International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 25-01-2024, Accepted: 17-02-2024, Published: 11-03-2024
Volume 9, Issue 1, 2024, Page No. 24-30

Immediate effectiveness of compelled weight bearing on balance and gait in hemiparetic patient – an experimental study

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Abstract
Introduction: Stroke is one of the leading causes of death and disability in India. The commoner type is an ischemic stroke, caused by interruption of blood flow to a certain area of the brain. Ischemic stroke accounts for 85% of all acute strokes and 15% of acute strokes are haemorrhagic strokes which are caused by bursting of a blood vessel i.e. acute haemorrhage. The estimated adjusted prevalence rate of stroke range in India, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies. Individuals with stroke-related hemiparesis frequently bear most of their body weight through their uninvolved lower extremity, showing distinct asymmetrical stance and weight bearing. Individuals with stroke-related hemiparesis frequently bear most of their body weight through their uninvolved lower extremity, showing distinct asymmetrical stance and weight bearing.
Aim & Objective: 1. To Analyse Immediate Effect of Compelled Weight Bearing on Balance of Hemi paretic Patient
2. To Analyse Immediate Effect of Compelled Weight Bearing on Gait Velocity of Hemi paretic Patient
Methods: We conducted experimental study among 30 Stroke patients from Pune. Null hypothesis was created followed by alternative hypothesis. We collected data as per inclusion criteria. We used Microsoft excel for data entry and Graph pad instat (version 3.0632) for statistical analysis.
Results: There was significant rise in score on berg balance scale and gait velocity after inserting insole in an unaffected side among patients.
Conclusion: The study has shown Compelled Weight Bearing has significant effect on Balance and Gait Velocity in hemi paretic patients.

Keywords: Stroke, berg balance scale, gait velocity, 10MWT, Compelled weight bearing, balance, Hemiparetic

Introduction

Stroke is one of the leading causes of death and disability in India. [2] According to the World Health Organisation, a Stroke is defined as an accident to the brain with "rapidly developing clinical signs of focal or global disturbance to cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than of vascular origin and includes cerebral infarction, intracerebral haemorrhage, and subarachnoid haemorrhage". Acute stroke is also commonly called a cerebrovascular accident which is not a term preferred by most stroke neurologists. Stroke is NOT an accident. The better and more meaningful term is "brain attack", similar in significance to "heart attack". [1]

There are two main types of strokes [1]

- The commoner type is an ischemic stroke, caused by interruption of blood flow to a certain area of the brain. Ischemic stroke accounts for 85% of all acute strokes. According to the TOAST classification, there are four main types of ischemic strokes. These are large vessel atherosclerosis, small vessel diseases (lacunar infarcts), cardio embolic strokes and cryptogenic strokes (see left hand picture on image).
- 15% of acute strokes are haemorrhagic strokes which are caused by bursting of a blood vessel i.e. acute haemorrhage. There are two main types of haemorrhagic strokes, intracerebral haemorrhage (ICH) and subarachnoid haemorrhage which accounts for about 5% of all strokes

Regardless the type of stroke, it is important to know that with each minute of large vessel ischemic stroke untreated, close to two million neurons die. This is the most important "time is brain" concept in understanding acute stroke and its treatment.

Ischaemic

Ischaemic strokes are the most common, accounting for up to 80% of strokes, and occur when there is an occlusion of a blood vessel impairing the flow of blood to the brain.
Ischaemic Strokes are divided into:

1. **Thrombotic:** Where a blood clot forms in a main brain artery or within the small blood vessels deep inside the brain. The clot usually forms around atherosclerotic plaques.
2. **Embolic:** A blood clot, air bubble or fat globule forms within a blood vessel elsewhere in the body and is carried to the brain.
3. **Systemic Hypoperfusion:** A general decrease in blood supplycaused by chronic, uncontrolled hypertension resulting in the pathological entity of lipohyalinosis and arteriolosclerosis. These strokes occur in the basal ganglia, internal capsule, thalamus, and pons [1].
4. Venous Thrombosis

Haemorrhagic

Haemorrhagic Strokes occur when a blood vessel in the brain ruptures and bleeds.

1. **Intracerebral Haemorrhagic Stroke:** There is bleeding from a blood vessel within the brain. High blood pressure is the main cause of intracerebral haemorrhagic stroke.

2. **Subarachnoid Haemorrhagic Stroke:** there is bleeding from a blood vessel between the surface of the brain and the arachnoid tissues that cover the brain.

