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The Impact of Aerobic Exercise on Motor and Cognitive Outcomes in Individuals with Parkinson's Disease

Author: Rotaru Constantin-Călin[1]
Co-authors: Rebenciuc Tudor-Ștefan[1], Trandafir Cristiana Maria[1]
Scientific Coordinator: Assistant Professor Savin Ilie-Andreas, MD, PhD[1]
Affiliation: University of Medicine and Pharmacy "Gr. T. Popa", Iași[1]

Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder that primarily affects motor function due to the loss of dopamine-producing neurons. It is diagnosed in approximately 300,000 people globally each year, with incidence rising with age. This review explores the role of physical therapy and exercise in enhancing motor function and reducing disability in people living with PD.

Methods

This review analyzed eight studies: 7 randomized controlled trials (RCTs) and one pilot study, with a total of 504 participants diagnosed with PD. A literature search was conducted in PubMed, Scopus and Elsevier up to April 1, 2025, using terms such as "Parkinson's disease", "aerobic exercise", "treadmill training" and "MDS-UPDRS".

Inclusion criteria were: adults with PD (Hoehn and Yahr stages I–III), aerobic exercise interventions and reported motor or gait-related outcomes. Exclusion criteria were: studies focusing solely on pharmacological treatments and non-peer-reviewed publications.

Results

In a phase II RCT involving 128 patients with PD, those assigned to the high-intensity treadmill training group (4 days/week at 80%–85% of maximum heart rate) experienced minimal motor decline (mean UPDRS score change: 0.3) over 6 months, whereas the control group showed a greater deterioration (mean change: 3.2). In a more recent double-blind RCT, 130 patients were assigned to either the aerobic intervention group or the control group. The off-state MDS-UPDRS motor score showed a between-group difference of 4.2 points, favoring aerobic exercise. Improvements in gait parameters such as: walking capacity, assessed by the 6-minute walk test (6MWT), walking speed and spatiotemporal variables (step and stride length) are most commonly observed in aerobic exercise trials that involve treadmill training, overground walking, Nordic walking. In a 24-week RCT, participants were assigned to speed treadmill training (TT), mixed TT or control group (light exercise). Only the speed (9.9%) and mixed (5.5%) TT groups showed significant improvements in 6MWT distance after 6

months. Another example is a pilot study involving 9 patients that had to walk on a treadmill for 30 minutes/session, four times a week for six weeks. The study showed improvements of 4%–20% in walking speed, 5%–10% in walking distance and 4%–14% in stride length. Also, six months of moderate-intensity aerobic exercise has been shown to enhance cognitive and emotional well-being in individuals with mild to moderate PD. In a pilot single-blind RCT (n=17), treadmill training led to improved FAB-it scores after one month (from 14 to 16), while the control group showed no change (14.5 to 14). This showed a significant improvement in cognitive control, attention and memory.

Conclusion

Aerobic exercise has a positive impact on motor symptoms and gait parameters in individuals with PD, especially in earlier stages. The studies reviewed suggest that aerobic exercises can help slow motor decline, enhance walking speed and distance and improve the psychological health. As such, they should be considered a key component of non-pharmacological management, contributing to greater independence and improved quality of life for people living with PD.

Keywords

Aerobic exercise, Gait parameters, Unified Parkinson's Disease Rating Scale (UPDRS)