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Original Article

A STUDY ON THE EFFECT OF ADDITIONAL BACKWARD WALKING TRAINING ON BALANCE AND FUNCTIONAL OUTCOMES IN PATIENTS WITH STROKE

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ABSTRACT

Objective: Stroke is a significant cause of mortality and disability globally, with a higher prevalence in urban areas of India compared to rural regions. Men in India face a greater risk of stroke, attributed to factors such as smoking and drinking, which are more prevalent among Indian men. This study aimed to evaluate the influence of backward walking training on balance and functional outcomes in stroke patients.

Methods: Experimental Group received 30 min of backward walking training three times per week for three weeks. Balance was assessed using the Berg Balance Scale (BBS), and functional outcomes were measured using the Barthel Index (BI) before and after the intervention. Data analysis was performed using Student's paired t-test and unpaired t-test.

Results: Before the intervention, there were no significant differences between the Control Group and Experimental Group in terms of BBS and BI scores. However, after the intervention, the Experimental Group showed a significant improvement in both balance (BBS) and functional outcomes (BI) compared to the Control Group. The Experimental Group demonstrated a greater improvement in BI scores (9.94%) compared to the Control Group (4.95%), and a similar pattern was observed for BBS scores, with the Experimental Group showing a greater improvement (7.87%) compared to the Control Group (3.49%). These differences were statistically significant ($p<0.01$), indicating that the intervention in the Experimental Group was more effective than the Control Group.

Conclusion: These findings suggest that incorporating backward walking training into stroke rehabilitation programs can be beneficial for patients in terms of enhancing their balance and functional abilities.

Keywords: Stroke, Conventional therapy, Backward walking training

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INTRODUCTION

A stroke, also known as a brain attack, occurs when the supply of blood to the brain is disrupted, resulting in an abrupt impairment of neurological abilities. There are two main types of strokes: ischemic stroke, caused by a clot obstructing blood flow, and haemorrhagic stroke, characterized by the rupture of blood vessels. Stroke is a significant cause of mortality and disability globally, with millions of individuals affected each year [1].

In emerging countries like India, stroke poses a major health concern, ranking as the second leading cause of death and the third foremost cause of disability. The impact of stroke extends beyond mortality, with a high incidence rate and a substantial contribution to non-communicable disease burden. Motor function impairment, particularly in balance and walking, is a common issue following a stroke, affecting the ability to perform everyday tasks [2].

Balance impairment is recognized as a significant risk factor for falls and the development of fear related to falling, leading to increased mortality rates among stroke survivors. Prevalence rates of stability impairments after stroke have been reported to range from 16.7% to as high as 83%. Achieving upright balance is crucial for proper gait patterns and mobility in individuals who have had a stroke [3].

Rehabilitation strategies for stroke survivors encompass various therapeutic approaches, including exercises for strengthening, motor imagery, virtual reality exercises, cycling, electrical stimulation, and gait training. Among these approaches, backward walking has emerged as a potentially beneficial intervention for improving balance and mobility function after a stroke [4].

Backward walking, previously utilized in orthopedic rehabilitation, has shown effectiveness in enhancing quadriceps strength and power. Recent studies have explored backward walking as a method to improve gait and dynamic balance in post-stroke individuals, demonstrating promising advantages. Compared to forward walking, backward walking induces greater cerebral activation, engaging areas of the brain involved in motor control and sensory feedback. This novel motor skill may promote cortical neural plasticity by actively engaging circuits that have been affected by stroke [5].

Activities of daily living (ADLs) are often compromised after a stroke, leading to a dependency on assistance for tasks essential for self-maintenance and personal care. Even individuals with mild strokes can experience difficulties with ADLs, highlighting the need for effective rehabilitation interventions [6].

The Barthel Index (BI) is a widely used measure for assessing basic ADL function, providing valuable insights into a stroke survivor's functional status and progress over time. It considers the degree of assistance required for activities such as dressing, bathing, and grooming, enabling healthcare professionals to track a patient's level of independence [7].

MATERIALS AND METHODS

Sample size

40 Community-dwelling as well as institutional subjects who had a history of stroke was identified and included for the study. Informed consent was gained from the subjects prior to participation. All subjects included for the study underwent basic general assessment and clinical examination. Selection of subjects was based on the following inclusion and exclusion criteria.

Inclusion criteria

- No previous history of Cerebrovascular Accidents (CVA).
- Unilateral motor/sensory deficit.

- Brunnstorm recovery stage 3 or stage 4.
- Capability to ambulate a distance of 11 meters with or without the use of a walking aid or orthosis.
- Physically stable condition that enables participation in the testing protocol and intervention.
- Ability to comprehend instructions and carry out commands.

Exclusion criteria

- Active arthritis.
- Joint or muscular pathology affecting lower extremities.
- History of spinal fracture due to osteoporosis or any other condition that would prevent the subject from performing strengthening exercises.
- Uncontrolled hypertension or cardiac condition as determined by the physician.

Source of data: OPD of Pacific medical college and hospital.

