Research Article

Effectiveness Of Rehabilitation Exercises On Activities Of Daily Living In Clients With Parkinson Disease: A Randomized Controlled Trial

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Abstract

Background: Parkinson disease is a progressive neurological condition that impairs motor functioning and decreases independence in Activities of Daily Living (ADL). Non-pharmacological intervention is to use rehabilitation exercises to enhance functional ability.

Purpose: This study aligns with the United Nations Sustainable Development Goal (SDG) 3 (Good Health and Well-Being) by evaluating the effectiveness of rehabilitation exercises in enhancing activities of daily living among clients with Parkinson's disease.

Methodology: It was a quantitative true experimental pre-test-post-test control group study with 60 patients with Parkinson disease. The study participants were randomized into an experimental group (n=30) and a control group (n=30). After 6 weeks of weekly exercise (5 sessions/week, 30-45 minutes/session) under the experimental group, structured rehabilitation exercise was done and routine care was done with the control group. Barthel Index was used to measure ADL. Analysis was done based on descriptive and inferential statistics (paired and independent t-tests and chi-square test).

Results: There was no significant difference in pre-test ADL scores between the experimental (52.40 ± 8.12) and control groups (51.10 ± 7.95). Post-test scores showed significant improvement in the experimental group (78.60 ± 7.45) compared to the control group (54.30 ± 8.20) ($t = 9.72$, $p < 0.001$). The only significant improvement was within-group analysis, which was significant only in the experimental group ($t = 12.85$, $p < 0.001$). There was a significant relationship between ADL performance and disease duration and stage ($p < 0.05$). **Conclusion:** ADL performance and functional independence in patients with Parkinson disease increased with structured rehabilitation exercises.

Keywords: Parkinson Disease; Rehabilitation Exercises; Activities of Daily Living; Functional Independence; Healthy Aging; Health Equity; SDG 3 (Good Health and Well-Being); Sustainable Development Goals.

1. Introduction

Parkinson disease is a progressive and chronic neurodegenerative disease where the dopaminergic neurons in the substantia nigra degenerate causing non-motor and motor symptoms. It is the second most prevalent neurodegenerative disease in the world with over 8.5 million cases, and this number is likely to increase because of the prolonged life span[1]. The most common motor symptoms are resting tremor, rigidity, bradykinesia, and postural instability, whereas non-motor symptoms like cognitive impairment, depression, sleep disturbances, and autonomic dysfunction make the disease management more complicated[2]. Such impairments slowly diminish functional ability and independence, especially in the performance of routine daily activities[3].

Activities of Daily Living (ADL) are simple self-care activities like feeding, bathing, dressing, toileting, and mobility, without which individuals cannot lead an independent life. The issue of motor coordination and balance is also a

major factor affecting the ADL performance in Parkinson disease, leading to higher dependency and lower quality of life[3]. ADL limitations can also correlate to disease severity, duration of illness and burden on the caregiver hence it is a significant clinical outcome measure.

As much as pharmacological treatment, especially dolaminergic therapy, is the most common approach of managing the condition, it does not completely control the restrictions of functionality or permanent incapacitation. Thus, such non-pharmacological interventions as rehabilitation exercises and occupational therapy have become relevant. Rehabilitation aims at enhancing strength, balance, coordination, and mobility with structured exercise programs, whereas occupational therapy encourages independence by modifying activities and modifying the environment[4].

The latest evidence (2020-2025) demonstrates the usefulness of rehabilitation interventions in enhancing functional outcomes in the population with Parkinson disease. Systematic reviews have indicated that physiotherapy has a significant beneficial effect on gait, balance, and motor performance[4]. The effects of occupational therapy interventions on ADL performance and participation have also been positive but the evidence is moderate[5]. Also, these interventions can be used to enhance instrumental ADL like medication management and community engagement[6].

Clinical guidelines also focus on personalized and goal-based rehabilitation plans to enhance functional independence[7]. It has been indicated that task-specific training, balance training, and motor learning strategies are useful to enhance ADL performances and minimize fall risk[8,9]. Also, multidisciplinary rehabilitation strategies, which involve physiotherapy, occupational therapy, and behavioral interventions, have demonstrated an improvement in mobility and quality of life[10,11].