Epidemiology

According to the World Health Organization (WHO), 15 million people suffer stroke worldwide each year. Of these, 5 million die and another 5 million are left permanently disabled. [2] The 2010 Global Burden of Disease Study suggested Stroke is the second leading cause of death globally and the third leading cause of premature death and disability as measured in Disability Adjusted Life Years (DALY). Cerebrovascular disease is the largest neurologic contributor and accounts for 4.1% of total global DALY.

In the United States, there are 800,000 new strokes every year. There is one new stroke every 40 seconds. Stroke is the 5th leading cause of death and the first leading cause of disability. [1]

Stroke kills more than 49,000 people each year in the UK, nearly 1 in 10. In 2010 stroke was the fourth-largest cause of death in the UK after cancer, heart disease, and respiratory disease. [3]

The estimated adjusted prevalence rate of stroke range in India, 84-262/100,000 in rural and 334-424/100,000 in urban areas. [4] The incidence rate is 119-145/100,000 based on the recent population based studies [4].

Aetiology

Many aetiologies can lead to a stroke. Some of the most common risk factors include [1]

- Hypertension, diabetes mellitus, hypercholesterolemia, physical inactivity, obesity, genetics, and smoking.
- Cerebral emboli commonly originate from the heart, especially in patients with pre-existing heart arrhythmias (atrial fibrillation), valvular disease, structural defects (atrial and ventricular septal defects) and chronic rheumatic heart disease.
- Emboli may lodge in areas of pre-existing stenosis.
- Alcohol intake has a J-shaped relationship with ischemic stroke. Mild to moderate drinking carries a slightly lower risk of ischemic stroke yet heavier drinking increases the risk drastically. Alcohol intake increases the risk of haemorrhagic stroke in a near-linear relationship

Individuals with stroke-related hemiparesis frequently bear most of their body weight through their uninvolved lower extremity, showing distinct asymmetrical stance and weight bearing. The causes of asymmetries include motor weakness, asymmetric muscular tone, and somatosensory deficits [8] Asymmetries of stance contribute to balance impairments in Gait and increase risk of fall Balance and Gait affected in hemi paretic Patient.

Compelled Body Weight Shift Therapy involves prolonged lift of the unaffected lower extremity through the use of shoe insert which forces loading of body weight towards the affected lower extremity and helping in overcoming learned disuse of affected lower limb.

Need of study

Symmetry of stance and weight bearing has been Important for Balance and Gait.Few Studies have shown that one of the important contributors to efficient ambulation is the symmetry of stance and weight-bearing. The Main Goal of this Study is Achieving symmetry of stance and weight bearing to Improve Balance and Gait Velocity. About 55.5% of chronic stroke survivors represent with asymmetric gait pattern due to altered weight distribution [6]. Continued asymmetrical weight-bearing may encourage further disuse of the paretic extremity.

The Various treatment approaches and assistive devices are available to improve Balance and Gait in stroke patients. That techniques have not shown significant improvement in weight-bearing symmetry. Balance and Gait among stroke patients [9] There is no studies on immediate effect of compelled weight bearing on Balance and Gait Velocity.

Compelled Weight bearing: Forced Shift of body weight towards the affected lower extremity. Compelled body weight bearing therapy could result in a long-lasting improvement of the weight bearing symmetry in patients with stroke [11]. It help to Improve Gait velocity and help to improve Balance.

AIM

To Find Out Immediate Effectiveness of Compelled Weight Bearing on Balance and Gait in Hemiparetic Patient – An Experimental Study

Objectives

1. To Analyse Immediate Effect of Compelled Weight Bearing on Balance of Hemi paretic Patient
2. To Analyse Immediate Effect of Compelled Weight Bearing on Gait Velocity of Hemi paretic Patient

Hypothesis

- **Null Hypothesis (H0)**

1. There is No Difference in the Immediate Effectiveness of Compelled Weight Bearing on Balance in Hemi paretic Patient.
2. There is No Difference in the Immediate Effectiveness of Compelled Weight Bearing on Gait Velocity in Hemi paretic Patient

- **Alternative Hypothesis (H1)**

1. There is Difference in the Immediate Effectiveness of Compelled Weight Bearing on Balance in Hemi paretic Patient.
2. There is Difference in the Immediate Effectiveness of Compelled Weight Bearing on Gait Velocity in Hemi paretic Patient

Review of literature

Mohapatra S, Eviota AC, Ringquist KL, Muthukrishnan SR, Aruin AS. (2012) In their study on Compelled body weight shift technique to facilitate rehabilitation of individuals with acute stroke. International Scholarly Research Notices. This study evaluated Eleven patients with acute stroke were randomly assigned to experimental and control groups. The experimental group received a two-week conventional physical therapy combined with CBWS and the control group received only a two-week conventional therapy.

