Revista ARACÊ
ISSN: 2358-2472

CARDIORESPIRATORY PHYSICAL THERAPY REHABILITATION IN PATIENTS WITH PARKINSON'S DISEASE

https://doi.org/10.56238/arev6n3-076

Submitted on: 08/10/2024 **Publication date:** 08/11/2024

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ISSN: 2358-2472

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ABSTRACT

Introduction: Parkinson's disease (PD) is a neurodegenerative disorder that affects motor function and often leads to a number of secondary complications, including cardiorespiratory impairments. The importance of cardiorespiratory physical therapy rehabilitation as a vital component of comprehensive care for individuals with PD is emphasized. This study highlights approaches and outcomes associated with cardiorespiratory physiotherapy in Parkinson's disease. Physical inactivity associated with PD may be linked to the appearance of obstructive ventilatory disorders, potentiated by the clinical worsening of the patient. In conclusion, the findings delimit promising results of physical therapy treatment on pulmonary parameters in PD, and sentence the need for further longitudinal studies of the clinical trial type to prove the cause-and-effect relationship of the variables in question. Parkinson's disease (PD) has a chronic and progressive characteristic and affects, in general, the elderly population in the age group between 50 and 70 years, reaching a peak between 60 years and increasing both the prevalence and incidence of PD. Approximately 1 to 2% of the Brazilian population over 65 years of age has PD. Objective: To provide an insight into the role of physical therapy rehabilitation in addressing the cardiorespiratory challenges faced by individuals with PD. Methods: Through a systematic review of existing literature on evidence-based practices, using the PICO strategy. Results and Discussion: 19 articles were found in the main databases, only 04 met the inclusion criteria. Conclusion: The articles studied tend to indicate that cardiorespiratory physiotherapy plays an important role in the treatment of cardiorespiratory complications in Parkinson's.

Keywords: Rehabilitation. Cardiorespiratory. Parkinson. Physiotherapy.

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ISSN: 2358-2472

INTRODUCTION

Parkinson's disease is a chronic and progressive neurological disorder that primarily affects the body's motor system. It is named in honor of the British physician James Parkinson, who first described the symptoms in 1817.Patients with Parkinson's disease who underwent physical therapy had notorious pulmonary function results in relation to sedentary patients with and without Parkinson's disease, physical inactivity associated with the disease may be linked to the appearance of obstructive ventilatory disorders, potentiated by the clinical worsening of the patient. Parkinson's disease is characterized by the degeneration and death of brain cells responsible for producing dopamine, a neurotransmitter involved in controlling body movements. As the amount of dopamine decreases, communication problems occur between the brain and muscles, resulting in motor symptoms. (Thomé *et al,* 2016).

The main symptoms of Parkinson's disease include tremors at rest (usually starting in one hand), muscle stiffness, bradykinesia (slow movements and difficulty initiating or executing movements), and postural instability (difficulty maintaining balance). In addition to motor symptoms, Parkinson's disease can also cause non-motor symptoms such as depression, anxiety, sleep disturbances, memory problems, and difficulties in controlling autonomic function (such as blood pressure and digestion. (Silveira *et al*, 2018).

Although Parkinson's disease has no cure, there are treatments available to help manage symptoms and improve patients' quality of life. Drug therapy, which aims to increase dopamine levels in the brain, is the main treatment used. In addition, physical therapy, occupational therapy, speech therapy, and other forms of therapy may be recommended to help improve mobility and quality of life. (Guimarães, *et al* , 2018).

Importantly, each case of Parkinson's disease is unique, and the symptoms and progression of the disease can vary significantly from person to person. With the evolution of the disease, due to multifactorial etiology, there is a decrease in respiratory functional conditions occurring in most patients with PD in advanced stages, increasing the severity of the disease. (Bonjorni *et al*, 2012).

