

A Study On The Effects Of Physical Therapy Management Using The Bobath Method For The Functional Recovery Of The Upper Limbs And Trunk In Post-Stroke Patients

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Abstract

Introduction: Stroke is a leading cause of disability, significantly affecting upper limb and trunk function. Conventional rehabilitation methods have limited effectiveness in restoring motor function. The Bobath approach, a neurodevelopmental treatment, emphasizes postural control, movement coordination, and functional activity, making it a widely used rehabilitation method.

Aim and Objectives: This study aims to evaluate the effectiveness of the Bobath approach in improving upper limb and trunk function in post-stroke patients. The objectives include assessing its impact on motor recovery and comparing its efficacy with conventional therapy.

Methodology: A randomized controlled trial was conducted with 36 post-stroke patients divided into two groups: one receiving Bobath therapy combined with conventional rehabilitation and the other undergoing only conventional therapy. The intervention lasted four weeks, with assessments conducted using the Motor Activity Log (MAL) and Fugl- Meyer Assessment (FMA). Statistical analysis was performed using SPSS software.

Results: Patients receiving Bobath therapy showed greater functional improvement compared to the control group. The Bobath group's FMA scores improved from 38.51 to 50.57, while the conventional therapy group improved from 33.78 to 43.78. Similarly, MAL scores demonstrated a significant increase in functional use of the affected limb in the Bobath group.

Discussion: Findings suggest that the Bobath approach effectively enhances upper limb function and trunk stability post-stroke. However, other modern rehabilitation techniques, such as task-specific training and robotics, may provide superior outcomes. Further research is needed to explore the integration of multiple rehabilitation strategies.

Conclusion: The study concludes that the Bobath approach is more effective than conventional rehabilitation in improving motor function in post-stroke patients. Future studies should investigate combining Bobath therapy with advanced rehabilitation methods for optimal recovery.

Keywords: Stroke, Bobath Approach, Neurodevelopmental treatment, Motor activity log scale, Fugl-Meyer Assessment

Introduction

Stroke is a major health issue that leads to impairment of the upper limbs and functional limitations in daily activities.[1,2] According to the World Health Organization (WHO), stroke is defined as the rapid development of clinical signs and symptoms of a focal neurological disturbance lasting more than 24 hours or leading to death with no apparent cause other than vascular origin.[3] Among stroke cases, ischemic strokes account for 87%, hemorrhagic strokes 10%, and subarachnoid hemorrhagic strokes 3%.[4] The prevalence of stroke in India ranged from 44.29 to 559/100,000 persons during the past decades. The incidence ranged from 105 to 152/100,000 persons per year.[5] According to Momosaki et al., about 80% of stroke survivors exhibit motor impairments related to the upper limb.[5] 75% of strokes occur in the region supplied by the middle cerebral artery. Due to this, the upper limb function will be affected in many patients. Recruitment and complex integration of muscle activity from shoulder to fingers are required for the functional recovery of the arm that includes grasping and holding objects[6]

The Bobath Concept, developed by Berta and Karl Bobath, is a neurodevelopmental approach aimed at improving movement control in stroke rehabilitation. This study investigates the impact of Bobath therapy on upper limb recovery and trunk function in post-stroke patients.[7] The International Bobath Instructors Training Association (IBITA) defines the current Bobath Concept as a problem-solving approach to the assessment and treatment of individuals with disturbances of function, movement, and postural control due to a lesion of the central nervous system; the association clearly states that the Bobath Concept aims to identify and analyze problems within functional activities and participation in everyday life as well as the analysis of movement components and underlying impairments.[8] In Bobath therapy, therapists influence sensory information by therapeutic handling

called 'facilitation' (Vaughan-Graham et al 2020). Facilitation provides afferent information that is believed to maintain, restore or update the body schema to optimise postural and movement control (International Bobath Instructors Training Association 2019)

Methodology

A randomized controlled trial was conducted with 36 post-stroke patients, divided into two groups: Group A (Bobath approach with conventional therapy) and Group B (conventional therapy only). Participants were assessed using the Motor Activity Log (MAL) and Fugl-Meyer Assessment (FMA) before and after a 4-week intervention. Treatment duration was 30 minutes per day, 5 days per week, for 4 weeks.

