

# Effect of Retro Walking Exercise on Balance in Geriatric Individuals

Dr. Harshil Shah (PT)<sup>1\*</sup>, Dr. Dhara Vaghela (PT)<sup>2</sup>

<sup>1</sup>MPT Second Year, Gujarat University, Shree Swaminarayan Physiotherapy College, Near G. S. T. Crossing Ranip, Ahmedabad

<sup>2</sup>MPT, Gujarat University, MPT (Rehabilitation Sciences), Shree Swaminarayan Physiotherapy College, Near G. S. T. Crossing Ranip, Ahmedabad

\*Corresponding author email: [hmsah9070\[at\]gmail.com](mailto:hmsah9070[at]gmail.com)

**Abstract:** **Background:** Falls are extremely common among the elderly population accounting for substantial morbidity and mortality. Approximately, 30 percent of people over the age of 65 fall each year. Older adults with neurological disorders, such as stroke and Parkinson's disease, are at an even higher risk of falling. In Retro - walking backward direction and reversal of leg movement, different muscle activation patterns from those in forward walking are required. **Need:** The purpose of this study is to see the effectiveness of retro walking for improving balance in geriatric patients who have balance impairments. **Method:** 30 elderly individuals aged between 65 - 75 years were included in the study according to the inclusion criteria. Treatment took place for 4 weeks and session will be given 3 times a week. **Outcome:** berg balance scale and functional reach test. **Result:** After treatment of 4 weeks and 3 times a week there was significant improvement in balance of elderly.

**Keywords:** Retro walking, Balance, Risk of fall, Berg balance scale, Functional reach test, geriatric

## 1. Introduction

Elderly is defined as being 65 years of age or older.<sup>1</sup>

However, the onset of health problems of elderly may occur in early 50s or may be only in 40s. On the other hand, many times we come across the people who are healthy and active even at the age of 70 years. It is because of these two contrasting representations of elderly in our society that this group of population should be defined in health terms: "What defines this group is the frequent presence of multiple pathology and the atypical way in which illness can present with confusion, falls and loss of mobility and difficulty with day - to - day functioning".<sup>2</sup>

Normal aging is an artificial concept which describes physiologic changes that occur with advancing age. Normally physiological capacity of various systems attains a maximum level in Third decade of life - between the late teens and thirty years of age. After 35 years there occurs a decline in physiologic and performance measures.<sup>3</sup>

Physiological degenerative changes like musculoskeletal system, cardiovascular system, pulmonary system, nervous system and special senses like visual acuity, hearing, etc. are more affective systems in geriatric individuals. But age - related changes in musculoskeletal system are very important, as they are directly related to limited mobility as well as increases in the incidence of falls in elderly.

Falls are extremely common among the elderly population accounting for substantial morbidity and mortality. Approximately, 30 percent of people over the age of 65 fall each year.<sup>1,9</sup> According to the World Health Organization global report on falls prevention, people aged 65 years and above fall about 28%–35% in each year and this proportion increases as age and frailty level increase.<sup>4</sup> The prevalence of falls in India, above the age of 60 years, reported to range

14%–53%.<sup>5</sup> Falling is a leading cause of serious injury, loss of independence and nursing home admission in older adults.<sup>6</sup>

Balance has three basic dimensions: maintenance of a position, stabilization for voluntary movements and reaction to external disturbance. Any movement of the body can displace the location of the center of the body relative to the base of support, but postural adjustment occurring prior to, during, and after voluntary movements keep the body center of gravity close to the base of support.<sup>7</sup>

Proactive balance training is an anticipatory and self - initiated approach incorporating balance and strength exercises to improve balance and lower fall risk. on other hand reactive balance training consists of automatic responses to unexpected perturbation for example slips, trips and nudges that may cause loss of balance.<sup>8</sup>

When the balance of a young adult is disturbed by a movement of support surface, he or she typically regains stability by using ankle movement strategy, in which, postural sway is focused on the ankle joint and muscle response are activated first in the stretched ankle muscles and then radiate upward to the muscles of the thigh and hip. Woollacott, Shumway - Cook and Nashner compared the muscle response characteristic of older adults and young adults and found that the response organization was generally similar between the older and younger groups with regard to responses being activated first in the stretched ankle muscle and radiating upwards to the muscles of the thigh.<sup>9</sup> Retro - walking is sometimes referred to as backward walking, has been thought to be used already for several decades in China, Japan and Europe to get a physical workout, improve sport performance, promote balance and to stay mentally fit. Since there is propulsion in backward direction and reversal of leg movement in Retro - walking, different muscle activation patterns from those in forward walking are required. Retro walking increases stride rate