Weight bearing, Gait velocity, Berg's Balance, and Fugl-Meyer's Scores were recorded before and after the intervention. It was found that Weight bearing on the affected side and gait velocity increased in the experimental group and decreased in the control group. The study outcome revealed that The implementation of a two-week intervention with CBWS resulted in the improvement in weight bearing and gait velocity of individuals with acute stroke.

Rodriguez GM, Aruin AS. The effect of shoe wedges and lifts on symmetry of stance and weight bearing in hemiparetic individuals. Archives of physical medicine and rehabilitation. 2002 Apr 1;83(4):478-82

In their study on determine the effect of shoe wedges and lifts on symmetry of stance and weight bearing in hemiparetic individuals. Nine individuals with hemiparesis as a result of unilateral stroke who were able to stand for 3 to 5 minutes without assistance or rest, and satisfied other inclusion criteria. It was found that Without a shoe wedge or a shoe lift, weight-bearing symmetry was characterized by underloading of the paretic limb (39.90% ±.80% of body weight). Weight shift induced by shoe wedges or shoe lifts applied to the unaffected limb promoted improved symmetry of weight bearing and stance. A shoe wedge of 5° provided the most symmetrical weight distribution (51.44% ± 1.88% of body weight). The study outcome revealed that Shoe wedges and shoe lifts under the unaffected limb induced compelled weight shift toward the paretic limb, resulting in improved symmetry of stance of individuals with mild hemiparesis

Aruin AS, Rao N, Sharma A, Chaudhuri G. Compelled body weight shift approach in rehabilitation of individuals with chronic stroke. Top Stroke Rehabil. 2012 Nov-Dec;19(6):556-63. doi: 10.1310/tsr1906-556. PMID: 23192720; PMCID: PMC3676671.

In their study on effectiveness of the Compelled Body Weight Shift (CBWS) therapy approach in the rehabilitation of individuals with chronic stroke. This study evaluated Eighteen individuals with chronic, unilateral stroke who showed asymmetrical stance were randomly divided into two groups: the experimental group received a six-week physical therapy combined with CBWS therapy and the control group received only physical therapy. It was found that Gait velocity and weight bearing on the affected side increased in the experimental group to a larger degree compared to the control group (9.7% vs. 6.4%). The study outcome revealed that a six-week intervention involving CBWS therapy could result in a long-lasting improvement of the symmetry of weight bearing and velocity of gait in individuals with chronic stroke.

Lobo AA, Joshua AM, Nayak A, Mithra P. P, Misri Z, Pai S. Effect of Compelled Body Weight Shift (CBWS) Therapy in Comparison to Proprioceptive Training on Functional Balance, Gait, andMuscle Strength Among Acute Stroke Subjects. Annals of Neurosciences. 2021;28(3-4):162-169. doi:10.1177/09727531211063132

In their study on compare the effects of CBWS therapy and PT in improving balance, kinematic gait parameters, and muscle strength among acute stroke patients. This study evaluated thirty subjects were nonrandomly divided into two groups where both groups received routine physiotherapy for two weeks in addition to which the CBWS group incorporated a 15 mm platform placed under the unaffected extremity while the PT group included incorporated proprioceptive exercises on the ground and foam mat. Functional balance, functional mobility, videographic analysis of degrees of hip flexion, knee hyperextension, and ankle dorsiflexion along with gait speed and satio-temporal gait parameters were obtained. It was found that pre-post analysis within both groups revealed statistically significant improvement in all parameters except for the kinematic parameters of gait. This Study Revealed that CBWS can be used as an alternative to PT in the rehabilitation of stroke patients concerning balance and gait. CBWS provided during active treatment sessions results as effective as those seen as a result of all-day therapy.

Chitra, Jeba, and Siddharth Mishra. "Effect of compelled body weight shift therapy on weight bearing symmetry and balance in post stroke patients: an experimental pre-post study." *Int J Physiother Res* 2.6 (2014): 781-786.

