

*Review Article*

## Effects of Pilates exercises on the quality-of-life in patients with multiple sclerosis: A narrative review

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### Abstract

Pilates exercise is a method of mind-body exercise used as a non-medical treatment strategy in patients with multiple sclerosis (MS) to elicit an outcome of improved health. The objective of this narrative review is to provide a comprehensive overview of the effectiveness of Pilates exercise in improving the quality-of-life for individuals diagnosed with MS. The present narrative review was carried out by conducting a thorough search of published articles using both the Google Scholar search engine and the PubMed database. The search strategy was specifically designed to identify studies that investigated the impact of Pilates exercise on the quality-of-life of individuals with MS. To ensure a comprehensive search, various Boolean operators were employed, including the use of the keywords "Pilates exercise", "quality of life", and "multiple sclerosis". Initial screening of literature, using titles and abstracts followed by full-text assessments, identified six clinical studies for this review, encompassing a sample of 187 patients with MS. Five studies concluded that Pilates exercise positively affects the quality-of-life among MS patients. In contrast, one study concluded that no meaningful effect on the quality-of-life can be found. Almost all reviewed studies supported that Pilates exercises as a clinical approach can improve the quality-of-life in patients with MS and other parameters related to general health conditions. Therefore, Pilates exercise as a therapeutic method can be introduced.

**Keywords:** Pilates Exercises, Quality of Life, Multiple Sclerosis, Nurses.

### 1 | Introduction

Multiple sclerosis (MS) is a chronic inflammatory, immune-mediated, and neurodegenerative disease of the central nervous system, leading to the damage of myelin sheath and axon [1, 2]. What brings more attention to this disease is its growing prevalence in recent years, as it is the most common non-traumatic neurological disease in young adults, particularly between 20 and 40 years old, involving more than 2.8 million people worldwide [3]. Although MS is recognized to have an autoimmune etiology, it is considered a multi-factorial disease, relying on genetic susceptibility and environmental factors as part of underlying pathophysiology mechanisms that have been the guiding force in

treatments [1, 4]. MS is a disease with a chronic and progressive nature and an inconsistent clinical course. Therefore, MS can cause many impairments, characterizing its symptoms and signs, such as balance abnormalities and ataxia, fatigue, and limited mobility [5-9]. One of the most expected impairments caused by MS is mobility dysfunction, which can force up to 69% of patients to use wheelchairs in around 28 years of diagnosis [9, 10]. Moreover, MS can also yield neurological deficits, including sensory disturbances, muscular spasticity and weakness, and visual, cognitive, and autonomic dysfunctions [5-8]. Cognitive impairment concerns 40% to 70% of patients via disrupting processing speed, attention, and memory, which are the most damaged cognitive

domains [11-13]. The combination of these factors, along with physical impairments, can lead to a significant decrease in self-sufficiency and freedom in day-to-day activities, ultimately affecting the overall quality-of-life [5, 7, 8, 11]. In current years, there has been a rising momentum to measure health beyond conventional health indicators (e.g., mortality and morbidity) to comprise measures of the effect and impairment of disease on daily activities and behavior, perceived health measures, disability, and functional status measures. Although these measures begin to estimate the impact of illness, they do not assess the quality-of-life per se, which has been appropriately designated as "the missing measurement in health". Health care is a humanistic transaction where the patient's well-being is the prior purpose that could be achieved via quality-of-life assessment. This results in interventions to increase attention to this aspect of the patient's well-being. Physical exercise is asserted to help develop a healthy attitude, promoting positive psychological outcomes and the quality-of-life in MS patients. Pilates is a method of physical exercise used as a non-medical treatment strategy in these populations [14, 15]. Pilates is a well-known mind-body exercise program that is taught worldwide. Originally called Contrology by its inventor, Joseph Pilates (1880–1967), this mind-body exercise program is based on six fundamental principles: centering, concentration, control, precision, flow, and breath [16, 17]. These principles introduce an inter-relationship among physical and mental processes to elicit an outcome of improved life satisfaction, self-concept, and overall health [16]. The method of Joseph Pilates is the total coordination of body, mind, and spirit, forming the proper balance between body and mind, providing the physical and mental power crucial for achieving health and happiness [16]. Pilates also praised the practical influences of Contrology on self-confidence, composure, and consciousness of maintaining the strength to fulfill one's desires with restored energy and interest in life [16]. Pilates is often divided into two categories: Pilates on the mat and Pilates equipment, in which the exercise is based on using Pilates machines [18]. Joseph Pilates designed his apparatus to assist movement and pattern comprehension as mastering the mat program was considered the method's goal, with the outcome progressing to a more functional and integrative activity [16, 18]. Original elements of Pilates equipment consist of these 12: the reformer, Cadillac, Wunda Chair, electric or high chair, magic circle, ladder barrel, small barrel, baby chair, mat, spine corrector, toe corrector, and breath-a-sizer [14]. Another notable feature of Pilates is the focus of this method on reinforcing the powerhouse (the circumference of the lower torso), which supports the other parts of the body, helping to create the body stability required for a long healthy life [19]. Current research has

