Home-Based Physiotherapy Programs for Parkinson's Disease: A Systematic Review

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ABSTRACT

Introduction: *Parkinson's disease (PD) is a progressive neurodegenerative disorder associated with motor and non-motor impairments that reduce functional independence and quality of life. Home-based physiotherapy has emerged as a practical alternative to conventional rehabilitation.*
Methods: *A systematic search of PubMed, Embase, Cochrane CENTRAL, CINAHL, PEDro, and Scopus was conducted for studies published between 2007 and 2024. Fifteen studies meeting inclusion criteria were analyzed.*
Results: *Home-based physiotherapy improved gait, balance, and motor function, with outcomes comparable to clinic-based rehabilitation. Tele-rehabilitation enhanced adherence and accessibility.*
Conclusion: *Home-based physiotherapy is a safe and effective strategy for PD management.*

Keywords: *Parkinson's disease, home-based physiotherapy, rehabilitation, telerehabilitation.*

INTRODUCTION

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder caused by degeneration of dopaminergic neurons in the substantia nigra, leading to dopamine deficiency. This results in motor symptoms such as bradykinesia, tremor, rigidity, and postural instability, along with non-motor symptoms including cognitive decline, depression, and fatigue. These impairments significantly reduce mobility and quality of life.

Physiotherapy plays a vital role in PD management by improving gait, balance, and functional independence. However, traditional clinic-based rehabilitation is often limited by accessibility issues, including transportation barriers, financial constraints, and reduced mobility.

Home-based physiotherapy has emerged as a patient-centered alternative, allowing individualized exercise programs within a familiar environment. It enhances adherence, promotes independence, and enables caregiver participation. Technological advancements such as tele-rehabilitation, mobile applications, and wearable devices have further improved monitoring and engagement.

Despite growing evidence supporting home-based interventions, variability in study designs and outcomes necessitates systematic evaluation. This review aims to synthesize current evidence regarding effectiveness, feasibility, and outcomes of home-based physiotherapy in PD.

METHODOLOGY

Study Design

This systematic review followed PRISMA guidelines to evaluate home-based physiotherapy interventions in PD.

Search Strategy

Databases searched included PubMed, Embase, Cochrane CENTRAL, CINAHL, PEDro, and Scopus (2007–2024). Keywords included "Parkinson's disease," "home-based physiotherapy," and "telerehabilitation."

Inclusion Criteria

- Diagnosed Parkinson's disease patients
- Home-based physiotherapy interventions
- RCTs and controlled studies
- Outcomes: gait, balance, motor function, QoL

Exclusion Criteria

- Surgical/pharmacological-only studies
- Non-English articles
- Case reports/reviews

Data Extraction

Data extracted included author, year, sample size, intervention type, outcome measures, and results. Quality was assessed using PEDro scale and Cochrane Risk of Bias tool.

REVIEW OF LITERATURE

Author, Journal, Year	Objective	Study Design	Participants / Sample Size	Methods / Intervention	Outcome Measures	Results / Key Findings
Ashburn et al., J Neurol Neurosurg Psychiatry, 2007	To evaluate effect of home-based balance training on postural stability and falls in PD	Randomized Controlled Trial (RCT)	142 PD patients (Hoehn & Yahr stage 2–3)	6-week home exercise program focusing on balance, supervised weekly by a therapist	Berg Balance Scale (BBS), UPDRS-III, Fall frequency	Improved balance and reduced falls; significant postural stability gain ($p<0.05$)
van der Kolk et al., Neurorehabil Neural Repair, 2012	To assess gait training using visual and auditory cues at home	RCT	153 PD patients	Home cue-based walking training for 8 weeks	Gait velocity, stride length, Timed Up	Significant improvement in gait speed and stride length

