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# Impact of Motor Relearning Program on Balance Among MCA Stroke Patients

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***Abstract***
***Background:*** *One of the main causes of permanent impairment in the globe is stroke. Impaired balance is a common consequence of Middle Cerebral Artery (MCA) strokes, which raises the risk of falls and decreases independence. A task-specific technique called the Motor Relearning Program (MRP) aims to promote functional recovery. The study's goal is to assess how well the Motor Relearning Program improves balance in MCA stroke patients.* ***Methodology:*** *MCA stroke patients were the subjects of a pre-post interventional investigation. For [duration was 4 weeks], participants participated in MRP sessions five days a week. The Berg Balance Scale (BBS) and Functional Reach Test (FRT) were used to measure balance both before and after the intervention.* ***Results****: BBS ratings improved from before to after the intervention in a statistically significant way with mean difference = 42.8, $p < 0.05$. Additionally, there was a substantial rise in FRT scores with mean difference = 23.7, $p < 0.05$ and Mental State Examination also found improved with mean difference = 27.1, $p < 0.05$* ***Conclusion****: The Motor Relearning Program helps MCA stroke patients become more balanced, which may lower their risk of falling and increase their level of functional independence.*
***Keywords:*** *Motor Relearning Program, MCA Stroke, Balance, Rehabilitation, Berg Balance Scale.*

## INTRODUCTION

Stroke is a primary reason for adult disability globally. Middle Cerebral Artery (MCA) strokes represent the most prevalent form of ischemic strokes and frequently lead to considerable motor impairments, such as reduced balance and mobility. These disabilities heighten the chance of falls, restrict autonomy, and diminish overall quality of life. Balance impairment after a stroke can result from a mix of motor weakness, sensory loss, and inadequate postural control. Rehabilitation strategies that focus on these elements are crucial for effective recovery [1].

Stroke ranks among the leading causes of adult disability worldwide, with MCA territory infarcts representing around 70% of ischemic strokes. Balance dysfunction frequently arises from muscle weakness, sensory impairments, and modified postural regulation. Conventional rehabilitation frequently highlights passive methods, whereas modern strategies such as the Motor Relearning Program prioritize task-focused, functional training that promotes active engagement and neuroplastic adaptations [2,3].

**Motor Relearning Program (MRP):** Despite its theoretical advantages, much evidence is available on the effectiveness of MRP specifically on balance in MCA stroke patients, underscoring the need for focused research. The Motor Relearning Program (MRP) is a task oriented approach developed by Carr and Shepherd.
Analysis of motor tasks, Practice of components and whole tasks, Use of feedback to improve performance, Elimination of unnecessary muscle activity, Encouraging normal movement patterns. Unlike traditional approaches that may rely heavily on passive techniques, MRP actively engages the patient in practicing meaningful tasks, which may facilitate neuroplasticity and functional reorganization [4,5].

**Rationale:** Balance is crucial for performing daily activities safely and effectively. Given that MRP focuses on functional task practice, it has the potential to improve dynamic and static balance by retraining anticipatory and reactive postural adjustments.

Patients undergoing MRP are expected to show significant improvement in balance compared to baseline. Improved balance would reduce the risk of falls, enhance mobility, and promote greater independence in activities of daily living. Incorporating the Motor Relearning Program into rehabilitation protocols for MCA stroke patients could lead to better outcomes in balance recovery. Future studies may also explore long-term effects and compare MRP with other evidence-based balance training methods [6,7] .

## METHODOLOGY

Study Design: Pre-post interventional study. MCA stroke Patients was included for the study. Patients were diagnosed with MCA stroke, aged 40–70, within 6 months post-stroke, able to follow simple commands. Severe cognitive deficits, orthopaedic conditions affecting balance were excluded from the study.

## MATERIALS AND METHODS:

Single-group, pre-post interventional study, which was approved by Institutional Ethics Committee. Informed consent was obtained from the participants.

**Participants:** Stroke patients (N = 20), aged 40-70, with first MCA ischemic stroke within 6 months, MMSE > 24, able to follow commands. Excluded were those with severe cognitive or other balance-affecting commodities.