Volume 11 Issue 8, August 2022

[www.ijsr.net](http://www.ijsr.net)

Licensed Under Creative Commons Attribution CC BY

decreases stride length and increases support time. Muscular structure supporting ankle and knee reversed their role during retro - walking. Retro walking is performed by generating impairment in walking rhythm, shortening step distance, and a decrease in walking speed and total walking time.<sup>10</sup>

Retro walking is an intervention that may be valuable for enhancing balance and self - efficacy to improve mobility function after stroke. It has been used in orthopedic rehabilitation as it produces less mechanical strain on the knee joint while backward running is an effective means for increasing strength and power of the quadriceps. Retro walking to improve gait and dynamic balance poststroke is a more recent application and appears to offer several potential benefits.<sup>11</sup>

A benefit of Retro walking training is that it challenges postural stability requisite for such tasks. During backward walking, visual cues, although present, do not provide information on the target to be reached, nor the resources to anticipate ground conditions. This variation in optic flow as well as the simple novelty of the task leads to alterations in spine and pelvis stabilization to maintain dynamic balance. Therefore, backward walking training, due to its greater postural demands, may be superior to a more traditional forward walking training to improve gait and dynamic balance and decrease fall incidence in individuals poststroke.<sup>11</sup>

### Need of Study

There are many studies which has find out the effect of retro walking for individuals with osteoarthritis, Parkinson's, hemiplegia etc. But very few studies are there which has find out effect of retro walking exercise on balance in geriatric individuals.

## 2. Methodology

- Source of data: Individuals of old age home and OPD based patients of Ahmedabad.
- Study type: An Experimental study
- Sample size: 30
- Sampling technique: Simple Random Sampling
- Study duration: 6 months

### Inclusion Criteria

- Age: between 65 - 75 years
- Gender: Male and Female
- Individuals who have moderate or low risk of fall (Berg Balance Scale)
- Fear of fall
- Willing to participate

### Exclusion Criteria

- Hypertension
- Cancer
- Individuals with chronic disorders, which affects balance
- Individuals underwent recent surgery
- Any individual not performing daily activities independently
- Patient with visual and auditory deficit

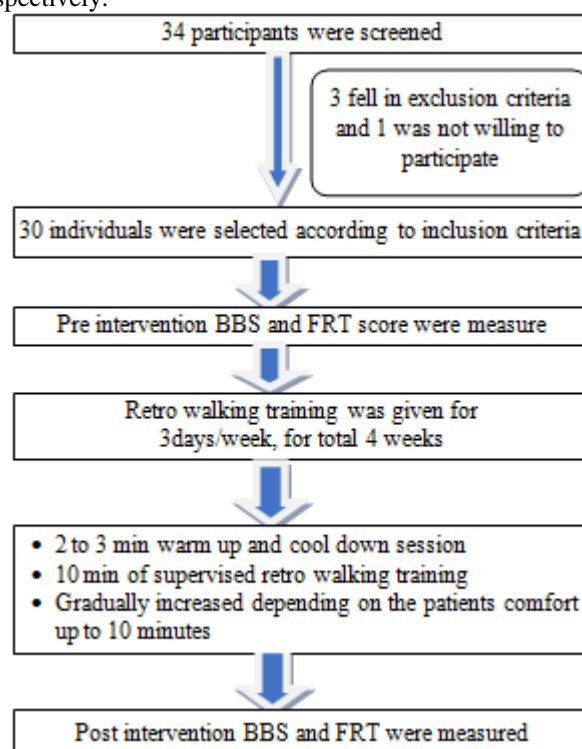
## 3. Outcome Measures

### Berg balance scale

Patients are asked to complete 14 tasks, and each task is rated by an examiner on a 5 - point scale ranging from 0 (indicating the lowest level of function) to 4 (indicating the highest level of function). Elements of the test are supposed to be representative of daily activities that require balance, including tasks such as sitting to standing, standing unsupported, sitting unsupported, standing to sitting, transfers, standing with eyes closed, standing with feet together, reaching forward with outstretched arm, retrieving an object from floor, turning to look behind, turning 360, placing alternate foot on stool, standing with 1 foot in front, and standing on 1 foot. Some tasks are rated according to the quality of the performance of the task, whereas the time taken to complete the task is measured for other tasks. The developers of the BBS provided operational definitions for each task and the criteria for grading each task. Overall scores can range from 0 (severely impaired balance) to 56 (excellent balance). The BBS can be administered in 15 to 20 minutes and requires minimal equipment.<sup>2, 13</sup> Reliability and Validity of berg balance scale is 0.99 and 0.98 respectively.<sup>14</sup>

