



# Rehabilitation in Multiple Sclerosis: Treadmill Training with Virtual Reality

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## ABSTRACT

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**Introduction:** Multiple sclerosis (MS) is a progressive, debilitating disease that results in a variety of neurological disorders, including cognitive and motor deficits that are associated with impaired daily functioning and reduced quality of life. Rehabilitation programs can significantly improve motor and cognitive function in MS patients. Treadmill training with virtual reality (TT-VR), performed by placing the patient on a treadmill and creating a game or personalized environment, has been investigated as a new cognitive and motor rehabilitation tool. This study examines the potential role of VR in the rehabilitation of MS patients through treadmill training.

**Search Strategy:** A PRISMA-based search was performed using four databases: PubMed, Scopus, Web of Science, and Google Scholar. The search period was from 2015 to 2024 with keywords "treadmill training," "virtual reality," and "multiple sclerosis." In the initial search, 30 articles were found. After removing duplicates and reviewing the titles and abstracts, six articles with entry conditions, including multiple sclerosis studies, virtual reality, treadmill training and synonyms, compliance with the specified publication period, and RCTs, were included in the study. Exclusion criteria also included any violation of the input parameters.

**Results:** The included studies demonstrate that TT-VR significantly enhances walking speed, kinematics, and kinetics, indicating increased functional abilities. Furthermore, TT-VR improves walking performance when crossing obstacles and complex conditions and spatiotemporal parameters of walking and balance. It also positively influences multiple aspects of cognitive function and mental health, improving learning and educational outcomes. This exercise is also safe and applicable for MS patients who have moderate disability.

**Conclusion and Discussion:** Creating a personalized environment, enhancing patient adherence to the rehabilitation process, and facilitating functional and cognitive aspects can make TT-VR a valuable addition to the rehabilitation environment. Nevertheless, further studies with more extended follow-up periods are necessary to ascertain the efficacy of this exercise in mitigating the disease process (either by reducing its severity or even reversing it).

### Citation:

Shaban F, Khajehpour A, Safari N, Razi M. Rehabilitation in Multiple Sclerosis: Treadmill Training with Virtual Reality. *Iranian biomedical journal. Supplementary* (12-2024): 438.

**Keywords:** Multiple sclerosis, Rehabilitation, Virtual reality

