

# Effect of Libra Balance Board Exercises on Dynamic Balance in Stroke Subjects: A Randomized Clinical Trial

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## ABSTRACT

**Background:** Stroke survivors are more prone for sensorimotor impairments such as static as well as dynamic balance which further results in physical disabilities, striking a major socioeconomic burden on the family and society, if the goals of the rehabilitation are inappropriate.

**Aim:** To compare the effect of Libra balance board exercises on dynamic balance in sub-acute and chronic stroke subjects.

**Setting and design:** This experimental study was carried out at a tertiary care hospital.

**Materials and methods:** This study included 17 individuals with sub-acute and chronic stroke with 40 to 65 years of age group. All the patients were recruited using the Brunnstrom Voluntary control grades 3 to 5. Intervention included Libra Balance Board exercises for 30 minutes, 5 sessions per week over a period of 4 weeks. Patients were assessed at baseline using BBS and ABC and reassessed after 4 weeks.

**Statistical Analysis:** SPSS Version 23 was used. Mean, Standard deviation, paired and unpaired t Test and Wilcoxon sign-rank test were used.

**Results:** There was a statistically significant change in both the outcome but Berg balance score showed more improvement with p value <0.05.

**Conclusion:** Libra balance board exercises were beneficial in the enhancement of dynamic balance in subjects with sub-acute and chronic stroke.

**Key words:** Stroke, Dynamic balance, Libra balance board exercises, Berg balance scale, Activity-specific balance confidence scale

## INTRODUCTION:

A stroke is a cerebrovascular event in which the blood supply to the brain is significantly disrupted, resulting in a sudden loss of neurological function. Stroke is becoming more common around the

world, with an estimated 70 million new cases by 2030. [1] There is significant loss of function depending on the degree of brain injury, location and extent of brain injury and the amount of collateral blood flow. Atherosclerosis, ischemia and hemorrhage are the major contributory factors in stroke or cerebrovascular disease. The risk factors include modifiable factors such as tobacco use or smoking, alcohol consumption, obesity and non-modifiable factors such as family history, previous history of stroke or Transient Ischemic Attack, gender age, and races. [2],[3]

Symptoms of stroke involve precipitous numbness or weakness of the arm, leg and face, particularly on one side of the body, difficulty in speech and language, communication or understanding, visual disturbances and severe headache, dizziness, nausea and vomiting. [4] The other most frequently reported symptoms in stroke are as follows: mass pattern of movement, altered sensations on the paretic side, impaired coordination, postural control and impaired static as well as dynamic balance, perceptual and cognitive deficits and gait disorders. [5]

Balance insufficiencies like impaired stability, symmetry and postural control throughout quiet standing, less synchronized responses to balance perturbations, and augmented weight bearing on the non-affected extremity are key factors for falls post stroke.

In traditional balance exercises, specific movements are recurrent and patients find these exercises purposeless and tedious subsequently lessens motivation and acquiescence with exercise protocol. Recently, multidisciplinary rehabilitation approaches for improving balance has been implemented. Studies conducted using Libra balance board has also shown to be beneficial for the betterment of dynamic balance, gait and quality of life in geriatric population. [6][7]

As there is lack in literature on the effect of Libra balance board training on dynamic balance, the current study aims to determine the effectiveness of Libra balance board exercises on the same in individuals with sub-acute and chronic stroke.

## **MATERIALS AND METHODS:**

This study was conducted on 17 individuals, (5 female and 12 male) clinically diagnosed with Sub-acute and Chronic stroke, in tertiary care hospital. The ethical clearance was gained from the Institutional Ethical Committee. All participants were given the informed consent in writing before participating in this study. Each group received intervention for 30 minutes, 5 sessions per week over a period of 4 weeks. Both gender between the age group of 40-65 years diagnosed with stroke more than 3 months onset with Brunnstrom Voluntary control grades 3 to 5 were included in this study. Subjects should also be able to stand without support and able to follow verbal commands.

Subjects with Visual and vestibular impairments, any cardiovascular or orthopaedic condition, Cognitive impairments and Using walking aid or foot orthotics were excluded from the study. The sampling method used in this study was convenience sampling.

**PROCEDURE:**

Libra Balance board exercises were given for 30 minutes, 5 sessions per week over a period of 4 weeks. The starting position of the subject was in standing. The subject placed their feet on the electronic Libra balance board and he/she has to direct the ball by shifting his/her body weight in the anterior-posterior or medial-lateral directions and try to hit the object on the screen. During the session the subject received visual feedback regarding the amount of their bodily sway while performing the task.

**OUTCOME MEASURES:**

1. [Berg Balance Scale](#) is used to evaluate the accurate ability of patient's capacity to balance securely while performing series of predetermined tasks and has intra-rater, inter-rater and test-retest reliability of 0.98.[8]
2. [Activity Specific Balance-Confidence Scale Test](#) is used to measure functional balance. Test-retest reliability of this test is 0.86.[9]

**STATISTICAL ANALYSIS:**

SPSS version 23 was used for the statistical analysis. Mean, standard deviation was used and distribution of demographic data was analysed by t-test. The comparison of the pre intervention and post intervention scores of outcome measures such as BBS and ABC scale was done by Wilcoxon sign-rank test.

**RESULTS:**

Table 1 Showed demographic data of the patients i.e. age, gender, body height, body weight and BMI

Table 2 showed significant improvement in BBS and ABC Scores in Libra Balance Board exercises.