### Functional reach test

The patient is instructed to stand next to, but not touching, a wall and position the arm that is closer to the wall at 90 degrees of shoulder flexion with a closed fist. The assessor records the starting position at the 3rd metacarpal head on the yardstick. Instruct the patient to "Reach as far as you can forward without taking a step." The location of the 3rd metacarpal is recorded. Scores are determined by assessing the difference between the start and end position is the reach distance, usually measured in inches. Three trials are done and the average of the last two is noted.<sup>15, 16</sup> Reliability and Validity of functional reach test is 0.89 and 0.76 respectively.<sup>17, 18, 19</sup>



4. Result

The present study was conducted to study the effect of retro walking for improving balance and to reduce fall in geriatric individuals

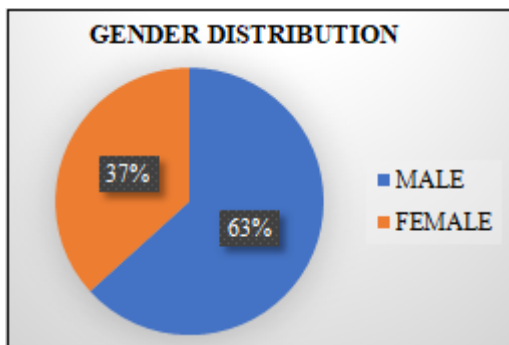
Total 30 individuals were included in the study and data analysis was performed on the following outcome measure:

- Berg Balance Test
- Functional reach test

Data of 30 individuals were analyzed using statistical package for social science version 28 (SPSS v28) and Microsoft excel 2010.

Table 1: Shows gender distribution of total population

Total	30 (100%)
Male	19 (63%)
Female	11 (37%)



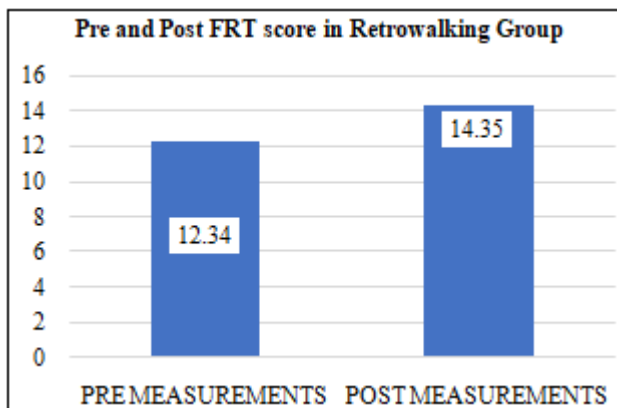
Graph 1: Shows gender distribution of total population

Table - 1 and Graph - 1 shows the gender distribution of all participants of the study. There was a male predominance seen.

Wilcoxon signed ranked test was applied for the analysis of the pre and post treatment outcome measures. Table - 2 and Graph - 2 shows pre and post treatment functional reach test score.

Table 2: Pre and post mean functional reach test score.

Outcome Measure (Functional Reach Test)	Pre (Mean±SD)	Post (Mean±SD)	Z Value	P Value
Group (Retro walking)	12.3433±1.54	14.35±2.002	- 4.624	<.005

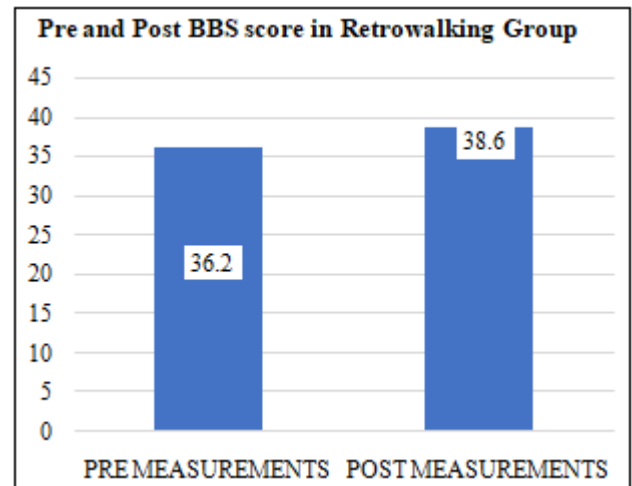


Graph 2: Pre and post mean functional reach test score

Graph 2 and Table 2 shows that the minor statistically significant improvement in balance when compared between pre and post treatment of FRT

Table 3: Pre and post mean berg balance scale score

Outcome measure (berg balance scale)	Pre (Mean±SD)	Post (Mean±SD)	Z Value	P Value
Group (Retro walking)	36.2±9.87	38.6±9.80	- 4.851	<.005



Graph 3: Pre and post mean berg balance scale score

Graph - 3 and table - 3 shows that the statistically significant improvement in balance when compared between pre and post treatment of BBS score.

