

EFFECTIVENESS OF BOBATH CONCEPT ON LOWER EXTREMITY DYNAMIC BALANCE AND GAIT VELOCITY AMONG SUBJECTS WITH ACUTE STROKE.

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ABSTRACT:

Stroke is a leading cause of adult disability worldwide, with a significant proportion of survivors experiencing motor deficits that impact functional mobility and independence. Among the most common post-stroke impairments are deficits in dynamic balance and reduced gait velocity, both of which severely affect a patient's ability to perform daily activities and increase the risk of falls.Rehabilitation during the acute phase of stroke is critical, as this period represents a window of heightened neuroplasticity, where timely interventions can significantly influence recovery outcomes(1). The Bobath Concept, is a widely utilized approach in neurological rehabilitation. It focuses on facilitating normal movement patterns, improving postural alignment, and reducing abnormal muscle tone through guided handling techniques and task-specific training.Therefore, this is to evaluate the effectiveness of Bobath concept on lower extremity dynamic balance and gait velocity among subjects with acute stroke(1).

AIM:

The Aim of the study is ” to determine the effectiveness of Bobath concept on Lower extremity Dynamic balance and Gait velocity among subjects with Acute stroke.

OBJECTIVES OF THE STUDY:

- To evaluate the effect of Bobath concept on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test in acute stroke in Experimental group.

 https://doi.org/10.5281/zenodo.17579125

- To evaluate the effect of Bobath concept on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test in acute stroke in Control group.

- To compare the effect of Bobath concept and Conventional physiotherapy on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test among subjects with acute stroke in Experimental group and Control group.

METHODS:

In this study 30 subjects diagnosed with acute stroke were enrolled, who exhibited impairments in lower extremity dynamic balance and gait velocity. Participants were randomly assigned to either the experimental group (receiving Bobath concept-based physiotherapy along with conventional physiotherapy) or the control group (receiving conventional physiotherapy alone). The study followed a pre-post experimental design over a 6-week intervention period. The experimental group underwent supervised Bobath-based therapy sessions focusing on postural control, facilitation of normal movement patterns, and gait re-education.

ANALYSIS: Pre- and post-values were analysed using Paired t-tests within the groups and individual unpaired t-test were used to analysed the data between the groups.

RESULTS:

The study included 30 acute stroke patients, equally divided into control and experimental groups (n=15 each). Baseline characteristics such as age, gender, and side of lesion were comparable between the groups ($p > 0.05$). Following intervention, both groups showed significant improvements in balance and gait. In the control group, the Berg Balance Scale (BBS) score increased from 29.73 ± 4.07 to 38.8 ± 4.2 ($p = 0.00$), while the experimental group improved from 31.87 ± 4.4 to 46.47 ± 2.7 ($p = 0.00$). Between-group comparison showed a significant post-treatment difference favoring the experimental group ($p = 0.00$). Similarly, gait speed improved from 1.43 ± 0.1 m/s to 1.65 ± 0.24 m/s in the control group, and from

 https://doi.org/10.5281/zenodo.17579125

1.47 ± 0.2 m/s to 1.9 ± 0.31 m/s in the experimental group (both p = 0.00). Post-intervention gait speed was significantly higher in the experimental group (p = 0.017), indicating superior improvement with the combined Bobath and conventional therapy.

CONCLUSION:

The present study concluded that the Bobath concept-based rehabilitation was effective in improving lower extremity dynamic balance and gait velocity among patients with acute stroke. Participants who received Bobath concept showed significant improvements when compared to those who received conventional physiotherapy alone. These results supported the use of the Bobath concept as a beneficial intervention during the early stages of stroke rehabilitation to enhance functional mobility and promote greater independence in daily activities.

KEYWORDS:

Bobath concept, Dynamic balance, Gait velocity, Acute stroke, Concentional physiotherapy.

INTRODUCTION:

Stroke is defined as a clinical illness characterized by a sudden onset of cerebral impairment that lasts more than 24 hours or results in death. It is the 2nd major cause of death and the 3rd major cause of disability worldwide(1).Various risk factors, including tobacco use, atrial fibrillation, physical inactivity, old age, genetic makeup and psychological factors, contribute to the occurrence of this common disease(2).

