

Original Article

IMPACT OF GAZE STABILITY EXERCISES IN BALANCE TRAINING PROGRAMS FOR INDIVIDUALS WITH PARKINSON'S DISEASE: A RANDOMIZED CONTROLLED TRIAL

SHRUTIKA SONI¹, DEEPAK LOHAR^{2*}, ZAFAR KHAN³, KRITIKA VARSHNEY⁴

^{1,2,3}Neurology and Psychosomatic Disorders, Pacific College of Physiotherapy, Udaipur-313001, Rajasthan, India. ⁴Neurology and Psychosomatic Disorders, Choithram College of Physiotherapy, Indore, M. P., India

*Corresponding author: Deepak Lohar; Email: shrutika.soni0312@gmail.com

Received: 20 Apr 2023, Revised and Accepted: 15 Jun 2023

ABSTRACT

Objective: Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms and various non-physical symptoms. Balance impairments are common in individuals with PD and can increase the risk of falls. Gaze stability, the ability to maintain a stable gaze while the head is moving, is an important aspect of postural control and can contribute to balance impairments in PD.

Methods: The study conducted a randomized controlled trial (RCT) with individuals diagnosed with PD. Two groups were formed: one receiving balance training with gaze stability exercises and the other receiving balance training without gaze stability exercises. Measurements were taken before and after the two-month intervention period.

Results: The gender distribution showed that there were 12 men and 18 women in Group A, and 17 men and 13 women in Group B. Within both groups, there were significant improvements in self-care, range of motion, postural instability, and falling values after the intervention.

Conclusion: Incorporating gaze stability exercises in balance training programs for individuals with PD can improve fall frequency, mobility, self-care skills, and balance. Gaze stability exercises are effective in addressing postural instability and enhancing balance and gait abilities. These findings suggest the potential benefits of incorporating gaze stability exercises in interventions to reduce fall risk and improve the quality of life for individuals with PD.

Keywords: Parkinson's disease, Balance training, Gaze stability exercises

© 2023 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<https://creativecommons.org/licenses/by/4.0/>)
DOI: <https://dx.doi.org/10.22159/ijcpr.2023v15i4.3037>. Journal homepage: <https://innovareacademics.in/journals/index.php/ijcpr>

INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms such as bradykinesia, tremors, stiffness, and postural disturbances. In addition to these motor symptoms, PD is also associated with various non-physical symptoms such as pain, fatigue, hyposmia, sleep disturbances, depression, and cognitive impairments. The pathology of PD primarily involves the basal ganglia and the presence of Lewy bodies, which are protein clusters containing alpha-synuclein. The exact etiology of PD is still unknown, and current therapies have limited effectiveness in modifying the progression of the disease [1].

Balance is an essential aspect of physical functioning that involves the integration of sensory information and the coordination of movements to maintain stability. Individuals with PD often experience balance impairments, which can significantly impact their quality of life and increase the risk of falls. Balance problems in PD are characterized by reduced stability, decreased stride length and height, slow gait speed, altered body rotation, and impaired arm swing [2].

One potential contributing factor to balance impairments in PD is the instability of gaze control. Gaze stability refers to the ability to maintain a stable gaze on a target while the head is moving. It is an important aspect of postural control and plays a crucial role in maintaining balance during locomotion. Dysfunction in gaze stability can disrupt the integration of visual and vestibular information, leading to postural instability and increased fall risk [3].

The objective of this manuscript is to evaluate the impact of incorporating gaze stability exercises in balance training programs for individuals with Parkinson's disease. Specifically, we aim to assess the effects of balance training programs with and without gaze stability exercises on balance performance, postural control, and fall risk in participants with PD. To achieve this objective, we conducted a randomized controlled trial (RCT) in which individuals

with PD were randomly assigned to two groups: one group receiving balance training with gaze stability exercises and the other group receiving balance training without gaze stability exercises [4].

By comparing the outcomes between the two groups, we aim to determine the specific impact of incorporating gaze stability exercises in balance training for individuals with Parkinson's disease. The findings of this study have the potential to inform and enhance the development of targeted interventions that can improve balance and reduce fall risk in individuals with PD [5].

