Comparison of Bobath Technique and Constraint Induced Movement Therapy in Stroke Rehabilitation: A Systematic Review

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ABSTRACT

Stroke is a "neurological deficit attributed to an acute focal injury of the central nervous system by a vascular cause. Stroke is the second leading cause of death (11.6% of total death globally) and the major cause of disability globally, affecting >80 million survivors. As the individuals with stroke have various degree of disabilities depending upon the site being affected by CVA. The primary goal for the stroke survivors are to prevent them from disabilities, regain motor control and make them functionally independent to improve their quality of life. Two modern techniques including CIMT and Bobath is used as a treatment technique in the rehabilitation of stroke patients and is practiced in several countries. To assess the efficacy of Bobath technique and constrain induced movement therapy in improving motor function and functional independence in stroke survivors. To compare the outcomes of Bobath technique and constraint induced movement therapy in terms of motor recovery and functional independence in stroke survivors. A comparative effectiveness systematic review was conducted. The purpose of this systematic review was to compare the modern techniques and their effect in stroke rehabilitation. The data was collected by searching five different databases. A total of four trials were eligible for this systematic review. The quality of the eligible studies were assessed through PEdro scale. The four trials consist of a total of 273 patients of either sex. Age of the subjects participated in the trial was 40 years and above. We compared two modern techniques including CIMT and Bobath. Numerous outcome measures were used in these four studies including Fugl-meyer assessment (FMA), Action research arm test (ARAT), graded wolf motor function test (GWMFT) and motor activity log (MAL), Jebsen Taylor hand function test (JTHFT), trunk impairment scale (TIS) and berg balance test (BBT). Both the techniques showed improvement in patients with stroke but CIMT showed better results than Bobath NDT in stroke rehabilitation. As per current systematic review which compared Bobath NDT to CIMT in stroke rehabilitation. Both the treatment protocols were found to be effective and made significant improvements in both experimental and control groups. But CIMT was found to be more effective than Bobath (NDT).

INTRODUCTION

Stroke affects over 80 million people worldwide and is the second greatest cause of mortality (11.6% of all deaths) as well as the main cause of disability[1]. Patients with damage to their central nervous systems were re-educated using both an orthopedic and compensatory approach prior to the development of neurophysiological approaches to rehabilitation. The orthopedic approach involved bracing, strengthening, and stretching the affected side while teaching the patient to become as independent as possible by relying more on the unaffected side[2]. The creation of new, modern treatments for individuals with neurological conditions coincided with developments in motor control and neurology throughout the past several decades. Worldwide, Bobath Concept is also known as neuro-developmental technique (NDT)[3]. Bobath is a therapeutic method that has been utilized in different countries to aid in the recovery of patients with strokes[3]. Bobath provided a neurophysiological explanation of movement failure in hemiplegia, highlighting that the patient must be actively involved for performing movement while the therapist uses reflex-inhibiting patterns and key areas of control to help them move[2]. Constraint-induced (CI) therapy has been proven to be an effective treatment method for stroke rehabilitation. It was originally used for the rehabilitation of upper limb motor function and gradually expanded to that of lower limb motor function recovery and aphasia treatment[4]. This approach involves restraining the unaffected limb while implementing an intensive motor activity training program focused on the paretic limb, aiming to improve or restore motor function. CIMT has demonstrated improvements in restoring the paretic limb's functioning, in the functional range of motion, and in lowering muscle tone, leading to a better quality of life[5]. As there was no clear consensus on which technique was more effective in stroke rehabilitation so we conducted a systematic review to compare the available evidence and determine the relative effectiveness of Bobath technique and constraint induced movement therapy.

MATERIALS AND METHODS

A quantitative approach was used to conduct comparative effectiveness systematic review as the aim was to compare the effectiveness of the bobath approach and constraint induced movement therapy (CIMT) in stroke rehabilitation. The study population was adults (>35 years) with ischemic stroke and hemorrhagic stroke. Patients with Acute as well as chronic ischemic stroke was included. A comprehensive search strategy was conducted to identify relevant research articles to be included in the SR. Databases including PubMed, CINAHL, embase, research gate and Google Scholar were searched. The search strategy included both free text and MeSH terms and the search syntax adjusted based on the requirements of each database. Three independent reviewers selected the studies that were relevant to the eligibility criteria based on articles titles and abstracts. The titles and abstracts of the studies rectified from the search were screened for eligibility. Full-text articles of potentially eligible studies were retrieved and reviewed for eligibility. Data was extracted from the eligible studies using a standardized data extraction form. The extracted data included study characteristics. Participant characteristics, intervention details and outcomes. The selected studies were analyzed to compare the outcomes of Bobath therapy and constraint induced movement therapy in terms of motor function and functional independence. The quality of the eligible studies were assessed through PEdro scale.

