



# Effect of Stability Trainer Exercise Program on Balance in Geriatric Population

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## Abstract

**Background:** Affected balance is one of the leading causes of falls in elderly. Falls are one of the major problems in the elderly and are considered one of the “Geriatric Giants”. Falls are often caused by a number of factors and may be grouped into intrinsic factors, such as existence of a specific ailment or disease, and external or extrinsic factors includes the environment and the way in which it may encourage or deter accidental falls. Stability trainers provide different sensory feedback. They come in different textures hence can provide different proprioceptive feedback according to requirement for training balance strategies. There is lack of research published previously to assess effect of stability trainer exercises on balance in diabetics, where they have found to show a significant change in balance abilities. Identifying the effect of stability trainers in training balance in elderly can help to address the specific problem of reduced balance and falls in this group more effectively. Hence, taking into consideration the need of the hour, this study is proposed to determine the effects of stability trainer exercise program on balance in elderly.

**Keywords:** Balance; Elderly; Stability trainer; Exercise

## Introduction

Aging means predictable, progressive, universal deterioration in various physiological systems, mental and physical, behavioral and biomedical system. In India, persons above 60 are called aged/elderly [1].

As per the 1991 census, the population of the elderly in India was 57 million as compared with 20 million in 1951. There has been a sharp increase in the number of elderly persons between 1991 and 2001 and it has been projected that by the year 2050, the number of elderly people would rise to about 324 million. India has thus acquired the label of “an ageing nation” with 7.7% of its population being more than 60 years old [1].

The problems faced by this segment of the population are numerous owing to the social and cultural changes that are taking place within the Indian society (Table 1). The major area of concern is the health of the elderly with multiple medical and psychological problems. Falls are one of the major problems in the elderly and are considered one of the “Geriatric Giants”. Recurrent falls are an important cause of morbidity and mortality in the elderly and are a marker of poor physical and cognitive status. Following are the physiological changes according to the age [2-5].

- Musculoskeletal system changes-reduced muscle strength, degenerative changes
- Neurological system-increases motor conduction latency, reduced sensation, reduced proprioception, impaired balance strategies, reduced number of neurons hence impaired processing of information
- Reduced visual acuity, reduced vestibular system function
- Cardio respiratory system reduced aerobic capacity, increased fatigue.

Decline in various body functions including changes in the musculoskeletal system, neurological system, vestibular system

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function, changes in visual acuity, and changes in cardiorespiratory system

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Increased risk of falls leading to increased dependency

↓

Psychosocial disturbances and impaired quality of life

Falls are often caused by a number of factors. Risk factors may be grouped into intrinsic factors, such as existence of a specific ailment or disease, and external or extrinsic factors includes the environment and the way in which it may encourage or deter accidental falls. All these in turn can lead to increased risk of falls, leading to increased dependency, psychosocial issues and impaired quality of life. This also contributes to a significantly high cost of care (Figures 1-5) [2].

Balance is dependent on feedback and feed forward mechanism. Feedback mechanism can be classified depending on information coming from various sensory systems of the individuals or internal stimuli called as intrinsic feedback or feedback or information coming from an external stimuli called as extrinsic feedback. Intrinsic feedback is feedback coming to an individual through the various sensory systems as a result of normal production of movement such as visual information concerning whether a movement was accurate, as well as somatosensory information concerning the position of the limbs as one was moving. Extrinsic (or augmented) feedback is information that supplements intrinsic feel

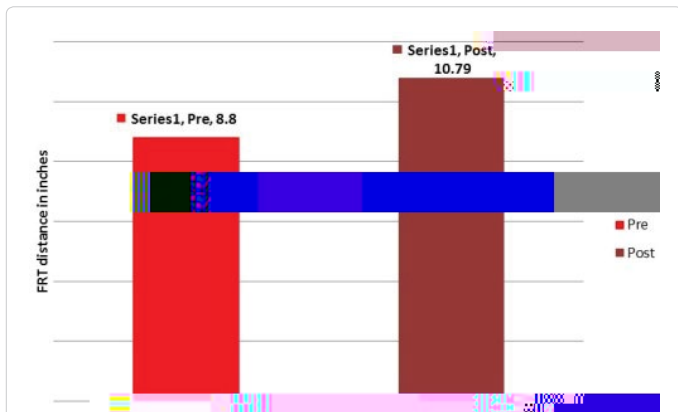


BBS		
	Pre	Post
Mode	50	53
SD	6.5	5.5
P value	<0.0001	
t value	10.601	
Inference	Extremely significant	

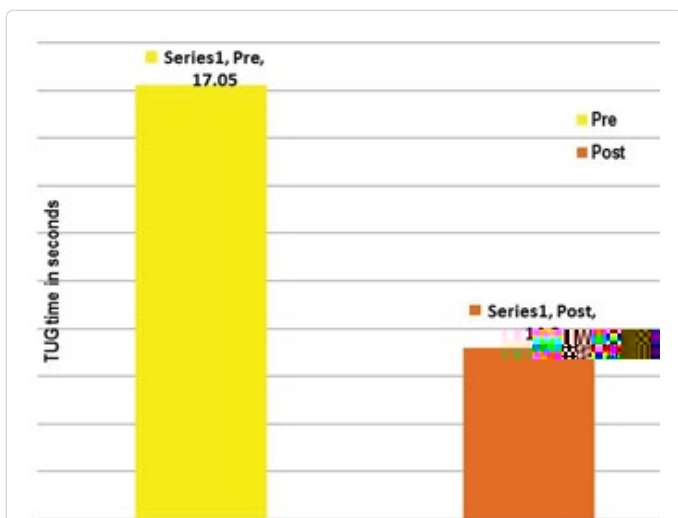
**Table 10:** Comparison of BBS scores before and after the treatment.