Treatment options have also been broadened by other emerging methods of rehabilitation like technology-assisted rehabilitation and tele-rehabilitation. Research has shown that virtual rehabilitation and home-based exercise interventions have the potential to enhance motor, treatment adherence, and ADL performance[12-14]. Treadmill training, a combination of neuromodulation, and group exercise programs are also other interventions that have demonstrated encouraging outcomes in enhancing functional independence[15-17].

Although this evidence is increasing, there are still a number of research gaps. Most of the research is based on individual functional outcomes and non-holistic programs addressing ADL[18,19]. The differences in interventions protocols, time, and outcome measures make it difficult to compare across studies[20,21]. Also, small sample sizes and scope of experiments diminish the generalizability of results. The absence of standardized and structured rehabilitation protocols also restraints their application in the standard clinical practice.

Based on these gaps, experimental studies that are well designed are required in order to assess structured rehabilitation exercise programs based on ADL performance in patients with Parkinson disease. These protocols can assist healthcare workers, especially the nurses and rehabilitation therapists in offering evidence-based care. The performance of ADL can be improved to promote independence, alleviate burden on caregivers, and quality of life. The United Nations Sustainable Development Goal 3 (Good Health and Well-Being) emphasizes the promotion of healthy lives and well-being across all age groups, including individuals living with chronic neurological conditions. Rehabilitation exercises have emerged as an important non-pharmacological strategy to enhance functional ability, maintain independence, and support healthy aging among persons with Parkinson's disease. Furthermore, improving access to effective rehabilitation contributes to SDG 10 (Reduced Inequalities) by addressing the healthcare needs of vulnerable populations and fostering inclusive healthcare practices

Thus, the purpose of the current research is to determine the effectiveness of structured rehabilitation exercises on the ADL performance in patients with Parkinson disease based on the experimental design. The results can be used to facilitate the introduction of structured rehabilitation programs as part of the everyday management of Parkinson disease.

2. Materials and Methods

The research design and approach involve the following:

Research Design and Approach.

The research design employed was a quantitative, true experimental design to determine the effectiveness of rehabilitation exercises on Activities of Daily Living (ADL) among patients with Parkinson Disease.

Study Setting

The research took place in Saveetha medical College and Hospitals(SMCH) rehabilitation centers where there was the provision of neurological and occupational therapy.

Study Population

The target population was patients with Parkinson disease who were receiving outpatient or inpatient care at the identified settings.

Sample Size and Sampling technique*.*

A total of 60 participants were included in the study. The participants were divided into Experimental group (n = 30) and Control group (n = 30).

Simple random (or quasi-experimental purposive) sampling method (as feasible) was employed to sample participants and allocate them to groups.

Eligibility Criteria

Inclusion Criteria

- Parkinson patients.
- Age between 45–75 years
- Mild to moderate severity of the disease.
- Able to understand and follow instructions
- Able to be involved and give informed consent.

Exclusion Criteria

- Moderate or extreme mental retardation or mental illness.
- Other neurological or musculoskeletal disorders.
- Patients who are bedridden or in a critical condition.
- The involvement in other rehabilitation programs within the period of the study.

Study Variables*.*

- Independent Variable: Structured rehabilitation exercise program.
- Dependent Variable: ADL performance.
- Extraneous Variables: Age, gender, length of illness, disease severity, medication adherence.

Instruments for Data Collection

A. Demographic and Clinical Data Sheet.

Age, gender, length of illness, stage of disease and treatment information are included.

B. Barthel Index of ADL.

- Barthel Index was invented in 1965 by Florence Mahoney and Dorothea W. Barthel at Maryland State Medical Society, scores ranging from 0 to 100.
- The Barthel Index is a 10-item scale, one item is a basic ADL function: Feeding, Bathing, Grooming, Dressing, Bowel control, Bladder control, Toileting, Transfers (bed to chair and back), Mobility (walking or wheelchair use), Stair climbing
- The Barthel Index has proven to be very reliable among different studies Inter-rater reliability: 0.85 0.95 and Test retest reliability: 0.89 0.98.