Table 3 Libra Balance Board exercises showed significantly more improvement in BBS score when compared with the scores of ABC Scale

Table 1: Socio-demographic details of group A and group B:

Factor		Libra Balance Board Exercises
Gender	Female	5 (29.4%)
	Male	12 (70.6%)
Age (Years)		54.94 ± 5.889
Height (Cms)		169.53 ± 5.98
Weight (Kgs)		67.26 ± 8.48
BMI (Kg/m <sup>2</sup> )		23.3 ± 1.79

*BMI-Body Mass Index*

Table 2: Comparison of BBS and ABC scores:

		Pre	Post	P-value
Libra Balance Board Exercises	BBS	41.53 ± 2.74	46.53 ± 2.92	<0.0001**
	ABC (%)	52.27 ± 11.69	56.39 ± 11.66	<0.0001**

*\*\* indicates the significance; BBS-Berg balance scale, ABC- Activity specific balance confidence scale*

## DISCUSSION:

The present study reports that significant improvement is observed on dynamic balance in terms of BBS and ABC scores with Libra Balance Board exercises in subjects with sub-acute and chronic stroke.

Improvement observed in BBS score is significantly more in subjects treated with Libra balance board exercises. The possible reason for this significant improvement in dynamic balance may interpret the probable learning mechanism that entities with sub-acute and chronic stroke can regain abilities in the adjustment of dynamic balance and walking patterns in reaction to self-initiated perturbation using anticipatory (feed forward) postural adjustment. In multidirectional perturbations, the recruitment of synergistic muscle is directed towards the perturbation, and produces a specific biomechanical function to re-establish the centre of mass. The muscle recruitment provides a motor

repertoire for trunk muscles during balance training. [10] The training induced on the balance board made the subjects to rely strongly on their proprioceptive system. Literature suggest that changes in the brain structure induces motor learning by exergaming which helps in sensory re-education, retraining of voluntary motor control of balance and to improve the subject's independence and motivation to exercise with visual feedback. Another studies recommended that augmented training with appropriate feedback improves motor learning and videogame based exercises improved balance and gait in older adults.[11.12] Lee MJ et al conducted a study to evaluate the effect of virtual reality games in improving balance, gait, depression and interpersonal relationships in stroke subjects and found beneficial effects.[13]

The limitation of the study can be stated as the effect of Libra Balance Board exercises in sub-acute and chronic stroke subjects was studied for shorter duration.

#### **FUTURE SCOPE:**

Studies can be taken up to assess long term effect of Libra balance board exercises in sub-acute and chronic stroke subjects. The similar study can be conducted with Libra balance board exercises in same population where other group receives other forms of balance board exercises to evaluate the efficacy of the same. Follow up studies can be conducted.

#### **CONCLUSION:**

The present study concludes that Libra Balance Board exercises were beneficial in improving dynamic balance in subjects with sub-acute and chronic stroke.

#### **REFERENCES:**

1. Kuklina EV, Tong X, George MG, Bansil P. Epidemiology and prevention of stroke: a worldwide perspective. Expert review of neurotherapeutics. 2012 Feb 1;12(2):199-208.
2. Cash, E. J., Textbook of neurology for physiotherapist. 4<sup>th</sup> edition. Wolfe Publications; 1992.
3. O'Sullivan, S. B., Schmitz, T. J., Fulk, G. (2019). Physical rehabilitation. FA Davis. 2019 Jan 25.
4. Nicol MB, Thrift AG. Knowledge of risk factors and warning signs of stroke. Vascular health and risk management. 2005 Jun;1(2):137.
5. Lisabeth LD, Brown DL, Hughes R, Majersik JJ, Morgenstern LB. Acute stroke symptoms: comparing women and men. Stroke. 2009 Jun 1;40(6):2031-6.

6. Sarah F Tyson, Marie Hanley, Jay Chillala, Andrea Selley, Raymond C Tallis, Balance Disability After Stroke, *Physical Therapy*, Volume 86, Issue 1, 1 January 2006, Pages 30–38, <https://doi.org/10.1093/ptj/86.1.30>
7. Mhaske GC, Kumar S. Effect of wobble board exercise feedback on balance and gait training in geriatric population: An experimental study; KLE university Belagavi; 2015.
8. Blum L, Korner-Bitensky N. Usefulness of the Berg Balance Scale in stroke rehabilitation: a systematic review. *Physical therapy*. 2008 May 1;88(5):559-66.
9. Stasny BM, Newton RA, ViggianoLoCascio L, Bedio N, Lauke C, Conroy M, Thompson A, Vakhnenko L, Polidoro C. The ABC scale and fall risk: A systematic review. *Physical & Occupational Therapy in Geriatrics*. 2011 Aug 22;29(3):233-42.
10. Deshmuk NV, Chitra J. Effect of libra balance board exercises versus pilates on dynamic balance, gait, and quality of life in stroke subjects: A randomized clinical trial. *Indian Journal of Physical Therapy and Research*. 2020 Jan 1;2(1):14.
11. Ribas CG, da Silva LA, Corrêa MR, Teive HG, Valderramas S. Effectiveness of exergaming in improving functional balance, fatigue and quality of life in Parkinson's disease: A pilot randomized controlled trial. *Parkinsonism & related disorders*. 2017 May 1; 38 (1): 3-8.
12. Papegaaij S, Morang F, Steenbrink F. Virtual and augmented reality based balance and gait training. White Paper; (February). 2017 Feb.
13. Lee MJ, Gyeongsan S, Koo HM, Busan S, Lee SM. Effects of Virtual Reality Therapy on Balance Function and ADL in Hemiplegic Patients. *Jour of AdvResearch in Dynamical & Control Systems*. 2017;9(12).