Open Access Journal

Indian Journal of Medical Research and Pharmaceutical Sciences

December 2016;3(12) ISSN: ISSN: 2349-5340

DOI: 10.5281/zenodo.222151 Impact Factor: 3.052

IMPACT OF RESISTANCE TRAINING ON BALANCE, GAIT AND FATIGUE IN MULTIPLE SCLEROSIS

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Keywords:
Resistance training, Multiple sclerosis, Balance, Gait, Fatigue.

Abstract

Introduction: Multiple sclerosis (MS) is the most prevalent progressive neurodegenerative disease among young adults.Multiple sclerosis (MS) is an autoimmune disease characterized by inflammation, selective demyelination and gliosis. It causes both acute and chronic symptoms and can result in significant disability and impaired quality of life. The vicious cycle of decreased activity contributes to increased disability, and reduced quality of life. However, regular exercise can improve daily activity,cardiovascular fitness,muscle strength,health perception, and fatiguein persons with MS.

Aim and objective: To study the impact of resistance training on balance, gait and fatiguein multiple sclerosis.

Methodology: It is an interventional study carried out in 22 MS patients. They underwent an intervention of resistance training over a period of 6 weeks for duration of 40 minutes.Session was divided as 10 minutes warm up, 20 minutes of resistance training followed by 10 minutes of cool down.

Result: Mean berg balance score pre intervention was 30.681(±2.982271). Mean berg balance score post intervention was 38.545(±2.971728).Mean Dynamic gait index score pre intervention was 9.954(±2.17074). Mean Dynamic gait index score post intervention was 12.545(±2.344746). Mean modified fatigue impact scale score was 45.363(±4.030189). Mean modified fatigue impact scale score was 29.363(±3.710288)

Conclusion: Resistance training has positive effects on gait, balance, and level of fatigue.

Introduction

Multiple sclerosis (MS) is the most prevalent progressive neurodegenerative disease among young adults [1]. Multiple sclerosis (MS) is an autoimmune disease characterized by inflammation, selective demyelination and gliosis. It causes both acute and chronic symptoms and can result in significant disability and impaired quality of life. In the past 15 years, various treatment methods have emerged that can slow disease progression, but a cure remains elusive. Although drug therapy can reduce the number and severity of relapses, patients generally continue to experience fatigue, muscle weakness, and balance problems. The disability resulting from this disease process can impede daily functioning and decrease quality of life, both for MS patients and for their care partners and families. There is fairly strong and consistent evidence that individuals with MS are less physically active than those unaffected by the disease, which is alarming given the high rate of inactivity among the general population [3]. Exercise training programs have traditionally been discouraged in the MS population because of the belief that they might exacerbate fatigue and other MS symptoms. To the contrary, recent studies have demonstrated positive effects of physical therapy and increased physical activity in reducing pain and improving mobility in MS patients [3, 4]. Structured exercise interventions have been shown to improve fitness and quality of life in people with MS [5]. As is the case in many chronic illnesses, patient access to physical therapy and exercise programs is often limited by insurance restrictions or inability to afford gym memberships or therapy services. Strength training is known to

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promote neural adaptations such as improved motor unit activation and synchronization of firing rates, which may deteriorate with periods of inactivity.[6]Neural adaptations gained through physical activity may have favourable functional outcomes in MS subjects, depending on MS lesion load and location. Moreover, improving strength in muscle capable of adaption to overload stimuli may also help maintain or improve overall fitness and functional ability including ambulatory status, although this has not been explored in people with moderate MS.

Materials and methods

Study design: Interventional study.
Study type: Experimental
Sample size:22 Multiple sclerosis patients.
Study setup: Mumbai.
Study duration: 6 Months

Inclusion criteria

1. Patients suffering from MS
2. Age between 19 and 65 years,
3. Ability to walk 25 feet with or without a cane or bracing
4. Ability to verbalize a willingness to comply with the study's evaluation schedule.

Exclusion criteria

1. Inability to provide informed consent
2. EDSS score of 7 or higher
3. Inability to walk 25 feet with the use of an assistive device
4. Pregnancy, breastfeeding, or having given birth within 3 months of initiation of the study
5. Diagnosis of any other neurologic disorder or disability that would affect balance and mobility.

The subjects were selected according to the inclusion and exclusion criteria. Consent was taken from all the subjects. According to the evaluation form data was collected. All patients who agreed to participate were treated. Berg balance scale was used to evaluate balance. Dynamic gait index was used to evaluate gait. Modified fatigue impact scale was used to evaluate fatigue. They were undergoing intervention of resistance training over a period of 6 weeks for duration of 40 minutes. Session was divided as 10 minutes warm up, 20 minutes of resistance training followed by 10 minutes of cool down. After 6 weeks duration their balance ,gait and fatigue was again assess with berg balance scale, dynamic gait index and modified fatigue impact scale. Results were compared pre and post intervention and conclusions were drawn. The overall resistance training program had three phases: Each exercise session focused on a single phase, and participants rotated through the phases to ensure equal participation in each phase.The **first phase** focused purely on strength improvement using therabands. Each exercise had different areas, including the abdominals and legs. During the **second phase**, the time was divided between the therabands and exercises to improve balance and dexterity. Balance exercises were conducted in a squat rack containing hand holds to provide stability and security and prevent falls. A combination of dumbbells and balance boards were used to improve conditioning, agility, and strength. The **third phase** focused on movements using free weights. A foot/ankle wrap was used to secure the weights for individuals with extremity weakness to protect them from weight-falling injuries.Extremities were exercised separately and unilaterally to allow both hands to be used for weight stabilization if needed and to provide adequate training for weakened extremities. Each phase of the program was designed to address balance and muscle strength, issues of special concern to MS patients, rather than overall conditioning.