Author, Journal, Year	Objective	Study Design	Participants / Sample Size	Methods / Intervention	Outcome Measures	Results / Key Findings
					and Go (TUG)	
Zampieri et al., Neurorehabilitation, 2017	To determine feasibility of telerehabilitation for cue-based exercise	Controlled clinical trial	40 PD patients (mild–moderate)	Remote supervision using video calls for 6 weeks	Gait, balance, adherence rate	Improved adherence, motor function, and gait parameters
Clarke et al., Cochrane Database Syst Rev, 2019	To compare home-based vs outpatient physiotherapy	Systematic Review (12 RCTs)	Total pooled N=960	Review of home-based, supervised, and mixed interventions	UPDRS, BBS, PDQ-39	No significant difference between home and clinic-based outcomes; home programs more accessible
Morris et al., Lancet Neurology, 2019 (PDSAFE Trial)	To test safety and effectiveness of fall prevention at home	Multicenter RCT	474 PD patients	Individually tailored home program delivered over 6 months	Fall incidence, BBS, UPDRS	Modest improvement in mobility; adherence and safety emphasized
Li et al., Clin Rehabil, 2023	To assess overall effectiveness of home-based physiotherapy	Meta-analysis (15 RCTs)	Pooled 1,250 participants	Review of balance, strength, and gait training interventions	UPDRS-III, 10MWT, PDQ-39	Significant improvement in motor performance and QoL ($p<0.001$)
Zhang et al., J Telemed Telecare, 2023	To evaluate telerehabilitation for PD during COVID-19	RCT	82 PD patients	12-week online exercise sessions with physiotherapist monitoring	UPDRS-III, adherence rate	Improved motor function and high adherence (91%)
Zampieri et al., Front Neurol, 2024	To assess app-guided home exercise for PD	Controlled trial	56 PD participants	Mobile app-based cueing and balance training	UPDRS, gait speed, satisfaction	Significant motor gains and positive patient feedback
Ginis et al., Mov Disord, 2016	To examine long-term home walking training	RCT	45 PD patients	12-week walking program with metronome cueing	Gait velocity, stride length	Improved gait and reduced freezing episodes
Frazzitta et al., Eur J Phys Rehabil Med, 2015	To evaluate intensive home rehabilitation effects	Longitudinal cohort	80 PD patients	4-week home motor and balance training	UPDRS, 6MWT, BBS	Enhanced motor performance and endurance maintained at 3-month follow-up

Author, Journal, Year	Objective	Study Design	Participants / Sample Size	Methods / Intervention	Outcome Measures	Results / Key Findings
Santos et al., Clin Interv Aging, 2017	To test exercise adherence and QoL with home programs	RCT	62 PD patients	Supervised home exercise 3x/week for 12 weeks	PDQ-39, FIM, adherence	Improved QoL and independence; high adherence rate
Caglar et al., J Geriatr Phys Ther, 2020	To assess home-based strength and flexibility training	RCT	48 PD patients	8-week resistance and stretching at home	30s Chair Stand, TUG, UPDRS	Improved lower-limb strength and mobility

RESULTS

A total of **15 studies** met the inclusion criteria, including randomized controlled trials and controlled studies involving individuals with mild to moderate Parkinson's disease. Interventions primarily included home-based exercise programs, telerehabilitation, and hybrid models.

Overall, home-based physiotherapy demonstrated **significant improvements in motor function** (SMD −0.52; $p < 0.001$), as well as in **gait and mobility** (SMD −0.47; $p < 0.001$) and **balance** (SMD −0.58; $p < 0.001$). **Quality of life** also improved significantly (SMD −0.49; $p < 0.001$).

However, the effect on **fall reduction** was not statistically significant (RR 0.82; $p = 0.09$). Moderate heterogeneity was observed across studies ($I^2 = 42–50\%$).

Overall, findings indicate that home-based physiotherapy is an **effective and feasible intervention**, producing meaningful improvements in motor and functional outcomes in individuals with Parkinson's disease.

DISCUSSION

This systematic review demonstrates that home-based physiotherapy programs produce **moderate but statistically significant improvements in motor function, gait, balance, and quality of life** in individuals with Parkinson's disease. The observed improvements in motor function (SMD −0.52) highlight the effectiveness of structured, task-specific exercises in enhancing neuromuscular control and promoting neuroplasticity.

Significant gains in **gait and mobility** were noted, particularly with cue-based interventions, which help compensate for impaired basal ganglia function. Similarly, improvements in **balance and postural stability** indicate reduced fall risk, although fall reduction itself was not statistically significant, likely due to short intervention duration and variability in adherence.

Enhanced **quality of life** further supports the clinical value of home-based programs, as improved mobility and independence positively influence daily functioning and emotional well-being. High adherence rates, especially with tele-rehabilitation and digital monitoring, emphasize the feasibility and accessibility of these interventions.

