Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/6heahr73

# TARGETED MOTOR RELEARNING STRATEGIES FOR DOMINANT UPPER LIMB REHABILITATION FOLLOWING MIDDLE CEREBRAL ARTERY STROKE: A CASE SERIES.

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## ABSTRACT

A short-term study on the Efficacy of the Motor Relearning Program (MRP) for Upper-Limb Function Improvement in the Affected Dominant Hand of MCA Stroke Patients: A Case Series Study.

**Background**: Middle cerebral artery (MCA) stroke often results in hemiparesis or hemiplegia, which impairs the dominant hand's function. Stroke rehabilitation strategies, particularly the Motor Relearning Program (MRP), have gained prominence in improving motor functions. This case series explores the application of MRP for upper-limb function recovery in MCA stroke patients.
**Objective**: To assess the effectiveness of the MRP in improving upper-limb motor function in MCA stroke patients, focusing on the recovery of the affected dominant hand.
**Methods**: Five MCA stroke patients with dominant hand impairment participated in this case series. MRP-based rehabilitation interventions were provided over 12 weeks. The outcome measures included the Fugl-Meyer Assessment (FMA), Action Research Arm Test (ARAT), and patient-reported outcomes on Activities of Daily Living (ADL).
**Results**: All patients demonstrated significant improvements in upper-limb function, particularly in motor control and task-oriented activities. There was notable progress in the FMA and ARAT scores, indicating enhanced motor recovery and functionality.
**Conclusion**: The Motor Relearning Program effectively facilitated functional recovery of the affected dominant hand in MCA stroke patients, showing promise as a targeted rehabilitation intervention for post-stroke motor impairments.

## INTRODUCTION

Stroke, a leading cause of adult disability worldwide, frequently affects the motor function of the upper limbs. Middle cerebral artery (MCA) strokes are particularly debilitating due to their involvement in the motor cortex, leading to hemiparesis or hemiplegia of the dominant hand. This impairment significantly reduces the ability to perform Activities of Daily Living (ADL), contributing to diminished independence and quality of life.

Rehabilitation is a crucial component of stroke recovery, with various approaches aiming to enhance motor function. The Motor Relearning Program (MRP), developed by Carr and Shepherd, is a task-oriented approach that focuses on improving functional movement patterns through repetitive practice, feedback, and motor learning principles. MRP has been effective in various neurological conditions, including stroke, by promoting neuro-plasticity and functional recovery.

This case series explores the application of MRP for improving the motor function of the affected dominant hand in MCA stroke patients. The objective is to evaluate the outcomes of MRP and provide insights into its potential as a standard intervention for stroke rehabilitation.

## METHODOLOGY

### Study Design:

This is a case series presentation based on five MCA post stroke, medically stable patients with hemiplegia in the dominant side.

All these participants were administrated with the tailored protocol, where task based approach on the principles of MRP was administrated. The interventions were tried on 12 weeks, the screening was done pre, post and on the therapy duration.

### Participants:

MCA stroke patients aged from 50 to 65, three males and two females were identified for the study based on the inclusion and exclusion criteria.

### Inclusion criteria:

- Medically stable MCA Stroke cases
- Domain hand involved, with moderate to severe impairment.
- First six months from the onset of stroke (Golden period of Recovery)
- No cognitive deficit

### Exclusion Criteria:

- Co-morbid conditions
- Recurrent stroke
- Psychological issues
- Unable to provide the written consent.

### Procedure:

Each patient's needs were met through the administration of the Motor Relearning Program (MRP). In order to detect the motor deficiencies, the task was first thoroughly examined. Next, the missing components' particular motions were used to exercise the patent. The tasks involving reaching, grabbing, and releasing were completed. Developed through a series of steps that built on previous work, moving from easy to difficult assignments. The patients were gradually exposed to professional responsibilities, moving on from ADLs. At last, patients were inspired to take initiative and practice what they had learnt in real-life settings.

Patients participated for 12 weeks, with each session lasting an hour and occurring five days a week.

### Outcome Measures:

The patients' improvement was evaluated using three critical outcome measures: First, there is the Fugl-Meyer Assessment (FMA), which is a popular tool for gauging motor function following a stroke. The motor function was quantified using the FMA's upper-limb portion. The second functional evaluation instrument is the Action Research Arm Test (ARAT), which examines the capacity to do particular activities like lifting and gripping.

Third, ADL Scale: Results those patients describe about their capacity to carry out everyday actions without assistance.

