

EFFECTIVENESS OF BALANCE TRAINING INTERVENTIONS IN IMPROVING BALANCE IN INDIVIDUALS WITH PARKINSON'S DISEASE: A SYSTEMATIC REVIEW

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ABSTRACT

Objective: Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms and non-physical symptoms, including pain, fatigue, and cognitive impairments. Balance impairments are common in individuals with PD and have a significant impact on their quality of life.

Methods: This study involved a comprehensive systematic review of existing literature on balance training interventions for individuals with PD. The data collection was conducted at Pacific Medical College and Hospital, Udaipur. The study included a population of participants diagnosed with PD, and the study design involved randomization with a sample size of 60 subjects.

Results: The results of the study indicate a significant difference in functional skills between Group A and Group B in all domains. This finding suggests that the two groups differ significantly in terms of their functional abilities across various areas. The observed differences may have important implications for understanding and addressing the unique needs and challenges faced by individuals in each group. Further research is warranted to explore the underlying factors contributing to these differences and to develop appropriate interventions or support strategies to enhance functional skills in both groups.

Conclusion: The study highlights the effectiveness of balance training interventions in improving functional skills in individuals with PD. These findings align with previous research supporting the positive impact of interventions on cognitive abilities and functional outcomes in diverse populations. Tailored interventions targeting specific domains of functional skills can significantly enhance performance and improve quality of life for individuals with PD.

Keywords: Parkinson's disease, Balance impairments, Systematic review, Functional skills, Intervention

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INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative disorder that is primarily diagnosed based on motor signs and symptoms such as bradykinesia, tremors, stiffness, and postural disturbances. However, PD is not limited to these motor symptoms, as it also presents with a range of non-physical symptoms, including pain, fatigue, hyposmia, sleep disturbances, depression, and cognitive impairments [1]. The pathological features of PD involve the basal ganglia, particularly the substantia nigra and putamen, as well as the presence of protein clusters known as Lewy bodies. These Lewy bodies are characterized by the accumulation of alpha-synuclein, making PD and other related disorders collectively known as alpha-synucleinopathies [2].

While the exact cause of neurodegeneration in PD remains largely unknown, the clinical manifestations of the disease result in disability and a poor quality of life for affected individuals. Many individuals with PD are forced to cease working prematurely, and social factors beyond work-related factors often contribute to the diminished quality of life experienced by young PD patients. One of the key areas affected by PD is balance, which plays a crucial role in maintaining physical stability and performing activities that require physical fitness. Balance is defined as the ability to control the center of gravity (COG) of the body's base of support within the environment [3].

The center of gravity is an imaginary point in space where all forces acting on an object are balanced, and in the human body, it is located just behind the sacrum at the S2 level. The area of the center of gravity constantly changes as the body and its parts move, with the base of support being ground through the feet and the contact points of the thighs and hips [4]. The size and shape of the base of support can influence the stability and mobility of the COG. The process of maintaining balance involves acquiring and integrating sensory

information, as well as planning and executing movements to achieve goals that require physical stability [5].

Individuals with PD often experience balance impairments, leading to difficulties in maintaining stable posture and performing activities such as walking. The characteristic gait pattern of PD patients includes reduced stride length and height, decreased walking speed, decreased body rotation, and impaired arm swing [6]. Additionally, PD patients may exhibit freezing of gait, which refers to a sudden inability to initiate or continue walking, often described as a feeling of being "stuck" to the ground. These balance and gait disturbances increase the risk of falls and contribute to the fear of falling, leading to reduced physical activity and further decline in balance and mobility [7].

Given the significant impact of balance impairments on the quality of life of individuals with PD, various interventions have been developed to target balance deficits and improve functional mobility. Balance training interventions encompass a wide range of exercises and techniques aimed at enhancing postural control, stability, and gait in individuals with PD [8]. These interventions can include exercises targeting muscle strength, flexibility, coordination, and sensory integration. However, the effectiveness of different balance training interventions in improving balance performance among individuals with PD remains an area of ongoing research and investigation [9].