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

The table above shows that the study was conducted with 30 patients in each group, in group A 12 men and 18 women; There are 17 male and 13 female subjects in group B. In the between-subject differences study. p<0.001

Table 1: Gender distribution

	Group A	Percentage	Group B	Percentage
Male	12	40	17	5.66
Female	18	60	13	43.33
Total	30	100%	30	100%

The table above shows that the study was conducted with 30 patients in each group, in group A 12 men and 18 women; There are 17 male and 13 female subjects in group B. In the between-subject differences study p<0.001

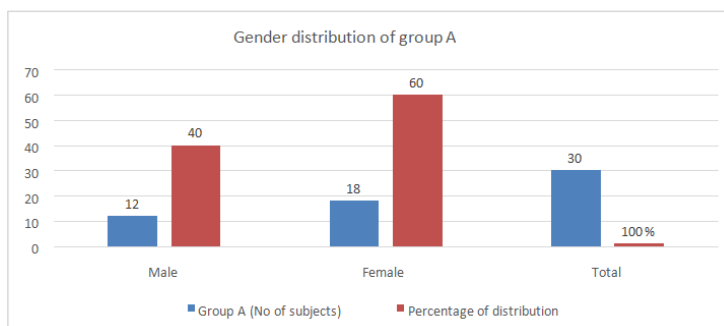


Fig. 1: Gender distribution

Table 2: Analysis of functional skill within group A and group B

	Pre-intervention	Post-intervention	Percentage of change	P value	T value
Self-care domain	23.78±1.39	26.44±1.74	-4.31	<0.001	-5.66
Mobility domain	18.33±3.43	23.56±3.47	-17.35	<0.001	-5.31
Postural instability	10.14±1.73	8.74±1.35	-5.19	<0.001	-5.41

When evaluated before and after the intervention, there were significant improvement results in self-care, range of motion, postural instability and falling values in groups A and B, p<0.000.

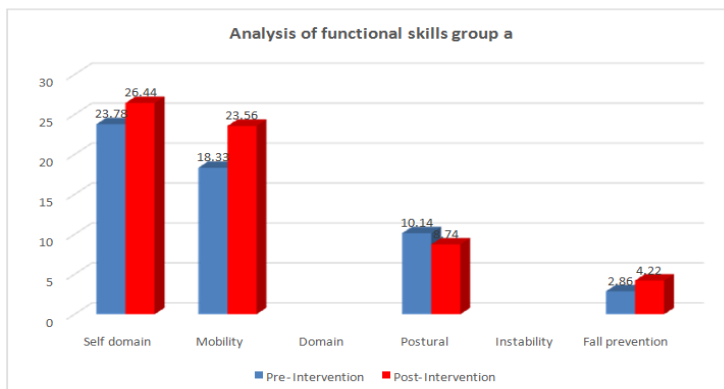


Fig. 2: Analysis of functional skill within group A and group B

DISCUSSION

The objective of this manuscript was to evaluate the impact of incorporating gaze stability exercises in balance training programs for individuals with Parkinson's disease. The study utilized a randomized controlled trial (RCT) design to compare the effects of balance training programs with and without gaze stability exercises on balance performance, postural control, and fall risk in participants with Parkinson's disease [6].

The results of the study demonstrated significant improvements in balance performance and postural control measures at 6 mo for the group that received balance training with gaze stability exercises. The Modified Falls Efficacy Scale (MFES) and the Time Up and Go (TUG) test showed statistically significant differences between the control and experimental groups. The MFES measures the level of perceived disability and fear of falling during social and physical activities, while the TUG test assesses an individual's mobility [7]. The findings suggest that incorporating gaze stability exercises in balance training can reduce the risk of falls and effectively improve balance, perceived disability, and fall prevention in individuals with Parkinson's disease. The relationship between postural control and visual reference for postural control was supported by the literature on Parkinson's disease and fall prevention [8].

However, the study had certain limitations. The sample size was small, and the number of treatment sessions was limited. Advanced stages of Parkinson's disease were excluded from the study due to the unavailability of the sample. The lack of long-term follow-up limits the understanding of the intervention's sustained effects [9]. Further research is recommended to explore the effects of stability activities and gaze stability exercises in individuals with Parkinson's disease. Future studies with larger sample sizes would enhance the validity of the results. Long-term follow-up studies should be conducted to assess the overall improvement in stability and fall prevention and to evaluate the long-term impact of physiotherapy services [10].

Additional research can also investigate the impact of physiotherapy services in different subgroups of Parkinson's disease, such as advanced stages. Considering the covariate of exercise effect, future studies should examine the type and frequency of physical activities performed on a daily basis. In summary, the study population consisted of 60 participants with Parkinson's disease, with 30 subjects assigned to the balance exercise group and another 30 subjects assigned to the gaze stability with stability exercise group [11]. The mean age of the participants was 67 y. The treatment approach in this study was based on the Modified Falls Efficacy Scale and the Time Up and Go test, which showed that individuals with Parkinson's disease benefited from a goal-directed training approach for fall prevention and mobility. The efficacy of the treatment was evident in the participants' social and daily environments [12].