studied the impacts of the Pilates-based exercise method on numerous health-related outcomes, indicating progression in self-efficacy, mood, sleep quality, and the quality-of-life [20, 21]. However, scientists are critical of the lack of studies regarding the effect of the Pilates-based method on psychological variables like the quality-of-life [22].

The results of research studies can inform healthcare professionals, patients, and caregivers about the potential benefits of Pilates as a complementary therapeutic approach and help optimize the use of Pilates exercise as a therapeutic intervention for MS patients. Furthermore, by understanding the potential benefits supported by scientific evidence, patients can be more engaged in their own care and take an active role in improving their well-being. Overall, conducting research on the effects of Pilates exercise on the quality-of-life of MS patients is essential for advancing clinical care, improving patient outcomes, and enhancing the overall well-being of individuals living with MS.

## 2 | Methods

The present narrative review was carried out by conducting a thorough search of published articles using both the Google Scholar search engine and the PubMed database. The search strategy was specifically designed to identify studies that investigated the impact of Pilates exercise on the quality-of-life of individuals with MS. To ensure a comprehensive search, various Boolean operators were employed, including the use of the keywords "Pilates exercise", "quality of life", and "multiple sclerosis". In order to refine the search results, certain limits were applied, such as excluding research with an inappropriate focus and articles not written in English. However, no restrictions were placed on the year of publication, allowing for a comprehensive analysis of the available literature. The EndNote X20 software was utilized to efficiently organize references when inputting the search results. To document the process of collecting, screening, and selecting articles Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flowchart was employed [23].

## 3 | Results

Articles that resulted from the mentioned keywords were initially screened based on their titles and abstracts, followed by full-text evaluation. Ultimately, six clinical studies were determined and included in the review. The total sample consisted of 187 MS Patients.

Ghasemi *et al.*, (2022) conducted a study to compare the impacts of TRX and Pilates exercises on balance, fatigue, and the