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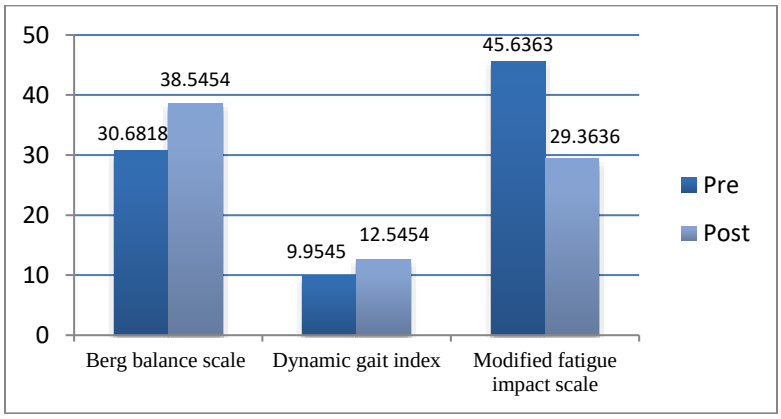
Results



Conclusion

The Berg Balance Scale was used to assess the balance in MS patients. Their values were compared twice: pre and post intervention. Mean berg balance score pre intervention was 30.681.Mean berg balance score post intervention was 38.545.Paired t test was used, t value: 20.112. Results gave p value <0.0001 stating the results are extremely significant. This shows balance in multiple sclerosis patients has significantly improved.

Dynamic gait index was used to assess the gait in MS patients. Their values were compared twice: pre and post intervention.Mean Dynamic gait index score pre intervention was 9.954(±2.17074). Mean Dynamic gait index score post intervention was 12.545(±2.344746). Paired t test was used, t value: 14.876 Results gave p value <0.0001 stating the results are extremely significant. This shows gait in multiple sclerosis patients has significantly improved. Modified fatigue impact scale was used to assess fatigue in MS patients. Their values were compared twice: pre and post intervention.Mean modified fatigue impact scale score was 45.363(±4.030189). Mean modified fatigue impact scale score was 29.363(±3.710288). Paired t test was used, t value: 14.113. Results gave p value <0.0001 stating the results are extremely significant. This shows fatigue in multiple sclerosis patients has significantly reduced.

Discussion

Physical activity and exercise improve strength in people with MS, increasing muscle tone and improving oxidative capacity. Whether exercise can produce changes in CNS functioning (i.e., neuroplasticity) remains unknown, although Daly and Ruff[7]described motor-learning principles required for the development of effective motor-recovery interventions for stroke patients based on evidence of brain plasticity. Little information is available about needed motor-learning principles and resistance training in patients with MS [8]or other CNS problems, with the majority of studies based on aerobic activities such as ergometry, treadmill exercise, or swimming. Regardless, it has been demonstrated that individuals who stay active remain independent longer, with slower disease progression.[5]This may indicate anti-inflammatory properties of physical activity, improvement of neuronal pathways, rechanneling and retraining of conduction pathways, or simply a basic response of healthier tissue.

The preliminary results of this study suggest that resistance training reduces fatigue, a finding consistent with previous research [9]. It is not known whether this improvement in fatigue is due to increased efficiency of movement, decreased levels of inflammatory cytokines, release of endorphins, or psychological factors.

Resistance training in patients with MS, along with balance and gait training must be performed in a safe environment and be supervised by adequately trained staff. A slow increase in resistance that is matched to the endurance level of the patient will result in gradual improvement in strength, balance, and walking ability. On the other hand, aggressive training is not well tolerated and can result in injury, severe fatigue, and disease

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exacerbations. Unilateral training is recommended, with decreased resistance and workload for weakened limbs to encourage muscle movement and toning. Increases in resistance should be implemented only when the individual can perform 10 repetitions with appropriate form. It has been reported that 40% of MS patients experience symptom exacerbation during and immediately after exercise because of a rise in core temperature.[10]Resistance training, however, does not increase core temperature to the extent seen in endurance training and thus may be better tolerated by people with MS. In the present study, no injury, long-term ill effect, or disease exacerbation was noted. The exercise intervention was well tolerated by all participants, regardless of level of disability. Further research is warranted to determine whether these results are reproducible.

These data are from a small sample, makingit difficult to generalize the results to a broader population. In addition, the study was non-blinded and nonrandomized. It is anticipated that the complete study data will support the preliminary findings, particularly in light of the robust nature of the initial results.

Conclusion

Participation in a structured resistance training program has positive effects on gait, balance, and level of fatigue. Thus exercise, particularly a structured weight resistance program, should be considered an essential component of comprehensive MS care, to be used in combination with pharmaceutical intervention and physical therapy.

Acknowledgements

We extend our gratitude towards participants for their consent and co-operation for the study.

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