- **Group A (Bobath + Conventional Therapy)** (n=18)

- **Group B (Conventional Therapy Only)** (n=18)

Assessment Tools

To measure functional recovery, the following standardized assessment tools were employed: - **Motor Activity Log (MAL)**: Evaluates the frequency and quality of upper limb usage in daily activities. The motor activity log (MAL) is an instrument widely used by professionals in the clinic, which has been validated in different countries, languages and populations. The aim of this study was to determine the reliability and validity of the MAL scale for post stroke patients. The target scale for the validation, in this case, was the MAL, which is a scale based on a semi-structured interview that assesses the quantity and quality of the use of the paretic upper limbs in the performance of activities of daily living (ADLs) and instrumental activities of daily living (IADLs) in post-stroke individuals.

It contains 30 items in each of the quantity and quality subscales, and the scores are provided for each of them independently, assigning a score ranging from 0 (never uses the affected arm to perform the activity) to 5 (ability to use the affected arm for this activity as effectively as the time before the stroke). All the scores are summed, and the total score is obtained from the average of the items answered (it is not necessary to answer all the items, but only those for which the affected arm was used before the stroke). Higher scores on this scale express both a higher quantity and quality of movement and a normalized use of the affected upper limb in the performance of activities. The measure is based on the patient's self-report and not on the direct assessment of their motor function.

- **Fugl-Meyer Assessment (FMA)**: Measures motor function, balance, sensation, and coordination in stroke patients.

The Fugl-Meyer Assessment (FMA) is a stroke-specific, performance-based impairment index. It is designed to assess motor functioning, sensation, balance, joint range of motion and joint pain in patients with post-stroke hemiplegia (Fugl-Meyer, Jaasko, Leyman, Olsson, & Steglind, 1975; Gladstone, Danells, & Black, 2002). It is applied clinically and in research to determine disease severity, describe motor recovery, and to plan and assess treatment.

Inclusion Criteria:

1. Sudden onset of an ischemic Cerebrovascular accident of < 3 months duration diagnosed by neurologist.
2. Ability to actively extend at least 10° at the metacarpophalangeal & interphalangeal joints and 20° at the wrist.
3. Middle Cerebral Artery stroke subjects.
4. History of not more than one stroke.

Exclusion Criteria:

1. Patient with any comorbidity or disability other than stroke that precludes upper-extremity training.
2. Any uncontrolled health condition for which exercise is contraindicated.
3. Excessive spasticity, defined as a grade of 3 or higher on the modified Ashworth scale.
4. Not participating in any experimental rehabilitation or drug studies.
5. Un co-operative patients

Hypothesis

Null Hypothesis (H0): There is no significant difference between Bobath approach and Conventional therapy in improving the upper limb function in post stroke patients.

Alternate Hypothesis (H1): There is significant in Bobath approach is more effective than Conventional therapy in improving the upper limb function in post stroke patients.

Statistical Analysis

Statistical analysis was performed using SPSS Version 20.0. Descriptive statistics were presented as mean $\pm$ standard deviation. Paired t-tests and one-way ANOVA were used to compare pre- and post-intervention results. A p-value of < 0.05 was considered statistically significant.

TABLE-1: ANALYSIS OF EFFECTIVENESS OF THE TREATMENT AMONG THE 2 GROUPS.

