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EFFECTIVENESS OF THE BOBATH APPROACH VERSUS CIMT IN IMPROVING HAND DEXTERITY AND QOL AMONG STROKE SURVIVORS

Original Research

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ABSTRACT

Background: Stroke significantly impairs hand dexterity and quality of life, affecting independence in daily activities. Rehabilitation plays a crucial role in restoring upper limb function, with the Bobath Approach and Constraint-Induced Movement Therapy (CIMT) being widely used interventions. While both therapies aim to improve motor recovery, CIMT emphasizes repetitive, task-specific training, whereas the Bobath Approach focuses on normalizing movement patterns. This study evaluates and compares the effectiveness of these two rehabilitation techniques in improving hand dexterity and quality of life among stroke survivors.

Objective: To determine the effects of the Bobath Approach versus CIMT on hand dexterity and quality of life in stroke survivors.

Methods: An experimental study was conducted on 32 stroke survivors (mean age: Bobath 55.2 ± 6.8 years, CIMT 54.9 ± 7.2 years) experiencing upper limb motor impairments. Participants were randomly assigned to Group A (Bobath) or Group B (CIMT). Hand dexterity was assessed using the Nine-Hole Peg Test (NHPT) and the Box and Block Test (BBT), while the Stroke-Specific Quality of Life Scale (SS-QOL) measured quality of life. The intervention lasted eight weeks, with sessions held three times per week for 45 minutes. Ethical approval was obtained, and data were analyzed using SPSS version 22.

Results: Both groups showed significant improvements ($p < 0.05$) in hand dexterity and quality of life. The CIMT group demonstrated superior reductions in NHPT completion time (46.5 ± 11.9 to 30.4 ± 8.2 seconds) compared to the Bobath group (45.8 ± 12.2 to 38.2 ± 9.8 seconds). BBT scores increased from 29.1 ± 6.8 to 42.6 ± 6.9 blocks/min in the CIMT group and from 28.6 ± 6.5 to 35.1 ± 7.3 blocks/min in the Bobath group. SS-QOL scores improved from 51.8 ± 9.3 to 69.8 ± 9.7 in the CIMT group and from 52.3 ± 8.9 to 65.7 ± 10.2 in the Bobath group.

Conclusion: CIMT was more effective than the Bobath Approach in improving fine motor skills, hand dexterity, and quality of life among stroke survivors. These findings highlight the clinical significance of task-specific training in stroke rehabilitation and suggest that CIMT should be considered as a primary intervention for optimizing motor recovery.

Keywords: Bobath Approach, Constraint-Induced Movement Therapy, Hand dexterity, Neurorehabilitation, Quality of Life, Stroke, Upper limb function.

INTRODUCTION

Stroke is a leading cause of long-term disability, affecting millions of individuals worldwide each year. According to the World Health Organization (WHO), approximately 15 million people suffer a stroke annually, resulting in 5 million fatalities and another 5 million individuals experiencing permanent disability (1,2). In Pakistan, the estimated incidence of stroke is between 250 and 350 per 100,000 individuals, with an increasing trend due to risk factors such as hypertension and physical inactivity (3). Globally, stroke is one of the primary causes of neurological impairment, affecting an estimated 13 million individuals annually (4). It occurs due to an interruption in cerebral blood supply or the rupture of a brain artery, leading to significant morbidity and mortality (5). The impact of stroke is particularly severe in low- and middle-income countries, where over two-thirds of all stroke-related deaths occur. By 2030, cerebrovascular disease is projected to become the leading cause of mortality in these regions (6). One of the most debilitating consequences of stroke is impaired hand function, which significantly affects activities of daily living such as dressing, cooking, and handling tools (7). Functional recovery following stroke is a complex and iterative process aimed at restoring motor, cognitive, emotional, social, and physical abilities to improve independence and quality of life (8). Among stroke survivors, a common and persistent challenge is the inability to open the affected hand, leading to long-term disability and reduced quality of life (9). The primary goal of post-stroke rehabilitation is to improve motor control, strength, stability, and functional use of the affected upper limb, ultimately enhancing the individual's independence (10). Despite advancements in rehabilitation techniques, treatment options for individuals with severe upper extremity paralysis remain limited, necessitating the exploration of effective therapeutic approaches (11,12).