ABC		
	Pre	Post
Mode	89	95
SD	16.3	14.7
P value	<0.0001	
Inference	Extremely significant	

**Table 11:** Comparison of ABC scores before and after the treatment.

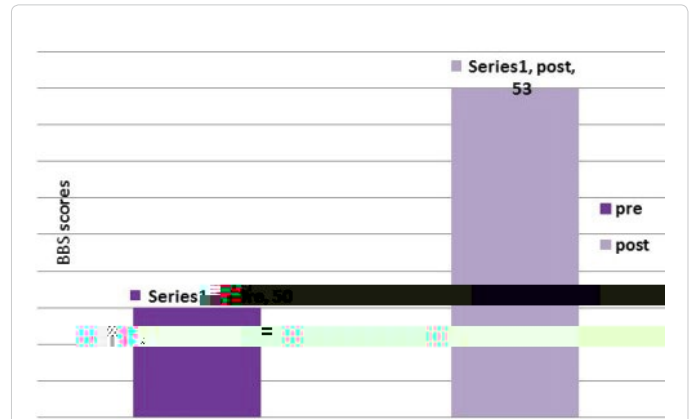


**Figure 6:** Comparison of FRT values before and after treatment. \*P value <0.0001=Extremely significant.

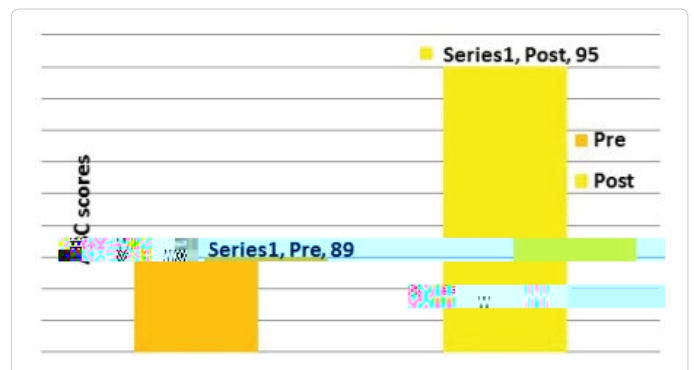


**Figure 7:** Comparison of TUG values before and after the treatment. \*P value <0.0001=Extremely significant.

- Static balance using Single leg stance test (SLS)
- Dynamic balance using functional reach test (FRT) and Timed Up and Go (TUG) test
- Static functional tasks using berg balance scale (BBS)



**Figure 8:** Comparison of BBS values before and after the treatment. \*P value <0.0001=Extremely significant.



**Figure 9:** Comparison of ABC values before and after the treatment. \*P value <0.0001=Extremely significant.

- Balance confidence using activity specific balance confidence assessment questionnaire (ABC)

### Experimental hypothesis

Stability trainer exercise program is effective in improving balance in elderly.

### Null hypothesis

Stability trainer exercise program has no effect on balance in elderly.

### Methodology

**Type of study:** Experimental

**Study population:** elderly people

**Inclusion criteria:** Adult above 60 years of age, ambulating without assistive device,

**Exclusion criteria:** any known neurological problems(stroke, parkinsonism, motor neuron disease, paraplegia) sensory loss, known orthopaedic problems (amputation, symptomatic lower limb arthritis, lower limb deformities, total knee/hip replacements), inability to follow commands, regular exercises for more than 2 hrs /week, symptomatic coronary artery diseases

**Study setting:** Old age homes, community

List of variables

**Independent variables:** functional reach test distance timed up and go test time, single limb stance test time, Age, gender, weight, height.

### Dependent variables

**Scores of Outcome measures:** single limb stance test time, functional reach test distance, Timed Up and Go test time, Berg balance scale score, activity specific balance confidence assessment questionnaire score.

**Confounding factors:** previous participation in exercise program, lower limb pain and deformities.

**Sample size (with rationale):** 41 individuals (calculated by taking previous researches into consideration, with  $\alpha=0.05$ , confidence level-95, power-0.80 mean (SD)  $\pm 4.0(1.3)$ ).

### Sampling method-random

**Method of allocation:** block randomization.

**Interventions:** Stability trainer exercise program (made by taking into consideration previous references and programs).

### Detailed plan

- Consent from the ethical committee was obtained
- Selection of subjects according to inclusion criteria, and explanation of procedures
- Consent of subject was taken and the format and details of the stability training exercise program was explained to the healthy subjects
- Interview-collection of demographic data, allocation of exercise group
- Pre intervention evaluation
- Implementation of exercise program(4/week→6 weeks)
- Assessment for post intervention data
- Analysis of collected data.

### Results

There was a significant difference in the mean SLS time before and after administration of STEP indicated by the p value (p value <0.0001) which is extremely significant. There was a significant difference in the mean FRT and TUG values before and after administration of STEP indicated by the p value (p value <0.0001) which is extremely significant. There was a significant difference in the BBS scores before and after administration of STEP indicated by the p value (p value <0.0001) which is extremely significant [19-22]. There was a significant difference in the ABC scores before and after administration of STEP indicated by the p value (p value <0.0001) which is extremely significant.

### Conclusion

Stability trainer exercise program (STEP) is extremely effective for balance training and improving the quality of life in the elderly.

### Clinical Implication

- This study is clinically relevant and can be used for the following:
- STEP can be used as an effective mode of balance training in geriatric population with or without any history of fall thereby preventing any chances of fall in future. It also improves the confidence of the elderly preventing them from having any psychological implications (eg- fear of falling)

- This programme has a holistic approach targeting and improving all the factors affecting balance like proprioception, lower limb muscle strength and vestibular functions.
- Spreading awareness of how exercises done on stability trainers in particular help in improving the quality of life in the elderly.

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