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**ORIGINAL ARTICLE**

# Physical therapy and Pilates in the functionality and quality of life of people with multiple sclerosis

## *Fisioterapia e Pilates na funcionalidade e qualidade de vida de pessoas com esclerose múltipla*

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## Abstract

*Background*: Multiple Sclerosis is a chronic progressive disease that affects the Central Nervous System, causing destruction of myelin, and like many autoimmune diseases, it should be caused by a combination of environmental and genetic factors. *Objective*: To evaluate the influence of conventional physical therapy and the Pilates method in patients with Relapsing Remitting MS (RRMS) on their daily activities and quality of life. *Methods*: We retrospectively analyzed 25 medical records of patients submitted to Pilates (group A with 12 patients) and physical therapy (group B with 13 patients) with only one technique for each group from 2018 to 2019. Some scales were used: the Berg Balance Scale, Modified Fatigue Impact Scale (MFIS), MRC Medical Research Council Scale (MRC), and Quality of Life in Multiple Sclerosis Scale (MSQOL-54). *Results*: With the significance level adopted for $p < 0.05$, by the Wilcoxon test, we obtained MFIS: conventional $p = 0.030$ and Pilates $p = 0.005$, BERG: conventional $p = 0.015$ and Pilates

p = 0, 004, MSQOL-54 (Physical): Conventional p = 0.263 and Pilates p = 0.009 and MSQOL-54 (Mental): Conventional p = 0.807 and Pilates p = 0.028. *Conclusion*: The Pilates method proved to be more efficient, both in terms of functionality regarding fatigue and balance, as well as in quality of life, showing physical and mental improvement.
**Keywords**: multiple sclerosis; physiotherapy; Pilates; quality of life; rehabilitation.

## Resumo

*Introdução*: A Esclerose Múltipla (EM) é uma doença autoimune crônica que afeta o Sistema Nervoso Central, causando destruição da mielina e, como muitas doenças autoimunes, acredita-se que seja causada por uma combinação de fatores ambientais e genéticos. *Objetivo*: Avaliar a influência da fisioterapia convencional e do método Pilates em pacientes com Esclerose Múltipla Remitente Recorrente (EMRR) nas atividades diárias e na qualidade de vida. *Métodos*: Foram analisamos retrospectivamente 25 prontuários de pacientes com EMRR submetidos a Pilates (grupo A com 12 pacientes) e fisioterapia convencional (grupo B, com 13 pacientes), sendo que cada grupo utilizou apenas uma técnica, no período de 2018 a 2019. Foram comparados os dados obtidos por meio da Escala de Equilíbrio de Berg, Escala Modificada do Impacto da Fadiga (MFIS), Medical Research Council Scale (MRC) e Escala de Qualidade de Vida na Esclerose Múltipla (MSQOL-54). *Resultados*: Com o nível de significância adotado para p < 0,05, pelo teste de Wicoxon, obteve-se MFIS: convencional p = 0,030 e Pilates p = 0,005; BERG: convencional p = 0,015 e Pilates p = 0,004; MSQOL (Físico): convencional p = 0,263 e Pilates 0,009; MSQOL (Mental): convencional p = 0,807 e Pilates p = 0,028. *Conclusão*: O método Pilates se mostrou mais eficiente, tanto na funcionalidade referente à fadiga e equilíbrio, quanto na qualidade de vida, apresentando melhora física e mental.
**Palavras-chave**: esclerose múltipla; fisioterapia; Pilates; qualidade de vida; reabilitação.

## Introduction

Multiple sclerosis is a chronic, autoimmune disease that affects the central nervous system, causing destruction of myelin, a fundamental protein in the transmission of nerve impulse. The main areas of the Central Nervous System affected by MS are the periventricular areas of the brain, optical formations, cerebellum, brainstem and spinal cord [1].

In Brazil, around 40 thousand people are affected by MS [3], and in the world according to the International Federation of Multiple Sclerosis, there are about 2.8 million people with the disease [2]. It is the most common among demyelinating disorders, and

although it can manifest itself in both sexes and at any time in life, it is more prevalent between the ages of 20 and 40, and women are twice most affected as men [3].

The clinical manifestations are varied and determined by the location of the lesions, and include paresis, spasticity, gait disorders, intentional tremor, visual disturbances, fatigue, bladder and intestinal disorders, sensory disorders, sensory and/or drunken ataxia, nystagmus and cognitive disorders [4].

The benefits of regular physical exercise for healthy people and the prevention and treatment of various diseases has been proven by numerous studies [5].