Two widely used rehabilitation techniques for upper limb recovery in stroke survivors are the Bobath Approach and Constraint-Induced Movement Therapy (CIMT). The Bobath Approach, introduced in the 1950s, remains one of the most commonly utilized methods for stroke rehabilitation. This approach emphasizes restoring movement patterns by normalizing muscle tone and facilitating voluntary motor control through key body areas, such as the shoulders, trunk, pelvis, and limbs. It is based on the premise that motor control is influenced by an individual's interaction with their environment and intrinsic personal characteristics (13). Bobath therapy aims to enhance motor recovery without promoting compensatory movements, thereby fostering improved functional outcomes in stroke survivors (14). Conversely, CIMT is a neurorehabilitation technique that encourages the use of the affected limb by restricting movement of the unaffected side. This therapy has gained recognition for its ability to improve upper limb function in stroke survivors by promoting functional retraining and neuroplasticity (15,16). Given the significant burden of stroke-related disability and the need for effective rehabilitation strategies, it is imperative to evaluate the comparative effectiveness of the Bobath Approach and CIMT in improving hand dexterity and quality of life among stroke survivors. This study aims to determine the impact of these two rehabilitation techniques, providing evidence-based insights to optimize post-stroke rehabilitation and enhance patient outcomes.

METHODS

An experimental study was conducted to evaluate the effectiveness of the Bobath Approach versus Constraint-Induced Movement Therapy (CIMT) in improving hand dexterity and quality of life among stroke survivors experiencing upper limb motor deficits. A total of 32 participants were recruited from Jinnah Hospital and Ganga Ram Hospital, Lahore, using a simple random sampling technique to ensure unbiased selection. Stroke survivors aged between 40 and 65 years, of both genders, who had experienced a stroke at least six months prior to enrollment and exhibited some degree of voluntary movement in the affected upper limb were included. Specifically, participants were required to have at least a Brunnstrom stage 3 or above in the affected upper limb, indicating some active movement. Exclusion criteria included individuals with severe cognitive impairment (e.g., Mini-Mental State Examination score <24), Parkinson's disease, multiple sclerosis, or those with severe impairments in hand movement, such as complete spasticity (Modified Ashworth Scale grade ≥3) or flaccidity with no active movement (Brunnstrom stage 1 or 2). Additionally, participants who had undergone intensive upper limb rehabilitation within the last six months or had uncontrolled hypertension (systolic blood pressure >180 mmHg or diastolic >110 mmHg) were excluded to ensure homogeneity of the study sample.

Participants were randomly assigned to two intervention groups using a computer-generated randomization sequence. Group A received rehabilitation based on the Bobath Approach, while Group B underwent CIMT therapy. Hand dexterity was assessed using the Nine-Hole Peg Test (NHPT) for fine motor skills and the Box and Block Test (BBT) for gross motor function. Quality of life was evaluated

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using the Stroke-Specific Quality of Life Scale (SS-QOL). The intervention lasted eight weeks, with each session lasting 45 minutes, conducted three times per week. Ethical approval was obtained from the institutional review board (IRB), and written informed consent was obtained from all participants before study enrollment. Ethical considerations included ensuring confidentiality, voluntary participation, and adherence to the principles outlined in the Declaration of Helsinki. Statistical analysis was conducted using SPSS version 22. Descriptive statistics, including mean and standard deviation, were used to summarize demographic and baseline characteristics. The Shapiro-Wilk test was performed to assess the normality of the data distribution. Between-group comparisons were conducted using an independent t-test for normally distributed continuous variables and the Mann-Whitney U test for non-normally distributed variables. Categorical data were analyzed using the chi-square test or Fisher's exact test, as appropriate. A significance level of $p<0.05$ was considered statistically significant.

RESULTS

The study findings revealed significant improvements in hand dexterity and quality of life among stroke survivors following intervention with the Bobath Approach and Constraint-Induced Movement Therapy (CIMT). The mean age of participants in the Bobath and CIMT groups was 55.2 ± 6.8 years and 54.9 ± 7.2 years, respectively. Gender distribution was nearly equal in both groups, with 16 males and 14 females in the Bobath group and 15 males and 15 females in the CIMT group. The affected side distribution was comparable, with 17 participants exhibiting left-sided impairment and 13 with right-sided impairment in the Bobath group, while the CIMT group had 18 left-sided and 12 right-sided impairments. The mean time since stroke was 7.1 ± 2.5 months for the Bobath group and 6.9 ± 2.7 months for the CIMT group. Within-group analysis demonstrated notable improvements in both groups after intervention. The Bobath group exhibited a reduction in Nine-Hole Peg Test (NHPT) completion time from 45.8 ± 12.2 seconds to 38.2 ± 9.8 seconds, while the CIMT group showed a greater reduction from 46.5 ± 11.9 seconds to 30.4 ± 8.2 seconds. Similarly, the Box and Block Test (BBT) scores increased from 28.6 ± 6.5 to 35.1 ± 7.3 blocks per minute in the Bobath group and from 29.1 ± 6.8 to 42.6 ± 6.9 blocks per minute in the CIMT group. Quality of life, assessed through the Stroke-Specific Quality of Life Scale (SS-QOL), improved from 52.3 ± 8.9 to 65.7 ± 10.2 in the Bobath group and from 51.8 ± 9.3 to 69.8 ± 9.7 in the CIMT group.