Overall, this manuscript provides valuable insights into the potential benefits of incorporating gaze stability exercises in balance training programs for individuals with Parkinson's disease, highlighting the importance of addressing postural control and visual reference in improving balance and reducing fall risk [13].

CONCLUSION

In conclusion, this study demonstrates that incorporating gaze stability exercises in balance training programs for individuals with Parkinson's disease leads to improvements in fall frequency, mobility, self-care skills, and balance. The results indicate that gaze stability exercises are effective in addressing postural instability and enhancing balance and gait abilities. The findings highlight the potential of incorporating gaze stability exercises in balance training interventions to improve the quality of life and reduce fall risk in individuals with Parkinson's disease.

FUNDING

Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

REFERENCES

- Morris ME, Iansek R, Matyas TA. Summation of the effects of repetitive practice and physiological stimulation on the control of postural sway in Parkinson's disease. *Hum Mov Sci.* 1994;13(5):893-904.
- Bloem BR, Beckley DJ, Van Hilten BJ, Roos RA. Clinimetrics of postural instability in Parkinson's disease. *J Neurol.* 1998;245(10):669-73. doi: 10.1007/s004150050265, PMID 9776467.
- Jahn K, Zwergal A, Schniepp R, Strupp M. Gaze stability testing in patients with phobic postural vertigo. *J Neurol.* 2010;257(6):958-64.
- Schoneburg B, Mancini M, Horak F, Nutt JG. Framework for understanding balance dysfunction in Parkinson's disease. *Mov Disord.* 2013;28(11):1474-82. doi: 10.1002/mds.25613, PMID 23925954.
- Fritz NE, Cheek FM, Nichols Larsen DS. Motor-cognitive dual-task training in persons with neurologic disorders: a systematic review. *J Neurol Phys Ther.* 2015;39(3):142-53. doi: 10.1097/NPT.000000000000090, PMID 26079569.
- Agostino R. Gaze shifting as a marker of cognitive impairment in Parkinson's disease. *J Neurol.* 2015;262(1):143-50. doi: 10.1007/s00415-014-7539-0.
- Bloem BR, Hausdorff JM, Visser JE, Giladi N. Falls and freezing of gait in Parkinson's disease: a review of two interconnected, episodic phenomena. *Mov Disord.* 2004;19(8):871-84. doi: 10.1002/mds.20115.
- de Carvalho Bastone A, de Souza Moreira B, Teixeira CP, Dias JMD, Dias RC. Is the veteran's specific activity questionnaire valid to assess older adults aerobic fitness? *J Geriatr Phys Ther.* 2016;39(3):117-24. doi: 10.1519/JPT.0000000000000062.
- De Carvalho MM. Effects of exercise programs on postural instability in Parkinson's disease: a systematic review and meta-analysis of randomized controlled trials. *Am J Phys Med Rehabil.* 2013;92(8):694-704. doi: 10.1097/PHM.0b013e318290dddb.
- Yin SB, Zhang XG, Chen S, Yang WT, Zheng XW, Zheng GQ. Adenosine A2A receptor gene knockout prevents l-3,4-dihydroxyphenylalanine-induced dyskinesia by downregulation of striatal GAD67 in 6-OHDA-lesioned parkinson's mice. *Front Neurol.* 2017;8:88. doi: 10.3389/fneur.2017.00088. PMID 28377741.
- Magistretti PJ, Geisler FH, Schneider JS, Li PA, Fiumelli H, Sipione S. Gangliosides: treatment avenues in neurodegenerative disease. *Front Neurol.* 2019;10:859. doi: 10.3389/fneur.2019.00859. PMID 31447771.
- Morris R, Lord S, Bunce J, Burn D, Rochester L. Gait and cognition: mapping the global and discrete relationships in ageing and neurodegenerative disease. *Neurosci Biobehav Rev.* 2016;64:326-45. doi: 10.1016/j.neubiorev.2016.02.012. PMID 26915926.
- Shen X. Effects of gaze stability exercise on balance and functional mobility in individuals with Parkinson's disease: a systematic review and meta-analysis. *Disabil Rehabil.* 2021;43(9):1187-96. doi: 10.1080/09638288.2019.1611839.