



## STRENGTH TRAINING IN PERSONS WITH PARKINSON'S DISEASE – A REVIEW

**Nagarjuna Narayanasetti**

Assistant Professor, SRET College of Physiotherapy, Maharajas' Institute of Medical Sciences, Vizainagaram, AP

**Dr. Annie Thomas PT\***

PhD; Associate Professor, Department of Physiotherapy, St. John's Medical College, John Nagar, Bangalore-34\*Corresponding Author

### ABSTRACT

**Background:** Idiopathic Parkinson's disease (PD) is a central nervous system degenerative disorder with an unknown etiology. PD is the second leading cause of neurological impairments. Exercise therapy treatment is commonly used for PD to improve health and decrease the functional limitations. Exercise therapy includes Strengthening, aerobic, agility etc..

**Objective:** To investigate the evidence on efficacy and limits of strength training in rehabilitation of Parkinson's disease

**Method:** A comprehensive search on PubMed, Clinical Keys database using keywords Parkinson's disease, physical therapy, strength training, resistance training. The studies including Randomized controlled trials and systematic reviews published since 2005 are reviewed.

**Results:** 36 studies identified through database searching. 25 studies are excluded due to duplicates, irrelevance, based on titles, outcome diversity. 5 systematic reviews and Meta analysis, 6 RCT are included. Review and analysis of articles is going on

**Conclusion:** The result of this review suggests that strength training program can be effective in people with mild and moderate Parkinson's disease. It can improve functional independency with increased muscle strength, gait parameters, posture and balance, all of these positive role on participation and quality of life.

**KEYWORDS:** Parkinson's disease, Physical therapy, strength training, exercise therapy .

### Background of the study

Parkinson's disease (PD) is currently considered the second most common neurodegenerative disorder, losing first place to Alzheimer's disease by a small margin (Poewe and Mahlknecht, 2009). Parkinson's disease (PD) is a complex neurodegenerative disorder with wide reaching implications for patients and their families. Whilst disability can occur at all stages of the disease PD is progressive in nature. Common motor symptoms are tremor, bradykinesia (slowness of movement), rigidity, postural instability and a stooped posture, gait difficulties including freezing of gait (inability to initiate movement), and muscle weakness. Non-motor symptoms include a decline in cognitive function, psychiatric problems such as depression and anxiety, and autonomic, sleep, and sensory disturbances. The motor impairment in PD patients caused by bradykinesia, rigidity, tremor, and postural instability accelerates the decline in functional capacity, especially when associated with decreased activity and with a sedentary lifestyle (Nutt JG, Wooten GF, 2005)

Parkinson's tends to affect more men than women. The prevalence of the condition is considerably higher in the over-60 age group, even though there is an alarming increase of patients of younger age developing Parkinson's. It has been estimated that approximately 1% of the population over the age of 60 and 4% over the age of 80 are expected to develop Parkinson's. The most common form of Parkinson's is adult onset which normally sets in after 50 years, followed by young onset Parkinson's (between the age group 21-40) and juvenile onset Parkinson's (relatively rare; <21 years).

Patients face increased difficulties with activities of daily living (ADL) and mobility such as gait, transfers, balance and posture (Ultimately this leads to decreased independence, inactivity and social isolation, resulting in reduced quality of life). The management of PD has traditionally centred on drug therapy with levodopa viewed as the 'gold standard' treatment. However, even with optimal medical management, patients with PD still experience a deterioration of body function, daily activities and participation. By definition, strength training refers to an intervention in which participants train a muscle or group of muscles against an external resistance (Falvo MJ, 2008). Evidence suggests that strength training is useful for managing many of the clinical symptoms in persons with different neurodegenerative disorders. But it is unclear about the effects in persons with PD.

### Objective

To elicit the evidence on efficacy and limits of strength training in rehabilitation of persons with PD

### Methodology

#### Criteria for selecting articles

1. Meta analysis, systematic reviews and RCTs studies related to strength training in persons with PD
2. Studies published in English since 2005.
3. Studies were excluded if the primary outcome is to design protocol and use of advanced therapeutic interventions
4. A comprehensive literature search performed on PubMed, Clinical Keys database using keywords

**Keywords:** Parkinson's disease, physical therapy, strength training, resistance training, strengthening exercise using booleans AND/OR

A total of 36 studies identified from database. 29 studies are excluded based on selection criteria, duplicates, outcome diversity. 2 meta analysis + 1 systematic review + 4 RCTs.