Between-group analysis revealed statistically significant differences in outcome measures, favoring CIMT over the Bobath Approach. The reduction in NHPT completion time was greater in the CIMT group (16.1 ± 2.5 seconds) compared to the Bobath group (7.6 ± 2.1 seconds) ($p < 0.001$). Similarly, BBT performance improved significantly in the CIMT group (13.5 ± 1.8 blocks/min) compared to the Bobath group (6.5 ± 1.5 blocks/min) ($p < 0.001$). The improvement in SS-QOL scores was also superior in the CIMT group (18.0 ± 2.6) compared to the Bobath group (13.4 ± 2.3) ($p < 0.001$). These findings indicate that while both rehabilitation approaches were effective, CIMT led to more substantial improvements in hand dexterity and quality of life among stroke survivors.

Table 1: Demographic Characteristics

Characteristics	Bobath Group (n=30)	CIMT Group (n=30)
Age (years)	55.2 ± 6.8	54.9 ± 7.2
Gender (M/F)	16/14	15/15
Affected Side (Left/Right)	17/13	18/12
Time since stroke (months)	7.1 ± 2.5	6.9 ± 2.7

Table 2 within-group analysis of outcome measures before and after the intervention.

Outcome Measures	Bobath Group (Pre)	Bobath Group (Post)	CIMT Group (Pre)	CIMT Group (Post)
Nine-Hole Peg Test (NHPT) (seconds)	45.8 ± 12.2	38.2 ± 9.8	46.5 ± 11.9	30.4 ± 8.2
Box and Block Test (BBT) (blocks/min)	28.6 ± 6.5	35.1 ± 7.3	29.1 ± 6.8	42.6 ± 6.9
Stroke-Specific Quality of Life (SS-QOL)	52.3 ± 8.9	65.7 ± 10.2	51.8 ± 9.3	69.8 ± 9.7

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Table 3 between-group analysis of changes in outcome measures, including statistical significance (p-values).

Outcome Measures	Bobath Group	CIMT Group	p-value
NHPT (seconds)	7.6 ± 2.1	16.1 ± 2.5	< 0.001
BBT (blocks/min)	6.5 ± 1.5	13.5 ± 1.8	< 0.001
SS-QOL	13.4 ± 2.3	18.0 ± 2.6	< 0.001