Although Parkinson's disease is primarily known for its motor symptoms, it can also cause cardiorespiratory complications. These complications can arise due to the effects of the disease on the autonomic nervous system, which controls functions such as heart rate, blood pressure, and lung function. Some of the cardiorespiratory complications associated with Parkinson's disease include hypoventilation, Orthostatic hypotension (OH), Obstructive

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Sleep Apnea (OSA), Heart Rhythm Disorders (CKD), Respiratory Muscle Weakness (RMS), Respiratory Dysfunction (RD), Dysphagia, and Breathing Disorders in "Off" Episodes (DRED). The treatment of cardiorespiratory complications in Parkinson's should be based on the severity of the symptoms and the specific needs of each patient, that is, ensuring treatment based on individuality. Regular medical follow-up and a multidisciplinary approach, involving physical therapists, occupational therapists, and other specialized healthcare professionals, are essential for developing an appropriate treatment plan and monitoring progress over time. (Thomé *et al* 2016).

Cardiorespiratory physiotherapy plays an important role in the treatment of cardiorespiratory complications in Parkinson's. Specific guidance and exercises can help strengthen respiratory muscles, improve lung capacity, improve breath control, and promote proper posture. This approach aims to improve lung function, strengthen respiratory muscles, and promote aerobic capacity. (Pereira et al, 2010).

The objective of this study was to describe Parkinson's disease and cardiorespiratory physiotherapy rehabilitation interventions as a vital component of comprehensive care for individuals with Parkinson's Disease using a Systematic Review combined with Evidence-Based Practice (EBP).

METHOD

This study is a descriptive research by systematic review of the literature. Evidence-based practice (EBP) seeks to highlight what is clear, the verification of a truth that does not cause any doubt, where the clinical problems that arise in care practice are fragmented and organized using the PICO strategy.

Elucidated by Santos *et al,* (2007), the PICO strategy can be used to construct research questions of different natures, arising from the clinic, the management of human and material resources, the search for instruments to assess symptoms, among others. This strategy enables the correct definition of what information (evidence) is necessary for the resolution of the clinical research question, maximizes the retrieval of evidence in the databases, focuses on the scope of the research and avoids unnecessary searches.

To prepare this systematic review, the PICO strategy was used, described in Table 1, which represents an acronym for **Patient,**Intervention, **Comparison** and **Outcomes.**

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Table 1 – PICO Description

Acronym	Description
P	Parkinson's patients
I	Cardiorespiratory Physiotherapy
C	Other Treatments
Or	Highlight the importance of cardiorespiratory physiotherapy rehabilitation to improve the overall health and well-being of individuals with PD.

Source: Authors

The Health Sciences Descriptors (DCS) and the Boolean operators (AND/OR) were used. The descriptors selected for the disease were: Physiotherapy, Cardiorespiratory, Parkinson's and Rehabilitation.

The inclusion criteria consisted of: (1) type of study: controlled clinical trial and any study with participants (sampling) and intervention protocol. (2) publication between 2012 and 2023, search for current literature.

The exclusion criteria consisted of: (1) type of study: systematic review, meta-analysis, cross-sectional studies, and case report. (2) Research that uses animals for study. (3) Theses.

The literature searches of the articles were carried out from June to November 2023, in English and Portuguese. The articles were searched in recognized databases such as: PUBMED (National Center for Biotechnology Information, U.S. National Library of Medicine), MEDLINE (Medical Literature Analysis and Retrieval System Online), PEDro (Physical Therapy Evidence Database), SciELO (Scientific Electronic Library Online) and LILACS (Latin American Literature)

– American and Caribbean in Health Sciences.

To choose the selected studies, the pair search was used, first carried out with a focus on randomized clinical trials, the inclusion criteria were applied by the titles and year of the articles; soon after, the summaries and, finally, the full text. The selected articles were those that met the proposed theme and objective.

RESULTS

A total of 19 articles were found, of which: 3 results in PubMed, 2 in LILACS, 3 results in PEDro and 11 articles from SciELO, as shown in Table 2.