OTCOME MEASURES	GROUPS	N	MEAN $\pm$ STANDARAD DEVIATION	STANDARADERROR	95% CONFIDENCE INTERVAL FOR MEAN		P- VALUE
					LOWER BOUND	UPPER BOUND	
MAL PRE: AOU	A	18	1.8761 $\pm$ 0.08354	0.01969	1.8346	2.0177	0.05*
	B	18	1.7461 $\pm$ 0.04474	0.01055	1.7239	1.7684	
	Total	36	1.8178 $\pm$ 0.08767	0.01193	1.7938	1.8417	
MAL POST: AOU	A	18	2.1244 $\pm$ 0.066	0.01556	2.0916	2.1573	0.05*
	B	18	1.8689 $\pm$ 0.06388	0.01506	1.8371	2.0007	
	Total	36	2.0557 $\pm$ 0.08941	0.01217	2.0313	2.0801	
MAL PRE: QOM	A	18	1.8117 $\pm$ 0.07702	0.01815	1.7734	1.85	0.05*
	B	18	1.7644 $\pm$ 0.05125	0.01208	1.739	1.7899	
	Total	36	1.7476 $\pm$ 0.09105	0.01239	1.7227	1.7724	
MAL POST QOM	A	18	2.0417 $\pm$ 0.06627	0.01562	2.0087	2.0746	0.05*
	B	18	1.7822 $\pm$ 0.06656	0.01569	1.7491	1.8153	
	Total	36	1.8737 $\pm$ 0.09215	0.01254	1.8486	1.8989	
FMA PRE TESTS	A	18	38.51 $\pm$ 3.09	0.728	37.07	40.15	0.05*
	B	18	33.78 $\pm$ 2.734	0.545	32.42	35.14	
	Total	36	35.75 $\pm$ 3.434	0.467	34.81	36.79	
FMA POST TESTS	A	18	50.57 $\pm$ 3.841	0.829	48.71	52.53	0.05*
	B	18	43.78 $\pm$ 2.734	0.545	42.42	45.14	
	Total	36	46.7 $\pm$ 4.276	0.582	45.54	47.77	

MAL=MOTOR ACTIVITY LOG,AOU=AMOUNT OF USE,QOM=QUALITY OF LIFE,FMA=FUGL MEYER ASSESSMENT *0.00= Highly significant

ONE-WAY ANOVA ANALYSIS

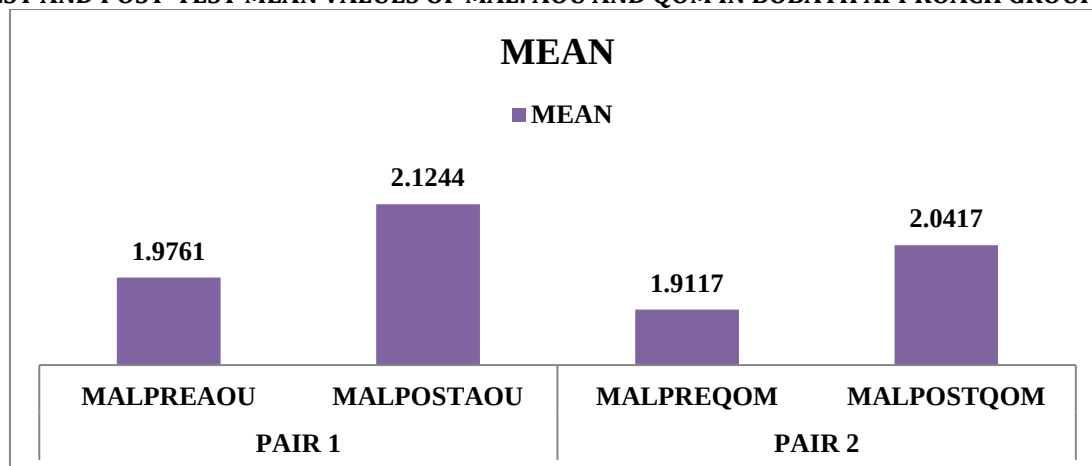
TABLE-4.2: ANALYSIS OF PRE AND POST INTERVENTION OF UPPER LIMB FUNCTION IN BOBATH APPROACH.

GROUP A	OUTCOME MEASURES	N	MEAN $\pm$ STANDARAD DEVIATION	STANDARAD ERROR MEAN	P-VALUE
PAIR 1	MAL PRE:AOU	18	1.8761 $\pm$ 0.08354	0.01969	0.05*
	MAL POST:AOU	18	2.1244 $\pm$ 0.066	0.01556	
PAIR 2	MAL PRE:QOM	18	1.8117 $\pm$ 0.07702	0.01815	0.05*
	MAL POST:QOM	18	2.0417 $\pm$ 0.06627	0.01562	
PAIR 3	FMA PRETEST	18	38.51 $\pm$ 3.09	0.728	0.05*
	FMA POSTTEST	18	50.57 $\pm$ 3.841	0.829	