Currently observe the use of aerobic exercise, muscle strengthening or flexibility in the search for a better quality of life for all people [6].

In the case of MS, the implementation of physical exercise programs has only recently started to be considered. In the last two decades, several researches have provided encouraging evidence so that these people can engage in body practices, safely and achieving improvements in physical fitness and in some symptoms attributed to the disease [7].

Studies indicate that interventions such as physical therapy and therapeutic physical exercises can improve many of the deficiencies observed in MS. However, the effectiveness of these interventions is not always proven in functional aspects. An overview of the rehabilitation strategies developed for autoimmune diseases, identified as the main components in the rehabilitation of MS the increase of the physical capacity, muscular strength, aerobic resistance and functional abilities [4]. Since MS accommodates a wide range of symptoms, the rehabilitation of these patients requires a multidisciplinary approach, with more satisfactory results being observed in the techniques that demonstrate the use of sensory strategies [5].

Physical exercise is an important non-pharmacological tool in the rehabilitation of MS. Contrary to previous belief, exercise is well tolerated and induces beneficial effects in patients with MS. Studies examining resistance training are, in general, of low methodological quality, which makes it difficult to draw solid conclusions about the effects of this training modality. However, resistance formation with moderate intensity appears to be well tolerated and has beneficial effects in patients with moderate disabilities [6].
Some scales are used to quantify the evolution of the patients, just like MFIS (modified fatigue impact scale) for fatigue, Berg balance scale for balance, MSQOL-54 (multiple sclerosis quality of life – 54) for quality of life, MRC (medical research council) for strength evaluation.

*Objective*

To compare the benefits of conventional physical therapy and Pilates method in fatigue, strength, balance and quality of life in patients with multiple sclerosis.

## Methods

*Type of study*

We retrospectively analyzed 25 medical records of MS patients undergoing rehabilitation program between 2018 and 2019, using the MFIS, MRC, BERG and MSQOL-54 scales. It was approved by the Ethics Committee in Research by the number 3.635.962 from ABC Federal University, in 2019.

*Evaluation methods*

The MFIS, BERG, MRC and MSQOL-54 were chosen because they were valid instruments for multiple sclerosis and fatigue, balance and strength are common symptoms.

The Modified Fatigue Impact Scale (MFIS) is one of the most used scales to assess fatigue, it consists of 21 questions divided into: physical (9), cognitive (10), psychosocial (2), allowing scores of 0 to 4 for each item. The result is given by the sum of the scores of the three domains, and varies from 0 to 84. A score under 38 means no fatigue and above this value until the higher the score, a strong fatigue [7].

The Medical Research Council (MRC) aims to assess muscle strength, analyzing movements of the main muscle groups, and the absence or presence of muscle contraction, ranging from 0 = no contraction to 5 = normal muscle strength [8].

The Berg Balance Scale evaluates a quantitative description of the functional balance skill in 14 items common to daily life. In this case the higher the score means a better result. Each item has an ordinal scale that varies from 0 to 4 points, with a score of 56 being the maximum achieved. A score below 44 points is described as a predictor of falls in MS [9].

The MSQOL-54 is the first specific instrument applied to MS. This scale is a modification of the SF-36, with the addition of 18 specific questions. There are 52 items grouped into 12 subscales and two distinct questions that deal with changes in health status and the patient's assessment of satisfaction with sexual function [10].

*Protocol*

The sample were divided into two groups: Group A with Pilates intervention and Group B with conventional physical therapy.

Protocol Group A: muscle strengthening of the lower limbs, upper limbs and trunk, balance training, central stabilization and posture) with the participation of 12 patients.

Protocol Group B: muscle strengthening of lower limbs, upper limbs and trunk, global stretching, static and dynamic balance training) with the participation of the other 13 patients.

The evaluations of Pilates and physical therapy training were performed before the beginning of the treatment and 4 months later, after 16 sessions, once a week, for 1 hour.

Some other information were collected, such as age, gender, time of diagnosis, EDSS degree (from 0 to 6.5), medication used and rehabilitation time, contained in the medical records of these patients with an informed consent form signed by the participant, authorizing the collect of data from medical records.

*Inclusion criteria*

As inclusion criteria, all the medical records of patients who started physical therapy in 2018 were analyzed. Participants signed the Informed Consent Form.

*Exclusion criteria*

Patients who did not undergo physical therapy at the institution or the ones who suffered outbreaks during the rehabilitation process.

*Statistical analysis*

Qualitative variables were presented by absolute frequency and relative frequency. Quantitative variables were presented by measures of position and measures of variability using the normality test of the Shapiro-Wilk test data.