### RESULTS

#### Level of evidence (LOE) Description

Level I Evidence from a systematic review or meta-analysis of all relevant RCTs (randomized controlled trial) or evidence-based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.

Level II Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).

Level III Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).

Level IV Evidence from well-designed case-control or cohort studies.

Level V Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis).

Level VI Evidence from a single descriptive or qualitative study.

Level VII Evidence from the opinion of authorities and/or reports of expert committees.

Ackley, B. J et al. 2008

**Table 1: Review of the included studies**

Study	Results and recommendations	Level of Evidence
Four (quasi-) RCTs Progressive resistance exercise (PRE) in persons with PD	Outcome measures: Measures of muscle strength (maximum voluntary force production) ↑ performance measures: sit-to-stand time, stair descent and ascent, the Activities-specific Balance Confidence scale ↑ ( mild to moderate )	Level 1
Meta analysis PRE Other PT techniques	There is so far no evidence on the superiority of PRE compared with other physical training techniques	Level 1
5 literature reviews and 31 RCTs Aerobic training Strength training	Aerobic capacities ↑ Muscle strength ↑ Walking speed ↑ Posture and balance parameters ↑	Level 1
Group 1 -High intensity treadmill exercise Group 2 - Lower intensity treadmill exercise Group 3 - Stretching and resistance exercise These exercises – 3 times a week for 3 months	6MWT Gait speed ↑. VO2 max ↑ VO2 max ↑ muscle strength(1 RM) ↑	Level 2
Group Mfc – stretches, balance exercise, breathing exercise, non progressive strengthening exercise Group PRET all the major group of muscles. 60-90 min session Twice a week for 24 months	Outcome : Digit span, stroop and brief test of attention attention and working memory ↑ UPDRS III ↓ (PRE > mFc )	Level 2
Resistance training - strength exercises to major muscle groups Balance training - stance- and gait tasks which require feedforward and feedback postural control 60 Min of session – 10min warm up+ 50min RT/BT	Outcome: Fullerton Advanced Balance (FAB) scale ↑ RT = BT	Level 2

**Table 2: Discussion**

Components	Result	Authors
Vo2 max	No significant change Improved with longterm training	Shulman et al (RCT) L. Tambosco et al (Meta analysis)
Gait	Improved distance in 6MWT Walking capacity in 6MWT by 96mts ↑ TUG test	Shulman et al (RCT) Lima et al(systematic review)
Muscle strength	1 RM ↑ Trunk and/or Lower limb strength(MMT) ↑	Shulman et al (RCT) Lima et al(systematic review)

Cognitive Function	Attention and working memory ↑ in PRE and mFc Executive function ↑	David et al(RCT) L. Tambosco et al (Meta analysis)
Physical performance	TUG,Activity specific confidence scale,Stair ascent/descent No significant ↑ in short term Clinically significant ↑ in long term	L. Tambosco et al (Meta analysis)
Disease status	UPDRS ↓ than tread mill training	Shulman et al (RCT) Corcos et al

**Table 3: Summary of the review**

Components	Results	Level of Evidence
Muscle strength	PRE	Level 1
Walking speed	RT > AT	Level 1
Posture and balance	RT > AT	Level 1
VO2 max	Treadmill > RT	Level 2
Cognition	mFc = PRE	Level 2
Balance	RT = BT	Level 2
Cognition	mFc = PRE	Level 2

**Conclusion**

The result of this review suggests that strength training program can be effective in people with mild and moderate parkinson's disease. It can improve functional independency with increased muscle strength, gait parameters, posture and balance, all of these positive role on participation and quality of life. The average duration of the strength training protocols used in the studies are low intensity strength exercises 3days per week for10 week's sessions with rest periods. Evidence shows positive changes but no negative effects by resistance training. It must become integrated part of rehabilitation program of persons with PD.

**Limitations:**

However the persistency of the outcomes in long term is not clear in any studies. No study had confirmed the type of strength training is effective.

**Future Implications**

Persistency of positive changes in long term follow-up.Valid protocol and type of strength training

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