherland et al.¹⁰ did not state the pool temperature used. Peterson¹¹ investigated the effects of a water

temperature 94°F on a single subject. These studies all lack details on the exercises performed in the water and instead use general terms such as calisthenics and water aerobics to describe the activities performed in the water. The small number of studies on aquatic therapy does not allow physical therapists to find a consensus on the benefits of this type of therapy for patients with MS. Gehlsen et al.⁸ found that aquatic therapy can increase muscle strength, power, and work while decreasing fatigue. Sutherland et al.¹⁰ discovered aquatics can also be used to increase physical, social, and mental health, decrease pain and increase energy. In addition, patients may benefit from

increased functional mobility and increased patient satisfaction.

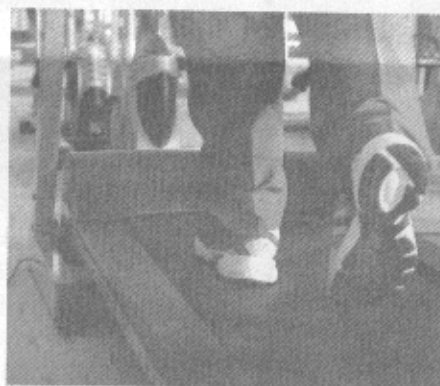
Resistance training alone has been shown to increase muscle strength but have little to no effect on balance and functional activities. An eight week resistance training program has been shown by Debolt et al.¹² and Harvey et al.¹⁴ to help increase muscular strength in mild to moderately disabled MS patients. Romerg et al.¹⁵ discovered that a program that combines aerobic and strength training can lead to decreased walking time for short and long distances and increase muscular strength in MS patients. Bjarnadottir et al.¹⁶ found that a combination of aerobic and strength exercises increased VO₂peak, peak workload and anaerobic threshold. Length of combination aerobic and resistance training programs varied from 8 weeks to 6 months. Studies had subjects exercise three to five times a week.

Aerobic training methods for MS patients have included use of aquatics, treadmill, stairmaster, and leg cycle ergometers. Newman et al.¹⁹ found that twelve 30 minute treadmill training sessions at 55-85% age predicted maximum

heart rate increased speed, endurance and stride length in stronger leg and decreased oxygen consumption at rest and stance time in the weaker leg. Rampello et al.¹⁷ found that an aerobic program consisting of three 40 minute sessions a week for eight weeks increased walking speed and distance and improved peak oxygen consumption and oxygen pulse. Cattaneo et al.²⁰ found that balance training that includes motor and sensory strategies helps to improve dynamic balance.

More randomized controlled trials are needed to assess the benefits of aerobic,

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resistance, and combination programs on MS patients. Few similarities exist in the current studies. This lack of consistency neither allows clinicians to assess the benefits of certain types of treatments on MS patients nor to determine the parameters that have proven successful. Some studies lack detailed parameters and interventions which does not allow other researchers to replicate studies with larger sample sizes to truly assess significance of outcomes. Today there is increasing pressure on physical therapists by insurance companies to use treatment techniques that have been proven successful in order to be reimbursed for that treatment. As a result, it is even more important for therapists to continue research in this area.

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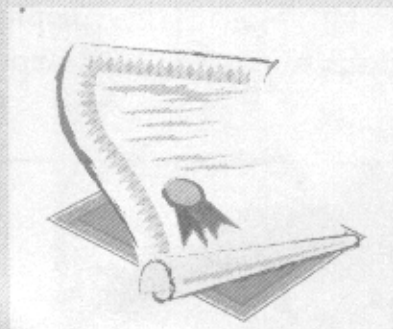
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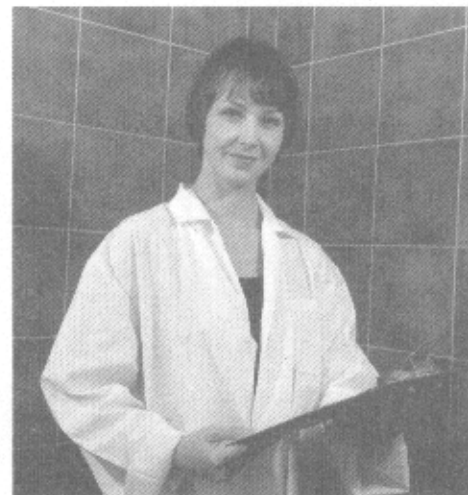


