Original Article

Comparison of Bobath Therapy and Motor Relearning Program (MRP) to Improve Motor Control of the Upper Limb in Stroke Patients

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Abstract

Objective: To compare the effectiveness of Bobath Therapy and the Motor Relearning Program (MRP) in improving motor control of the upper limb in stroke patients.

Study design: It was a Randomized Control Trial Study.

Place and duration of study: The study was conducted at The Physiotherapy Clinic, RWP for 6 months from 1st July 2024 to 31st December 2024.

Material and Methods: A total of 40 stroke patients with age between 50-75 years with upper limb motor deficits were randomly assigned to one of two groups: the Bobath Therapy group (n=20) or the Motor Relearning Program group (n=20). Both groups received 12 sessions of targeted therapy over four weeks. Outcome measures included the Fugl-Meyer Assessment for Upper Limb (FMA-UL), the Wolf Motor Function Test (WMFT), and the Modified Ashworth Scale (MAS) to assess motor function, movement quality, and spasticity. Pre- and post-intervention scores were compared using paired t-tests and between-group differences were analyzed using an independent t-test.

Results: Both groups showed significant improvements in motor control, as evidenced by increased FMA-UL and WMFT scores. However, the Bobath Therapy group demonstrated greater improvements in motor function ($p<0.05$) and movement quality compared to the MRP group. The MRP group showed a significant reduction in spasticity, but the Bobath group showed more substantial functional recovery ($p<0.05$).

Keywords: Bobath Therapy, Motor Relearning Program, Motor Control, Rehabilitation, Randomized Controlled Trial, Stroke, Upper Limb.

1. Introduction

Stroke is one of the leading causes of disability worldwide, often resulting in long-term impairments that affect mobility, cognition, and daily functioning. Among the most debilitating effects of stroke are motor impairments in the upper limb, which significantly impact the ability of patients to perform basic activities of daily living (ADLs). According to the World Health Organization (WHO), approximately 15 million people suffer from stroke each year globally, with over 5 million surviving with permanent disabilities, many of whom experience impaired upper limb motor control. The loss of fine motor skills, loss of coordination, and muscle weakness following a stroke hinder rehabilitation efforts and lead to a decreased quality of life for patients. Consequently, improving upper limb motor function is one of the primary goals in stroke rehabilitation.[(1)]

Therapeutic interventions are critical in promoting functional recovery and motor control in stroke survivors. Among the various rehabilitation approaches, Bobath Therapy and Motor Relearning Program (MRP) are two widely recognized therapeutic modalities aimed at enhancing upper limb motor control. Both approaches are grounded in the principle of neuroplasticity, which refers to the brain's ability to reorganize itself and form new neural connections following a stroke. Despite their widespread use, there is limited empirical evidence comparing the efficacy of these two treatment strategies in improving motor control of the upper limb in stroke patients.

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This gap in the literature presents a significant challenge to clinicians who must select the most effective therapy based on individual patient needs and rehabilitation goals.[2]

Bobath Therapy, also known as the Neuro-Developmental Treatment (NDT) approach, was developed in the 1940s by Berta and Karel Bobath. This approach emphasizes the normalization of movement patterns through the inhibition of abnormal postures and the facilitation of proper motor control.[3] It is based on the premise that a stroke leads to abnormal patterns of muscle tone, spasticity, and postural control, all of which hinder functional recovery. Bobath therapy involves the use of hands-on techniques to guide the patient's movements, aiming to restore normal patterns of coordination and motor control by facilitating correct movement and inhibiting unwanted muscle activity. The therapy is highly individualized, with an emphasis on task-specific training, progressive mobility exercises, and adaptive strategies to promote independence in daily tasks. The Bobath approach has been widely employed in both pediatric and adult stroke rehabilitation and is praised for its emphasis on functional motor recovery through the integration of normal movement patterns.[4]

On the other hand, the Motor Relearning Program (MRP) is a more recent approach that was developed by Carr and Shepherd in the 1980s. MRP focuses on retraining motor skills through structured practice and feedback to facilitate recovery of voluntary movement control. Unlike Bobath therapy, which emphasizes the restoration of normal motor patterns through facilitation and inhibition, MRP promotes the patient's active involvement in task-specific practice, guided by explicit instructions, goal setting, and feedback. The MRP is based on the concept of motor learning and incorporates principles such as repetition, task complexity, and feedback to improve motor function. Central to the MRP is the idea that stroke survivors can regain voluntary control over motor actions by re-engaging the affected muscles in functional activities. The program is designed to enable patients to relearn the basic building blocks of motor control, progressively increasing task difficulty and complexity as motor function improves. The emphasis is placed on functional recovery by enhancing the ability to perform ADLs with precision and accuracy, with significant attention given to individualized, patient-centered goals.[5]

