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Review Article

The Effectiveness of Physiotherapy Approaches in Patients with Parkinsonism Disease: A Literature Review

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ABSTRACT

Introduction: Parkinson's disease (PD) is a neurological disorder that causes loss of functional abilities and independence. It is characterized by four cardinal features i.e. Tremor at rest, Rigidity, Akinesia and Postural instability. Physiotherapy plays vital role in neuroplasticity and the ability of the brain to self repair.
Objective: To establish evidence based efficacy of physiotherapy approaches in patients with Parkinson's disease.
Design: Review of literature.
Data Synthesis: Recent researches, Meta analysis, clinical oriented literatures taken in the study.
Methodology- Various articles from following databases like Science Direct, PubMed and Cochrane were retrieved through a search by using keywords- 'Parkinson's disease, Parkinsonism disease and physiotherapy, etc. Total 20 articles were included in the study and based on their findings a review was made.
Conclusion: Literature review of present study concludes that exercise to be effective at improving physical functioning and HRQOL, leg strength, balance, and walking in patients with Parkinson's disease.
Key words: Parkinson's disease, Tremor, Akinesia, Review of literature, Unified Parkinson's Disease Rating Scale, Health-related quality of life (HRQOL), Rigidity.

INTRODUCTION

In 1817, James Parkinson first described the clinical syndrome "the shaking palsy" that was later to bear his name. Previously referred to as ''paralysis agitans'', but later in 19th century Charcot gave credit to Parkinson by referring to the disease as by his name ''maladie de Parkinson'' or Parkinson's disease (PD). [1] Parkinson's disease is second most common neurodegenerative disease in worldwide. The onset is insidious with slow rate of progression. Males are slightly more at risk than females. About 5 million people are affected worldwide. Prevalence rises from 1% with those with 60years age to 4% in population over 80 years. [2] In Europe, 1.8 per 100 inhabitants over the age of 65 is diagnosed with Parkinson's disease, whereas in the age category of 65-69 years 2.4 per 100 inhabitants are affected. For the age group of 85-89 years, the prevalence increases up to 2.6 per 100 inhabitants. [3]

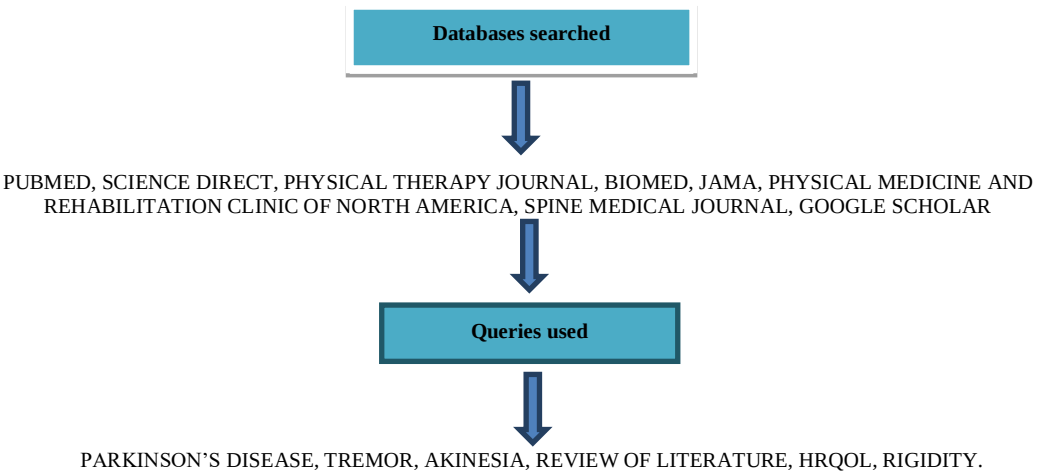
Parkinson disease (PD) is a common disorder, especially among older adults. Movement disorders, and in particular gait disorders, are a hallmark of PD. It is characterized by four cardinal features that can be grouped under the acronym "TRAP": Tremor at rest, Rigidity, Akinesia (or

