

EFFECTIVENESS OF SUPPLEMENTED BACKWARD WALKING TRAINING ALONG WITH CONVENTIONAL THERAPY ON BALANCE AND FUNCTIONAL OUTCOME IN PATIENTS WITH STROKE

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ABSTRACT

Objective: A stroke is a significant cause of mortality and disability worldwide, including in India, where it ranks as the second leading cause of death and the third most common cause of disability. Impairments in motor functions, such as balance and walking, are common consequences of stroke and have a substantial impact on functional abilities. Various rehabilitation strategies have been employed, but the effectiveness of these approaches varies.

Methods: The study included 40 individuals with a history of stroke who met specific inclusion and exclusion criteria. The subjects were randomly assigned to either the control group or the experimental group. The control group received conventional therapy, while the experimental group received supplemented backward walking training along with conventional therapy. Functional outcomes were assessed using the Barthel Index (BI), and balance was evaluated using the Berg Balance Scale (BBS). Pre-and post-test scores were collected for both groups.

Results: The results showed that the experimental group demonstrated a significantly higher improvement in BI scores (9.94%) compared to the control group (4.95%), indicating that the supplemented backward walking training had a greater impact on enhancing activities of daily living. In terms of balance, both groups showed improvements in BBS scores, with the control group exhibiting a 3.49% change and the experimental group showing a larger improvement of 7.87%. These improvements were statistically highly significant.

Conclusion: Supplemented backward walking training, when combined with conventional therapy, has a positive impact on balance and functional outcomes in stroke patients. The results emphasize the potential of incorporating backward walking training into stroke rehabilitation programs to enhance recovery and improve the quality of life for stroke survivors. However, the study has limitations, including a relatively small sample size and short intervention duration, necessitating further research with larger sample sizes and longer intervention periods to validate the effectiveness of supplemented backward walking training in stroke rehabilitation.

Keywords: Stroke, Rehabilitation, Backward walking training, Balance

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INTRODUCTION

A stroke, characterized by the sudden impairment of neurological function due to a disruption in blood supply to the brain, is a leading cause of mortality and disability worldwide. In India, stroke is a major health concern, ranking as the third most common cause of disability and the second leading cause of death. Impairments in motor functions, including balance and walking, are common consequences of stroke and significantly impact functional abilities [1].

Balance impairment following a stroke is a significant risk factor for falls and can lead to increased mortality rates among stroke survivors [2]. Studies have reported a wide range of prevalence rates for balance impairments after a stroke, highlighting the need for effective rehabilitation strategies. Therapeutic approaches targeting lower extremity strengthening, motor imagery, virtual reality exercises, and gait training have been employed in stroke rehabilitation but have varying levels of effectiveness [3].

Backward walking training has emerged as a potentially beneficial intervention for improving balance and mobility function in post-stroke individuals. Backward walking reduces mechanical strain on the knee joint and has been shown to enhance quadriceps strength and power. Recent studies have demonstrated promising outcomes of backward walking training in improving gait and dynamic balance after stroke. Backward walking induces increased cerebral activation and cortical processing compared to forward walking, which may promote neural plasticity in stroke-affected circuits [4].

Activities of daily living (ADLs) are essential for independent functioning and are often compromised after a stroke. ADL

dependency persists in a significant proportion of stroke survivors, even in cases of mild strokes. Assessing functional status and tracking progress in ADL performance is crucial for evaluating the effectiveness of rehabilitation interventions. The Barthel Index (BI) is a widely used measure of basic ADL function, providing a simple and communicable assessment tool [5].

This study aims to evaluate the effectiveness of supplemented backward walking training along with conventional therapy on balance and functional outcomes in patients with stroke. By investigating the impact of this intervention, the study seeks to contribute to the development of evidence-based rehabilitation strategies for stroke survivors, addressing the pressing need for effective interventions to improve balance and functional abilities in this population [6].

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 the 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 outcomes 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

In Experimental Group, improvement in the BI score was 9.94% and that in the Control Group improvement was found to be 4.95%, which is statistically highly significant as $p < 0.01$. Intervention in Experimental Group was found to be more effective compared to that in Control Group (table 1).

Table 1: Comparison of effects on BI between groups

Group		Mean diff.	Std. deviation of diff	Change (%)	T value	P value
Change pre to post	Experimental	8.20	4.175	9.94	3.621	0.001
	Control	4.00	3.078	4.95		

In Control Group, BBS results before the intervention was 37.30 ± 5.20 and that of after the intervention, was 38.60 ± 5.12 resulting in 3.49% change which was statistically highly significant as $p < 0.01$. Both interventions were found to be effective in terms of Berg Balance scoring (table 2).

Table 2: Comparison between groups for BBS

Group	N	Minimum	Maximum	Mean	Std. deviation	Median	Mean diff.	Change (%)	T value	P value
Experimental	Before	20	29	47	38.75	5.476	38.50	7.87	14.44	.000
	After	20	34	49	41.80	4.884	41.00			
Control	Before	20	30	47	37.30	5.202	37.00	1.30	6.72	.000
	After	20	31	48	38.60	5.124	38.00			

DISCUSSION

The present study aimed to investigate the effectiveness of supplemented backward walking training along with conventional therapy on balance and functional outcomes in patients with stroke. The results of the study demonstrated significant improvements in both balance and functional outcomes in the Experimental Group compared to the Control Group [7].

In terms of functional outcomes, the Barthel Index (BI) scores showed a higher improvement in the Experimental Group (9.94%) compared to the Control Group (4.95%). This finding indicates that the supplemented backward walking training had a more significant impact on enhancing the patients' ability to perform activities of daily living. The statistically significant difference between the two groups reinforces the effectiveness of the intervention in improving functional outcomes in stroke patients [8].

Regarding balance, the Berg Balance Scale (BBS) scores also exhibited noteworthy improvements. The Control Group showed a 3.49% change in BBS scores, which was statistically highly

significant. However, the Experimental Group demonstrated a larger improvement of 7.87% in BBS scores. This finding suggests that the supplemented backward walking training was more effective in enhancing balance compared to the conventional therapy alone [9].

These results are consistent with previous studies that have examined the effects of backward walking training in post-stroke individuals. Backward walking has been shown to induce greater activation and cortical processing in the brain compared to forward walking. This increased neural engagement may contribute to the observed improvements in balance and functional outcomes. Furthermore, backward walking places less strain on the knee joint, making it a suitable rehabilitation approach for stroke patients with lower extremity weakness or joint limitations [10].

It is important to note that the current study contributes to the existing body of literature by specifically evaluating the effectiveness of supplemented backward walking training along with conventional therapy in stroke patients [11]. The statistically significant differences observed in both functional outcomes and

balance support the inclusion of backward walking training as a valuable component of stroke rehabilitation programs [12].

However, it is crucial to acknowledge some limitations of the study. Firstly, the study sample size was relatively small, which may limit the generalizability of the findings. Additionally, the study duration was relatively short, with a three-week intervention period. Future studies with larger sample sizes and longer intervention durations are warranted to further validate the effectiveness of supplemented backward walking training in stroke rehabilitation [13].

CONCLUSION

In conclusion, the results of this study suggest that supplemented backward walking training along with conventional therapy has a positive impact on balance and functional outcomes in patients with stroke. The findings highlight the potential of incorporating backward walking training into stroke rehabilitation programs to enhance recovery and improve the quality of life for stroke survivors. Further research is needed to explore the long-term effects and optimal implementation strategies of this intervention.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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