MAL=MOTOR ACTIVITY LOG,AOU=AMOUNT OF USE,QOM=QUALITY OF LIFE,FMA=FUGL MEYER ASSESSMENT

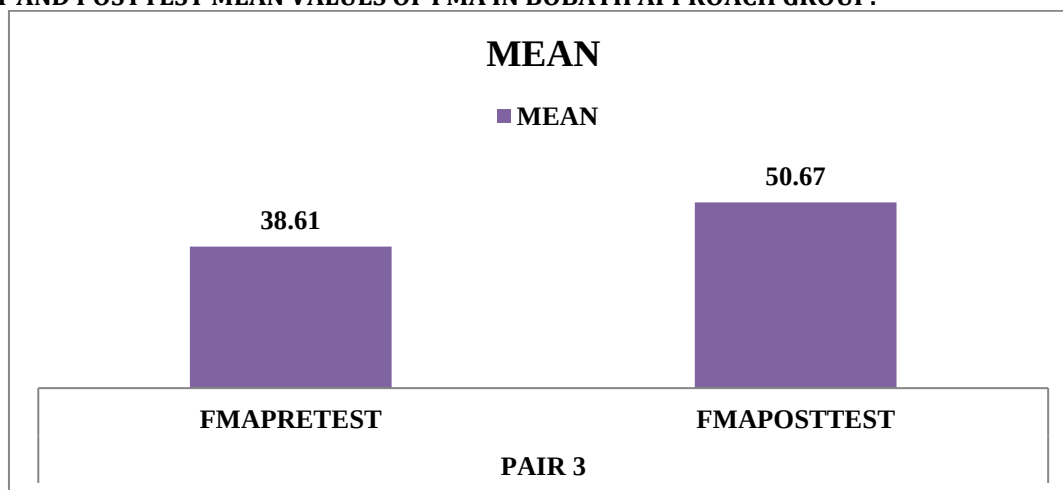
*0.00= Highly Significant

The improvement of upper limb function of Group A was recognized by increase in MAL and FMA score. For this MAL and FMA was noted on the first day and last day(after 4weeks) of treatment for all subjects. However the difference between the 2 scores was considered for analysis of difference between the pre and post-tests values.

PRE-TEST AND POST-TEST MEAN VALUES OF MAL: AOU AND QOM IN BOBATH APPROACH GROUP.

MAL=MOTOR ACTIVITY LOG,AOU=AMOUNT OF USE,QOM=QUALITY OF LIFE

The average baseline MAL score in group A was AOU=1.876,QOM=1.811, which was increased to AOU=2.124, QOM=2.041 on last day(after 4 weeks) of the treatment.

PRETEST AND POSTTEST MEAN VALUES OF FMA IN BOBATH APPROACH GROUP.

FMA= FUGL MEYER ASSESSMENT

The average baseline FMA score in group A was 38.51,which was increased to 50.57 on last day(after 4 weeks) of the treatment.

TABLE-3: ANALYSIS OF PRE AND POST INTERVENTION OF UPPER LIMB FUNCTION IN CONVENTIONAL THERAPY.