bradykinesia) and Postural instability. [4] In addition, the disease may cause variety of indirect impairments like movement and gait disturbances, masked face, cognitive and perceptual disturbance, communication and swallowing dysfunction. Most of the movement related symptoms of Parkinson's disease are caused by lack of dopamine due to loss of dopaminergic cells in substantia nigra. When the amount of dopamine is too low, communication between substantia nigra and corpus striatum becomes ineffective. Thus, movement becomes impaired. Genetic and pathological studies have revealed that various dysfunctional cellular processes, inflammation, stress and other associated conditions like Shy Drager syndrome, Creutzfeldt-Jakob disease, Encephalitis, Wilson's disease etc can contribute to cell damage. In addition, lewy bodies which contain protein alpha-synuclein are found in brain cells of individuals with Parkinson's disease. [2] In the course of their disease, most patients with Parkinson's disease (PD) face mounting mobility deficits, including difficulties with transfers, posture, balance, and walking. This frequently leads to loss of independence, (fear of) falls, injuries, and inactivity, resulting in social isolation and an increased risk of osteoporosis or cardiovascular disease. Consequently, costs increase and quality of life decreases. These mobility deficits are difficult to treat with drugs or neurosurgery. Physical therapy is often prescribed next to medical treatment. [5]

However, there is a growing body of evidence regarding the benefits of Physiotherapy in terms of neuroplasticity and the ability of the brain to self repair. Exercise has protective benefits against the onset of symptoms in Parkinson's disease (PD). This appears to be due to the release of neurotrophic factors, and greater cerebral oxygenation, which together promote new cell growth and cell survival. It is also found that exercise stimulates dopamine synthesis in remaining dopaminergic cells and thus reducing symptoms. Fox et al. suggest there are five key principles of exercise that enhance neuroplasticity in relation to PD, these being: (a) intensive activity maximizes synaptic plasticity; (b) complex activities promote greater structural adaptation; (c) activities that are rewarding increase dopamine levels and therefore promote learning/relearning; (d) dopaminergic neurones are highly responsive to exercise and inactivity ("use it or lose it"); (e) where exercise is introduced at an early stage of the disease, progression can be slowed. A number of systematic reviews and a meta-analysis have been undertaken to investigate the efficacy of physiotherapy among people with PD. [6]

Objective: To establish or review existing studies evaluating the effectiveness of physiotherapy approaches in Parkinson's disease.

METHDOLOGY



To review the literature that describes and evaluates role of Physiotherapy in patients of Parkinson's disease. Relevant articles in English were retrieved through a search of Science Direct, Springer Link, Medline, PubMed and Cochrane. Total 20 articles were taken and studied, out of which 13 review literature, 6 experimental studies and 1 case study were included. Inclusion criteria were: The target population was people with Parkinson Disease, The effects of an physiotherapy treatment was given, studies published from 2000 to present, studies published in the English language, recent research, meta analysis, & clinical oriented literature included in to present study. Exclusion criteria were Studies published before 2000.This review did not rank or rate the quality of the studies reviewed as this was not the purpose of the review, but was to summarize the studies and comment on their usefulness in a clinical setting. The following keywords were used in combinations: Parkinson's disease, Parkinsonism disease and physiotherapy, physical therapy.

RESULT

Total 20 articles were taken and studied. The review study is tabulated in table 1. As describing below about author, nature, Title and findings of studies.

Table 1: Description of Author, year, nature, title and findings of the reviewed articles.