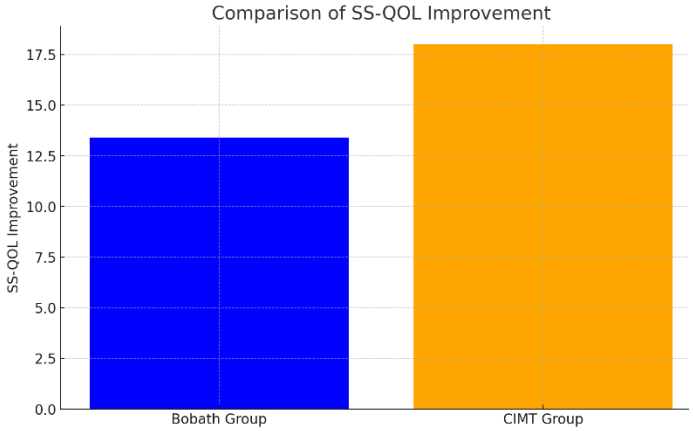

Figure 2 Comparison of SS- QOL Improvement

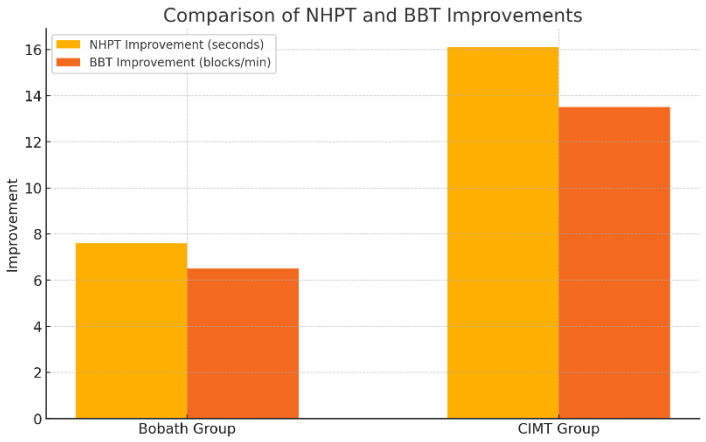

Figure 1 Comparison of NHPT and BBT Improvements

DISCUSSION

The findings of the study demonstrated that Constraint-Induced Movement Therapy (CIMT) led to significantly greater improvements in hand dexterity and quality of life among stroke survivors compared to the Bobath Approach. These results align with previous research, which has highlighted the effectiveness of CIMT in enhancing motor function by encouraging the active use of the affected limb. The significant reduction in Nine-Hole Peg Test (NHPT) completion time observed in the CIMT group suggests superior fine motor coordination and control compared to the Bobath group. The greater improvement in NHPT scores supports existing evidence that CIMT promotes neuroplasticity and facilitates motor skill refinement through repetitive and task-specific training (17). The Box and Block Test (BBT) results further reinforced the superiority of CIMT in enhancing gross manual dexterity. Participants in the CIMT group exhibited a marked increase in the number of blocks transferred per minute, indicating improved speed and precision in upper limb function. These findings are consistent with previous studies that have demonstrated the positive impact of CIMT in accelerating motor recovery through intensive and structured rehabilitation techniques. Although the Bobath Approach also yielded improvements in BBT scores, the extent of progress remained comparatively lower, which may be attributed to the emphasis of Bobath therapy on normalizing movement patterns rather than specifically targeting functional hand use (18).

Quality of life, assessed through the Stroke-Specific Quality of Life (SS-QOL) scale, improved in both groups, reflecting the overall benefits of structured rehabilitation in post-stroke recovery. However, the CIMT group exhibited greater improvements, suggesting that the restoration of functional upper limb use plays a pivotal role in enhancing perceived well-being and independence. The observed differences may be attributed to the intensive and task-oriented nature of CIMT, which reinforces motor learning and encourages real-life application of improved motor skills, thereby promoting greater engagement in daily activities (19). While these findings contribute to the growing body of evidence supporting CIMT, certain limitations must be acknowledged. The study was conducted over an eight-week period, limiting the ability to assess the long-term sustainability of the observed improvements. A follow-up assessment after several months would provide valuable insights into the retention of motor gains and quality-of-life enhancements. Additionally, the sample size was relatively small, which may restrict the generalizability of the findings to broader stroke populations. Future research with larger cohorts and multicenter trials would strengthen the evidence base and allow for more robust conclusions. Another limitation

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is the exclusion of individuals with severe upper limb impairments, which may limit the applicability of the results to patients with more profound motor deficits. Incorporating a more diverse range of stroke severities in future studies would provide a comprehensive understanding of the effectiveness of these rehabilitation techniques across different patient subgroups (20).

Despite these limitations, the study holds notable strengths, including the use of validated assessment tools for hand dexterity and quality of life, as well as the application of standardized rehabilitation protocols. The randomized group allocation minimized potential selection bias, ensuring a balanced comparison between interventions. The findings reinforce the efficacy of CIMT in post-stroke rehabilitation and underscore the importance of incorporating structured, task-oriented training to optimize motor recovery. Further exploration of the optimal duration, intensity, and individualized adaptations of CIMT would enhance its applicability and maximize its therapeutic potential for stroke survivors.

CONCLUSION

The study demonstrated that Constraint-Induced Movement Therapy (CIMT) was more effective than the Bobath Approach in enhancing fine motor skills, hand dexterity, and overall quality of life in stroke survivors. Both rehabilitation techniques contributed to functional recovery; however, CIMT led to more substantial improvements, highlighting its potential as a preferred intervention for upper limb rehabilitation. These findings emphasize the importance of structured, task-specific training in post-stroke motor recovery and suggest that incorporating CIMT into rehabilitation programs could optimize functional outcomes and promote greater independence in daily activities.

AUTHOR CONTRIBUTIONS

Author	Contribution
Asha	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Yasir Ali Kazmi	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Hifza Riaz*	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Sarfraz Ahmad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Faria Ali Shahid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Bisma Hanif	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Syed Saqlain Babar	Contributed to study concept and Data collection Has given Final Approval of the version to be published

REFERENCES

1. Díaz-Arribas MJ, Martín-Casas P, Cano-de-la-Cuerda R, Plaza-Manzano G. Effectiveness of the Bobath concept in the treatment of stroke: a systematic review. Disabil Rehabil. 2020;42(12):1636-49.

