

# Comparative Study on the Effect of Perturbation-Based Balance-Training versus Dynamic Balance Training for Postural Control in Post Stroke Patients

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## **ABSTRACT**

**BACKGROUND:** A stroke occurs when a blood vessel in the brain ruptures and bleeds, or when there's a blockage in the blood supply to the brain. The rupture or blockage prevents blood and oxygen from reaching the brain's tissues. Stroke is the second leading cause of death and a major contributor to disability worldwide. The prevalence of stroke is highest in developing countries. During the past three decades, in absolute terms, global stroke incidence increased by 70%, its prevalence increased by 85%, its mortality increased by 43%.

**METHODOLOGY:** After assigning into 2 groups Group A - Subjects were received Perturbation based balance training for 30 minutes. The intervention was followed 5 days per week for 12 weeks. Group B - Subject receives Dynamic balance training for 30 minutes ,5 days per week, for 12 weeks and pre and post intervention of 'BBS' and 'PASS' was carried out.

**RESULT:** According to statistical analysis, it was concluded that firstly, the calculated value of p-value was found to be less than 0.05, then the null hypothesis was rejected and it was concluded that there is a significant difference in the BBS and PASS Scores of Group A and Group B, and negative mean difference states the mean score of Group B is more than Group A, which concludes the superiority of Group B (Dynamic Balance Training) over Group A (Perturbation Based Balance Training).

**CONCLUSION:** From the result of the study, it is concluded that after 12 weeks of treatment, both the Perturbation Based Balance Training and Dynamic Balance Training is significantly effective in treatment for Postural control in Post Stroke Patients but in comparison Dynamic Balance Training is more effective than Perturbation Based Balance Training.

## **INTRODUCTION**

Stroke is the second leading cause of death and a major contributor to disability worldwide. The prevalence of stroke is highest in developing countries <sup>[1]</sup>. During the past three decades, in absolute terms, global stroke incidence increased by 70%, its prevalence increased by 85%, its mortality increased by 43%, with a greater increase in stroke burden in low-income and middle-income countries (LMICs) than in high-income countries (HICs) <sup>[2,3]</sup>. Stroke can cause a variety of impairments, such as muscle weakness and decline of balance function, and increase the risk of falls and decrease the ability to perform activities of daily living/ADLs <sup>[4-6]</sup>. Stroke is the cause of long-term disability <sup>[5]</sup>. A stroke happens when the blood flow to a part of the brain is cutoff. Without the oxygen in blood, brain cells start dying within minutes.<sup>[6]</sup>

There are 3 main types of strokes: Ischemic stroke is the most common type of stroke, making up 87% of all cases. A blood clot prevents blood and oxygen from reaching an area of the brain. Hemorrhagic stroke occurs when a blood vessel ruptures. These are usually the result of aneurysms or arteriovenous malformations (AVMs). Transient ischemic attack (TIA) occurs when blood flow to a part of the brain is inadequate for a brief period of time. Normal blood flow resumes after a short amount of time, and the symptoms resolve without treatment. Some call this a Ministroke. <sup>[7]</sup> One of the most important causes of neurological morbidity and mortality in the world is ischemic stroke. It can be a result of multiple events such as embolism with a cardiac origin, occlusion of small vessels in the brain, and atherosclerosis affecting the cerebral circulation. <sup>[8]</sup> Stroke is defined as a sudden neurological deficit caused by focal vascular lesion in the brain. Stroke patients are at high risk of falling because their balance control is impaired. Falls may cause several serious problems for stroke patients. So, effective therapeutic measure for improving balance function and preventing falls are important in the rehabilitation of stroke patients. Balance is the ability of an individual to successfully maintain the position of their body or restore the center of mass over time.<sup>[9]</sup> Post-stroke rehabilitation improves patient outcomes by decreasing the chance of developing secondary complications and maximizing the patient's independence despite their impairments. Post-stroke rehabilitation is delivered by an interdisciplinary team experienced in the rehabilitation process. There are specific focus areas during this process, which ensure a holistic approach. Early discharge planning is essential and can help to ease the transition from inpatient rehabilitation to a patient's home environment. Stroke recovery is