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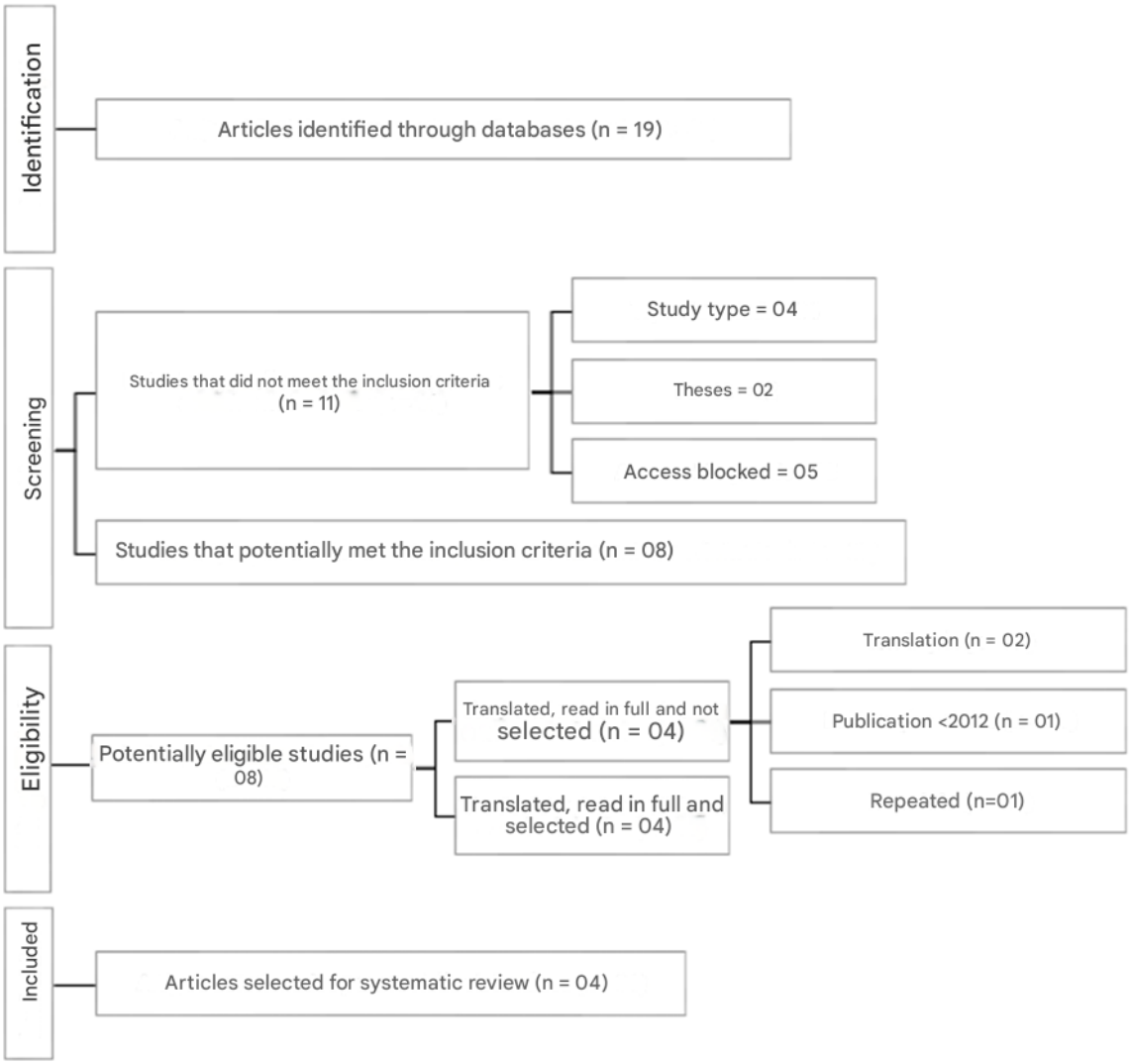
Table 2 – Description of the total number of articles found per database searched.

Database	Physiotherapy AND Rehabilitation AND Cardiorespiratory AND Parkinson's
PubMed	03
LILACS	02
Peter	03
SciELO	11

Source: Authors

A total of 19 articles were found in the aforementioned databases (Figure 1), which met the theme proposed in the research. After analyzing the titles and abstracts of each article, 11 and 8 were discarded and thus selected for reading and elaboration of this review, however, only 4 articles met all the inclusion criteria.

Figure. 1 - Sample Flowchart.