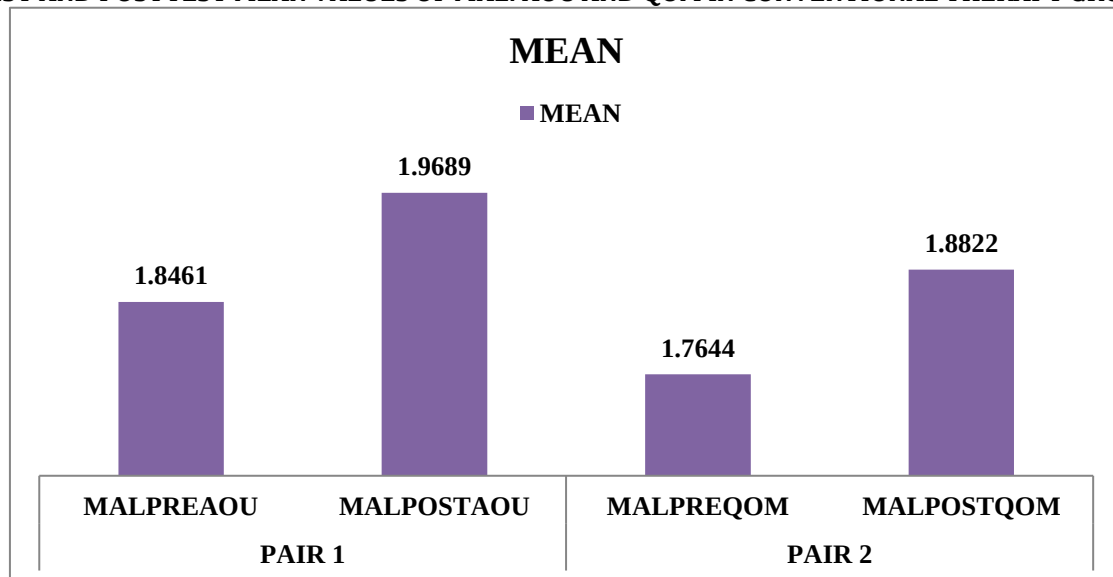
GROUP B	OUTCOME MEASURES	N	MEAN± STANDARAD DEVIATION	STANDARAD ERROR MEAN	P-VALUE
PAIR 1	MAL PRE:AOU	18	1.7461±0.04474	0.01055	0.05*
	MAL POST:AOU	18	1.8689±0.06388	0.01506	
PAIR 2	MAL PRE:QOM	18	1.7644±0.05125	0.01208	0.05*
	MAL POST:QOM	18	1.7822±0.06656	0.01569	
PAIR 3	FMA PRETEST	18	33.78±2.734	0.545	0.05*
	FMA POSTTEST	18	43.78±2.734	0.545	

MAL=MOTOR ACTIVITY LOG,AOU=AMOUNT OF USE,QOM=QUALITY OF LIFE,FMA=FUGL MEYER ASSESSMENT

*0.00= Highly significant

The improvement of upper limb function of Group B was recognized by increase in MAL and FMA score. For this MAL and FMA was noted on the first day and last day(after 4weeks) of treatment for all subjects. However the difference between the 2 scores was considered for analysis of difference between the pre and post-tests values.

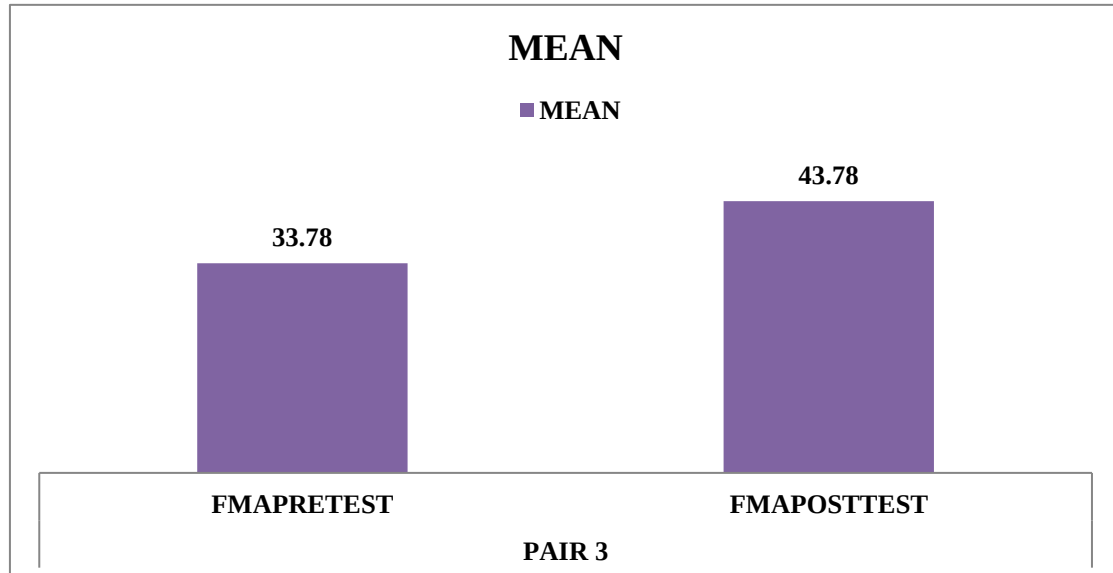
PRETEST AND POSTTEST MEAN VALUES OF MAL: AOU AND QOM IN CONVENTIONAL THERAPY GROUP.



