

Comparative study on effectiveness of swiss ball Vs Frenkel's exercise to improve balance and mobility in Parkinson patients

, Navjyoti Gupta¹ MPT Neurology , Ritika Purbia²

INTRODUCTION

Parkinson's disease (or called PD, hereafter) is a debilitating and chronic neuro-degenerative disease [12]. The disease is initiated in the neurons present in Basal Ganglia (an area of brain that controls movement) and these neurons produce dopamine. As the disease progresses with dying and impairing of these neurons, less dopamine is produced. This affects the central nervous system and parts of the body connecting the nerves [11].

Parkinson's signs and symptoms include Tremors or rhythmic shaking often begins in a limb, often hands or fingers, arms, legs, jaw, or head, Slowness of movement (bradykinesia), Rigid Muscles, Impaired balance and coordination, sometimes leading to falls, Loss of automatic movement, Difficulty swallowing, chewing, and speaking, Writing changes, Muscle stiffness, where muscle remains contracted for a long time.[21]

Symptoms frequently start on one aspect of the frame or maybe in a single limb on one aspect of the frame. As the disorder progresses, it finally impacts each side. However, the signs and symptoms might also additionally nonetheless be greater extreme on one aspect than at the other. Parkinson's causes a stooped posture.[40]

Balance has been defined as control of the body's centre of mass over its base of support in order to achieve postural equilibrium and orientation. Balance impairment in PD may be present in the early stage of the disease, even at diagnosis, but it becomes more prevalent and worsens with disease progression. Balance impairment and resulting falls are major factors determining the quality of life, morbidity, and mortality in individuals with PD. In a review of 22 studies, 60.5% of all patients reported at least one fall during the last year, with 39% reported recurrent falls. [1][9]. A few cohort studies have evaluated balance in patients with PD prospectively. However, it has not been fully investigated to what extent balance is impaired at the very start of the disease.[18][27]

Swiss Balls in exercise-based recuperation work on an individual's equilibrium, the capacity to deal with the body weight equitably and foster strength of arms and legs. Curved surface of the ball encourages steady interest for harmony response in light of the fact that the ball has negligible contact with floor and assists patients with finding out about adjusting, offsetting with their eyes. The ball likewise compels them to remain upstanding, and makes the patient concentration, consideration and alarm, which works on postural mindfulness and evenness.[30] Swiss ball allows a scope of activities that depend on the client's capacity to move with the movement of the ball while playing out the activity, utilizing the ball to both help the body during the development as well as to give a proportion of protection from the muscles utilized in the movement[44].

Frenkel Exercises are a series of motions of increasing difficulty performed by patients to facilitate the restoration of balance and coordination. Frenkel's exercises are used to bring back the rhythmic, smooth and movements. The exercises are performed in supine, sitting, standing and walking. Each activity is performed slowly with the patient using vision to carefully guide correct movement. These exercises require a high degree of mental concentration and effort. For those patients with the prerequisite abilities, they may be helpful in regaining control of movement through cognitive compensation strategies. Patients with partial sensation can progress to practicing exercises with eyes closed. The main principles of Frenkel exercises are the following : Concentration or attention, Precision and Repetition.[19] .Avoid fatigue, Perform each exercise not more than four times, Rest between each exercise ,Exercises should be done within normal range of motion to avoid over-stretching of muscles, The first simple exercises should be adequately performed before progressing to more difficult patterns.[22]

Berg balance scale measure balance in elderly people with varying conditions and disabilities. It was developed in 1989 consists of 14 items, scored from 0 to 4, which are added to make a total score between 0 and 56 , a higher score indicates better balance and lower score in older people have found to predict the onset of inability to perform important activities of daily living. it takes 10-15 min. to complete. It requires a stop watch, a chair, a ruler and a step.[17]

6MWT assesses endurance and ability to walk over longer distance. It was first described in 1963 as a field test for physical fitness. An individual is walk in 6 minutes on a hard, Flat, Indoor surface. Standardized verbal encouragement can be provided at minute intervals and rest is allowed as required. 6MWT used in many conditions such as osteoarthritis (OA), Stroke, Parkinson's, Alzheimer's disease, as well as in elderly populations and children. [16]