Source: Authors

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Table 3 – Characteristics of the included studies

Authors Year	Objective	Sample	Assessment Instruments	Conclusions
Thomé J.S. *et al* (2016)	To investigate the pulmonary parameters (spirometry and impulse oscillometry) of patients with PD and eutrophic controls, comparing the values of the participants and those who did not participate in a program of physical therapy assistance.	37 patients divided into 4 groups and 2 underwent a physical therapy exercise program and 2 remained inactive.	Mixed experimental study, with longitudinal follow-up and cross-sectional analyses STROBE and CONSORT	The results are promising in the physical therapy treatment of pulmonary parameters in PD, and indicate the need for further longitudinal studies of the clinical trial type to prove the cause and effect relationship of the variables in question.
Silveira R. A *et al* (2018)	To compare the effects of functional training and exercise on a stationary bicycle on the respiratory function of elderly people with PD.	20 patients divided into 2 groups.	Pilot randomized controlled clinical trial with blinded evaluation that followed the recommendations of the Consolidated Standards of Reporting Trials (CONSORT)	Exercise programs lasting 8 weeks are not able to improve respiratory function in older adults with Hoehn & Yahr stages 2 to 3 PD. Both groups that performed functional training and exercise on a stationary bicycle did not improve the respiratory function of elderly people with DP.
Guimarães D *et al* (2018)	To evaluate the respiratory function of elderly patients with PD in the mild to moderate phase of the disease	60 elderly patients with PD	Observational, quantitative, and cross-sectional research according to the Helsinki Declaration	Elderly patients in mild or moderate PD had reduced respiratory parameters. Spirometry proved to be an important tool for assessing respiratory function and for indicating the modality of respiratory exercise. Our results suggest the indication of thoracic flexibility exercises for patients with PD classified as restrictive disorders and respiratory muscle strength exercises for those classified as restrictive disorders as an obstructive disorder.

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Bonjorni L.A *et al* (2012)	OBJECTIVE: To evaluate and compare the lean body mass index (MMMI), spirometric variables, respiratory muscle strength, and physical capacity in patients with PD and healthy older adults. In addition, to verify which of these variables influence the physical capacity of patients with PD.	25 elderly patients of both sexes	were submitted to anamnesis, general physical evaluation, in addition to spirometry, evaluation of respiratory muscle strength, body composition and physical capacity by the walk test six-minute (SS6)	The PD group showed reduced muscle mass, endurance and respiratory muscle strength, and physical capacity, when compared to healthy older adults. In addition, MEP and MV influence the physical capacity measured by the 6MWT, just as muscle mass influences muscle endurance respiratory disease in patients.

Source: Authors

DISCUSSION

The treatment of cardiorespiratory complications in Parkinson's should be based on the severity of the symptoms and the specific needs of each patient, that is, ensuring treatment based on individuality.

Cardiorespiratory physiotherapy plays an important role in the treatment of cardiorespiratory complications in Parkinson's.

Breathing Exercises (ER): Specific exercises are performed to improve lung capacity, chest expansion, and rib cage mobility. This can include deep breathing techniques, diaphragmatic breathing exercises, and respiratory muscle training. (Pereira *et al*, 2010).

Authors state that associated therapies can improve the state of dependence and the quality of life of the patient and include:

- Aerobic Exercise (AE): Regular aerobic exercise can improve cardiovascular capacity, promote blood circulation, and increase endurance. Examples of aerobic exercise include walking, cycling, swimming, and dancing. These activities can be adapted according to the patient's individual physical condition and symptoms. (Rodrigues-de-Paula *et al*,2010); (Silveira *et al*, 2018).
- Effective Cough Training (TTE): Ineffective coughing is common in people with Parkinson's and can lead to lung problems. Cough training aims to improve the strength and coordination of the muscles involved in coughing, ensuring proper removal of secretions and preventing complications such as pneumonia. The physical therapist can teach specific coughing techniques and exercises to strengthen the muscles involved. (Ramos et al, 2014).
- Education and Self-Care (EiA): Cardiorespiratory physiotherapy also involves

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educating the patient about the importance of correct breathing, adopting proper postures, preventing respiratory infections, and promoting self-care. This may include guidance on bronchial hygiene, breathing techniques during daily activities, and strategies for conserving energy. For physiotherapy, in the treatment of cardiorespiratory complications, the focus is on approaches that improve cardiac and pulmonary function, as well as the patient's overall quality of life. In this paper, the review will present some of the main evidence-based physical therapy approaches that collaborate in the treatment of cardiorespiratory complications. (Thomé *et al* 2016).