In their study on effect of Compelled Body Weight Shift Therapy on weight bearing symmetry and balance in post stroke patients. This study evaluated Total 22 participants were included in the study. All patients received 10mm shoe insole which is to be used on their unaffected side and along with this conventional rehabilitation program were given for 1 hour per day for 2 weeks. It was found that There was significant difference in pre-post weight bearing distribution ($p<0.001$) and balance ($p<0.001$). There was also significant difference in all the component of Berg Balance Scale ($p<0.001$).

This Study concluded that Compelled Body Weight Shift Therapy can be easily administrated in the daily rehabilitation protocol, while treating stroke patients.

Chen CH, Lin KH, Lu TW, Chai HM, Chen HL, Tang PF, Hu MH. Immediate effect of lateral-wedged insole on stance and ambulation after stroke. Am J Phys Med Rehabil. 2010 Jan;89(1):48-55. doi: 10.1097/PHM.0b013e3181c1ea8a. PMID: 19884813.

In their study on to perform kinematic and kinetic analyses on the static standing and ambulation in subjects after stroke with and without wearing a 5-degree lateral-wedged insole. This study evaluated Ten hemiparetic individuals with unilateral stroke were recruited. Participants performed quiet stance and ambulation with no insole wedge, paretic side wedged, and nonparetic side wedged in a random order. The vertical ground reaction force and temporal-spatial parameters of gait were measured. Symmetry index was also calculated. It was found that during quiet stance, the symmetry index of weight bearing improved significantly with nonparetic side-wedged ($P < 0.017$), but not with paretic side-wedged insoles. During ambulation, the symmetry indices of kinematic and kinetic measurements in the frontal plane were not significantly different among the three conditions. This Study concluded that Application of nonparetic side wedge insole can improve stance symmetry and tends to reduce the paretic knee abductor load during ambulation.

Son SM. Effects of compelled weight shift on balance ability in patients with stroke. *PhysTher Korea*2017; 29(5): 255–258.

This study aimed to investigate the effects of compelled weight shift in paretic lower limb training on balance ability in patients with stroke.This study evaluated Thirty-six individuals with hemiparesis, who were randomly assigned to a 10CWST (10 mm constrained -weight shift training) group, a 5CWST (5 mm constrained-weight shift training) group, and a control group participated in this study.It was found that The post hoc analyses indicated that, following intervention, the 10CWST group showed more significant changes in the M-L and A-P sway velocities, and the M-L sway distance than the control group.This Study Revealed that These results suggest that the use of compelled weight shift in paretic lower limb training may be an effective method to improve balance ability in patients with stroke.

Sheikh M, Azarpazhooh MR, Hosseini HA. Randomized comparison trial of gait training with and without compelled weight-shift therapy in individuals with chronic stroke. ClinRehabil. 2016 Nov;30(11):1088-1096. doi: 10.1177/0269215515611467. Epub 2016 Jul 11. PMID: 26545392.

In their study on To compare the effects of gait training combined with compelled weight-shift therapy and gait training alone on velocity and gait symmetry in patients with chronic stroke. This study evaluated Six weeks of gait training combined with compelled weight-shift therapy via a shoe lift applied under the non-paretic leg (experimental group, n=14) or gait training alone (control group, n=14). It was found that When comparing the two groups, weight bearing on the affected side increased more significantly in experimental group than in control group (40.14±3.77, 38.28±4.06) after the end of treatment and also after a three-month follow-up (44.42±3.5, 38.5±3.77) ($P<0.05$). Among the experimental and control groups, there were no significant differences of gait velocity (cm/s) and gait spatiotemporal symmetry after six weeks of treatment and also after a three-month follow-up. This study did not confirm that the effect of gait training combined with compelled body weight shift therapy was better thangait training alone on improving velocity and gait symmetry in patients with chronic stroke.

Methodology

- **Study Design:** Pre-Post Experimental study
- **Sample Size:** 30 (both male and female)

Confidence interval: 95%
Z score: 1.96
P=0.5; q+1p=0.5
E=5%
Sample Size:
n0=(Z^2 pq)/e^2
=1.96 2 (0.5) (0.5)2
=385
n=(n0)1+(n0 −1)N
=385/1+ (384) / 28 =27

- Sampling method – Convenient sampling.
- Study population – Hemiparetic Stroke Patient
- Study Location – In and Around the City
- study duration –6 months.