The TUG assesses basic mobility skill as well as strength , balance, and agility. It was originally developed in 1986 for frail elderly people as the "get-up and go-test". The TUG is used in a range of populations from children to elderly and for many conditions, including osteoarthritis, joint arthroplasty, Rheumatoid Arthritis, Stroke, CP, Parkinson's. Time taken to rise from sitting in an arm chair, walk 3 meters, turn, walk back to the chair, then sit down using regular footwear and a walking aid if required. [17]

- As with many degenerative neurologic disorders, non-pharmacological management can offer symptomatic relief of motor or non-motor symptoms in PD. Several studies have investigated specific forms and approaches to physiotherapy including strength training, gait and balance training, intense rehabilitation training and hydrotherapy.[29]
- Also, no literature has been found on the study of effectiveness of Swiss ball versus Frenkel's Exercise to improve balance and mobility in Parkinson's.
- So, this study is proposed to identify the effectiveness of Swiss ball versus Frenkel's Exercise to improve balance and mobility in Parkinson's.

METHODOLOGY

Study Design: It is comparative study in which 30 patients' with Parkinson's disease and the duration of the study: 12 weeks (40 minutes per day, 6 days in a week.). In this sample will be selected by the randomized sampling. In this the age group between 55-75 years both the gender will include. Patient suffered with Cardiovascular and musculoskeletal disorder, Head Injury, Brain Tumour , Seizures were excluded from the study. OUTCOME MEASURES taken in the study is Berg Balance Scale ,Tug Scale (Time up and go) , 6 MWT (6 METER WALK TEST)

PROCEDURE

After collecting the written consent form the patients selected by inclusion and exclusion criteria they would be divided into two group- group A and group B.

Group A will be treated with Swiss ball and Group B will be treated with Frenkel's exercise. All the pre and post data of outcome measures would be kept safely for analysing.

DATA ANALYSIS

The shapiro-wilk test will be used to analyse the normality because data is less than 50. After the checking the normality depending on data distribution , [parametric and non parametric test will be decided. Mean Standard deviation paired 't' test and unpaired 't' test will be performed for analysis of pre and post data evaluation within and between groups.

RESULTS

Results of the study will be revealed after getting the analyzed data

DISCUSSIONS AND CONCLUSIONS

Discussion and conclusions will be included after revealing of analyzed data.

REFERENCES

1. Matinolli, JT Korpelainen, R Korpelainen, KA Sotaniemi, V-M Matinolli, VV Myllylä. Mobility and balance in Parkinson's disease: a population-based study Mobility. European Journal of Neurology. 2009, 105-111.
2. Michael J Falvo, Gammon M Earhart. Six-minute walk distance in persons with Parkinson disease: a hierarchical regression model Archives of Physical Medicine and Rehabilitation, 2009, 1004-1008.
3. Margaret KY Mak, Marco YC Pang. Balance confidence and functional mobility are independently associated with falls in people with Parkinson's disease. Journal of neurology, 2009, 256(5), 742-749.