- For Thomé *et al* (2016), the human respiratory system undergoes structural changes in capacity, flow, and volume during aging. This process is a consequence of elastic loss, associated with alveolar dilation and decreased transmission of stimuli in the respiratory muscles. When associated with chronic neurodegenerative conditions, such as PD, physical and functional decline is enhanced, leaving the patient vulnerable to perform basic and instrumental activities of daily living.
- Also according to Tthomé *et al* (2016) In the literature, there is still no consensus on the type of pulmonary dysfunction predominant in PD, and it is possible to observe both obstructive and restrictive ventilatory deficiency. For this reason, we used spirometry and impulse oscillometry to investigate the characteristic pulmonary dysfunction and to compare scores between groups. When analyzing the spirometric values of the subjects, we found that two participants had a pattern of mild obstructive disorder and 30 had normal patterns of pulmonary function. The fact that the two subjects with obstructive disorders were in group G2, formed by subjects with PD and physically sedentary, suggests that both factors may be linked to the appearance of the obstructive process. Considering that this pattern was not observed in the group of physically active PD patients or in the group of inactive eutrophic subjects, it is possible to affirm that the response found is linked to these two conditions, in which the greater the severity of PD, the greater the patient's physical inactivity tends to be, predisposing him to the appearance of ventilatory disorders.

Baros *et al* (2015) elucidate that with the evolution of the disease, due to multifactorial etiology, there is a decrease in respiratory functional conditions occurring in

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most patients with PD in advanced stages, increasing the severity of the disease. It is believed that this decrease is due to muscle stiffness and postural changes, such as the frequent hyperkyphotic pattern, which influence less thoracic expansion, resulting in fewer lung volumes and restrictive deficit in ventilation.

Costa et al *(2016) corroborate this statement, explaining that one of the dysfunctions found is the reduction of thoracic mobility, assessed by cirtometry, which consists of a set of measurements of chest and abdominal circumferences during respiratory movements.*

Caldeira *et al* (2007) clarify that cirtometry, or thoracoabdominal perimetry, consists of a set of measurements of the circumferences of the chest and abdomen during respiratory movements. Its purpose is to evaluate thoracic expansibility in a simple and accessible way, and for this purpose, only a tape measure is required.

The treatment relationships of PD are based on the use of drug therapy that markedly influences motor performance, however, drug treatment cannot abolish all symptoms, and physical therapy is then recommended, as stated by Vara *et al* (2012).

Thomé et al (2016) conclude in their work that physical inactivity associated with PD may be linked to the appearance of obstructive ventilatory disorders, potentiated by the patient's clinical worsening.

Specific guidance and exercises can help strengthen respiratory muscles, improve lung capacity, improve breath control, and promote proper posture. This approach aims to improve lung function, strengthen respiratory muscles, and promote aerobic capacity.

Bonjorni *et al* (2012) explain that individuals with mild to moderate stage PD have a better prognosis for normal exercise capacity with regular aerobic exercise. It also suggests that a significant relationship is that the greater the expiratory muscle strength and respiratory muscle endurance, the greater the physical capacity. They also explain that the greater the amount of muscle mass, the greater the respiratory muscle endurance in these patients. Stating that these results were not found in the scientific literature for the population studied.

CONCLUSION

Parkinson's disease (PD) is a neurodegenerative disorder that affects motor function and often leads to a number of secondary complications, including cardiorespiratory impairments. For physiotherapy, the focus cannot be only on motor conditions and the treatment must be attentive to the patient as a whole, considering cardiorespiratory

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ISSN: 2358-2472

complications where the best elucidated therapeutic approach is based on approaches that improve cardiac and pulmonary function, as well as the patient's general quality of life.

In the elderly, the aging of the locomotor, cardiorespiratory and sensory systems, cognitive and psychic changes and the interaction of various pathologies require adaptation of rehabilitation techniques in Parkinson's disease. Rehabilitation should be initiated early and directed towards functional goals defined by a multidisciplinary team. Maintaining movements is a fundamental objective and must take into account the fatigue of the elderly. Neurostimulation treatment in the elderly also raises new questions for rehabilitation

The articles studied tend to indicate that cardiorespiratory physiotherapy plays an important role in the treatment of cardiorespiratory complications in Parkinson's. Specific guidance and exercises can help strengthen respiratory muscles, improve lung capacity, improve breath control, and promote proper posture. The authors recommend that more studies be carried out on the subject in order to promote the improvement of the quality of life of Parkinson's disease patients.

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