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EFFECT OF BOBATH TRAINING FOR TRUNK CONTROL FOR THE IMPROVEMENT OF SPATIAL PARAMETER OF GAIT IN STROKE PATIENT (HEMIPLEGIA)

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Abstract: This study aimed to evaluate the impact of various rehabilitation strategies, including Bobath-based tailored trunk exercises, rhythmic auditory-cued gait training, and robotic gait training, on trunk control, limb functionality, walking, balance, and gait among stroke patients. A particular focus was placed on the Bobath approach's efficacy in enhancing these functional outcomes. Additionally, the study sought to provide critical insights into stroke rehabilitation, especially in developing more targeted interventions for gait impairments in patients with stroke-induced hemiplegia.
In an experimental setup, 16 stroke patients who met the inclusion criteria were enrolled and divided into pre-and post-intervention groups. The experimental group received the Bobath Approach combined with conventional physiotherapy, and trunk control was evaluated using the Trunk Impairment Scale. Both groups participated in a 6-week therapy program, consisting of four sessions per week, each lasting 40 minutes. Notably, significant improvements in trunk control were observed in both groups, with the Bobath approach demonstrating a more substantial enhancement in Trunk Impairment Scale scores compared to conventional physiotherapy. This approach achieved statistical significance at the 0.05% level with a p-value of less than 0.04.
The study's findings suggest that the Bobath training might be more effective in improving the spatial parameters of gait in stroke patients with hemiplegia than other rehabilitation methods like conventional physiotherapy or proprioceptive neuromuscular facilitation. This research was driven by the considerable impact of stroke-related hemiplegia on individuals' quality of life, functional independence, and the broader implications for the healthcare system.

Index Terms – Bobath, spatial parameter, gait, trunk impairment scale

I. INTRODUCTION

Stroke is a leading cause of long-term disability worldwide, affecting millions of individuals each year [1]. One of the primary consequences of stroke is hemiplegia, a partial or complete paralysis of one side of the body that significantly impacts an individual's ability to perform activities of daily living, such as walking [2]. Among the various motor impairments experienced by stroke survivors, trunk control, or the ability to maintain and coordinate trunk movement, plays a crucial role in maintaining postural stability and effective gait [3]. The Bobath Concept, along with neurodevelopmental treatment (NDT), is a widely used rehabilitative approach that aims to improve trunk control and overall motor functions in individual with neurological disorders, including stroke [4].
The Bobath Concept, developed by Berta and Karel Bobath in the 1940s, is a problem-solving approach to the assessment and treatment of individuals with neurological impairments [5]. The primary goal of this approach is to facilitate the recovery of normal movement patterns by promoting sensory-motor integration and inhibiting abnormal reflexes [6]. The Bobath Concept emphasizes the importance of trunk control as a foundation for functional movement, postural stability, and balance [4].
Trunk control is essential for maintaining postural stability during various activities, such as sitting, standing, and walking [7]. Impaired trunk control can lead to a decreased ability to maintain balance, increased risk of falls, and reduced functional mobility [3]. In stroke patients with hemiplegia, the loss of trunk control can further exacerbate the asymmetrical gait patterns and spatial parameters, such as stride length, step length, and base of support [8].
Several studies have demonstrated the effectiveness of the Bobath Concept in improving trunk control in stroke patients [4; 9]. A randomized controlled trial by Cabanas-Valdés et al. [9] found that stroke patients who received Bobath therapy showed significant improvements in trunk control, balance, and functional mobility compared to a control group that received conventional physiotherapy. Another study by Paci [4] reported similar findings, with the Bobath group demonstrating significant improvements in trunk control and functional mobility compared to a control group that received proprioceptive neuromuscular facilitation (PNF) therapy.
Despite the evidence supporting the effectiveness of the Bobath Concept in improving trunk control, its impact on spatial parameters of gait in stroke patients with hemiplegia has not been extensively studied. Research examining the relationship between trunk control and gait in stroke patients has primarily focused on temporal parameters, such as gait speed and cadence,

rather than spatial parameters [7; 3]. However, understanding the influence of trunk control on spatial parameters of gait is crucial for developing effective interventions that target gait impairments in stroke patients.