Materials

- Insole of 10mm
- Berg BalanceAssessment form
- Tape
- Cone
- Pen
- Paper

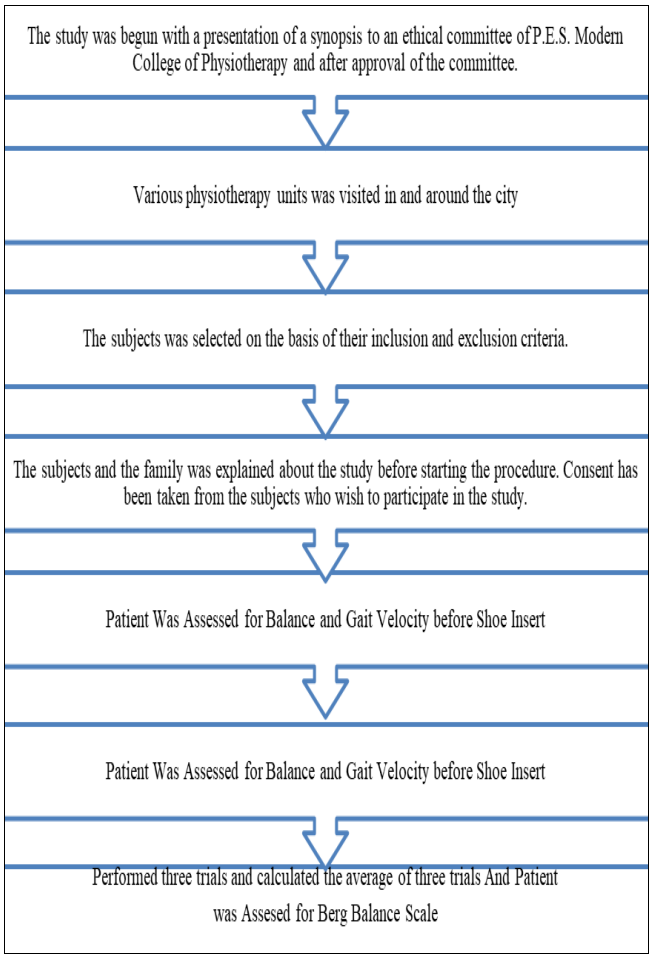
Study criteria

Inclusion Criteria

- Age 30-65 year
- History of first ever stroke more than six months ago
- Able to walk at least 10 meters without assistive devices and Orthosis
- Stance asymmetry toward the non-paretic side More Than 30% of Body Weight
- Berg Balance Scale Score More Than 41
- Muscle Tone is 1 or +1 (According to Modified Ashworth Scale)

Exclusion Criteria

- Unstable medical conditions; cognitive impairments
- Apraxia
- History of other neurological diseases (i.e. Parkinson's disease, and multiple sclerosis)
- Contractures
- Leg Length Discrepancy
- Sacroiliac Joint Dysfunction
- Lower limb Fracture
- Deformity



Procedure

Flow diagram showing the process used in the study

Outcome Measures

1. Berg Balance Scale

The Berg Balance Scale19 includes grading of patient's different balance abilities, monitors functional balance over time and evaluates patient's responses to treatment. It is a test of 14 items; the first 5 are basic balance items while the last 9 are considered as advanced

balance tasks and has a scale of 0-4 for each item (higher score for independent performance)

with a maximum score of 56where potential risk of all is estimated on the basis of total scores; (0 –20) high, (21-40) medium and (41-56) low fall risk.

Reliability

Studies of various elderly populations (N = 31–101, 60–90 + years of age) have shown high intrarater and interrater reliability (ICC =.98,14,15 ratio of variability among subjects to total = .96–1.0,16 rs =.8817). Test-retest reliability in 22 people with hemiparesis is also high (ICC [2, 1] =.98).

Validity

Content validity of the BBS was established in a 3-phase development process involving 32 health care professionals who were experts working in geriatric settings. Criterion-related validity has been supported by moderate to high correlations between BBS scores and other functional measurements in a variety of older adults with disability.

2. Gait Velocity

The 10 Metre Walk Test is a performance measure used to assess walking speed in meters per second over a short distance. It can be employed to determine functional mobility, gait, and vestibular function

Calculating Gait Speed - total distance/time

Stroke: (n = 25; mean age = 72 years; stroke onset = 2 to 6 years, Chronic Stroke)

Test-retest assessed three times within a single session:

- Excellent test-retest reliability (ICC = 0.95 to 0.99)
- Excellent reliability for comfortable (ICC = 0.94) and fast (ICC = 0.97) gait speeds

Stroke: (Tyson & Connell, 2009; n = 40, review article of 17 measures, Stroke)

Predictive Validity

- Excellent correlation with dependence in instrumental activities of daily living (r = 0.76)
- Excellent correlation with Barthel Index (r = 0.78)

Data Analysis

The data collected was statistically analyse using SPSS Version 23.0 and GraphPad InStat 3

Immediate Effectiveness of Compelled Weight Bearing on Balance and Gait was analysed using appropriate parametric test.