The McNemar test was used to compare the evolution of muscle strength of upper and lower limbs before and after sessions in both physical therapy and Pilates groups. The Wilcoxon test was used to correlate muscle fatigue (MFIS), balance (Berg Balance Scale) and quality of life (physical and mental aspects with MSQOL-54) before and after therapy performed by physical therapy and Pilates groups. The EDSS classification and muscle strength of the upper and lower limbs were also associated

with the Chi-square test. In all analyzes, the level of significance adopted was p ≤ 0.05. The statistical program used was Stata version 11.0.

## Results

The participants in this study were aged between 21 and 77 years. There were 25 participants, 21 were female (84%) and 4 were male (16%). The degree of EDSS ranged from 0 to 6.5. As shown in Table I, the muscle group that suffered the most involvement was the lower limbs and the hip, affecting 96% of the participants, while the upper limbs are affected in 48% of the participants.

**Table I** - *Characterization of the sample*

| Variables | n | % |
|---|---|---|
| **Sex** | | |
| Female | 21 | 84 |
| Male | 4 | 16 |
| **Diagnosis time** | | |
| 1 to 4 years | 9 | 36 |
| 5 to 9 years | 7 | 28 |
| Above 10 years | 9 | 36 |
| **EDSS** | | |
| 0 | 3 | 12 |
| 1 to 1.5 | 4 | 16 |
| 2 to 2.5 | 7 | 28 |
| 3 to 4.5 | 8 | 32 |
| 5 to 6.5 | 3 | 12 |
| **Deficits** | | |
| Upper limbs | 12 | 48 |
| Lower limbs + hips | | |
| **Variables** | **media** | **DP** |
| **Age** | | |
| **21 to 77 years** | 47,28 | ± 14,32 |

When we compare EDSS and the impairment in muscle strength, we observe that the higher degree of EDSS takes a greater tendency to affect muscle strength, as shown in Table II. The degree zero, showed a high index, due to one of the participants presenting associated hemiparesis, causing a decrease in muscle strength.

**Table II** - Comparison between degree of EDSS and impairment in muscle strength

| Variables | n | muscles | % |
|---|---|---|---|
| **EDSS** | | | |
| 0 | 3 | 2 | 66.67 |
| 1 to 1.5 | 4 | 1 | 25 |
| 2 to 2.5 | 7 | 3 | 42.86 |
| 3 to 4.5 | 8 | 4 | 50 |
| 5 to 6.5 | 3 | 2 | 66.67 |

From the data presented in Table III, we found that the two methods proved to be efficient in improving patient's fatigue, in this case, the Pilates method showed better results compared to the conventional method. In the balance assessment, we verified that both methods showed improvement, again the methods showed improvement, with the Pilates method having better efficiency. The quality of life analysis was subdivided into two parts, Physical Health and Mental Health, in both, conventional physical therapy did not show significant improvement and the opposite occurred with Pilates method.

**Table III** - *Comparison of the rating scales with the results of the medians of pre and post Pilates and physical therapy sessions (Wilcoxon Text)*

| Variables | n | pre | post | p |
|---|---|---|---|---|
| **MFIS** | | | | |
| Group A | 12 | 51.5 | 43.5 | 0,005 |
| Group B | 13 | 48 | 48 | 0,030 |
| **BERG** | | | | |
| Group A | 12 | 46.5 | 50 | 0,004 |
| Group B | 13 | 42 | 52 | 0,015 |
| **MSQOL-54 Physics** | | | | |
| Group A | 12 | 43.25 | 57.4 | 0,009 |
| Group B | 13 | 51.7 | 52.5 | 0,263 |
| **MENTAL** | | | | |
| Group A | 12 | 36.25 | 46 | 0,028 |
| Group B | 13 | 50.4 | 48.2 | 0,807 |

## Discussion

In this study, we found a significant improvement in balance and a reduction in fatigue through the practice of exercises, with conventional physical therapy and the Pilates method.

This study is relevant for clinical practice because elucidate different types of therapies to the improvement of multiple sclerosis patients and there is no other study that compare the benefits between Pilates and physical therapy. Regular therapeutic exercise is particularly important, to improving muscle strength; it is designed to improve endurance, muscle tone, postural stability, and flexibility. Any program must be adapted to the needs and symptoms of an individual patient [11].

Especially when we think about patients with RRMS, each patient, depending on their EDSS degree, has a degree of physical and emotional involvement, for this reason the Pilates method is very well accepted, bringing body awareness, increasing the level of concentration and spatial perception, improving balance, controlling muscle strength and consequently improving functionality and quality of life, as we can see in the results of this study.