The Global and India stroke burden is rapidly increasing, with global stroke deaths expected to rise from 6.6 million in 2020 to 9.7 million by 2050, especially in low and middle income countries like India. In India the cumulative incidence of stroke ranged 200/1,00,000 populations per year (2). Stroke is more common in Males with 64.4% than the females with 35.6%, the most common age group is 58-67 years (28.29%), the most common clinical feature was hypertension (89.5%) followed by diabetes mellitus (51.70%), most common type of stroke was followed by ischemic stroke(39.75%)(2). Stroke is more prevalent in an urban population ranging from 334-424 out of 100000 due to risks of lifestyle factors like smoking,unhealthy diet as compared to rural population which ranges from 84-262 out of 100000(1).

Most symptoms in patients after stroke result in the formation of hemiparesis or hemiplegia of the upper and lower limb, including trunk control(3). Impairments in stroke depends on the territory involved in brain. Tonal abnormalities, swallowing issues, urinary issues, contractures in extremities, transition issues, balance and gait abnormalities are the common impairments seen in stroke patients(4).Mobility is changing body position, walking, moving and it is a key factor in daily activities and overall health(5,6,).

Balance and gait impairments are among the most common consequences of stroke, affecting nearly 60–80% of survivors during the acute and subacute phases. These deficits result from motor weakness, poor postural control, and asymmetrical weight distribution, leading to difficulties in standing, walking, and performing daily activities. Impaired balance increases the risk of falls, while reduced

 https://doi.org/10.5281/zenodo.17579125

gait velocity limits functional mobility and independence. Together, these impairments significantly hinder recovery, prolong rehabilitation, and negatively affect the quality of life in stroke patients (Langhorne et al., 2020)(7).

Physiotherapy plays a crucial role in the rehabilitation of individuals with acute stroke, especially in addressing impairments related to balance and gait. The primary goal of physiotherapy in this population is to enhance motor function, restore independence, and reduce the impact of neurological deficits, thereby improving the overall quality of life. Physiotherapists employ a variety of evidence-based interventions to promote strength, coordination, and voluntary control of movement. Although treatment approaches may vary depending on the individual's needs, the central focus remains on restoring motor abilities essential for functional mobility and daily activities(8). In the context of stroke rehabilitation, especially for improving trunk control, dynamic balance, and gait, commonly used interventions include core strengthening exercises, task-specific training, constraint-induced movement therapy (CIMT), partial body-weight-supported treadmill training, motor relearning techniques, balance training, neurodevelopmental treatment (Bobath concept), and Swiss ball exercises(9).

Bobath concept is a widely accepted approach in many countries for the rehabilitation of stroke survivors.Neurodevelopmental therapy is originated with work by Berta Bobath and Karel Bobath in England in 1940s for the treatment of individuals with Nuerological disorders of posture and movement.It aims to get a normal activity out of the affected side for functional use, to inhibit the patients abnormal patterns of movement, because normal patterns cannot be superimposed upon abnormal ones. Facilitation of normal movement and task-specific practice using manual guidance are critical elements of Bobath concepts. Individually developed exercise programs in the Bobath concept have been demonstrated to improve trunk performance, balance, and walking ability in stroke patients(10).

The Bobath concept utilizes facilitation and assistance techniques aimed at supporting muscle activity while also applying inhibitory strategies to regulate and control movement and posture. Its primary objective is to promote the development of postural reactions by minimizing the effects of gravity and ensuring proper body alignment. This approach also focuses on enhancing functional performance by offering external support to improve proximal stability, which in turn aids in better distal limb function. The therapy is implemented through various positions such as

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supine, sitting, side-lying, sit-to-stand, and stand-to-sit transitions. It adopts a holistic approach, addressing not only the motor aspects but also the patient's sensory, perceptual, and adaptive responses(11).

AIM OF THE STUDY:

The Aim of the study is to determine the effectiveness of Bobath concept on Lower extremity Dynamic balance and Gait velocity among subjects with Acute stroke.

OBJECTIVES OF THE STUDY:

- To evaluate the effect of Bobath concept on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test in acute stroke in Experimental group.
- To evaluate the effect of Bobath concept on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test in acute stroke in Control group.
- To compare the effect of Bobath concept and Conventional physiotherapy on lower extremity dynamic balance by Berg balance scale and gait velocity by Timed 10 meter walk test among subjects with acute stroke in Experimental group and Control group.