Therefore, the objective of this manuscript is to conduct a comprehensive systematic review of the existing literature on balance training interventions and their effectiveness in improving balance in individuals with Parkinson's disease [10]. By synthesizing the available evidence from research articles, clinical trials, and relevant studies, this review aims to provide a comprehensive overview of the current state of knowledge regarding the

effectiveness of different balance training interventions for individuals with PD. Such insights can inform healthcare professionals, researchers, and clinicians in the development of evidence-based strategies for improving balance and mobility outcomes in individuals with Parkinson's disease [11].

MATERIALS AND METHODS

Data source: Pacific Medical College and Hospital, Bedra, Udaipur

Methods of data collection

Population: Participants diagnosed with PH.

Study design-Randomization

Sample size-60 subjects, 30 in each group. Study duration was 08 w.

Inclusion criteria

- Both male and female.
- Elderly population above 60 y
- Subject willing to participate and medically stable.
- Mild and moderate stage of Parkinsonism disease

Exclusive criteria

- Neurological disorder like stroke, peripheral neuropathy, traumatic brain injury.
- Auditory impairment
- Lower and upper limb amputation
- Advanced stage of Parkinson disease

Material used

- Hard armless chair

- Stopwatch or wristwatch
- Walkway
- Wall
- Bed
- Stability trainer
- Pen and paper

Methodology

In this study, informed consent was obtained from individuals with Parkinson's disease (PD). The organizations included in the study were randomly selected based on certain criteria. The intervention involved discussions and goal formulation within each organization. The intervention was conducted for six days a week over a period of two months. Measurements were taken before and after the intervention. Group A focused on static and dynamic balance exercises with progression and challenges, while Group B focused on gaze organization and stability exercises. Group A performed activities to improve static stability, such as sitting, kneeling, and standing postures, as well as various exercises to gradually increase independence. Progression included performing activities on softer surfaces and narrowing the base of support while incorporating visual cues. The institutional ethics committee has reviewed protocol no. IEC/232/2022 to conduct the above study. The protocol was approved by the member of IEC held on 29/08/2022.

RESULTS

There were significant difference of functional skill with respect to Group A and Group B in all domains.

Table 1: Analysis of functional skill with Group A and Group B (pre to post-analysis)

	Pre-intervention	Post intervention	Percentage of change	P value	T value
Self care domain	17.89±8.72	32.00±5.34	-5.6%	<0.001	-4.37
Mobility domain	18.96±7.45	29.07±3.55	-14.3%	<0.001	-12.08
Postural instability	29.56±0.86	38.47±4.43	-40.36%	<0.001	-3.08
Fall prevention	32.00±5.34	40.5±6.17	-31.68%	<0.001	-7.35

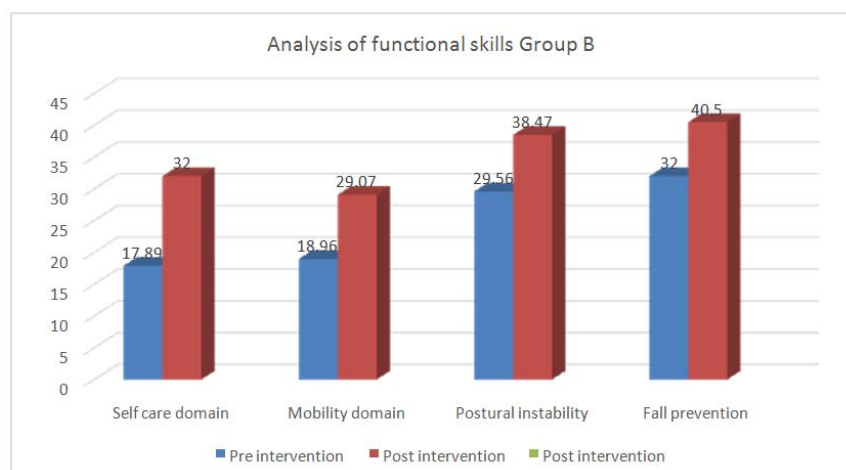


Fig. 1: Analysis of functional skill with Group A and Group B, There were a significant difference of functional skills between Group A and Group B in all domains