Data collection: After completing the inclusion criteria, subjects were randomly assigned to either control group or an experimental group.

Pre-test scores of Berg Balance Scale and Barthel Index were taken from each subjects of both groups and noted.

Group I: The subjects of Control Group received only conventional therapy. The exercise interventions were tailored for a duration of 40 min, 3 times a week over a stretch of 3 w.

Group II: The subjects of the experimental Group received conventional therapy along with backward walking for 30 min, 3 times a week for 3 w.

Procedure

The study involved two groups, an Experimental Group and a Control Group, randomly selected. Pre-test scores of the Berg Balance Scale (BBS) and Barthel Index were recorded for both groups. The Experimental Group received a conventional stroke rehabilitation program, which included various interventions such as mat activities, range of motion exercises, weight-bearing and weight-shifting activities, standing exercises, balancing activities, and functional activities. The training program lasted for 40 min, three times a week, over a period of three weeks. Additionally, the Experimental Group also underwent Backward Walking Training (BWT) for 30 min, three times a week, for three weeks. The Control Group received only conventional therapy for the same duration and frequency. Assistance was provided to prevent falls during the training sessions. After three weeks of intervention, post-test results of the BBS and Barthel Index were compared to the pre-test values to evaluate the efficacy of the additional backward walking training on balance and functional outcome in stroke patients. The BBS is a scale that assesses static and dynamic balance abilities, while the Barthel Index measures the level of assistance required in mobility and self-care activities of daily living. Pacific Medical University, Institute's ethical approval obtained dated 29/08/2022, PMU/PMCH/IEC/239/2022. All participants completed the information and consent form at recruitment.

RESULTS

The scores of both BBS and BI were taken prior to intervention on both the Experimental Group and the Control Group. No significant difference was observed in the groups as p-value in both the cases>0.05 (table 1).

Table 1: Comparison between groups for BBS and BI before intervention

Parameter		Group	N	Minimum	Maximum	Mean	Std. deviation	Median	T value	P value	
Before	BARTHEL	Experimental	20	65	95	82.50	9.934	85.00	.640	NS	.526
		Control	20	70	95	80.75	7.122	80.00			
		Total	40	65	95	81.63	8.578	80.00			
	BBS	Experimental	20	29	47	38.75	5.476	38.50	.859	NS	.396
		Control	20	30	47	37.30	5.202	37.00			
		Total	40	29	47	38.03	5.323	37.50			

In Control Group, BI results before the intervention was 80.75±7.1 and that of after the intervention was 84.75±7.1 resulting in 4.95% change which was statistically highly significant as p value<0.01.

Table 2: Comparison between groups for BI

Group		N	Minimum	Maximum	Mean	Std. deviation	Median	Mean diff.	Change (%)	T value	P value
Experimental	Before	20	65	95	82.50	9.934	85.00	8.20	9.94	8.78	.000
	After	20	75	100	90.70	7.630	94.50				HS
Control	Before	20	70	95	80.75	7.122	80.00	4.00	4.95	5.81	.000
	After	20	75	95	84.75	7.159	85.00				HS

DISCUSSION

This prospective study aimed to compare the effects of backward walking training combined with conventional physical therapy to conventional therapy alone in patients with a diagnosis of cerebrovascular accident (CVA) [8]. The study included 80 patients, with 40 subjects analyzed in total. The experimental group received backward walking training along with conventional therapy, while the control group received conventional therapy alone [9].

The study found that balance-related issues and falls were common among stroke patients, leading to reduced balance and mobility. Different levels of balance ability were associated with variations in stroke severity, impairments, and disability. Another study revealed significant correlations between balance confidence and range of motion of affected knee joints and strength of quadriceps femoris muscles. Functional activity assessed using the Barthel Index showed considerable impairment among the subjects [10].

Both groups in the study showed significant improvements in balance and functional outcomes, but the experimental group that received backward walking training showed greater effectiveness compared to the control group [11]. The inclusion of both community-dwelling and institutionalized adults was a possible limitation of the study. Previous research has supported the effectiveness of conventional physical therapy and strength training in improving balance and mobility in stroke survivors [12].

Backward walking training has shown to offer more benefits than forward walking. It elicits higher muscle activity with less exertion, increases oxygen consumption and metabolic response, and promotes neural adaptability. It involves hip extension and knee flexion, making it particularly beneficial for individuals with hemiplegic synergy affecting the lower extremities. Training in backward walking has been shown to significantly increase gait speed, step length, and stride length in individuals with hemi paresis due to stroke [13].

CONCLUSION

In conclusion, this study compared the effects of backward walking training combined with conventional physical therapy to conventional therapy alone in patients with CVA. The results indicated that backward walking training supplemented with conventional therapy was more effective in improving balance and functional outcomes compared to conventional therapy alone. The study highlighted the importance of addressing balance and mobility disorders in stroke rehabilitation and suggested that backward walking training could be a beneficial intervention. Further research and trials should consider eliminating confounding variables and explore the potential benefits of backward walking training in larger populations.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INETRESTS

Declared none

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