MATERIALS AND METHODS:

Study setup:

Neurology ward- SVIMS hospital,Tirupati

Study design:

A Randomized control trail

Sample size:

30 subjects

Sampling type:

Purposive sampling

Randomization technique:

By lottery method

Duration of study:

6 months

Treatment duration:

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5sessions/week,40minutes per day for total duration of 6weeks.

Ethical approval No: 1776

Ethical approval received from the Institutional Ethics Committee, SVIMS, Tirupati. (Roc.No.AS/11/IEC/SVIMS/2017).

CTRI No

Trail Registration No : CTRI/2025/06/088807

- **Informed consent:**

The study protocol was explained to the subjects and written informed consent was collected, after getting willing from the subjects/ relatives (subjects who are not able to give consent) were included in the study.

MATERIALS:

❖ **Materials for Assessment:**

- Stop watch.
- Measuring tape.
- Cones.

❖ **Materials for intervention:**

- Couch.
- Drape sheet.
- Pillows.
- Stepper

INCLUSION CRITERIA:

- Age group above 45-60years.
- Both genders Males and Females
- Subjects with Cardiovascular stability
- Subjects with Acute ischemic stroke.
- Ability to walk (Dynamic gait index –Grade-1 moderate impairment (-change in gait speed)
- Voluntary control grading of affected Lower limb -grade 3 and >3
- Berg balance score should be (>24).

EXCLUSION CRITERIA:

- Haemorrhagic stroke and transient ischemic stroke.

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- Contraindications to rehabilitation,lack of ability to walk.
- Subjects with communication problems.
- Subjects with neurological disorders that might affect their motor performances.
- Subjects with visual and auditory deficits.
- Having any active infections and open wounds.

METHODS:

- **STUDY PROCEDURE:**

30 acute stroke subjects who met inclusive criteria with and voluntary control grading (Grade 3 & Grade >3) were included in the study. Subjects were assigned randomly to Experimental group-15 and Control group-15 after getting written consent from the subjects. Experimental group received Bobath concept, along with conventional physiotherapy and while Control group received conventional therapy. The study was conducted for a total of 5sessions for week, 40minutes per day for total duration of 6weeks. Pre-test and post- test evaluation of Balance was evaluated by using Berg balance scale and Gait velocity was evaluated by using 10MWT.

OUT COME MEASURES

1. Berg balance scale was used to assess the Balance in subjects with acute stroke

2. Meter Walk Test was used to assess the Gait velocity in subjects with acute stroke.

INTERVENTION:

EXPERIMENTAL GROUP	**CONTROL GROUP**
Bobath concept : (a) **Facilitatory techniques -** 1)Foot preparation, 2)Lateral pelvic shifting, 3)Linear extension, 4)Sit to stand 5)stand to sit(12). **(b) Conventional physiotherapy:**	**Conventional physiotherapy:** 1)Weight bearing exercises 2)Transfer exercises 1)Weight bearing exercises: 1. Facilitating stride weight shift forward and step with involved leg from the front. 2. Facilitating stride weight shift forward and step with the involved leg(13). 2)Transfers exercises:

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1)Weight bearing exercises: 1. Facilitating stride weight shift forward and step with involved leg from the front. 2. Facilitating stride weight shift forward and step with the involved leg. 2)Transfers exercises: 1. Transfer from bed to chair. 2. Scooting pelvis to the side standing beside bed (bridging with rotation). Treatment duration: 40minutes/session,1 session/day, 5sessions/week for a duration of 6 weeks.	1. Transfer from bed to chair. 2. Scooting pelvis to the side standing beside bed (bridging with rotation)(13). Treatment duration: 40minutes/session,1 session/day, 5sessions/week for a duration of 6 weeks.

Table 1: Interventions of Experimental group and Control group

TREATMENT PROTROCOL:

EXPERIMENTAL GROUP: The Bobath concept is used to improve balance in subjects with acute stroke by using facilitatory techniques along with the Conventional Physiotherapy.

Foot preparation: The patient lay on their back with hips and knees relaxed, the affected foot at the table’s edge and ankle in a neutral 90° position. The therapist, seated at the foot end, supported the heel and aligned the forefoot and toes, maintaining close proximity for precise control and facilitation.

Lateral pelvic shifting: The subject was seated on a firm surface with hips and knees at 90 degrees and feet flat on the floor, aligned with the pelvis. The therapist, positioned in a low squat at the side, supported the ankle and lower leg to maintain proper foot alignment and stability. From this position, gentle lateral pelvic movements were guided while ensuring lower limb alignment and encouraging active trunk responses.