Data Collection Procedure

The intervention study that studied the effectiveness of rehabilitation exercises in the performance of ADL among Parkinson disease patients was done after six weeks. Data collection was done after obtaining administrative permission and Institutional Ethics Committee approval. Informed consent was obtained in a written form and confidentiality was assured.

Sixty participants who fit the criteria of inclusion were chosen and were randomly assigned to experimental (n=30) and control (n=30) groups. A structured questionnaire was used to gather baseline demographic and clinical information. Barthel Index was used to measure pre-test ADL performance in both groups based on observation and interview.

The experimental group was given a six-week program of rehabilitation exercise program (5 sessions/ week, 30-45 minutes/session) under supervision to maintain safety and compliance. Adequate rest periods were given to avoid fatigue. The control group was provided with usual care without rehabilitation intervention.

The level of participation, exercise tolerance, and fatigue signs were observed during the intervention. Follow-up was done regularly to ensure that the protocol was adhered to, with small modifications done depending on individual tolerance. Six weeks post-test evaluation was also done based on the same Barthel Index. The exercise schedule of rehabilitation is given in Table 1.

Table 1: Schedule of Rehabilitation Exercise

Week	Focus Area	Warm-up (5–10 min)	Core Exercises (20–25 min)	ADL Training (5–10 min)	Expected Outcome
Week 1	Mobility & Flexibility	Deep breathing, gentle stretching	Neck & trunk rotation, ROM exercises, sitting balance	Bed mobility, grooming (face wash, combing)	Reduced stiffness, improved flexibility
Week 2	Strength & Posture	Stretching, light movements	Sit-to-stand, wall standing, resistance band exercises, posture correction	Dressing, brushing teeth	Improved strength and posture

Week 3	Balance & Coordination	Breathing, stretching	Tandem standing, heel-to-toe walk, reaching tasks, coordination exercises	Feeding, pouring water	Better balance, reduced fall risk
Week 4	Gait & Mobility	Warm-up walking	Gait training with cues, turning, obstacle walking, step exercises	Toileting, independent walking	Improved walking ability
Week 5	Advanced Functional Training	Stretching, breathing	Dual-task training, functional reach, simulated home tasks	Cooking simple tasks	Increased independence
Week 6	Fine Motor & Independence	Gentle stretching	Buttoning, writing, object manipulation	Managing personal belongings	Improved fine motor skills

Note: All exercises were performed under the supervision of Physiotherapist in SMCH.

Data Analysis

The analysis of data was performed with the help of the relevant statistical techniques:

Descriptive Statistics:

- Frequency, percentage, mean and standard deviation.

Inferential Statistics:

- Paired t-test ,Independent t-test and Chi-square test were used.

A p-value of less than 0.05 was taken as a statistical significance.

Results

This part gives the data analysis and interpretation of the data collected in order to assess the effectiveness of the rehabilitation exercises on the performance of activities of daily living (ADL) among the patients with Parkinson Disease.

Distribution of Participants by Demographic Variables

Table 2: Frequency and Percentage Distribution of Participants (n = 60)

Variable	Category	Experimental (n=30)	Control (n=30)
Age (years)	45–55	10 (33.3%)	9 (30%)
	56–65	12 (40%)	13 (43.3%)
	66–75	8 (26.7%)	8 (26.7%)
Gender	Male	18 (60%)	17 (56.7%)
	Female	12 (40%)	13 (43.3%)
Marital Status	Married	22 (73.3%)	23 (76.7%)