MAL=MOTOR ACTIVITY LOG,AOU=AMOUNT OF USE,QOM=QUALITY OF LIFE

The average baseline MAL score in Group B was AOU=1.746,QOM=1.764, which was increased to AOU=1.868, QOM=1.782 on last day(after 4 weeks) of the treatment.

PRE-TEST AND POST-TEST MEAN VALUES OF FMA IN CONVENTIONAL THERAPY GROUP.



FMA=FUGL MEYER ASSESSMENT

The average baseline FMA score in group B was 33.78,which was increased to 43.78 on last day(after 4 weeks) of the treatment.

There was highly significant difference between the FMA score in the subjects in Conventional group ($p < 0.00$).

Results

The study found significant improvements in upper limb function in the Bobath group compared to the conventional therapy group. The mean FMA score in Group A increased from 38.51 to 50.57, while in Group B, it increased from 33.78 to 43.78 ($p < 0.05$). Similarly, MAL scores improved more significantly in Group A than in Group B, indicating that the Bobath approach is more effective for upper limb rehabilitation.

Outcome Measure	Group	Pre-Test Mean	Post-Test Mean	p-value
MAL (AOU)	A	1.876	2.124	0.05*
MAL (AOU)	B	1.746	1.868	0.05*
FMA	A	38.51	50.57	0.05*
FMA	B	33.78	43.78	0.05*

Change in Motor Activity Log (MAL) Scores

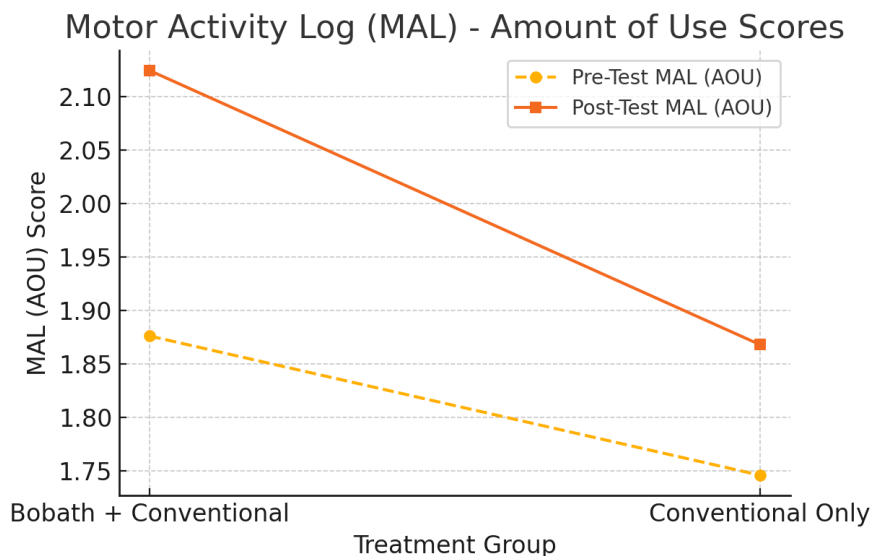


Figure 1: Comparison of Pre- and Post-Intervention MAL Scores in the Bobath and Conventional Therapy Groups.