4. Kuptniratsaikul V, Praditsuwan R, Assantachai P, Ploypetch T, Udompunturak S, Pooliam J. Effectiveness of simple balancing training program in elderly patients with history of frequent falls. *ClinInterv, Aging*, 2011, 6: 111-7
 5. Cris Zampieri, Arash Salarian, Patricia Carlson-Kuhta, John G Nutt, Fay B Horak. Assessing mobility at home in people with early Parkinson's disease using an instrumented Timed Up and Go test. *Parkinsonism & related disorders*. 2011, 17(4),277-280.
 6. Hasan Daneshmandi, Parisa Sedaghati, Noredin Karimi, Amir Hosein Barati, Seyyed Mojtaba Banitaba-Bidgoli. Effect of exercise interventions on movement performance in Parkinson disease. *August*, 2014,18(4): 389-404.
 7. Emilio J Martínez-López Emilio et al. The association of flexibility, balance, and lumbar strength with balance ability: risk of falls in older adults. *J Sports Sci Med*. 2014, 13(2):349- 357.
 8. David Conradsson, et al. Journal effects of Highly Challenging Balance Training in Elderly with Parkinson's disease. *Journal Neurorehabilitation & neural repair*. 2015 October, 29(9); 827-836, 10.11771.
 9. Steno Rinalduzzi, Carlo Trompetto, Lucio Marinelli, Alessia Alibardi, Paolo Missori, Francesco Fattapposta, Francesco Pierelli, Antonio Currà. Balance dysfunction in Parkinson's disease. *BioMed research international*. 2015:10.1155/434683.
 10. Asmare Yitayeh et al. The effectiveness of physiotherapy treatment on balance dysfunction and postural instability in persons with Parkinson's disease: a systematic review and meta analysis. *BMC Sports Sci Med Rehabil*. 2016, 10.1186/s13102-016-0042-0.
- Page 20 of 26
11. Sze-Ee Soh et al. Perceptions of aquatic physiotherapy and Health-related quality of life in people with Parkinson's disease receiving comprehensive care. *Aust Health Rev*. Jan 2016, 24(2): 566-577,10.1111/hex.13202.
 12. M. Lauzé, J. F. Daneault, and C. Duval. The effects of physical activity in Parkinson's disease: a review. *Journal of Parkinson's Disease*. 2016, 1877-7171.
 13. G. Abbruzzese, R. Marchese, L. Avanzino, and E. Pelosin. Rehabilitation for Parkinson's disease: current outlook and future challenges. *Parkinsonism & Related Disorders*. 2016, 10.1016/j.parkreldis.
 14. Myoung-Kwon Kim. The effects of trunk stabilization exercise using a Swiss ball in the absence of visual stimulus on balance in the elderly. *J Phys Ther Sci*. July2016, 28(7);2144- 7,10.1589/jpts.28.2144.
 15. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*. 1991, 39(2): 142- 8.10.1111/J.1532-5415.

16. Eiji Kobayashi, Nobuaki Himuro, Mitsuhiro Takahashi. Clinical utility of the 6-min walk test for patients with moderate Parkinson's disease. *International Journal of Rehabilitation Research*. 2017, 40(1): 66-70. 10.10.97/MRR.0000000000000205.
17. Kim Bennell, Fiona Dobson and Rana Hinman. Measures of Physical Performance Assessments Self-Paced Walk Test (SPWT), Stair Climb Test (SCT), Six-Minute Walk Test (6MWT), Chair Stand Test (CST), Timed Up & Go (TUG), Sock Test, Lift and Carry Test (LCT), and Car Task. *American college of physiotherapy*. 2011, 63 Suppl 11:S350-70, 10.1002/acr.20538.
18. Talia Herman, Aner Weiss, Marina Brozgot, Nir Giladi, Jeffrey M Hausdorff. Gait and balance in Parkinson's disease subtypes: objective measures and classification considerations. *Journal of neurology*. 2014, 261, 2401-2410.
19. Thakker, Roopa Harish; Kulkarni, Parag. Effectiveness of Frenkel's Exercise on Reaction Time. Source: *Indian Journal of Physiotherapy & Occupational Therapy*. Oct-Dec 2017, Vol. 11 Issue 4, p74-77. 4p.
20. David E Vaillancourt, Karl M Newell. The dynamics of resting and postural tremor in Parkinson's disease. *Clinical Neurophysiology*. 2000, 10.1016/S1388-2457(00)00467-3. 21. Buhmann C, Wrobel N, Grashorn W, Freundt O, Wesemann K, Diedrich S, Bingel U. Pain in Parkinson disease: a cross-sectional survey of its prevalence, specifics, and therapy. *J Neurol*. 2017, vol. 264, 758-759.
- Page 21 of 26
22. Manisha Rathi, Nargis Hamdulay, Tushar J Palekar, Reema Joshi, Ravi Patel, Rajlakshmi Shah, Mrunal Kulkarni. Effectiveness of Frenkel's Balance Exercises on Elderly People. *Indian Journal of Gerontology*. 2021, vol. 35, No. 4, pp. 483-494, 0971-4189.
23. Miriam R Rafferty, Peter N Schmidt, Sheng T Luo, Kan Li, Connie Marras, Thomas L Davis, Mark Guttman, Fernando Cubillos, Tanya Simuni. Regular exercise, quality of life, and mobility in Parkinson's disease: a longitudinal analysis of national Parkinson foundation quality improvement initiative data all NPF-QII Investigators. *Journal of Parkinson's disease*. 2017, 7(1): 193-202. 10.3233/JPD-160912.
24. E Ray Dorsey, Bastiaan R Bloem. The Parkinson Pandemic-A Call to Action. Jan 1, 2018, 75(1): 9-10, 10.1001, 3299.
25. C Marras, JC Beck, JH Bower, E Roberts, B Ritz, GW Ross, RD Abbott, R Savica, SK Van Den Eeden, AW Willis, CM Tanner. Prevalence of Parkinson's disease across North America. *NPJ Parkinson's disease* 2018, 10.1038/s41531-018-0058-0.
26. Martina Mancini, Carolin Curtze, Samuel Stuart, Mahmoud El-Gohary, James McNames, John G Nutt, Fay B Horak. The impact of freezing of gait on balance perception and mobility in community-living with Parkinson's disease. 2018, 3040-3043, 10.1109.