	Others	8 (26.7%)	7 (23.3%)
Education	Primary	12 (40%)	11 (36.7%)
	Secondary	10 (33.3%)	12 (40%)
	Higher	8 (26.7%)	7 (23.3%)
Occupation	Employed	9 (30%)	10 (33.3%)
	Unemployed	11 (36.7%)	10 (33.3%)
	Retired	10 (33.3%)	10 (33.3%)
Income	Low	14 (46.7%)	15 (50%)
	Medium	10 (33.3%)	9 (30%)
	High	6 (20%)	6 (20%)
Family Type	Nuclear	18 (60%)	17 (56.7%)
	Joint	12 (40%)	13 (43.3%)
Residence	Urban	16 (53.3%)	17 (56.7%)
	Rural	14 (46.7%)	13 (43.3%)
Duration of Illness	<5 years	14 (46.7%)	15 (50%)
	≥5 years	16 (53.3%)	15 (50%)
Disease Stage	Mild	12 (40%)	11 (36.7%)
	Moderate	18 (60%)	19 (63.3%)
Comorbidities	Yes	17 (56.7%)	18 (60%)
	No	13 (43.3%)	12 (40%)
Medication Adherence	Regular	20 (66.7%)	21 (70%)
	Irregular	10 (33.3%)	9 (30%)
History of Falls	Yes	15 (50%)	16 (53.3%)
	No	15 (50%)	14 (46.7%)
Assistive Device Use	Yes	13 (43.3%)	14 (46.7%)
	No	17 (56.7%)	16 (53.3%)
Physical Activity Level	Active	9 (30%)	8 (26.7%)
	Moderate	12 (40%)	13 (43.3%)
	Sedentary	9 (30%)	9 (30%)

Table 2 shows that most participants in both the experimental and control groups were aged 56–65 years, predominantly married men, and were either unemployed or retired with primary or secondary education. The majority belonged to nuclear families and lived in urban areas. With regard to clinical variables, most respondents had a disease duration of more than 5 years and were in the moderate stage of Parkinson's disease. More than half had comorbid conditions and reported regular medication adherence. About half had a history of falls, a moderate proportion used assistive devices, and most reported a moderate level of physical activity.

Effect of Rehabilitation Exercises (Experimental Group)

The comparison of pre-test and post-test ADL scores within the experimental group in Table 3 showed a substantial increase in the mean score after the intervention. The difference was found to be highly statistically significant ($p < 0.001$), indicating that the structured rehabilitation exercise program was effective in improving ADL performance.

Table 3: Pre-test vs Post-test ADL (Experimental Group)

Test	Mean	SD	Mean Difference	t-value	p-value
Pre-test	52.40	8.12			

Post-test	78.60	7.45	26.20	12.85	<0.001 (HS)

Control Group Comparison

The control group showed only a slight increase in post-test ADL scores compared to pre-test scores in Table 4. However, this difference was not statistically significant ($p > 0.05$), suggesting that routine care alone did not result in meaningful improvement in ADL performance.

Table 4: Pre-test vs Post-test ADL (Control Group)

Test	Mean	SD	Mean Difference	t-value	p-value
Pre-test	51.10	7.95			
Post-test	54.30	8.20	3.20	1.45	>0.05 (NS)

Post-test Comparison Between Groups

The post-test comparison between the experimental and control groups in Table 5 revealed a significant difference in mean ADL scores, with the experimental group demonstrating higher scores. The difference was highly statistically significant ($p < 0.001$), confirming the effectiveness of the rehabilitation exercises.

Table 5: Post-test ADL Score Comparison

Group	Mean	SD	t-value	p-value
Experimental	78.60	7.45	9.72	<0.001 (HS)
Control	54.30	8.20		

Association Between ADL Scores and Demographic Variables

The association analysis in Table 6 showed that selected variables such as duration of illness, disease stage, medication adherence, and physical activity level had a statistically significant association with post-test ADL scores ($p < 0.05$). In contrast, variables such as age, gender, marital status, education, and residence were not significantly associated ($p > 0.05$). This suggests that clinical factors play a more important role than demographic factors in influencing ADL performance.