RESULTS AND DISCUSSIONS

Study Selection: A total of 3359 records were identified. Out of which 1356 studies were identified on Google scholar, 690 studies on PubMed, 1304 on Embase, 8 studies on research gate and 1 on CINAHL a total of 1994 studies were removed as they were duplicates. Titles and abstracts of 1365 studies were screened. 1343 studies were excluded for being irrelevant. 22 studies were found to be relevant and were assessed for eligibility. Out of them 18 studies were excluded for not meeting the eligibility criteria. Thus a total of 4 studies were included in the review. **(Fig. 1)** is PRISMA.
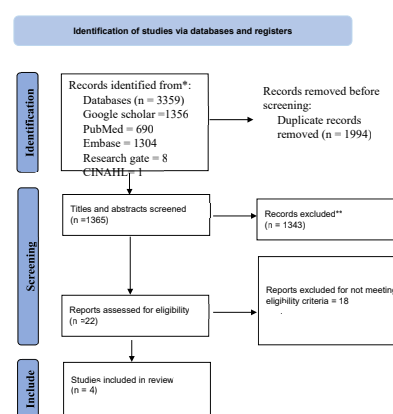

Fig 1: Prisma Flow Diagram

Study Characteristics: A summary of the characteristics of the include studies are mentioned in table 3. The randomized controlled trials published in the articles were all written in English. The most recent Study included in this systematic review was published in January and oldest one dates back to 2012. There were between 30 and 103 subjects in the sample. The four trials consist of a total of 273 patients of either sex. Age of the subjects participated in the trial was 40

Table 1: literature Matrix:

Intervention Author/study year	No of participants	Duration of intervention and its dosage	Intervention	Compative intervention	Outcome measures	Results
Fatima younas *et al* (2024)	66 patients (either sex) of chronic unilateral stroke with age 45-75 years	12 weeks for 1 hour and 3 days/week	Task oriented trunk training	Bobath based trunk training	Berg balance scale and task impairment scale	For each outcome measure the Task Oriented Trunk training group showed statistically significant improvements when comparison was made between task oriented trunk training group and Bobath based trunk training group (p<0.001)
Sumaya Manzoor *et al.* (2023)	74 patients (either sex) of chronic ischemic stroke with age 40-65 years	12 weeks for 45 minutes and 3 days/week	Task specific protocol with routine physical therapy	NDT with routine physical therapy	Modified ashworth scale (MAS) and fugl-meyer assesment scale (FMA)	TST group showed better results for spasticity than NDT group with p = 0.00. they also show better improvement in functional ability when compared to NDT group with a p-value of 0.00.
Bushra rehman *et al.* (2015)	30 (either sex) with sub-acute stage of stroke with age > 40 years	CIMT for 2 hours, 5 cosecutive days/week for 3 weeks. NDT protocol for 1.5 hours, 5 consective days /week for 4 weeks	NDT	CIMT	Wolf motor function test (WMFT) and Jebsen taylor hand function test (JTHFT)	There were no notable differences in both in posttest and follow up with a p value of 0.861 and 0.395 respectively. CIMT group showed more improvements for improving dexterity movements (apart from writing part, with a p value of 0.752 at post-test and checkers with a p value of 0.197 at post-test) when compared to the Bobath group.
Kamal Narayan *et al.* 2012	103 patients (62 men and 41 women) of sub-acute stage of stroke with hemiparesis and mean age of 50.93±7.78 years	For a duration of 1 hour , 4 to 5 days/week for 4 weeks	MTST	Bobath NDT	fugl-meyer assesment scale (FMA). Action research arm test (ARAT), graded wolf motor function test (GWMFT) and motor activity log (MAL)	For each outcome measures the MTST group showed statistically significant improvements when comparison was made between the MTST group and bobath NDT group (p<0.001)

Table 2: Study Quality Assessment

Study quality and risk of bias:

References	Pedro scale score										
	1	2	3	4	5	6	7	8	9	10	11
Fatima younas *et al.* (2024)	1	1	1	1	0	0	1	1	1	1	1
Sumaya manzoor *et al.* (2023)	1	1	1	1	0	1	1	1	1	1	1
Bushra rehman *et al.* (2015)	1	1	0	1	0	0	0	1	1	1	1
Kamal Narayan *et al.* (2012)	1	1	1	1	1	0	1	1	1	1	0

years and above. In one study participants included were with sub-acute stage of stroke, one with sub-acute as well chronic stroke patients and two studies including only chronic stroke patients. Out of these four studies, two of the trials were conducted in India and two in Pakistan. Numerous outcome measures are used in these four studies including Fugl-meyer assessment (FMA), Action research arm test (ARAT), gradedwolf motor function test (GWMFT) and motor activity log (MAL), Jebsen taylor hand function test (JTHFT), trunk impairment scale (TIS) and berg balance test (BBT).