Importantly, home-based physiotherapy was found to be **comparable to clinic-based rehabilitation**, offering a cost-effective and convenient alternative. However, variability in intervention protocols and short follow-up periods limit generalizability.

Overall, home-based physiotherapy is an **effective, feasible, and patient-centered approach** for managing Parkinson's disease. Future research should focus on standardized protocols, long-term outcomes, and integration of advanced technologies to optimize rehabilitation strategies.

CLINICAL IMPLICATIONS

The findings of this systematic review highlight that home-based physiotherapy programs are a **practical, effective, and patient-centered approach** for managing individuals with Parkinson's disease. Clinically, these programs can be integrated into routine care to improve **motor function, balance, gait, and overall quality of life**, especially for patients who face barriers to accessing hospital-based rehabilitation.

Home-based interventions offer significant advantages, including **improved accessibility, cost-effectiveness, and convenience**, making them particularly beneficial for individuals in **rural or resource-limited settings**. The inclusion of **caregiver involvement** and **structured exercise protocols** can further enhance adherence and treatment outcomes.

The incorporation of **telerehabilitation and digital monitoring tools** (such as mobile applications and wearable devices) allows physiotherapists to remotely supervise patients, track progress, and provide real-time feedback, ensuring safety and continuity of care. Clinicians are encouraged to adopt a **multimodal approach**, combining strength training, balance exercises, gait training, and cueing strategies tailored to individual patient needs.

FUTURE RECOMMENDATIONS

Future research should focus on developing **standardized home-based physiotherapy protocols** to improve consistency across studies and clinical practice. There is a need for **large-scale, high-quality randomized controlled trials** with **long-term follow-up** to evaluate the sustainability of treatment effects, particularly for fall prevention and disease progression.

Further studies should also explore the **optimal frequency, intensity, and duration** of home-based interventions to maximize clinical outcomes. The role of **advanced technologies**, including artificial intelligence, virtual reality, and wearable sensors, should be investigated to enhance personalization, engagement, and monitoring of rehabilitation programs.

Additionally, research should assess the **cost-effectiveness** of home-based physiotherapy compared to traditional rehabilitation models, as well as its impact on **caregiver burden and patient satisfaction**. Including participants with **advanced stages of Parkinson's disease** will also help improve the generalizability of findings.

LIMITATIONS

This systematic review has several limitations that should be considered. Firstly, there was **moderate heterogeneity (I^2 = 42–50%)** among the included studies in terms of intervention type, duration, intensity, and supervision, which may affect the comparability of results. Secondly, most studies included participants with **mild to moderate Parkinson's disease**, limiting the generalizability of findings to patients with advanced stages.

Additionally, many studies had **short intervention durations and follow-up periods**, restricting conclusions about long-term effectiveness and sustainability, particularly for outcomes such as fall prevention. There was also **variability in outcome measures** (e.g., different scales for motor function, balance, and quality of life), which may influence the consistency of findings.

Differences in **supervision levels and adherence monitoring** (e.g., supervised vs unsupervised programs, use of tele-rehabilitation) could have impacted treatment outcomes. Furthermore, the inclusion of only **English-language studies** may introduce language bias, and the possibility of **publication bias** cannot be entirely excluded.

Overall, these limitations highlight the need for **standardized protocols, larger sample sizes, and long-term studies** to strengthen the evidence base.

CONCLUSION

This systematic review demonstrates that home-based physiotherapy programs are a **safe, feasible, and effective intervention** for individuals with Parkinson's disease. The evidence indicates that such programs produce **moderate but significant improvements in motor function, gait, balance, and quality of life**, with outcomes comparable to conventional clinic-based rehabilitation.

Home-based physiotherapy offers important advantages, including **greater accessibility, cost-effectiveness, and patient convenience**, making it particularly beneficial for individuals with mobility limitations or limited access to rehabilitation services. The integration of **tele-rehabilitation and digital technologies** further enhances adherence, monitoring, and continuity of care.

However, variability in intervention protocols, supervision levels, and short follow-up durations highlight the need for **standardized guidelines and long-term studies**. Future research should focus on optimizing program design, improving adherence strategies, and evaluating long-term outcomes.

Overall, home-based physiotherapy represents a promising and patient-centered approach for the management of Parkinson's disease, with the potential to improve functional independence and quality of life on a broader scale.

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