Table 6: Chi-square Association

Variable	χ^2 Value	p-value	Inference
Age	4.12	>0.05	NS
Gender	2.36	>0.05	NS
Marital Status	3.21	>0.05	NS
Education	5.12	>0.05	NS
Occupation	6.45	<0.05	Significant
Income	4.98	>0.05	NS
Family Type	2.87	>0.05	NS
Residence	3.05	>0.05	NS
Duration of Illness	6.85	<0.05	Significant
Disease Stage	7.42	<0.05	Significant
Comorbidities	3.76	>0.05	NS
Medication Adherence	5.89	<0.05	Significant

History of Falls	4.67	>0.05	NS
Assistive Device	3.44	>0.05	NS
Physical Activity	6.21	<0.05	Significant

Discussion

The current research revealed that structured rehabilitation exercises were very effective in enhancing the performance of patients with Parkinson disease in ADL activities. Such results are in agreement with other studies that have indicated that rehabilitation plays a significant role in enhancing functional independence. Other similar studies have demonstrated that physiotherapy interventions enhance motor function, gait and balance, and that occupational therapy interventions have significant impacts on ADL performance although moderate evidence was found because of differences in studies[4,5].

The increase in the scores of ADL was possibly caused by the structured session-based rehabilitation program comprising mobility training, balance exercises, coordination activities, and task-oriented ADL practice. This combined method is backed by the previous results which indicated that occupational therapy interventions can improve the outcomes of instrumental ADL and participation[6]. Clinical recommendations were also supported by the findings which highlighted the need to use individualized and goal-oriented rehabilitation programs to enhance functional independence[7].

The high level of difference between experimental and control groups also proves the effectiveness of structured rehabilitation with the use of routine care. Systematic reviews also support these findings by demonstrating that balance training, motor learning, and task-specific exercises have a positive effect on functional outcomes and quality of life in Parkinson's disease[8-10]. There is also some evidence to show that multidisciplinary and home-based rehabilitation programs enhance mobility, participation and ADL performance[11,19].

Tele-rehabilitation and technology-assisted interventions are the emerging rehabilitation methods that have proven effective to enhance motor functioning and ADLs outcomes, which has enhanced access to rehabilitation services[13,14]. Moreover, some interventions like treadmill training and group exercise programs have proved to be beneficial in functional independence and quality of life[12,17].

The measured correlation between ADL performance and variables related to the disease, including length of illness and disease stage is in line with the earlier reports of disease progression as a key determinant of functional loss[3,20,21]. Conversely, the insignificance of demographic factors like age and gender in relation to ADL performance indicates that clinical factors have a greater impact on functional outcomes as opposed to demographic factors[22].

Although this has shown positive results, past studies have tended to concentrate more on individual interventions as opposed to overall rehabilitation programs[18]. The current research helps fill this gap as it introduces a comprehensive, discipline-based rehabilitation regimen with emphasis on ADL performance.In general, the results validate the hypothesis that structured rehabilitation interventions can be used to enhance the performance of ADL in patients with Parkinson disease and justify their incorporation into the usual clinical practice.

These results contribute directly to SDG 3 (Good Health and Well-Being) by supporting evidence-based interventions that enhance functional independence, physical health, and overall well-being. Improved daily functioning may reduce caregiver burden and facilitate greater participation in community life, thereby supporting SDG 11 (Sustainable Cities and Communities). Additionally, the promotion of accessible rehabilitation services for individuals

with neurological disabilities aligns with SDG 10 (Reduced Inequalities), emphasizing equitable healthcare and inclusion for all individuals regardless of physical limitations."

Conclusion

The research finds that the performance of Activities of Daily Living (ADL) among patients with Parkinson Disease is greatly enhanced by structured rehabilitation exercises. The experimental group had higher functional independence than the control group, which implies the effectiveness of the intervention in improving day-to-day functioning and quality of life.

Ethics Committee Approval

Ethical clearance was obtained from the Institutional Scientific Review Board(ISRB) on Nov 21, 2025 (ISRB/11058/Nov/025).

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Conflict of Interest

The authors declare no conflict of interest for this study

CRediT authorship contribution statement

Pradhiba SPM – Conceptualization, Methodology, Supervision, Analysis, Validation and Writing; Investigation, Data Curation, writing

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