AUTHOR	TITLE	CONCLUSION
Monticone M *et al*,2015- Experimental study. [7]	In-patient multidisciplinary rehabilitation for Parkinson's disease: A randomized controlled trial.	Multidisciplinary rehabilitative care is useful in changing the course of motor impairment, balance, activities of daily living, and QOL. The effects lasted for at least 1 y after the intervention.
Tomlinson CL *et al*, 2014- A Review. [8]	Physiotherapy for Parkinson's disease: a comparison of Techniques.	There is insufficient evidence to support the effectiveness of one physiotherapy intervention over another in PD. This review shows that a wide range of physiotherapy interventions to treat PD have been tested. There is a need for more specific trials with improved treatment strategies to underpin the most appropriate choice of physiotherapy intervention.
Tomlinson CL *et al*, 2013- A Review. [9]	Physiotherapy versus placebo or no intervention in Parkinson's disease.	Benefit for physiotherapy was found significant only for speed, two or six-minute walk test, Freezing of Gait questionnaire, Timed Up & Go, Functional Reach Test, Berg Balance Scale, and clinician rated UPDRS. Most of the observed differences between treatments were small. No evidence of differences in treatment effect was noted between the different types of physiotherapy interventions being used, although this was based on indirect comparisons.
Santos VV *et al*, 2012- Experimental study. [10]	Effects of a physical therapy home-based exercise program for Parkinson's disease.	Patients with PD younger than 60 years of age and with less than five years of disease had a statistically significant improvement in the UPDRS scale.
Smania N *et al*, 2011- A Review. [11]	Balance and Gait Rehabilitation in Patients with Parkinson's Disease.	Balance and gait training shows significant improvement in patients with Parkinson disease.
Winser SJ and Kannan P, 2011- A Case study. [12]	A Case Study of Balance Rehabilitation in Parkinson's Disease.	The results of this study suggested that sensory-specific balance exercise had a positive training effect on balance.
Morris ME *et al*, 2010- A Review. [4]	Striding Out With Parkinson Disease: Evidence-Based Physical Therapy for Gait Disorders.	Comprehensive, client-centered physical therapy for people with PD is based on compensatory strategies to bypass the defective basal ganglia, strategies to improve motor learning and performance through practice, management of secondary sequelae affecting the musculoskeletal and cardio-respiratory systems, and fall education, as well as on assisting people to make lifelong changes in physical activity habits.
Sage MD and Almeida QJ, 2010- Experimental Study. [13]	A Positive Influence of Vision on Motor Symptoms During Sensory Attention Focused Exercise for Parkinson's Disease	There is positive influence of sensory attention focused exercise programs a on the specific motor symptoms of PD.
Smania N, *et al* 2010, Experimental study. [14]	Effect of Balance Training on Postural Instability in Patients With Idiopathic Parkinson's Disease.	A program of balance training can improve Postural Instability in patients with Parkinsonism Disease.
Hirsch MA and, Farley BG. 2009- A Review. [15]	Exercise and neuroplasticity in persons living with Parkinson's disease.	An enormous capacity of the PD brain to reshape itself in response to self produced activity and provide a plausible rationale for exercise-induced plasticity-related mechanisms in humans with PD. Multiple time dependent mechanisms (i.e. neuroprotection, neurorestoration) are capable of contributing to behavioral recovery in PD.

Table 1: To be Continued…		
Goodwin VA *et al*, 2008, Systematic Review. [6]	The Effectiveness of Exercise Interventions for People with Parkinson's Disease: A Systematic Review and Meta-Analysis.	Exercise to be effective at improving physical functioning and HRQOL, leg strength, balance, and walking but there is currently insufficient evidence with regards effectiveness in the areas of falls prevention and the management of depression in PD.
Keus SHJ *et al*, 2007- Evidence based Literature review. [5]	Evidence-Based Analysis of Physical Therapy in Parkinson's Disease with Recommendations for Practice and Research.	There are indications that physical therapy might be effective in patients with PD.
Kwakkel G *et al*, 2007- A Review. [16]	Impact of physical therapy for Parkinson's disease: A critical review of the literature.	The effects of PT are task and context specific. This indicates that the tasks that are trained tend not to generalize to related activities that are not directly trained in the rehabilitation programme itself.
Crizzle*et al*, 2006- A Review. [17]	Is Physical Exercise Beneficial for Persons with Parkinson's Disease?	Patients with PD improve their physical performance and activities of daily living through exercise.
Ellis T *et al*, 2005- Experimental study. [18]	Efficacy of a physical therapy program in patients with Parkinson's disease: A randomized controlled trial.	People with PD derive benefits in the short term from Physical Therapy group treatment, in addition to their Medication Therapy, for quality of life related to mobility, comfortable walking speed, and ADLs; long-term benefits were found in CWS, UPDRS ADL, and total scores but varied between groups.
Lim I *et al*, 2005- A Systemic review. [3]	Effects of external rhythmical cueing on gait in patients with Parkinson's disease.	Auditory rhythmical cueing, suggesting that the walking speed of patients with Parkinson's disease can be positively influenced. However, it is unclear whether positive effects identified in the laboratory can be generalized to improved activities of daily living (ADLs) and reduced frequency of falls in the community.
Gage H and Storey L, 2004- A Systemic review. [19]	Rehabilitation for Parkinson's disease: a systematic review of available evidence.	Findings may reflect publication bias, but suggest interventions can affect patients' lives for the better in a variety of ways. It is difficult to interpret the clinical importance of statistically significant improvements reported in most studies. There is a need for methodologically more robust research with meaningful follow-up periods, designed in a manner that separates specific and nonspecific effects. Cost-effectiveness evidence is required to provide clear guidance on service extensions.
Bergen JL *et al*, 2002- Experimental study. [20]	Aerobic exercise intervention improves aerobic capacity and movement initiation in Parkinson's disease patients.	The improvement in aerobic capacity suggests that PD patients may benefit from exercise just as much as a normal population. The change in MI indicates that aerobic exercise may reduce the detrimental effects of neuromuscular slowing within PD patients, by improving the subjects' ability to initiate and perform appropriate movement patterns.
DeGoede CJ *et al*, 2001- A Review. [21]	The effects of physical therapy in Parkinson's Disease: A research synthesis.	The results of the present research synthesis support the hypothesis that Parkinson patients benefit from PT added to their standard medication.
Toole T *et al*, 2000- A Review. [22]	The effects of a balance and strength training program on equilibrium in Parkinsonism: A Preliminary study.	Improvements were noted in strength and equilibrium, particularly in the hamstring and quadriceps groups muscle strength and balance on conditions where proprioceptive cues were unreliable and vision was present, absent, or faulty. Results indicate that 10 weeks of balance and strength training lead to improved equilibrium by producing positive changes in two different control mechanisms. One, training altered the ability to control the motor system when vestibular cues had to be the primary source of reliable feedback; and two, training helped subjects to override faulty proprioceptive feedback and utilize reliable visual or vestibular cues.