Linear extension: The subject was seated upright on a firm surface with hips and knees at 90 degrees, feet flat, and trunk and head aligned. The therapist stood behind and slightly to the side, placing hands on the lower back and sacral area. Gentle upward pressure was applied to facilitate trunk extension, postural elongation, and symmetrical activation of the trunk extensors.

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Sit to stand: The subject moved from sitting to standing on a firm surface with feet flat under the hips and trunk upright. The therapist, in a low squat in front, supported the pelvis and guided the trunk to ensure symmetrical weight-bearing and active use of the affected side.

stand to sit: The subject began lowering from standing to sitting with feet hip-width apart, trunk slightly flexed, and hips and knees bending for a controlled descent. The therapist, kneeling in front, guided the pelvis and upper trunk to maintain alignment and control, providing support and feedback for a smooth, symmetrical movement.

CONTROL GROUP:

By giving Conventional Physiotherapy; They are Weight bearing exercises and Transfer exercises improves gait velocity.

Facilitating stride weight shift forward and step with involved leg from the front: The subject stood upright with feet hip-width apart and weight evenly distributed, preparing to step with the involved leg. The therapist, seated slightly to the front and side of the involved leg, placed one hand on the pelvis to guide weight shift and the other on the lower trunk for support. This facilitated forward trunk movement, postural control, balance, and stepping with the affected limb.

Facilitating stride weight shift forward and step with the involved leg: The subject stood upright with feet hip-width apart, trunk slightly inclined forward, and knees slightly flexed to prepare for stepping. The therapist, seated in front and toward the involved side, placed one hand on the upper trunk to guide forward movement and the other on the pelvis to assist weight shift and limb release. Tactile and verbal cues were given to maintain alignment and prevent compensatory movements.

Transfer from bed to chair: The subject sat at the edge of the bed with feet flat, hip-width apart, trunk upright, and arms ready to assist. The therapist, seated close to the affected side, placed one hand on the upper trunk to guide flexion and the other on the pelvis or thigh to aid weight shift and control. Support was maintained throughout to ensure a safe and smooth transfer to the chair.

Scooting pelvis to the side standing beside bed (bridging with rotation): The subject lay on their back with knees bent, feet flat on the bed, and arms crossed on the chest, maintaining midline alignment. The therapist stood beside the bed at pelvis level, placing both hands on the pelvis to guide lateral movement and control rotation, ensuring safety, alignment, and smooth facilitation throughout the motion.

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STATISTICAL ANALYSIS:

The statistical analysis was performed using SPSS software version 26.0, IBM Chicago. The data was first entered into a Microsoft excel spread sheet, Tabulated, and then subjected to statistical analysis.

All 30 participants completed this study protocol with in four weeks of treatment session the demographic data was analysed using the Chi-square test. Paired t-test were used for with in experimental, control group analysis whereas unpaired t-test were used for between group analysis.To determine the effectiveness of the treatment, a paired t-test was used for both the experimental group and between-experimental group analysis, with outcome measures of BBS and T10MWT.

RESULTS:

DESCRIPTIVE STATISTICS:

Table 2: Descriptive data of Experimental and Control group:

Variable	Experimental group	Control group	P-Value
AGE IN YEARS(Mean ± SD)	46.8 ±8.8	49.2±8.3	0.452
GENDER RATIO (M:F)	7:8	8:7	0.5
AFFECTED SIDE RATIO (R:L)	7:8	8:7	0.5

The mean age of participants in the control group was 49.2 ± 8.3 years, while that in the experimental group was 46.8 ± 8.8 years (p = 0.452). Gender distribution was balanced, with 8 males and 7 females in the control group, and 7 males and 8 females in the experimental group (p = 0.5). The affected side (right or left hemisphere) was similarly distributed across both groups (8 right / 7 left in control; 7 right / 8 left in experimental; p = 0.5), indicating successful randomization.

INTERPREETATION: The mean age of participants in the control group was 49.2 ± 8.3 years, while that in the experimental group was 46.8 ± 8.8 years (p = 0.452). Gender distribution was balanced, with 8 males and 7 females in the control group, and 7 males and 8 females in the experimental group (p = 0.5). The affected side (right or left hemisphere) was similarly distributed across both groups (8 right / 7 left in control; 7 right / 8 left in experimental; p = 0.5), indicating successful randomization.