5. Discussion

The objective of the study was to see the effect of the retro walking for improving balance and reduce fall in geriatric individuals who have balance impairments. We found significant improvement in the functional reach test and berg balance scale score after retro walking session. Present study focused on score of berg balance scale and functional reach test score. This study has concluded that retro walking can be used as a simple task - specific intervention that can be used to improve reactive balance control in geriatric individuals.

In our study we found significant improvement in the balance. In retro walking toes contact the ground first and the heel is lifted off the ground at the end during BW stance phase, which leads to different muscles activation patterns and gait characteristics. The retro walking/backward walking (BW), unsimilar to forward walking, requires specialized control circuits, in addition to rhythm circuitry. Motor systems could initiate timely, then appropriate, responses and consequently counteract various disturbances, contributing to achievement of equilibrium condition through modifying the biomechanical state. BW training caused changes in movement control system and gait characteristics and exerted a positive effect on postural stability. Furthermore, because of little dependence on vision, BW training participants had to rely more on neuromuscular proprioceptive and vestibular senses to maintain postural stability. It was proved that BW training is more effective in improving gait speed and stride length.<sup>20</sup>

Above explanation coincide some past study with **Winter et al.** suggested that backward walking was a near image of forward walking, and suggested that in order to produce the muscle activation patterns involved in forward walking the temporal cycling of the muscle contractions in backward walking was simply reversed.<sup>2</sup><sup>1</sup>**Grasso et al.** found that the waveforms of all elevation angles in backward walking gait were essentially time reversed relative to the corresponding waveforms in forward walking gait.<sup>2</sup><sup>2</sup>**Junjie Wang et al. in 2019** found that motor systems contribute to balance by initiating timely and appropriate responses to counteract various disturbances. They launch, select, and employ motor command programs and synergies to modify the biomechanical state towards the desired equilibrium condition. Changes in movement control system and gait characteristics resulted from BW training may contribute to its positive impact on balance performance. The increased heel force and decreased standing foot angle following BW training could contribute to the change in gait characteristics and improvement in balance performance. BW training could increase forward gait speed, enhance hamstring flexibility, and improve stride length by strengthening the leg muscles related to push - off. Besides, BW training could strengthen quadriceps and hamstring muscles, resulting in greater muscle strength compared to FW training and reduced knee joint compression force. Improved muscle strength of lower extremity could contribute to increased forward gait speed and further improve balance performance.<sup>2</sup><sup>3</sup>

In conclusion, coming to the implication of the study geriatric individuals are at higher risk of falls in general and it is significantly increases with the age advances so this study will be beneficial for prevention of fall risk. Hence, Retro - walking can be used clinically for improving the balance and reducing risk of fall.

## 6. Conclusion

Balance disturbances are a common medical problem in old age. Age related changes in the balance are associated on gait with a decrease in self - selected gait speed, cadence, stride length, and relative direction of the swing phase, accompanied by an increase in single and double time. The ability to avoid falling depends on the 'change in support' balance reactions that involves a rapid limb movement (i. e., a step or a grasp response) to alter the base of support. The result of present study indicates that there is significant improvement in Retro - walking in terms of berg balance scale and functional reach test score.

## 7. Limitation of the Study

- 1) Limited sample size
- 2) Further studies are needed to examine long term effect of the therapy
- 3) Different gait rehabilitation strategies are not used in the study.

## 8. Future Scope of the Study

- 1) Future study with a larger population

- 2) Further studies are needed to examine long term effect of the therapy
- 3) Future studies can be done on different gait rehabilitation strategies for retro walking
- 4) Long time follow up of the subjects was taken.