quality-of-life in female MS patients. The study divided 30 participants into control, Pilates, and TRX groups, undergoing eight-week training programs with three sessions per week. Assessment tools included the Berg Balance Scale, Fatigue Severity Scale, and the MS Quality-of-Life Inventory. Results showed significant improvements in balance, fatigue, and the quality-of-life across both exercise groups [24]. Ozkul *et al.*, (2020) investigated the effects of combined aerobic and Pilates exercise on MS patients with cognitive impairment. Thirty-four patients with relapsing-remitting MS were split into control and exercise groups, with the exercise group showing marked benefits in verbal memory, cognitive fatigue, walking capacity, and physical aspects of quality of life. Notably, changes in various cognitive functions correlated with alterations in mental quality-of-life and mood [25]. Duff *et al.*, (2018) explored the influence of Pilates on MS patients' walking performance. Thirty participants were randomized into Pilates or massage therapy groups for a 12-week period. While the Pilates group exhibited an increase in walking distance and faster completion of the timed up and go test, the quality-of-life indicators did not show significant changes [26]. A study by Abasiyanik *et al.*, (2020) compared the effects of yoga and clinical Pilates on respiratory muscle strength, cognition, and the quality-of-life in 28 MS patients. The study concluded that clinical Pilates significantly improved balance, walking speed, and the quality-of-life over yoga, with no remarkable changes in other studied parameters [27]. In another study by Küçük *et al.*, (2016) Pilates exercises were evaluated for their influence on various health aspects of MS patients, including cognition, physical performance, and quality of life. This work found significant benefits, advising healthcare professionals to consider Pilates as a treatment modality for MS [28]. Lastly, Najafi *et al.*, (2023) assessed the impacts of tele-Pilates and tele-yoga on biochemical, physical, and psychological parameters in women with MS. The intervention led to positive changes in prolactin and cortisol levels, as well as notable improvements in depression, physical activity levels, quality of life, and walking speed, suggesting the potential of these tele-rehabilitation methods as complementary treatments for MS patients [29]. These studies collectively support the effectiveness of exercise interventions, particularly Pilates, in improving physical and mental health outcomes in MS patients. Studies included in this review presented a range of outcomes highlighting the multifaceted benefits of Pilates. Given the heterogeneity of methodologies and outcome measures used across the studies, the results are categorized by the identified themes relevant to the patient's quality of life.

### 3.1 | Physical functioning and mobility

Several studies demonstrated a significant improvement in physical functioning and mobility among MS patients following a Pilates exercise regimen. It has been reported by Duff *et al.*, (2018) that participants showed notable enhancements in balance and walking parameters, which are pivotal for day-to-day functioning [26].

### 3.2 | Fatigue and energy levels

Fatigue, a common symptom affecting MS patients, was another primary outcome addressed by the selected studies. It has been found that Pilates participants experienced a reduction in fatigue severity, likely contributing to the enhanced quality of life. Energy levels were indirectly assessed through improvements in endurance-based activities, such as increased walking distances [29].

### 3.3 | Emotional well-being and mental health

Pilates' impact on emotional well-being and mental health also emerged as a significant theme. A reduction in depression scores and a positive shift in mood parameters have been found. These psychological benefits suggest that Pilates may contribute to better overall mental health in MS patients [26, 29].

### 3.4 | Cognitive function

Cognitive impairment associated with MS was also a focus in some of the reviewed articles. While observed enhancements in cognitive functions such as verbal memory and processing speed, the correlation between these cognitive improvements and overall, the quality-of-life was not thoroughly explored by all studies [25, 27].

### 3.5 | Social and personal factors

It has been identified that Pilates might also support social aspects of quality of life, though this area was less frequently assessed. Evidence of participants feeling more engaged and capable in their social lives post-intervention.

### 3.6 | General quality-of-life measures

Using validated the quality-of-life instruments, like the MS Quality of Life-54 (MSQoL-54), several studies within this review consistently reported an overall enhancement in the quality-of-life scores post-Pilates intervention, indicating its potential as a supportive therapy for MS patients.

### 3.7 | Tele-rehabilitation Pilates

With the advent of tele-rehabilitation, remote Pilates sessions can also yield significant the quality-of-life benefits, expanding the accessibility of Pilates as a therapeutic option for MS patients who may face challenges with in-person attendance [29].

## 4 | Limitations

Amongst analyzed studies, several limitations should be considered. First, the inadequate and small sample size in different groups would have diminished the reliability of the statistical analysis. Furthermore, some samples were selected among specific patients, especially mild disabled patients. At the same time, the effect of Pilates on severe levels of disability and various phases of MS has remained unknown. Second, the training characteristics varied broadly between studies, which would have restricted the generalizability of the results. Third, the type of medication every patient takes should be considered, as medications can alter the outcome remarkably. Fourth, the lack of investigation of the adverse effects of Pilates is another limitation that could be related to dropouts, so it should be elucidated precisely. Another limitation can be the absence of follow-up plans, which would help examine how long this training effect can last and whether its effect is constant. Finally, the underlying means of how Pilates improves health conditions is still unclear, and further investigation is required to reveal its action mechanism.