heterogeneous and multi-layered <sup>[10]</sup>. Maintaining dynamic balance during community ambulation is a major challenge post-stroke <sup>[11]</sup>. Rehabilitation initiated early after a stroke has been shown to assist with reducing complications and residual post-stroke functional disabilities. A reduction in functional disability, as well as a reduced incidence of complications, results in a greater quality of life for stroke survivors and a decrease in potentially expensive long-term care costs. <sup>[12,13]</sup> However, despite the increasing evidence that post-stroke rehabilitation is beneficial, many healthcare professionals are unaware of stroke survivors' potential for improvement and reduction of secondary complications. <sup>[14]</sup> Although there is growing evidence that post-stroke rehabilitation is beneficial, <sup>[15]</sup> there is limited research into the specificities of post-stroke rehabilitation interventions. Therefore, information on the complexities and specific fundamentals of post-stroke rehabilitation tends to rely mainly on expertise of individual healthcare professionals <sup>[16]</sup>. Postural control can be categorized into conscious and unconscious control in response to vision, the vestibular system, and proprioceptors <sup>[17]</sup>. Posture control is also associated with adjusting postural stability and orientation in space <sup>[18]</sup>. Automatic stabilization is needed to maintain balance <sup>[19,20]</sup>. It is defined as a postural response that occurs unconsciously and automatically while consciously maintaining posture or performing movements <sup>[21]</sup>.

**Perturbation- Based Balance Training:** Perturbation-based balance training (PBBT) is a task-specific intervention aiming to improve reactive balance control after loss of balance in a safe and controlled environment. <sup>[22]</sup> Perturbation training is an emerging and promising treatment strategy for preventing falls <sup>[23]</sup>. The novelty of perturbation training is in the focus Perturbation-based balance training (PBT) focuses on practicing responses to instability, aiming to improve reactive balance control and reduce fall risk. <sup>[24]</sup> **Dynamic Balance Training:** Dynamic balance training is necessary to improve balance under controlled situations with divided attention. Dynamic balance training programme is a multi-task exercise program, designed to develop balance control, gait control, coordination, and functional tasks. Performance level of person may vary depending on the type of exercise given. This balance training is effective in reducing falls <sup>[25]</sup>

## **PROCEDURE**

Group A was treated with Perturbation Based Balance Training and Group B was treated with Dynamic Balance Training

**GROUP A: Perturbation-Based Balance Training-** There were 10 repetitions of each training, every day for 5 days in a week, 30 seconds for each exercise, with a total span of 30 minutes per day.

- **Balance on Trampoline:**



- **Exercise on Swiss ball:**



**GROUP B: Dynamic Balance Training-** There were 10 repetitions of each training, every day for 5 days in a week, 30 seconds for each exercise, with a total span of 30 minutes per day.

- **Walking with walker:**



- **Lateral shift:**



## **RESULTS**

The results from the application of independent t-test derived that the BBS score for Group A (Perturbation Based Balance Training) was  $41.8333 \pm 4.83581$ , and for Group B (Dynamic Balance Training) was  $46.9333 \pm 4.57077$ . The results from the application of independent t-test derived that the PASS score for Group A (Perturbation Based Balance Training) was  $25.1667 \pm 4.52642$  and for Group B (Dynamic Balance Training) was  $27.8333 \pm 4.99022$ .

## **DISCUSSION**

An experimental study was conducted on 30 patients aged between 40-60 years to see and compare the effect of Perturbation-Based Balance Training and Dynamic Balance Training for postural control in post stroke patients.

Group A subjects were given Perturbation-Based Balance Training and Group B subjects were given Dynamic Balance Training. And the outcome measures were BBS and PASS.

The results of the present study showed that the application of independent t-test derived that the BBS score for Group A (Perturbation Based Balance Training) was  $41.8333 \pm 4.83581$ , and for Group B (Dynamic Balance Training) was  $46.9333 \pm 4.57077$ ; p-value was found to be less than 0.05, the null hypothesis was rejected and it was concluded that there was a significant difference in BBS Score of Group A and Group B and negative mean difference states the mean score of Group B is more than Group A, which concludes the superiority of Group B (Dynamic Balance Training) over Group A (Perturbation Based Balance Training).

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