2. Murphy SJ, Werring DJ. Stroke: causes and clinical features. Medicine. 2020;48(9):561-6.

3. Rashid MH, Yaseen G, Ghaffar U, Khan AA, Kabir A, Aisha A, et al. Prevalence of acute coronary syndrome and various risk factors in acute stroke patients. Cureus. 2020;12(8).

4. Scrivener K, Dorsch S, McCluskey A, Schurr K, Graham PL, Cao Z, et al. Bobath therapy is inferior to task-specific training and not superior to other interventions in improving lower limb activities after stroke: a systematic review. J Physiother. 2020;66(4):225-35.

5. Sherin A, Ul-Haq Z, Fazid S, Shah BH, Khattak MI, Nabi F. Prevalence of stroke in Pakistan: Findings from Khyber Pakhtunkhwa integrated population health survey (KP-IPHS) 2016-17. Pakistan journal of medical sciences. 2020;36(7):1435.

6. Stinear CM, Lang CE, Zeiler S, Byblow WD. Advances and challenges in stroke rehabilitation. The Lancet Neurology. 2020;19(4):348-60.

7. Bastola P, Singh P, Pinto D. A comparison of the effect of resistance training on upper extremity motor function, motor recovery, and quality of life in sub-acute stroke participants. Medical Journal of Dr DY Patil University. 2021;14(2):219-25.

8. Farooq A, Venketasubramanian N, Wasay M. Stroke care in Pakistan. Cerebrovascular Diseases Extra. 2021;11(3):118-21.

9. Handoko T, Susilo TE, Fauziah MR, editors. Improving Post Stroke Functional Ability Using The Bobath Concept: a Case Report. Academic Physiotherapy Conference Proceeding; 2021.

10. Mohamed R, Yousef A, Radwan N, Ibrahim M. Efficacy of different approaches on quality of upper extremity function, dexterity and grip strength in hemiplegic children: a randomized controlled study. European Review for Medical & Pharmacological Sciences. 2021;25(17).

11. Platz T, Schmuck L, Roschka S, Burridge J. Arm rehabilitation. Clinical Pathways in Stroke Rehabilitation: Evidence-based Clinical Practice Recommendations. 2021:97-121.

12. Rocha LSO, Gama GCB, Rocha RSB, de Barros Rocha L, Dias CP, Santos LLS, et al. Constraint induced movement therapy increases functionality and quality of life after stroke. Journal of Stroke and Cerebrovascular Diseases. 2021;30(6):105774.

13. Grozdek Čovčić G, Jurak I, Telebuh M, Maček Z, Bertić Ž, Žura N, et al. Effects of Bobath treatment and specific mobilizations on gait in stroke patients: A randomized clinical trial. NeuroRehabilitation. 2022;50(4):493-500.

14. Kim MG, Lee SA, Park EJ, Choi MK, Kim JM, Sohn MK, et al. Elastic Dynamic Sling on Subluxation of Hemiplegic Shoulder in Patients with Subacute Stroke: A Multicenter Randomized Controlled Trial. Int J Environ Res Public Health. 2022;19(16).

15. Rupasinghe CD, Bokhari SA, Lutfi I, Noureen M, Islam F, Khan M, et al. Frequency of stroke and factors associated with it among old age hypertensive patients in Karachi, Pakistan: a cross-sectional study. Cureus. 2022;14(3).

16. Dorsch S, Carling C, Cao Z, Fanayan E, Graham PL, McCluskey A, et al. Bobath therapy is inferior to task-specific training and not superior to other interventions in improving arm activity and arm strength outcomes after stroke: a systematic review. J Physiother. 2023;69(1):15-22.

17. Sütçü G, Özçakar L, Yalçın A, Kılınç M. BOBATH vs. TASK-ORIENTED TRAINING AFTER STROKE: An assessor-blind randomized controlled trial. Brain Inj. 2023;37(7):581-7.

18. Akgün İ, Demirbüken İ, Timurtaş E, Pehlivan MK, Pehlivan AU, Polat MG, et al. Exoskeleton-assisted upper limb rehabilitation after stroke: a randomized controlled trial. Neurol Res. 2024;46(11):1074-82.

19. Damiano D, Novak I. Bobath, NeuroDevelopmental Therapy, and clinical science: Rebranding versus rigor. Dev Med Child Neurol. 2024;66(5):668.

20. Zhang J, Mao W, Dai F, Wu M, Yang K, Qin X, et al. Tongdu Tiaoshen acupuncture combined with Bobath rehabilitation training for upper limb spasm after stroke: a randomized controlled trial. Zhongguo Zhen Jiu. 2024;44(1):43-7.