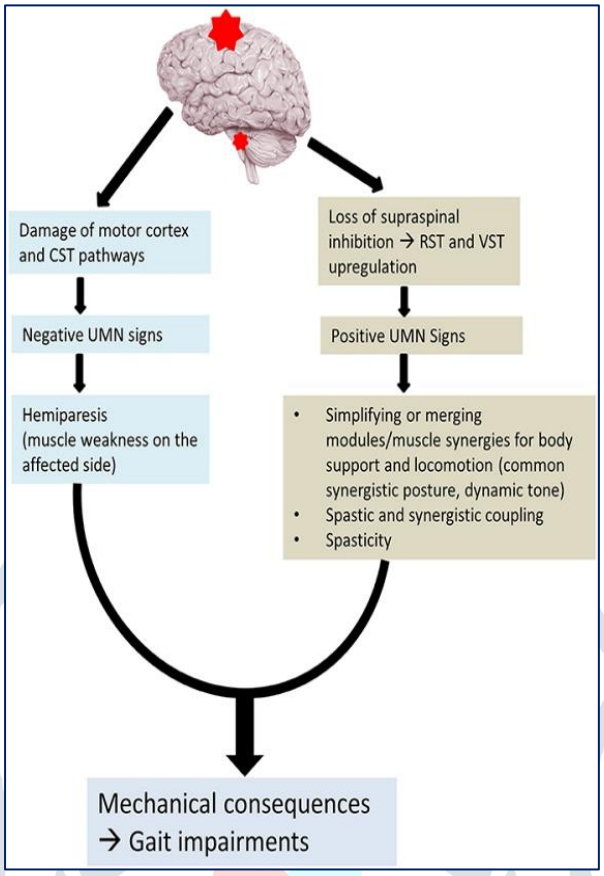

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Figure 1: Altered neural control for post-stroke gait. CST, corticospinal tract; RST, reticulospinal tract; VST, vestibulospinal tract.

II. OBJECTIVES

1. Assess the efficacy of Bobath training in enhancing trunk control among stroke patients with hemiplegia.
2. Examine the impact of improved trunk control on spatial parameters of gait, including stride length, step length, and base of support.
3. Compare the effectiveness of Bobath training with other rehabilitation approaches in terms of their influence on spatial parameters of gait in stroke patients with hemiplegia.

III. HYPOTHESIS

Alternate hypothesis- There may be a significant difference, Effect of Bobath training for trunk control for the improvement of spatial parameter of gait in stroke patient (Hemiplegia).

Null hypothesis- There may not be any significant difference between, Effect of Bobath training for trunk control for the improvement of spatial parameter of gait in stroke patient (Hemiplegia).

IV. METHODOLOGY

4.1 Study Design

This is randomised controlled trial study conventional sampling method will be used to include patients in this study inclusion criteria will be assessing before include any subject in this study design. Pre-test and post-test of various variables in gait cycle.

4.2 Study Settings

The study was conducted at Outpatient department.

1. Gurudwara Singh Sabha Charitable Hospital, Dehradun, Uttrakhand
2. Sardar Bhagwan Singh post graduate institute O.P.D Dehradun, Uttrakhand.

4.3 Sample Size

The Population of 30 Patients with post stroke were selected as samples for the study and divided into two groups. who were residing within the Municipal boundary of Dehradun city.

4.4 Test administration

The study was carried out in four steps
STEP-1: Pre-test of all participants.
STEP-2: Divide the subject's randomly into two groups.
STEP-3: Treatment interventions.
STEP-4: Post-test of all participants