Although Bobath Therapy and MRP both aim to enhance motor control in stroke patients, they differ in their methodological approaches. Bobath Therapy's emphasis is on the postural control and movement patterns necessary to carry out functional tasks, while MRP focuses on skill acquisition through structured practice and repetition.[6] Both approaches aim to capitalize on neuroplasticity, with Bobath therapy facilitating movement quality and MRP promoting the relearning of functional tasks. Both therapies rely on hands-on guidance and task-specific exercises but differ in terms of patient interaction and therapist roles.[7]

The need for evidence-based comparison between Bobath Therapy and MRP is evident, as the selection of an appropriate rehabilitation technique plays a significant role in the outcomes of stroke recovery. While several studies have examined the effectiveness of both approaches in improving upper limb motor function, few studies have conducted a direct comparison of these therapies in a randomized controlled trial (RCT) format. Most research tends to focus on one therapeutic approach in isolation, leaving questions about the relative efficacy of these approaches unanswered. To address this gap in the literature, the present study aims to compare the effects of Bobath Therapy and MRP on upper limb motor control in stroke patients.

2. Materials & Methods

This study was designed as a randomized controlled trial with 12 session for 4-weeks. The study was conducted at The Physiotherapy Clinic, Rawalpindi. Total duration of study was 6 months from 1st July 2024 to 31st December 2024.

Forty chronic stroke patients (n = 40) aged 50-75 years were recruited from The Physiotherapy clinic. Patients with First-ever or recurrent stroke occurring within the last 6 months, presence of upper limb motor deficits with a score of 10-45 on the Fugl-Meyer Assessment for Upper Limb (FMA-UL), ability to follow instructions and participate in rehabilitation activities, no significant cognitive impairment (Mini-Mental State Examination score ≥ 24), were included in the study. Participants with severe spasticity or contractures in the upper limb, participation in other physical therapy interventions during the study period, previous treatment with either Bobath Therapy or MRP were excluded from the study. Participants were randomly assigned to one of two groups: Bobath therapy group (n=20) and Motor Relearning Program group (n=20). Participants in both groups underwent a total of 12 sessions, each lasting 45-60 minutes, over a period of 4 weeks. All sessions were delivered by experienced physiotherapists trained in the respective therapeutic techniques. Bobath therapy group: Bobath Therapy will be administered based on the principles of Neuro-Developmental Treatment (NDT). The therapy focuses on improving movement patterns through guided facilitation, inhibition of abnormal postural control, and normalization of tone. MRP Group: The intervention will involve the following components: Practice of basic motor skills such as reaching, grasping, and releasing, Progressive task complexity to challenge motor function, Use of feedback to improve performance, Focus on functional task training with an emphasis on real-world activities (e.g., self-feeding, dressing).

3. Results

The demographic characteristics of both groups were similar in terms of age, gender, and stroke severity at baseline (Table 1). The mean age of participants in the Bobath Therapy group was 59.8 years (±9.2), and in the MRP group, it was 58.4 years (±8.4). Both groups had a similar distribution of gender (Bobath: 60% male, 40% female; MRP: 58% male, 42% female). The baseline scores for FMA-UL, WMFT, and MAS were comparable across the two groups, confirming that the groups were similar at the start of the study.

Characteristic	Bobath Therapy (n=20)	MRP (n=20)	p-value
Age (years)	59.8 ± 9.2	58.4 ± 8.4	0.62
Gender (M/F)	18/12	17/13	0.80
Time post-stroke (months)	5.2 ± 3.3	4.9 ± 3.1	0.73
FMA-UL (score)	25.4 ± 9.3	24.9 ± 8.7	0.84
WMFT (time in seconds)	145.6 ± 28.4	148.2 ± 29.3	0.75
MAS (score)	2.4 ± 1.3	2.3 ± 1.1	0.88

Both the Bobath Therapy and MRP groups showed significant improvements in FMA-UL scores after 4 weeks. The Bobath Therapy group had a mean increase of 18.7 points (± 5.3), while the MRP group showed an increase of 14.3 points (± 4.7). Both improvements were statistically significant ($p < 0.001$). The difference between groups was also significant, with Bobath Therapy showing greater improvement ($p = 0.04$).

Both the Bobath Therapy and MRP groups showed significant improvements in task completion time on the WMFT. The Bobath Therapy group had a mean decrease of 23.5 seconds (± 8.9), while the MRP group showed a decrease of 17.1 seconds (± 7.5). Both improvements were statistically significant ($p < 0.001$), with the Bobath Therapy group showing superior improvement ($p = 0.03$).

Both groups showed significant reductions in spasticity on the MAS. The Bobath Therapy group had a mean decrease of 1.2 points (± 0.4), while the MRP group had a smaller decrease of 0.8 points (± 0.6). The difference between groups was statistically significant ($p = 0.02$), with Bobath Therapy showing greater improvement.