DISCUSSION

The present study outlines the development and research evaluates the effectiveness of exercise interventions undertaken with people with PD. Our study supports and updates the findings of previous reviews and identified that exercise is of benefit to people with PD in respect of physical functioning, HRQOL, strength, balance and gait speed. In the present study after review the literature it is found that exercise to be effective at improving physical functioning and HRQOL, leg strength, balance, and walking in patients with Parkinson's disease. Our findings add to the growing body of evidence regarding the effectiveness of physiotherapy for people with PD. [5]

There is currently insufficient evidence to support or refute the value of exercise in reducing falls or depression, or its safety with people with PD. The meta-

analyses provide support for exercise as an effective intervention for improving physical functioning and HRQOL for people with PD. [6] Jaswinder *et al*. 2012 in their study find that Exercise focusing on strength training, balance training, aerobic conditioning as well as use of external cues during gait can results in overall improvement in motor performance and quality of life. [2] Kerrigan *et al*., 2003 found that stretching of the hip flexors and plantar flexors improved walking speed they also found that stretching of the hip flexors might improve muscle flexibility and balance in the elderly. In addition, stretching exercises may reduce freezing of the gait, resulting in improved gait initiation time in PD patients. [22]

Deane *et al*. had reported that many studies were of poor methodological quality and had small participant numbers when reviewing the effectiveness of physiotherapy techniques (which may include exercise) in people with PD, suggesting that methodological quality can be an issue in studies of this type. Given the generally relatively small sample size of most trials, a lack of statistically significant difference between groups may simply reflect a lack of statistical power rather than the absence of a real lack of difference. [23,24] Comprehensive, client-centered physical therapy for people with PD is based on compensatory strategies to bypass the defective basal ganglia, strategies to improve motor learning and performance through practice, management of secondary sequelae affecting the musculoskeletal and cardio-respiratory systems, and fall education, as well as on assisting people to make lifelong changes in physical activity habits. The extent to which strategies, exercises, and health education are used varies according to individual needs and changes over time as the person ages and the disease progresses. [4] So we can say that physiotherapy is an effective and intelligent approach for the improvement of physical functioning, quality of life, motor strength, balance, flexibility and walking in the patients affected with Parkinson's disease.

CONCLUSION

Literature review of present study concludes that exercise to be effective at improving physical functioning and HRQOL, leg strength, balance, and walking in patients with Parkinson's disease. But future research needs to establish what elements constitute an optimalexercise intervention for people with PD such as the dosage, component parts of intervention, subject adherence, follow up designs and the targeted stage of the disease.

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