27. Christer Johansson, Britta Lindström, Lars Forsgren & Gudrun M. Johansson. Balance and mobility in patients with newly diagnosed Parkinson's disease – a five-year follow-up of a cohort in northern Sweden. Published online: 19 Nov 2018, 10.1080/09638288.1509240.

28. Rossi A, Berger K, Chen H, Leslie D, Mailman RB and Huang X. Projection of the prevalence of Parkinson's disease in the coming decades: revisited. *Movement Disorder*. 2018, 33(1): 156-159, 10.1002/mds.27063.

29. Helena de Oliveira Braga et al. EMPOWER-PD - A physical therapy intervention to empower the individuals with Parkinson's disease: a study protocol for a feasibility randomized controlled trial. *Pilot Feasibility Stud*. 2019, 10.1186/s40814-019-0394-9.

30. Maureen Flett. *Swiss ball: for strength, tone and posture*. Sterling Publishing Company, Inc., 2003, 2003284003.

31. Rastislav Šumec, Pavel Filip, Kateřina Sheardová, Martin Bareš. Psychological benefits of nonpharmacological methods aimed for improving balance in Parkinson's disease: a systematic review. *Behavioural Neurology*. 2015, 10.1155/620674.

32. Vimonwan Hiengkaew, Khanitha Jitaree, Pakaratee Chaiyawat. Minimal detectable changes of the Berg Balance Scale, Fugl-Meyer Assessment Scale, Time "Up & Go" Test, gait speeds, and 2-minute walk test in individuals with chronic stroke. *Archives of physical medicine and rehabilitation*. 2012,93(7):1201-8.

Page 22 of 26

33. Michela Picardi, Valentina Redaelli, Paola Antoniotti, Giuseppe Pintavalle, Evdoxia Aristidou, Irma Sterpi, Mario Meloni, Massimo Corbo, Antonio Caronni . Turning and sit to-walk measures from the instrumented Timed Up and Go test return valid and responsive measures of dynamic balance in Parkinson's disease. *Clinical Biomechanics*. 2020, 10.1016.

34. Seyyed Mojtaba Tabatabai Asl, Parisa Sedaghati. Effect of Combining Cawthorne-Cooksey and Frenkel Exercises on Functional Balance and Fall Risk in the Elderly with a History of Falling. *Medical Journal of Islamic republic of Iran*. 2022, 32(1): 429-433.