Highlighting the benefits obtained by methods like Pilates in neurological dysfunctions are attributed to the ability that this practice has to work the balance between the mind and the body in a global and non-segmented way. Benefits that can positively influence the recovery and maintenance of brain capacity with the consequent activation of neuronal cells necessary for carrying out the most diverse functional activities [12].

However, physical therapy is also important for improvement of physical conditions of patients with MS, especially in balance issues, comparing pre and post intervention studies [13].

We provide them with better conditioning, pain relief, through stretching, which can contribute to improving great spasticity and muscle stiffness, greater independence and improvement in the performance of their activities of daily living and prevention of future injuries [14].

## Conclusion

With the data obtained in this sample analyzed, we understand that physical activity is an important ally to improve the quality of life of patients with RRMS, the two methods studied showed good results.

More studies are still needed to prove the effectiveness of physical activities in people with MS, as well as to evaluate other techniques and other methods.

**Conflitos de interesse**
Não há conflito de interesses

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Não houve financiamento

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## References

1. Dobson R, Giovannoni G. Multiple Sclerosis - an review. Eur J Neurol. 2019;26(1):27-40. doi: 10.1111/ene.13819
2. The atlas of multiple sclerosis. 3rd ed. [cited 2023 mar 8]. Available from: https://www.msif.org/wp-content/uploads/2020/10/Atlas-3rd-Edition-Epidemiology-report-EN-updated-30-9-20.pdf
3. Harbo HF, Gold R, Tintoré M. Sex and gender issues in multiple sclerosis. Ther Adv Neurol Disord. 2013;6(4):237-48. doi: 10.1177/1756285613488434

4. Oh J, Vidal-Jordana A, Montalban X. Multiple Sclerosis: clinical aspects. Curr Opin Neurol. 2018;31(6):752-9. doi: 10.1097/WCO.0000000000000622
5. Reynolds ER, Ashbaugh AD, Hockenberry BJ, McGrew CA. Multiple sclerosis and exercise: a literature review. Curr Sports Med Rep. 2018;17(1):31-5. doi: 10.1249/JSR.0000000000000446
6. Kim Y, Lai B, Mehta T, Thirumalai M, Padalabalanarayanan S, Rimmer JH, Motl RW. Exercice trining guidelines for Multiple Sclerosis, Stroke and Parkinson Disease: rapid review and synthesis. Am J Phys Med Rehabil. 2019;98(7):613-21. doi: 10.1097/PHM.000000000000117
7. Halabchi F, Alizadeh Z, Sahrajan MA, Abolhasani M. Exercise prescription for patients with multiple sclerosis: potential benefits and practical recommendations. BMC Neurol. 2017;17(1):185. doi: 10.1186/s12883-017-0960-9
8. Camargo, L.; Preira, C. Dispneia em DPOC: além da escala modified medical research council. J. Bras. Pneumol. 2010;36(5). doi: https://doi.org/10.1590/S1806-37132010000500008
9. Flachenecker P. Autoimmune diseases and rehabilitation. Autoimmun Rev. 2012;11(3):219-25. doi: 10.1016/j.autrev.2011.05.016
10. Lindroth JL, Sullivan JL, Silkwood-Sherer D. Does hippotherapy effect use of sensory information for balance in people with multiple sclerosis. Physiother Theory Pract. 2015;31(8):575-81. doi: 10.3109/09593985.2015.1067266
11. Dalgas U, Stenager E, Ingemann-Hansen T. Multiple sclerosis and physical exercise: recommendations for the application of resistance-, endurance- and combined training. Mult Scler. 2008;14(1):35-53. doi: 10.1177/1352458507079445
12. Pavan K, Schmidt K, Marangoni B, Mendes MF, Tilbery CP, Lianza S. Multiple sclerosis: cross-cultural adaptation and validation of the modified fatigue impact scale. Arq Neuropsiquiatr. 2007;65(3A):669-73. doi: 10.1590/s0004-282x2007000400024
13. Miyamoto ST, Lombardi Junior I, Berg KO, Ramos LR, Natour J. Brazilian version of the Berg balance scale. Braz J Med Biol Res. 2004;37(9):1411-21. doi: 10.1590/s0100-879x2004000900017
14. Kalron A, Rosenblum U, Frid L, Achiron A. Pilates exercise training vs. physical therapy for improving walking and balance in people with multiple sclerosis: A randomized controlled trial. Clinical Rehabilitation. 2916;31(3):319-28. doi: 10.1177/0269215516637202