## References

- [1] C. Seth Landefeld, Robert Palmer, Mary Anne Johnson, Catherine Bree Johnston, and Lyons, William E. Current geriatric diagnosis and treatment. International edition, McGraw Hill, 2004, 4 - 6.
- [2] College NR. Frail older people, In Davidson's principles and practice of medicine, 19<sup>th</sup> edition, Churchill Livingstone, 2002, 237 - 44.
- [3] McArdle WD, Katch FI, Katch VL. Exercise physiology: energy, nutrition, and human performance.
- [4] World Health Organization. WHO Global Report on Falls Prevention in Older Age. Available from: [http://www.who.int/ageing/publications/Falls\\_prevention7March.pdf](http://www.who.int/ageing/publications/Falls_prevention7March.pdf). [Last accessed on 2016 Jun 15].
- [5] Dsouza SA, Rajashekar B, Dsouza HS, Kumar KB. Falls in Indian older adults: A barrier to active ageing. *Asian J GerontolGeriatr* 2014; 9: 33 - 40.
- [6] Mansfield A, Peters AL, Liu BA, Maki BE. A perturbation - based balance training program for older adults: study protocol for a randomised controlled trial. *BMC geriatrics*.2007 Dec; 7 (1): 1 - 4.
- [7] Berg KO, Maki BE, Williams JI, Holliday PJ, Wood - Dauphinee SL. Clinical and laboratory measures of postural balance in an elderly population. *Archives of physical medicine and rehabilitation*.1992 Nov 1; 73 (11): 1073 - 80.
- [8] Sadowski CA, Espy D. Comparison of Responses in Proactive vs. Reactive Balance Control.
- [9] Woollacot MH, Shumway cook et al. Aging and posture control: changes in sensory organization and muscular condition. *Int J Aging human Dev*, 1986; 23: 97 - 114.
- [10] Manisha N, Joginder Y, Priyanka R. Effect of retro walking on pain, balance and functional performance in osteoarthritis of knee. *Quadriceps Femoris Strength Training: effect of Neuromuscular Electrical Stimulation Vs Isometric Exercise in Osteoarthritis of Knee*.2015 Jul; 9 (3): 3154.
- [11] Rose DK, DeMark L, Fox EJ, Clark DJ, Wludyka P. A backward walking training program to improve balance and mobility in acute stroke: a pilot randomized controlled trial. *Journal of Neurologic Physical Therapy*.2018 Jan 1; 42 (1): 12 - 21.
- [12] Sergio Romero, Mark D. Bishop et al. Minimum Detectable Change of the Berg Balance Scale and Dynamic Gait Index in Older Persons at Risk for Falling. *Journal of GERIATRIC Physical Therapy*.2011; 34: 131 - 137.
- [13] Daniel L Riddle Paul W Stratford. Interpreting Validity Indexes for Diagnostic Tests: An Illustration Using the Berg Balance Test. *Physical Therapy*. Volume 79. Number 10. October 1999.
- [14] Berg KO, Wood - Dauphinee SL, WilliamsJI, Maki B. Measuring balance in the elderly: validation of an



- instrument. Can J Public Health.1992; 83 (Suppl 2): S7 - 11. PMID: 1468055.
- [15] FRT Available from: <https://www.sralab.org/sites/default/files/2017-06/5Hgjkv-Functional%20Reach%20Test.pdf> (last accessed 16.10.2020)
- [16] SAFA Production. Funtional Reach Test. Available from: <http://www.youtube.com/watch?v=yYBmBkbvAyk> [last accessed 8/5/2019].
- [17] Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. JGerontol.1990; 45 (6): M192 - 197.
- [18] Duncan PW, Studenski S, Chandler J, Prescott B. Functional reach: predictive validity in a sample of elderly male veterans. Gerontol.1992; 47 (3): M93 - 98.
- [19] Eagle JD, Salama S, Whitman D, Evans LA, Ho E, Olde J. Comparison of three instruments in predicting accidental falls in selected inpatients in a general teaching hospital. Journal of Gerontology Nursing.1999; 25 (7): 40 - 45.
- [20] Chen Z, Ye X, Wang Y, Shen Z, Wu J, Chen W, Jiang T, Wu H, Xu X. The efficacy of backward walking on static stability, proprioception, pain, and physical function of patients with knee osteoarthritis: a randomized controlled trial. Evidence - Based Complementary and Alternative Medicine.2021 Jun 11; 2021.
- [21] Winter DA, Pluck N and Yang JF. Backward walking: a simple reversal of forward walking? J Mot Behav 1989; 21: 291–305.
- [22] Grasso R, Bianchi L and Lacquaniti F. Motor patterns for human gait: backward versus forward locomotion. J Neurophysiol 1998; 80: 1868–1885.
- [23] Wang J, Xu J, An R. Effectiveness of backward walking training on balance performance: A systematic review and meta - analysis. Gait & posture.2019 Feb 1; 68: 466 - 75.

## Author Profile



**Harshil Shah**, MPT (Rehabilitation Science) student studying in Shree Swaminarayan Physiotherapy College Ranip - Ahmedabad. Certified in Taping, Needling, Cupping, Spinal Manipulation and Yoga

instructor.



**Dhara Vaghela**, MPT (Rehabilitation science) Guide and senior lecturer at Shree Swaminarayan Physiotherapy college Ranip - Ahmedabad. Certified in Manual therapy for vertebral column, NDT, Taping

and Aerobics instructor.