Paired-t test was used to obtain the difference between Pre and Post values.

The various statistical measures such as Mean, Standard Deviation (SD) and the test of significance where utilized to analyse the data.

The results were concluded to be statistically Extremely significant as p-value is <0.05.

The data was represented in both tabular and graphical format

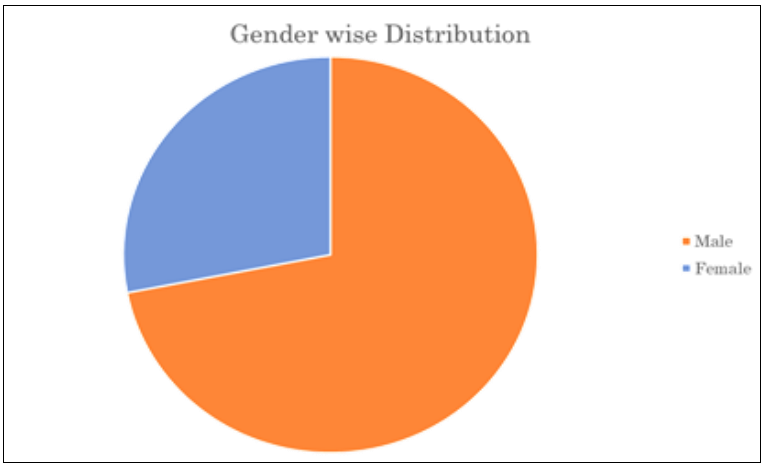


Fig 1: Show Gender wise Distribution

Results

Effect on balance:

Figure 2. Shows changes in total Berg Balance Scale, the mean pre-test value was 37.83 ± 2.62 and post-test value was 41.53 ± 3.23. The Difference in Scores between pre and post value was 3.7 ± 2.02. There was a significance difference in pre post values of Berg Balance scores (p< 0.001).

Effect on Gait Velocity

Figure 3. Shows changes in Gait Velocity, the mean pre-test value was 0.3060 ± 0.04 and post-test value was 0.3393 ± 0.05. The Difference in Scores between pre and post value was 0.3393 ± 0.05. There was a significance difference in pre and post values of 10 MWT scores (p< 0.001).

Table 1: Pre and Post Scores on Berg Balance Scale Comparing pre and post scores on outcome measure Berg Balance Scale

Parameters	Pre-test		Post test		T value	P value	Result
Berg balance scale	Mean	Sd	Mean	Sd	10.034	<0.05	Highly significant
	37.83	±2.62	3.7	±2.02			

Graph 1: Pre and Post scores on Berg Balance Scale

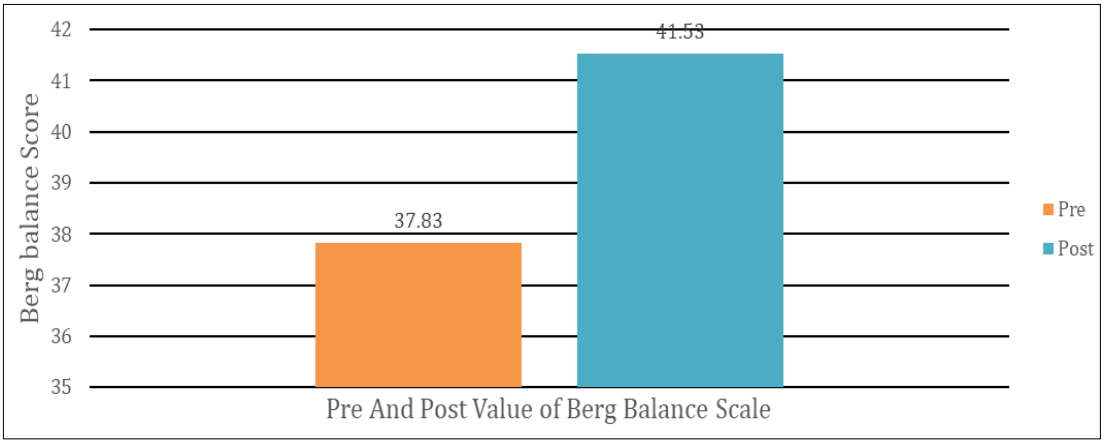


Fig 2: Comparison of Pre And Post Berg Balance Scale

Table 2: Pre and Post Effect on Gait Velocity Comparing pre and post scores on outcome measure gait velocity