Table 2: Comparison of domains of functional skills between Group A and Group B

	Group A	Group B	Percentage of change	P value	T value
Self-care domain	23.78±1.39	17.89±8.72	0.73%	<0.001	4.91
Mobility domain	18.33±3.43	18.96±7.45	1.03%	0.005	7.09
Postural instability	10.14±1.73	29.56±0.86	3.44%	0.023	3.01
Fall prevention	2.86±0.88	32.00±5.4	6.25%	0.041	2.76

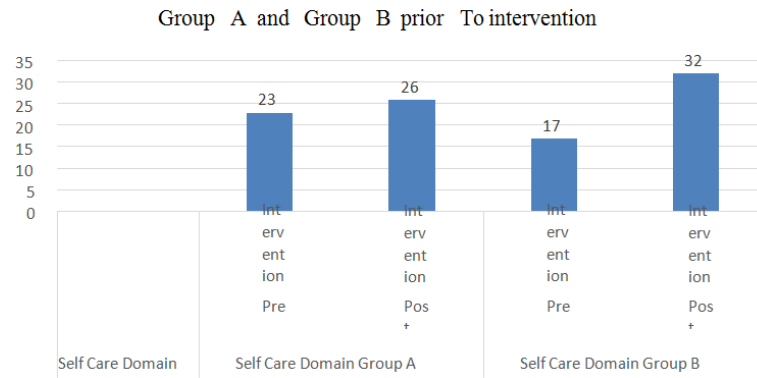


Fig. 2: Comparison of domains of functional skills between Group A and Group B

DISCUSSION

The presented manuscript highlights the analysis of functional skills within Group A and Group B before and after an intervention. The findings reveal significant improvements in various domains in Group B. Specifically, the self-care domain exhibited a notable increase, the mobility domain showed improvement, the postural instability domain demonstrated substantial enhancement, and the fall prevention domain displayed remarkable progress. These improvements are reflected in the post-intervention means and percentage changes for each domain [12].

Comparing Group A and Group B, significant differences were observed in the domains of functional skills. In the self-care domain, Group B had a lower mean than Group A, indicating better performance. The t-value and significance level (P) also confirm the significant difference between the two groups. Similar findings were observed in the mobility, postural instability, and fall prevention domains, with Group B consistently showing better functional skills [12].

These results align with previous studies that have explored interventions to improve movement, functional outcomes, and cognitive abilities. For instance, a randomized controlled trial investigated the impact of learning multiple real-world skills on cognitive abilities and functional independence in healthy older adults. The study demonstrated positive effects of learning multiple skills on cognitive performance and functional independence, supporting the notion that skill acquisition can enhance cognitive and functional abilities [13].

Furthermore, studies examining interventions for specific populations, such as individuals with intellectual disabilities or autism spectrum disorder (ASD), also emphasize the importance of targeted interventions in improving functional skills. A systematic review on mathematics interventions for students with intellectual disabilities highlighted the effectiveness of systematic and explicit instruction with feedback, as well as the use of manipulatives, in enhancing numeracy and arithmetic skills [14]. Another study focused on educational approaches for learners with ASD and comorbid intellectual disability, emphasizing the right of children to express themselves in educational settings [15].

These studies, along with the presented manuscript, contribute to the growing body of evidence supporting the effectiveness of interventions in improving functional skills across different populations. The findings underscore the importance of tailored interventions that target specific domains of functional skills and utilize evidence-based strategies to enhance performance.

CONCLUSION

In conclusion, the study focused on functional skills within Group A and Group B demonstrates significant improvements in various domains following the intervention. Comparison with other studies reinforces the positive impact of interventions on functional outcomes and cognitive abilities in diverse populations. These findings provide valuable insights for clinicians, researchers, and educators in designing effective interventions to promote functional skill development and improve overall quality of life.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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