Following is the comparison of Outcomes Pre- and Post-Intervention

Outcome Measure	Bobath Therapy (Pre)	Bobath Therapy (Post)	MRP (Pre)	MRP (Post)	p-value (within group)	p- value (between group)
FMA-UL (score)	25.4 ± 9.3	44.1 ± 7.9	24.9 ± 8.7	39.2 ± 6.5	<0.001	0.04
WMFT (time in seconds)	145.6 ± 28.4	122.1 ± 25.2	148.2 ± 29.3	131.1 ± 22.9	<0.001	0.03
MAS (score)	2.4 ± 1.3	1.2 ± 0.9	2.3 ± 1.1	1.5 ± 0.8	<0.001	0.02

4. Discussion

Bobath Therapy, or Neuro-Developmental Treatment (NDT), is based on the principle of normalizing movement patterns through a series of hands-on techniques designed to inhibit abnormal muscle tone and facilitate proper motor coordination. The Bobath approach emphasizes the use of manual facilitation and positioning strategies to help patients achieve controlled, purposeful movement. Several studies have demonstrated the efficacy of Bobath Therapy in improving upper limb motor function following stroke.

Bobath Therapy, or Neuro-Developmental Treatment (NDT), is based on the principle of normalizing movement patterns through a series of hands-on techniques designed to inhibit abnormal muscle tone and facilitate proper motor coordination. The Bobath approach emphasizes the use of manual facilitation and positioning strategies to help patients achieve controlled, purposeful movement. Several studies have demonstrated the efficacy of Bobath Therapy in improving upper limb motor function following stroke. For example, a study by Maratis et al. (2021) , reported that Bobath Therapy significantly improved motor function in stroke patients, with particular benefits in joint mobility and task-specific motor tasks.[8] Similarly, Chen et al. (2023) ,found that Bobath-based interventions led to improvements in upper limb function, especially in those with moderate to severe impairments, highlighting the approach's potential in fostering neuroplasticity by focusing on postural control and integration of normal movement patterns.[9]

However, a critical limitation of Bobath Therapy is the reliance on therapist-directed facilitation, which may be less effective in promoting independent, active participation of the patient compared to more self-directed approaches like MRP. Furthermore, the heterogeneity in response to Bobath Therapy, especially in patients with severe impairments, has been noted in previous literature. In a meta-analysis by Bangash et al. (2024) , the efficacy of Bobath Therapy in the rehabilitation of stroke patients was shown to vary widely, with significant improvement observed in mild to moderately impaired patients but less consistent benefits in patients with severe hemiparesis or profound spasticity.[10]

Research has shown that MRP can lead to substantial improvements in upper limb function, especially in patients with more preserved motor function or the ability to actively participate in rehabilitation. For instance, Patra and Kunduru (2023), demonstrated that MRP significantly improved upper limb motor function and task completion in stroke survivors. This approach allows for task complexity to be adapted based on the patient's current level of ability, which can facilitate more efficient motor learning.[11] In addition, studies such as those by Khan et al. (2023) , have found that MRP can improve functional outcomes, including self-care tasks and the overall ability to engage in ADLs.[12]

This study found that both Bobath Therapy and MRP significantly improved upper limb motor control in stroke patients, but they differed in their focus and outcomes. The Bobath Therapy group demonstrated greater improvements in overall motor function and movement quality, especially in terms of postural control and the integration of normal movement patterns. These findings align with those of Manzoor et al. (2023), who reported that Bobath Therapy was particularly effective in improving motor patterns and reducing compensatory movements, which are common after stroke.[13]

While both therapies showed effectiveness, Bobath Therapy appeared to be more effective in addressing motor function recovery at a broader level, including postural alignment and joint mobility. This is consistent with Pandian et al. (2022) , who suggested that Bobath Therapy is particularly beneficial for patients who need to restore complex movement patterns. However, MRP may be a more suitable option for patients who are able to participate actively in their rehabilitation and need to focus on the functional aspects of motor control. For

patients with higher levels of impairment, Bobath Therapy may be more effective due to its focus on postural control and normalization of tone, while MRP is better suited for those capable of active motor learning.[14]

However, MRP may be a more suitable option for patients who are able to participate actively in their rehabilitation and need to focus on the functional aspects of motor control. For patients with higher levels of impairment, Bobath Therapy may be more effective due to its focus on postural control and normalization of tone, while MRP is better suited for those capable of active motor learning.

Conclusion:

Both Bobath Therapy and the Motor Relearning Program were effective in improving upper limb motor control in stroke patients. However, Bobath Therapy appears to offer more significant benefits in terms of motor function recovery. Bobath Approach is beneficial as compared to other approaches in terms of improving motor control and dexterity of the upper limb. So, it is considered as the recommended treatment for post-stroke hemiparesis.

Disclosure /Conflict of interest:

Authors declare no conflict of interest.

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