Table 1: Treatment Protocol for Stroke Rehabilitation Study

Week	Session Focus	Activities	Duration	Intensity/Progression	Notes
1-2	Initial Assessment and Bobath Approach	- Baseline functional assessment using the Trunk Impairment Scale - Bobath-based tailored trunk exercises - Basic balance activities in supine and sitting positions	40 min/session 4 sessions/week	Low intensity Focus on correct form and patient safety	Assess baseline abilities; tailor exercises to individual patient needs
3-4	Integration of Bobath Approach and Gait Training	- Progression to more challenging balance and trunk exercises - Introduction to rhythmic auditory-cued gait training - Basic gait exercises using aids if necessary	40 min/session 4 sessions/week	Moderate intensity Gradual increase in complexity	Monitor patient comfort and progress; adjust exercises as needed
5-6	Advanced Gait Training and Robotic Assistance	- Advanced Bobath exercises for trunk control - Enhanced rhythmic auditory-cued gait training - Introduction to robotic gait training for advanced support	40 min/session 4 sessions/week	Moderate to high intensity Tailored to individual patient progress	Focus on improving gait parameters and balance; ensure patient safety during robotic training

Notes:

- **Supervision:** All sessions should be supervised by a trained physiotherapist familiar with the Bobath concept.
- **Adaptations**: Modifications to the protocol may be necessary based on individual patient assessment and response to therapy.
- **Evaluation:** Regular assessment of trunk control and gait parameters should be conducted to monitor progress and adjust the treatment plan accordingly.

V. ANALYSIS RESULT

Table 1: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on CADENCE gait N=16

CADENCE	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	50.75 ± 18.901	3.290	15	0.005	Significant
Post test	58.06 ± 23.196				

**Paired t test applied for pretest & posttest comparison*

Table 1 shows that the mean score of pretest cadence gait was 50.75 and mean score of posttest cadence gait was 58.06.

There was statistical significance comparison between pretest and posttest effect of Bobath training on cadence gait with P<0.05. Post test had greater mean score than pretest in this study.

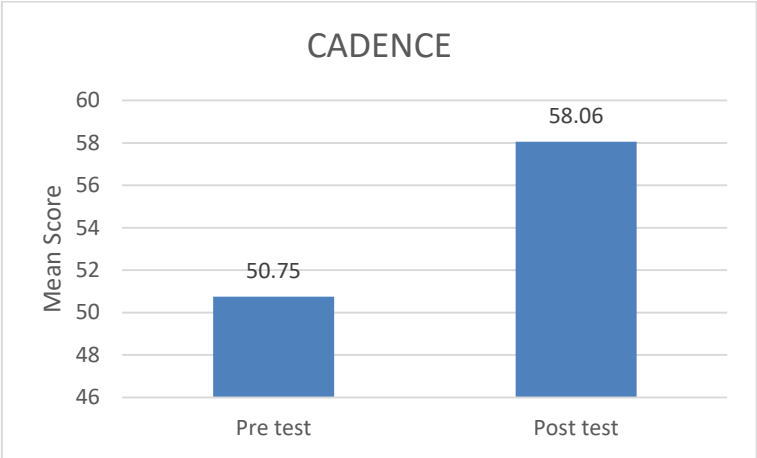


Table 2: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on step width gait N=16

Step width	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	17.19 ± 3.816	4.650	15	0.001	Significant
Post test	19.63 ± 2.918				

**Paired t test applied for pretest & posttest comparison*

Table 2 shows that the mean score of pretest step width gait was 17.19 and mean score of post test step width gait was 19.63.

There was statistical significance comparison between pretest and post test effect of Bobath training on step width gait with P<0.05. Post test had greater mean score than pretest in this study.

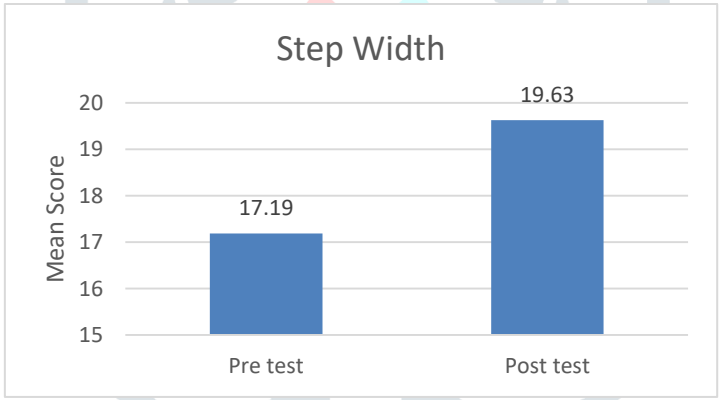


Table 3: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on step length gait N=16

Step length	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	23.81 ± 6.452	3.433	15	0.004	Significant
Post test	27.13 ± 7.839				

**Paired t test applied for pretest & posttest comparison*

Table 3 shows that the mean score of pretest step length gait was 23.81 and mean score of post test step length gait was 27.13.