Change in Fugl-Meyer Assessment (FMA) Scores

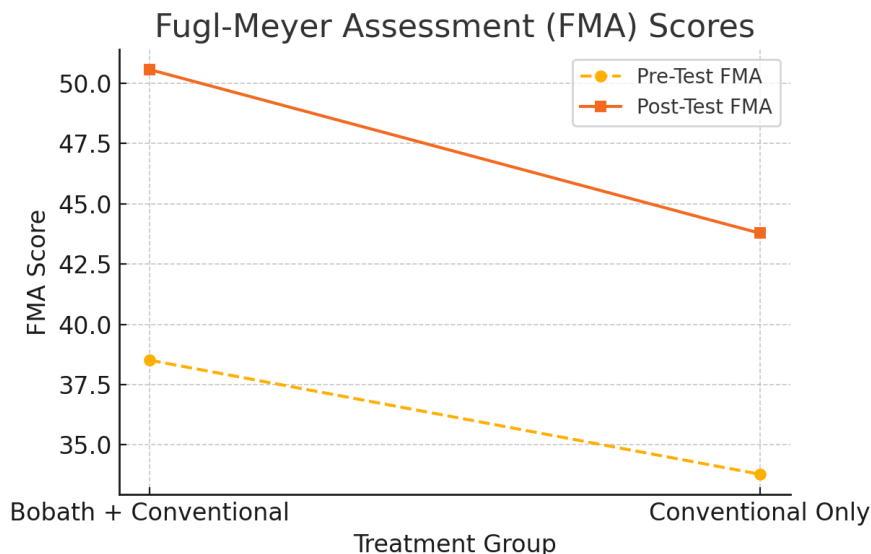


Figure 2: Comparison of Pre- and Post-Intervention FMA Scores in the Bobath and Conventional Therapy Groups.

Discussion

The findings suggest that the Bobath approach is beneficial for improving upper limb function and trunk stability in post-stroke patients. Compared to conventional therapy, Bobath therapy focuses on postural control and movement coordination, leading to better functional outcomes. However, some studies indicate that task-specific training and robotic therapy may provide comparable or better results.

Conclusion

The study concludes that the Bobath approach is an effective rehabilitation technique for improving upper limb function and trunk control in post-stroke patients. Further research with larger sample sizes and longer intervention durations is recommended to validate these findings

Recommendations

- Implementing Bobath therapy in early stroke rehabilitation.
- Exploring combination therapies for enhanced recovery.
- Conducting long-term follow-up studies.
- Explore hybrid models combining Bobath therapy with robotic-assisted rehabilitation.

References

1. Lima RC, Teixeira-Salmela L, Michaelsen SM. Effects of trunk restraint in addition to home-based modified constraint-induced movement therapy after stroke: a randomized controlled trial. *International Journal of Stroke*. 2012 Apr;7(3):258-64.
2. Taylor FC, Suresh Kumar K. Stroke in India fact sheet (updated 2012). Hyderabad: South Asia Network for Chronic Disease. 2012.
3. Yen JG, Wang RY, Chen HH, Hong CT. Effectiveness of modified constraint induced movement therapy on upper limb function in stroke subjects. *Acta Neurol Taiwan*. 2005 Mar 1;14(1):16-20.
4. Ovbiagele B, Nguyen-Huynh MN. Stroke epidemiology: advancing our understanding of disease mechanism and therapy. *Neurotherapeutics*. 2011 Jul 1;8(3):319.
5. Kamalakannan S, Gudlavalleti AS, Gudlavalleti VS, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. *The Indian journal of medical research*. 2017 Aug;146(2):175.
6. Feys HM, De Weerdt WJ, Selz BE, Steck GA, Spichiger R, Vereeck LE, Putman KD, Van Hoydonck GA. Effect of a therapeutic intervention for the hemiplegic upper limb in the acute phase after stroke: a single-blind, randomized, controlled multicenter trial. *Stroke*. 1998 Apr 1;29(4):785-92.
7. Smania N, Gandolfi M, Paolucci S, Iosa M, Ianes P, Recchia S, Giovanzana C, Molteni F, Avesani R, Di Paolo P, Zaccala M. Reduced-intensity modified constraint-induced movement therapy versus conventional therapy for upper limbs rehabilitation after stroke: a multicenter trial. *Neurorehabilitation and neural repair*. 2012 Nov;26(9):1035-45.
8. Bang DH, Shin WS, Choi SJ. The effects of Bobath approach in subacute stroke: a double-blinded randomized controlled trial. *Clinical rehabilitation*. 2015 Jun;29(6):561-9.