Parameters	Pre-test		Post test		T value	P value	Result
GAIT	MEAN	SD	MEAN	SD	10.0349.432	<0.05	Highly Significant
	0.3060	±0.04	0.03333	±0.04			

Graph 2: Pre and Post Effect on Gait Velocity

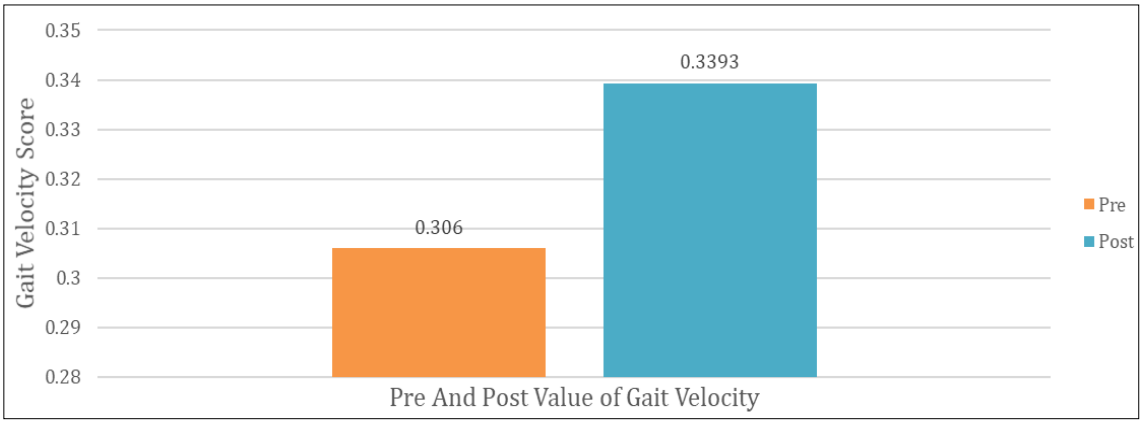


Fig 3: Comparison of Pre And Post Gait Velocity

Discussion

The aim of this study was To Find Out Immediate Effectiveness of Compelled Weight Bearing on Balance and Gait in Hemiparetic Patient. About 55.5% of chronic stroke survivors represent with asymmetric gait pattern due to altered weight distribution. Various treatment approaches and assistive devices are available to improve Balance and Gait in stroke patients. But immediate effect of compelled weight bearing on Balance and Gait Velocity has not been emphasized much. Hence this study was undertaken.

The findings of this revealed that use of insole on unaffected leg which led to compelled weight bearing on affected side showed significant improvement in balance and gait velocity in hemiparetic patients.

Balance depends on three main factors namely visual system that provides sensory information, the proprioceptive receptors located in joints and kinesthetic sensations. Use of shoe lift on unaffected side, facilitates weight bearing on affected side thereby stimulating the proprio-receptors located in joints. This furthers improves the balance of hemiparetic patient.

Another reason for improved balance could be that the insole lift created symmetric weight bearing on both lower limbs thereby enhancing more stable COG with adequate BOS leading to improvement in balance.

The improvement in balance while using a shoe lift shall most likely help the individuals to avoid the development of disuse atrophy of affected limb.

The limited walking ability that follows a stroke significantly limits the patients' capability to participate in many community activities. Moreover, gait velocity has been reported to be a predictor of the severity of impairment and the restoration of the ability to walk is considered to be the major goal of stroke rehabilitation.

Most common methods used to restore gait in individuals suffering from a stroke include functional electrical stimulation (FES), body weight-supported treadmill training (BWSTT), and robotic-assisted gait retraining. While the importance of the above-mentioned approaches is acknowledged, other methods are used which do not require expensive equipment and which can be implemented in any clinical facility.

The outcome of the current study demonstrated that gait velocity is improved when individuals with stroke use a shoe lift on the nonaffected side during treatment. It is important to note that the improvement of gait velocity was achieved in parallel with the improvement in balance.

The improvement in gait velocity in the study could be associated with the fact that weight-bearing symmetry was achieved by providing a shoe lift during the entire time of treatment that involved ambulation.