There was statistical significance comparison between pretest and post test effect of BOBATH training on step length gait with P<0.05. Post test had greater mean score than pretest in this study.

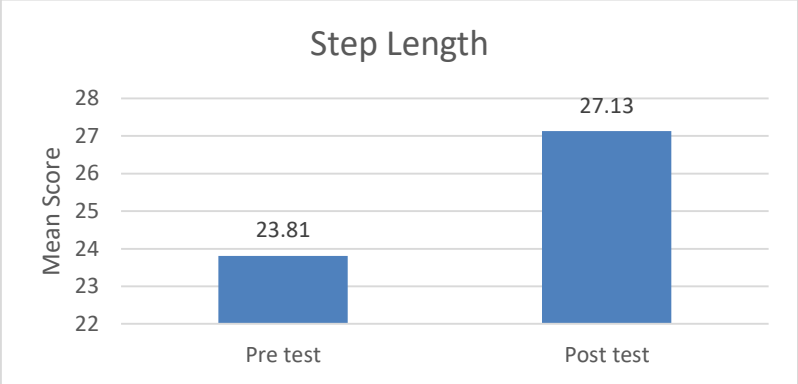


Table 4: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on stride length gait N=16

Stride length	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	56.06 ± 16.791	4.307	15	0.001	Significant
Post test	63.81 ± 18.656				

**Paired t test applied for pretest & posttest comparison*

Table 4 shows that the mean score of pretest stride length gait was 56.06 and mean score of post test stride length gait was 63.81.

There was statistical significance comparison between pretest and post test effect of BOBATH training on stride length gait with P<0.05. Post test had greater mean score than pretest in this study.

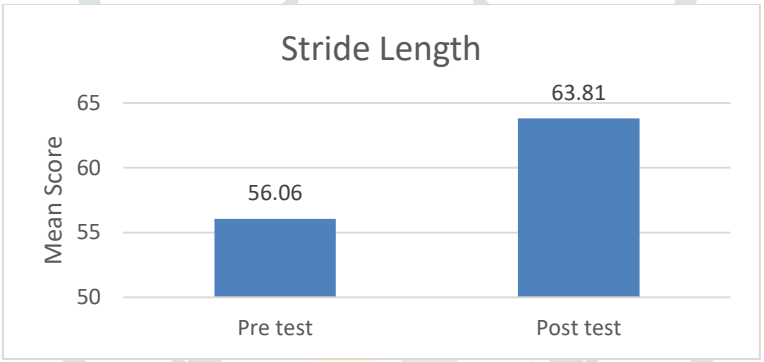


Table 5: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on foot angle gait N=16

Foot angle	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	9.38 ± 0.806	5.514	15	0.001	Significant
Post test	10.31 ± 0.873				

**Paired t test applied for pretest & posttest comparison*

Table 5 shows that the mean score of pretest foot angle gait was 9.38 and mean score of post test foot angle gait was 10.873.

There was statistical significance comparison between pretest and post test effect of BOBATH training on foot angle gait with P<0.05. Post test had greater mean score than pretest in this study.

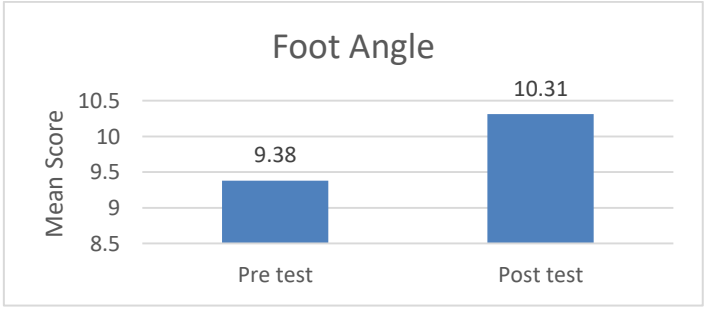


Table 6: Descriptive statistics and Comparison between pretest and posttest effect of BOBATH training on TIS score gait N=16

TIS score	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	15.38 ± 1.088	10.894	15	0.001	Significant
Post test	18.50 ± 1.673				

**Paired t test applied for pretest & posttest comparison*

Table 6 shows that the mean score of pretest TIS score gait was 15.38 and mean score of post test TIS score gait was 18.50.