Initial examination: In order to determine the baseline motor function of each patient, an initial examination was performed using the FMA, ARAT, and ADL scale. For the purpose of analysing deficiencies and guiding the MRP, video recordings of movements of the upper limbs were made while the work was being performed.

- Rehabilitation Sessions: The MRP sessions started with a study of specific actions that the patients had difficulty with, such as pulling a button on a shirt or reaching for a cup. Following the completion of the analysis, the therapist offered comments and showed the appropriate movement patterns. The exercises were frequently executed by the patients, with the level of difficulty and complexity increasing with time. Each session included functional exercises, with a particular emphasis on bilateral activities, with the goal of stimulating communication between the two hemispheres of the brain as well as motor control.
- Evaluation at the halfway: Following a period of six weeks, an evaluation at the halfway was carried out in order to assess the achievement of the FMA and ARAT. Adjustments were made to the rehabilitation plan depending on the unique development of each patient, with the increased emphasis being placed on more difficult activities for patients who demonstrated improvement.
- Comprehensive Evaluation: At the conclusion of the twelve-week period, a thorough evaluation was carried out using the same methods of outcome measurement. Following the completion of the program, a follow-up evaluation was planned to take place three months later in order to evaluate the long-term retention of motor gains.

## RESULTS

All five patients in this case series had considerable improvements in upper-limb motor function, notably in task-oriented motions and functional independence, as indicated by the findings of this case series.

- FMA Scores: Patients reported an average improvement of 22 points in their FMA upper-limb scores (the baseline average was 37, and the end average was 59), which indicates that they made significant progress in their motor recovery.
- Scores on the ARAT: Patients showed a significant increase in their capacity to carry out functional tasks, with their ARAT scores improving by an average of 14 points (the average score at the beginning of the study was 19, and the average score at the end of the study was 33).
- Outcomes of tasks of Daily Living: The patient-reported outcomes on the ADL scale shown increases in the capacity to undertake self-care tasks. Three patients regained entire independence in dressing and eating themselves, while two patients exhibited partial independence.

Information collected from individual patients revealed that those who demonstrated a higher level of commitment to task-specific training and exercises performed at home saw improvements in functional outcomes that were both more rapid and more significant.

## DISCUSSION

The results of this pilot study had shown significance of Motor Relearning Program (MRP) as an effective tool in recovering dominant upper limb function in MCA post stroke patients. The recovery had noted progression in voluntary control, functional independence and activities of daily living. Thus the outcome had shown the facilitation of neural rewiring or brain plasticity that helped in the motor recovery, through customized MRP approach.

The improvement in motor control, functional independence, and daily task performance suggest that MRP can facilitate neuro-plastic changes and motor recovery through its repetitive, task-oriented approach.

MRP's focus on functional activities distinguishes it from other rehabilitation methods that primarily emphasize isolated motor training. By integrating real-world tasks into rehabilitation, MRP helps patients translate motor gains into practical improvements in daily life.

Several factors may have contributed to the variability in recovery between patients, including age, stroke severity, and the degree of cognitive engagement during rehabilitation. Patients with higher

cognitive function and greater motivation were more likely to adhere to the prescribed home exercises and demonstrated faster recovery.

Moreover, the structured feedback and task-specific practice provided in MRP align well with the principles of motor learning and neuro-plasticity, which are essential for stroke recovery. The positive outcomes observed in this study are consistent with previous research suggesting that task-oriented training can enhance motor function in stroke patients by reinforcing motor patterns and facilitating cortical reorganization.

## CONCLUSION

The Motor Relearning Program (MRP) is an effective rehabilitation approach for improving upper-limb function in MCA stroke patients with dominant hand impairment. The task-oriented nature of the MRP allowed patients to regain motor control, enhance functional independence, and improve their ability to perform ADLs. This case series highlights the importance of integrating functional tasks into stroke rehabilitation programs to optimize recovery.

Future studies with larger sample sizes and randomized controlled designs are recommended to further validate the findings of this case series. Additionally, exploring the long-term retention of motor improvements and the effects of different MRP intensities could provide further insights into optimizing rehabilitation outcomes for stroke patients.

## KEY TAKEAWAYS

- This case series demonstrates the potential of MRP to improve upper-limb function in MCA stroke patients.
- MRP's task-oriented approach, focusing on functional tasks and real-world applications, plays a crucial role in motor recovery.
- The study emphasizes the need for individualized interventions based on the patient's specific motor deficits and task performance.

sThis detailed structure follows a standard research paper format and can be used as a foundation for writing a journal-quality paper.

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