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INFERENTIAL STATISTICS:

WITHIN GROUP ANALYSIS:

Table 3 :- Within group analysis of Pre and post mean values of Experimental group:

OUTCOME	PRE MEAN ± SD	POST MEAN ±SD	MEAN DIFFERNCE	T - VALUE	P-VALUE
BBS	31.87± 4.4	46.47± 2.7	14.6	16.44	0.00
10MWT (M/S)	1.47 ± 0.2	1.9 ± 0.31	0.43	7.47	0.00

The BBS score increased from 31.87 to 46.47, showing a larger improvement than in the control group. This result was also statistically significant (p = 0.00).10MWT speed increased from 1.47 to 1.9 m/s. This gain was higher than the Experimental group's improvement.

Table 4 :-Within group analysis of Pre and post mean values of control group:

OUTCOME	PRE MEAN ± SD	POST MEAN ±SD	MEAN DIFFERNCE	T - VALUE	P-VALUE
BBS	29.73± 4.07	38.8± 4.2	9.1	16.54	0.00
10MWT (M/S)	1.43 ± 0.1	1.65 ± 0.24	0.22	6.07	0.00

The Berg Balance Scale (BBS) score improved from 29.73 to 38.8. This change was statistically significant (p = 0.00), indicating a clear improvement in balance. This means participants walked faster after treatment (p = 0.00).The 10MWT speed increased from 1.43 to 1.65 m/s, again showing improvement in gait (p = 0.00) in control group.

INTERPRETATION: The Berg Balance Scale (BBS) score improved from 29.73 to 38.8. This change was statistically significant (p = 0.00), indicating a clear improvement in balance. This means participants walked faster after treatment (p = 0.00).The 10MWT speed increased from 1.43 to 1.65 m/s, again showing improvement in gait (p = 0.00) in control group.

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BETWEEN GROUP ANALYSIS

Table 5 :- Comparsion between pre and post mean values of Experimental and Control group.

OUTCOME	EXPERIMENTAL GROUP(MEAN ±SD)	CONTROL GROUP (MEAN ± SD)	MEAN DIFFERNCE	T - VALUE	P-VALUE
Berg post	46.47± 2.72	38.87± 4.24	7.6	5.84	0.00
10MWT (M/S) POST	1.91 ± 0.32	1.65 ± 0.25	0.26	2.54	0.017

Post-intervention BBS scores were higher in the experimental group (46.47 ± 2.72) than the control group (38.87 ± 4.24), with a mean difference of 7.6 (p = 0.00). Similarly, 10MWT gait speed improved more in the experimental group (1.91 ± 0.32 m/s) than in the control (1.65 ± 0.25 m/s), with a mean difference of 0.26 m/s (p = 0.017), indicating better postural control and walking ability.

INTERPRETATION: The BBS score after treatment was 38.87 in the control group and 46.47 in the experimental group. The difference of 7.6 points was statistically significant (p = 0.00).The 10MWT walking speed post-treatment was 1.65 m/s in the control group and 1.91 m/s in the experimental group. This 0.26 m/s difference was also statistically significant (p = 0.017). Both groups improved with therapy.However, the Bobath therapy group showed greater gains in balance (BBS), walking speed (10MWT), and overall functional levels.Bobath therapy was more effective than standard physotherapy for improving balance and gait.

DISCUSSION:

The present study aimed to evaluate the effectiveness of the Bobath concept on balance and gait velocity among individuals with acute ischemic stroke. Thirty subjects fulfilling the inclusion criteria were randomly divided into two groups: the Experimental Group, which received Bobath concept with conventional physiotherapy, and the Control Group, which received conventional therapy alone. Each subject underwent a 40-minute session, five times per week, for a duration of six weeks. Pre- and post-assessments were done using the Berg Balance Scale (BBS) and Timed 10-Meter Walk Test (10MWT).