There was statistical significance comparison between pretest and post test effect of BOBATH training on TIS score gait with P<0.05. Post test had greater mean score than pretest in this study.

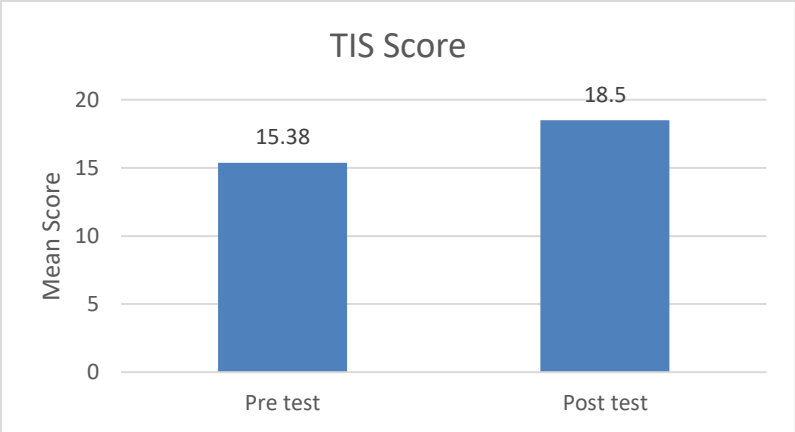
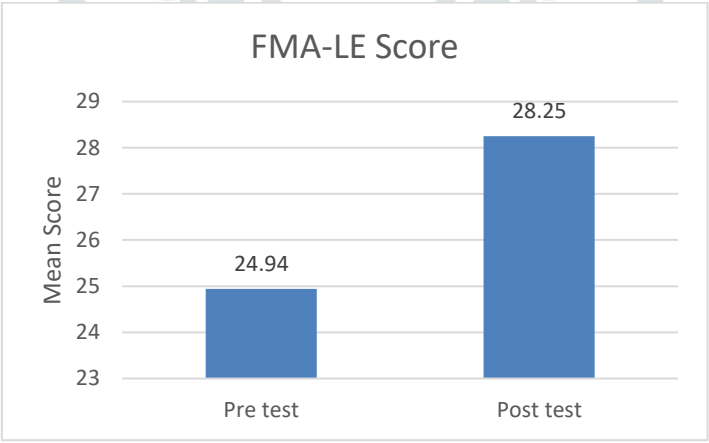


Table 7: Descriptive statistics and Comparison between pretest and posttest effect of Bobath training on FMA-LE score gait N=16

FMA-LE score	Mean ± SD	T test value	Degree of freedom	P-value*	Result
Pre test	24.94 ± 1.436	11.083	15	0.001	Significant
Post test	28.25 ± 1.528				

**Paired t test applied for pretest & posttest comparison*

Table 7 shows that the mean score of pretest FMA-LE score gait was 24.94 and mean score of post test FMA-LE score gait was 28.25. There was statistical significance comparison between pretest and post test effect of Bobath training on FMA-LE score gait with P<0.05. Post test had greater mean score than pretest in this study.



VI. CONCLUSION

The findings from the research on the effect of Bobath Training for trunk control in stroke patients with hemiplegia indicate promising clinical implications. This therapeutic approach has shown statically significant improving the spatial parameters of gait, specifically step length and stride length, in individuals who have experienced a stroke and have hemiplegia. Bobath Training focuses on enhancing trunk control, which plays a crucial role in maintaining balance and stability during gait. By targeting trunk control, this intervention aims to promote more efficient and coordinated movements, ultimately leading to improvements in gait quality.

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