## 5 | Implications for health managers and policy-makers

Pilates is beneficial for MS patients due to its focus on core strength, balance, flexibility, and coordination. These benefits can help manage symptoms such as fatigue, weakness, and impaired balance, which are common in MS. Pilates exercises can be adapted to suit the individual needs and abilities of MS patients, making it a versatile option for rehabilitation and exercise programs. Furthermore, the mind-body connection emphasized in Pilates may improve mental well-being and a sense of control over one's body, which is important for MS patients struggling with the psychological impact of the disease. Clinical studies have shown that Pilates can lead to improvements in balance, mobility, and overall physical functioning in MS patients. Additionally, the social aspect of participating in group Pilates classes may also positively impact the emotional well-being and social connection of MS patients. It's important to note that while Pilates can offer significant benefits, it's essential for MS patients to work with qualified healthcare professionals to ensure that the exercises are relevant to their specific needs and abilities.

## 6 | Recommendations for future research

Comparative studies to assess the effectiveness of Pilates exercise in comparison to other forms of exercise therapy commonly used for MS patients could provide valuable insights into how Pilates measures up against other modalities and whether it offers unique benefits. Additionally, understanding the barriers to long-term participation in Pilates could inform the development of strategies to optimize patient engagement. Moreover, Exploring the underlying physiological and neurological mechanisms through which Pilates exercise may exert its effects on MS patients. This could involve neuroimaging, biomarker analysis, or other investigative approaches to elucidate the mechanisms of action. Finally, conducting multi-center clinical trials can enhance the validity of the research across diverse populations. It can broaden the generalizability of research findings related to the effects of Pilates exercise on MS patients. This can help validate findings across diverse patient populations. By focusing on these areas, future research can contribute to a more comprehensive understanding of the potential benefits of Pilates exercise for improving the quality-of-life for individuals living with MS.

## 7 | Conclusions

According to analyzed results from reviewed studies, it would seem rational to accept that Pilates exercise is identified as an effective and safe option for improving the quality-of-life amongst MS patients and can provide the best chance for maintaining a high quality of life. The evidence discussed indicates that Pilates, as a form of exercise therapy, holds considerable promise for individuals coping with the symptoms of MS. It appears not only to offer potential physical benefits such as enhanced balance, greater functional mobility, and reduced levels of fatigue but also to provide psychological and social advantages, contributing to improved mental well-being and increased opportunities for social engagement. Notably, the mind-body integration at the core of Pilates emphasizes on the importance of nurturing mental resilience and emotional health alongside physical rehabilitation. However, there is a need for more extensive, long-term studies with larger cohorts to validate the initial positive outcomes observed in smaller-scale studies. Research that not only documents the immediate impact of Pilates but also its sustained effects over time will be invaluable. The integration of Pilates into therapeutic programs for MS patients should be considered cautiously and, on a case-by-case basis under the guidance of healthcare professionals. With a stronger commitment to research in this area, researchers can move toward an optimized and evidence-based approach to the incorporation of Pilates into MS care regimens,

ultimately supporting the goal of improving life quality for those affected by this complex and challenging condition.

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### Authors' contributions

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: SM, AMN, AK, BE, MEKK; Drafting the work or revising it critically for important intellectual content: SM, AMN, AK, BE, MEKK; Final approval of the version to be published: SM, AMN, AK, BE, MEKK; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: SM, AMN, AK, BE, MEKK.

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### Competing interests

We do not have potential conflicts of interest with respect to the research, authorship, and publication of this article.

### Availability of data and materials

The datasets used during the current study are available from the corresponding author on request.

### Using artificial intelligent chatbots

None.

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