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The results showed significant improvements within both groups, but the experimental group demonstrated superior outcomes in both balance and gait velocity. In the experimental group, the BBS score increased from 31.87 to 46.47 and the 10MWT improved from 1.47 m/s to 1.90 m/s ($p = 0.00$). The control group also improved, with BBS increasing from 29.73 to 38.80 and 10MWT from 1.43 m/s to 1.65 m/s ($p = 0.00$). Between-group analysis revealed statistically significant differences in post-treatment scores, with the experimental group showing higher BBS (46.47 ± 2.72 vs. 38.87 ± 4.24; $p = 0.00$) and faster gait velocity (1.91 ± 0.32 m/s vs. 1.65 ± 0.25 m/s; $p = 0.017$). These findings confirm that the Bobath concept is more effective than conventional therapy in improving balance and gait among acute stroke patients. Hence, the null hypothesis was rejected, and the alternative hypothesis was accepted.

The mean age of participants in the control group was 49.2 years, while in the experimental group it was 46.8 years, representing a middle-aged population. These findings align with Indian epidemiological data. Joseph et al. (2024) reported that 75.2% of stroke cases in India occur in individuals aged above 50 years, while 24% occur below 50 years, indicating an increasing prevalence of stroke among the middle-aged population. Similarly, Sylaja et al. (2018) reported a mean age of 58.3 ± 14.7 years in Indian ischemic stroke patients, suggesting stroke onset occurs earlier in Indian populations than in Western countries. This supports the need for early rehabilitation strategies such as the Bobath approach for individuals in their 40s and 50s(14,15).

The findings of this study are consistent with previous literature supporting the efficacy of the Bobath concept in enhancing postural control, motor recovery, and gait function in stroke rehabilitation. Agarwal and Tiwari (2024), in a systematic review of 15 clinical trials, reported that Bobath-based facilitation led to greater improvements in both balance and gait speed compared to conventional physiotherapy. They found an average increase of 0.25 m/s in gait velocity and a 10-point gain in BBS scores in Bobath groups, compared to only modest gains in controls. Similarly, Sutcu et al. (2023) conducted an assessor-blinded randomized controlled trial comparing Bobath and task-oriented training. The Bobath group showed significant improvements in trunk muscle activation and reduction in postural

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sway, demonstrating enhanced core stability and dynamic balance. These results support the findings of the present study, which showed significant gains in balance and walking ability following Bobath-based facilitation(16,17).

The improvement in balance and gait velocity among participants receiving the Bobath approach can be explained by its neurophysiological principles, which emphasize the facilitation of normal movement patterns, correction of abnormal postural reflexes, and promotion of symmetrical weight-bearing. By enhancing postural alignment and trunk control, the Bobath approach improves the coordination between the trunk and limbs, thereby facilitating smoother and more functional movement. Repetitive, task-specific training promotes neuroplasticity and cortical reorganization, which are key mechanisms in post-stroke motor recovery(18).

The present study demonstrates that incorporating the Bobath concept into conventional physiotherapy produces significantly better outcomes in dynamic balance and gait velocity among individuals with acute ischemic stroke. The findings highlight the importance of early neurofacilitation-based rehabilitation in promoting motor recovery, functional mobility, and independence in stroke survivors. Therefore, integrating Bobath-based facilitation into early rehabilitation protocols is strongly recommended to enhance postural control, gait performance, and overall functional outcomes in patients with acute stroke.

CONCLUSION:

This study demonstrates that the application of the Bobath concept in combination with conventional therapy significantly improves balance and gait velocity in individuals with acute stroke. Participants in the experimental group showed greater improvements in Berg Balance Scale (BBS) and 10-Meter Walk Test (10MWT) scores compared to the control group, reflecting enhanced postural control and walking speed. These results indicate that integrating the Bobath approach with conventional rehabilitation promotes neuroplasticity, facilitates motor recovery, and contributes to better functional outcomes and quality of life in stroke survivors. Hence, the alternate hypothesis stating that the Bobath concept improves balance and gait velocity in stroke subjects is accepted, while the null hypothesis is rejected.

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LIMITAION AND RECOMMENDATION:

Present study provides compelling evidence for the effectiveness of combined respiratory muscle training, there are several limitations to consider. First, the sample size was relatively small (n = 30), which may limit the generalizability of our findings. Larger studies with more diverse stroke populations, including different severities of stroke, are needed to validate these results. Additionally, while the 6-week duration showed significant results, the long-term sustainability of these improvements remains unclear. Future studies could incorporate follow-up assessments to determine whether the effects of bobath concept are maintained beyond the intervention period, more research is needed to know the effectiveness of Bobath concept and conventional physiotherapy, particularly in terms of long-term outcomes.

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