35. Raquel Bouça-Machado, Gonçalo S Duarte, Maria Patriarca, Ana Castro Caldas, Joana Alarcão, Ricardo M Fernandes, Tiago A Mestre, Ricardo Matias, Joaquim J Ferreira. Measurement instruments to assess functional mobility in parkinson's disease: a systematic review, *Movement disorders clinical practice*. 2020, 7(2): 129-139, 10.1002/mdc3.12874.

36. Hamlet Suarez, Dario Geisinger, Enrique D Ferreira, Santiago Nogueira, Sofia Arocena, Cecilia San Roman, Alejo Suarez. Balance in Parkinson's disease patients changing the visual input. *Brazilian journal of otorhinolaryngology*. 2011,77(5): 651-5.

37. Briana R. De Miranda, Samuel M. Goldmanb, Gary W. Millerc , J. Timothy Greenamyred and E. Ray Dorseye. Preventing Parkinson's Disease: An Environmental Agenda. 6 October 2021, 1877-7171.
38. Fahriye Coban et al. Randomized Controlled Trial: Effect of clinical Pilates training on balance and postural control in patients with Parkinson's disease. J Comp Eff Res. 2021 Dec, 10.2217/cer-2021-0091.
39. Steffen T, Seney M. Test-retest reliability and minimal detectable change on balance and ambulation tests, the 36-item short-form health survey, and the unified Parkinson disease rating scale in people with Parkinsonism.2008, 88: 733-746.
40. World Health Organization. Parkinson disease: a public health approach. Technical brief. Geneva. 2022, 9789240050983.
41. Stephen Down. The Berg Balance Scale. 2013, 10.1016/S1836-9553(13)70161-9. 42. WHO: Parkinson disease: a public health approach. Technical brief; 2022, iv, 21p, 9789240050983
43. Mehmet Karakoc, Mehmet Ilker Yon, Gul Yalcin Cakmakli, Ersin Kasim Ulusoy, Aydin Gulunay, Nese Oztekin, Fikri Ak. Pathophysiology underlying drooling in Parkinson's disease: oropharyngeal bradykinesia. Neurological Sciences. 2016, 37(12), 1987-1991
44. Maureen Flett. Swiss ball: for strength, tone and posture. Sterling Publishing Company, Inc., 2003.

Page 23 of 26

45. Andrey Dovzhenok, Leonid L Rubchinsky. On the origin of tremor in Parkinson's disease. Public Library of Science. 2012, 7(7), 41598.
46. Ania Winogrodzka, Robert C Wagenaar, Jan Booij, Eric C Wolters. Rigidity and bradykinesia reduce interlimb coordination in Parkinsonian gait. Archives of Physical Medicine and Rehabilitation.2005, 86(2), 183-189.
47. Meg E Morris, Hylton B Menz, Jennifer L McGinley, Frances E Huxham, Anna T Murphy, Robert Iansek, Mary Danoudis, Sze-Ee Soh, David Kelly, Jennifer J Watts. Falls and mobility in Parkinson's disease: protocol for a randomized controlled clinical trial. BMC neurology, 2011,11(1),1-8.
48. Robert I Griffiths, Katya Kotschet, Sian Arfon, Zheng Ming Xu, William Johnson, John Drago, Andrew Evans, Peter Kempster, Sanjay Raghav, Malcolm K Horne. Automated assessment of bradykinesia and dyskinesia in Parkinson's disease. Journal of Parkinson's disease,2012, 2(1), 47-55.
49. Mary Ann Thenganatt, Joseph Jankovic. The relationship between essential tremor and Parkinson's disease. Parkinsonism & related disorders,2016, 22, S162-S165. 50. Christoph Redecker, Anja Bilsing, Ilona Csoti, Wolfgang Fogel, Georg Ebersbach, Björn Hauptmann, Bernhard Hellwig, Martina Müngersdorf. Physiotherapy in Parkinson's disease patients: recommendations for clinical practice.2014, 2210-5336.

Page 24 of 26