The musculature responsible for abnormal gait pattern in hemiparetic patients could be Hip flexor spasticity Compensation for excessive knee flexion and ankle DF, Hip Abductor Weakness, Hip Adductor Contracture, Weak Hip Extensors. Calf Tightening or Contractures and Ankle Dorsiflexion Weakness. Use of shoe lifts causes significant increase in hip and knee excursion could be a contributing factor in improving gait pattern and velocity [6, 7].

The normal gait pattern demonstrates anterior-posterior displacement of pelvis, which alternates from left to right and facilitates anterior movement of the leg. Due to the malalignment of pelvis in hemiparetic patients, this normal mechanism is disturbed. Use of insoles on unaffected extremity increases the torque and moment arm on affected side. This could also be the possible mechanism for increasing gait velocity [7, 8].

Hence use of shoe lift can be a cost effective, feasible, and patient friendly tool in gait retraining and rehabilitation programme for hemiparetic patients.

Conclusion

The study has shown Compelled Weight Bearing has significant effect on Balance and Gait Velocity in hemiparetic patients.

Limitations

- The number of male patients included in the study were more as compared to female patients.
- The shoe lift was generalised for all patients.

Future scope

- Comparison study can be done between male and females.
- Study can be done on larger population.

Reference

1. Tadi P, Lui F. Acute Stroke (Cerebrovascular Accident). [Internet]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK535369/ (last accessed 28.12.2019).
2. MacKay J, Mensah GA. Global Burden of Stroke. The Atlas of Heart Disease and Stroke. World Health Organization.
3. Townsend N, Wickramasinghe K, Bhatnagar P, Smolina K, Nichols M, Leal J, Luengo-Fernandez R, Rayner M. Coronary heart disease statistics 2012 edition. British Heart Foundation: London, 2012.
4. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. Journal of stroke,2013:15(3):128.
5. Mohapatra S, Eviota AC, Ringquist KL, Muthukrishnan SR, Aruin AS. Compelled body weight shift technique to facilitate rehabilitation of individuals with acute stroke. International Scholarly Research Notices, 2012.
6. Patterson KK, Parafianowicz I, Danells CJ, Closson V, Verrier MC, Staines WR, Black SE, McIlroy WE. Gait asymmetry in community-ambulating stroke survivors. Archives of physical medicine and rehabilitation,2008:89(2):304-10.
7. Rodriguez GM, Aruin AS. The effect of shoe wedges and lifts on symmetry of stance and weight bearing in hemiparetic individuals. Archives of physical medicine and rehabilitation,2002 Apr 1:83(4):478-82.
8. Mohapatra S, Eviota AC, Ringquist KL, Muthukrishnan SR, Aruin AS. Compelled body weight shift technique to facilitate rehabilitation of individuals with acute stroke. International Scholarly Research Notices, 2012.
9. Lobo AA, Joshua AM, Nayak A, Mithra P P, Misri Z, Pai S. Effect of Compelled Body Weight Shift (CBWS) Therapy in Comparison to Proprioceptive Training on Functional Balance, Gait, and Muscle Strength Among Acute Stroke Subjects. Annals of Neurosciences,2021:28(3-4):162-9.
10. Aruin AS, Hanke T, Chaudhuri G, Harvey R, Rao N. Compelled weightbearing in persons with hemiparesis following stroke: the effect of a lift insert and goal-directed balance exercise. Journal of rehabilitation research and development,2000:37(1):65-72.
11. Sheikh M, Azarpazhooh MR, Hosseini HA. Randomized comparison trial of gait training with and without compelled weight-shift therapy in individuals with chronic stroke. Clinical rehabilitation,2016:30(11):1088-96.
12. Aruin AS, Hanke T, Chaudhuri G, Harvey R, Rao N. Compelled weightbearing in persons with hemiparesis following stroke: the effect of a lift insert and goal-directed balance exercise. Journal of rehabilitation research and development,2000:37(1):65-72.
13. Chitra J, Mishra S. Effect of compelled body weight shift therapy on weight bearing symmetry and balance in post-stroke patients: an experimental pre-post study. Int J Physiotherapy Res,2014:2(6):781-6.
14. Berg Balance Scale [Internet]. Available from: https://www.physio-pedia.com/Berg_Balance_Scale.
15. 10 Metre Walk Test [Internet]. Available from: https://www.physio-pedia.com/10_Metre_Walk_Test#cite_note-Collen_*et_al*.