PRACTICE OF LIMITED PHYSICAL THERAPY: TAKING AND DOCUMENTING MEASUREMENTS

The Maryland Practice Act (13-101) defines "taking and documenting measurements" as within the "practice of limited physical therapy" allowed by the physical therapist assistant. The Board of Physical Therapy Examiners voted on April 21, 2009 to clarify that manual muscle testing and assigning a numerical or letter grade is included in "taking and documenting measurements". This Board action validates that a manual muscle test "grade" is defined in objective and measurable terms. Therefore, when the PTA performs a manual muscle test (MMT) as an objective measure of patient status they may document the MMT grade and record their findings in the objective section of the physical therapy medical record.

The Board emphasizes the following key points:

1. Only the physical therapist can interpret the results of a manual muscle test.
2. Physical therapist assistants may not perform manual muscle tests as part of a physical therapy evaluation.
3. The physical therapist assistant should only perform and document the results of a manual muscle test to measure the patient's response to treatment.
4. The supervising physical therapist and physical therapist assistant should use consistent MMT grading systems and objective measures when assigning the grade.



NAME APPROVALS FOR PHYSICAL THERAPY PROFESSIONAL SERVICE CORPORATIONS

A "professional corporation" is one organized for the purpose of rendering a professional service, i.e. "a service that may lawfully be rendered only by a person licensed or otherwise authorized by a licensing unit in the State to render the service...." Md. Code Ann., Corps. & Ass'ns, § 5-101(g)(1) (2007 Repl. Vol.). Effective October 1, 2007, this definition has been expanded to include services provided by a physical therapist. § 5-101(g)(2). Thus, a corporation of physical therapists may elect to be a professional corporation provided the corporation complies with the applicable provisions of the law. § 5-112.

The corporate name of a professional corporation must include (1) the word "chartered"; (2) the abbreviation "chtd."; (3) the words "professional association"; (3) the abbreviation "P.A."; (4) the words "professional corporation"; or (5) the abbreviation "P.C.". § 1-501(f). The name of a professional corporation may not use any other word, abbreviation, affix, or prefix that indicates it is a corporation. § 1-503(c). The name must also meet the requirements set forth in §§ 1-504 and 1-505.

Further, § 5-107(B) requires the name of a Maryland professional corporation (or a foreign professional corporation authorized to transact business in the State) to contain the surname of one or more stockholders of the corporation unless the Board of Physical Therapy Examiners (the "Board") and Maryland APTA approves the name and issues a certificate for its use. In addition, the Board's certificate must be attached to the articles of incorporation document in which the name is adopted. § 5-107(B)(3). Thus, for example, if Jane Doe, P.T. elects to incorporate her professional physical therapy practice with the name "USA Physical Therapy," she must submit the name for approval and a certificate. However, if she chooses the name "Doe Physical Therapy, P.C.," she does not need to submit the name for Board and Maryland APTA approval.

In order to obtain a certificate of authorization for use of a corporate name, the physical therapist must file an application with the Board which contains the name to be adopted by the corporation and the reasons for adopting the name. § 5-107(B)(3)(a). In determining the appropriateness of the proposed corporate name, the Board and Maryland APTA will consider the established ethical standards, rules and regulations of the profession. § 5-107(B)(3)(c)(2). To obtain an application, please contact the Board's staff at (410) 764-4752.

PT NEWS

Publication of
The Maryland Board
of Physical Therapy

REMINDER:

The Board meets monthly on the third Tuesday of the month from 1:00 p.m. until business is finished. Licensees, students and the general public are welcome to attend the Open Session which commences at 1:00 p.m. Closed sessions and Administrative session are reserved for discussions concerning peer reviews and discipline. Those sessions are not open sessions.