As the individuals with stroke have various degree of disabilities depending upon the site being affected by CVA. The primary goal for the stroke survivors are to prevent them from disabilities, regain motor control and make them functionally independent to improve their quality of life. The purpose of this systematic review was to compare the modern techniques and their effect in stroke rehabilitation. We compared two modern techniques including CIMT and Bobath. Both the techniques showed improvement in patients with stroke but CIMT showed better results than Bobath NDT in stroke rehabilitation. A study conducted by[6] in Pakistan compared NDT with MRP in a randomized control trial of 80 patients. NDT and MRP along with routine physical therapy was given to patients with chronic stroke in age of 45-70 years for duration of 8 weeks. The mean spasticity of NDT group was 1.13±0.607 and the mean spasticity of MRP group was 0.65±0.622 which was significantly less than NDT group. Both was found to be effective in managing spasticity of upper extremity in patients with chronic stroke But MRP was found to be more effective and efficient in decreasing spasticity as compared to the NDT group.

Another study conducted in India in the year 2020 by Anandan.D *et al.* compared PNF with TST. A total of 74 patients with chronic stage MCA stroke of age ranging 56.44 ±7.05. One group was given PNF and the other group was given TST Exercise for 1 hour for 10 weeks duration. The study revealed that score for modified Ashworth scale was 6.16, the score for action reach arm test was 10.2, score for Berg balance scale was 18.9 and score for dynamic gait index was 10.3 at the level of p value 0.0001. TST protocol was found to be more effective than the PNF technique in patients with chronic stroke[7]. Batool *et al.* conducted a randomized control trial in Pakistan in the year 2015 compared CIMT with MRP. The study included 42 patients with ischemic and hemorrhagic stroke (sub-acute stage), age ranging between 35-60 years. Group A was given CIMT and group B was given MRP for a duration of 2 hours and 6 days/week for 3 weeks. The analaysis within the group of both the group for all MAS items was significant stasically (p<0.05). on the other hand the MRP group do not showed significant results for advanced hand activities item of MAS having a p-value of 0.059. The FIM Scale's self-care items gave a significant results in both groups (p-value<0.05), with the exception of the dressing upper body item (p-value=0.059) in the CIMT group and the grooming and dressing upper body item (p-value=0.059 and 0.063) in the MRP group. Thus the study concluded that the CMIT group was founf to be more effective than the MRP group in rehabilitation of patients with sub-acute stage of stroke[8]. Alaca *et al.* conducted a randomized controlled trial comprising of 45 patients, aged between 4080 years with chronic stroke (6 months ago). Group A was given only conventional physiotherapy, group B was conventional as well as PNF technique and group C was given conventional as well as mCIMT. All of them were given for 30 minutes BD, 5days/week for 6 weeks. Comparisons between the PTR-PT and PTR-mCMIT groups showed a statistically significant improvement in all scores (p = 0.006<0.001). Spasticity and motor function ratings were significantly improved in the PTR-mCIMT group as compared to the PTR (p<0.001) and PTR-PT groups (p=0.006-0.015) groups, according to intergroup comparisons. The study concluded that conventional physical therapy was not effective alone whereas when applied with proprioceptive training and mCIMT it was found to be effective, furthermore mCIMT showed better results as compared to proprioceptive training[9].

CONCLUSION

As per current systematic review which compared bobath NDT to CIMT in stroke rehabilitation. Both the treatment protocols were found to be effective and made significant improvements in both experimental and control groups. But CIMT was found to be more effective than Bobath (NDT).

Limitations: There were very few RCTs that compared NDT to CIMT so a very limited number of evidence was available. We also wanted to conduct an RCT in which we can compare NDT and CIMT but as there was no funding and stroke population available to us se we cannot conduct an RCT. Additionally while searching

for the available evidence on whether CIMT or NDT is best in stroke rehabilitation there were studies present on different databases that were not accessible to us as they were paid.

Recommendations: More trials should be conducted that compares NDT to CIMT or the comparison of different techniques to develop a treatment protocol that serves the best for people with stroke. There should be trials that should include only people with ischemic stroke as to find a protocol that is effective and efficient in prognosis of ischemic stroke survivors. A meta-analysis needs to be done to analyze the results of the selected RCT's to confirm their results. Additionally more such systematic reviews should be carried out that include all descriptive, observational and nonrandomized controlled trials.

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