**Intervention:** MRP sessions were for 45 min/session, 5 days/week, 4 weeks, utilized task analysis/ retraining of standing, reaching, and stepping. Equipment (e.g. Whole body vibration equipment, balance board) sourced from institutional Equipments. Patients received MRP-based therapy focusing on Task analysis and practice (e.g., standing, reaching, stepping). Correcting abnormal movement patterns, Facilitating functional balance tasks.
Conventional physiotherapy sessions was also 45 min/session, 5 days/week, 4 weeks continued with strengthening, stretching and standing balance in closed and open eye.
**Outcome Measures:** Berg Balance Scale (BBS) and Functional Reach Test (FRT)**,** BBS (0–56 scale), FRT (C M reached beyond arm's length), both assessed at baseline (pre) and immediately after intervention (post).
**Statistical analysis:** SPSS v25. Pre- and post-scores compared using paired t-tests; significance threshold was considered with $p < 0.05$.

## RESULT

Demographics: Mean age: 58.3 ± 7.2 years; M:F ratio = 12:8; mean time since stroke: 3.4 ± 1.2 months. BBS: Mean pre-intervention score = 32.5 ± 4.2; post-intervention = 42.8 ± 3.9 ($p < 0.001$). FRT: Mean pre = 16.2 ± 3.1 cm; post = 23.7 ± 2.8 cm ($p < 0.001$).
**Balance outcomes:** Measure Pre-intervention Post-intervention p- Value, BBS 32.5±4.2, 42.8 ± 3.9, p<0.001, FRT 16.2 ± 3.1 cm, 23.7 ± 2.8 cm, p<0.001

**Table 1: Participant Characteristics & Outcome Scores**

| **Variable** | **Mean ± SD / n (%)** |
|---|---|
| **Age (years)** | 58.3 ± 7.2 |
| **Sex** | |
| Male | 12 (60%) |
| Female | 8 (40%) |
| **Time since stroke (months)** | 3.4 ± 1.2 |
| **Side affected** | |
| Right | 11 (55%) |

| Left | 9 (45%) |
|---|---|
| **MMSE score** | 27.1 ± 1.6 |
| **Balance outcomes** | |
| **Variable** | **Mean ± SD / n (%)** |
| **BBS (score 0–56)** | |
| Pre-intervention | 32.5 ± 4.2 |
| Post-intervention | 42.8 ± 3.9 |
| **FRT (cm)** | |
| Pre-intervention | 16.2 ± 3.1 |
| Post-intervention | 23.7 ± 2.8 |

BBS-Berg Balance Scale; FRT-Functional Reach Test; MMSE-Mini Mental State Examination

## DISCUSSION

MRP led to significant improvement in balance measures. The BBS gains indicate meaningful functional improvements, while FRT results suggest enhanced anticipatory postural control. These findings echo Carr & Shepherd's motor relearning theory and align with task-specific training literature. Limitations include the single-group design, small sample size, lack of long term follow-up, and ongoing conventional therapy as a potential confounder. Future research should include randomized controlled trials and retention assessments[7].

The findings indicate that the MRP significantly improves balance in MCA stroke patients. By emphasizing functional task practice, MRP may enhance motor planning and coordination, leading to better postural stability. The findings indicate that the MRP significantly improves balance in MCA stroke patients. By emphasizing functional task practice, MRP may enhance motor planning and coordination, leading to better postural stability[8].

This supports earlier work by Carr & Shepherd and aligns with recent studies demonstrating the benefits of task-specific training in neuro-rehabilitation. Limitations: Small sample size, lack of long-term follow-up. Future studies should include randomized controlled designs [9, 10].

MRP has enhanced motor planning and coordination; this supports earlier work by Turton A, Cuningham P and aligns with recent studies demonstrating the benefits of task-specific training in neurorehabilitation. Repeated task training program is important for management of stroke Patients [11, 12, 13].

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**Conflict of Interest**: There was no conflict of interest to conduct or to publish this study.

**Limitations:** Small sample size, lack of long-term follow-up. Future studies should include randomized controlled designs.

## CONCLUSION

MRP is effective in enhancing balance among MCA stroke patients and may be recommended within stroke rehabilitation protocols. Larger RCTs are warranted to compare MRP with other balance-focused interventions.

The Motor Relearning Program is effective in improving balance among MCA stroke patients and may be incorporated into routine stroke rehabilitation to reduce fall risk and promote independence.

## REFERENCES

1. Winstein C, Lewthwaite R, Blanton SR, Wolf LB, Wishart L.J Infusing motor learning research into neurorehabilitation practice: a historical perspective with case exemplar from the accelerated skill acquisition program.Neurol Phys Ther. 2014 Jul;38(3):190-200. doi: 10.1097/NPT.0000000000000046.

2. Batool S, Soomro N, Amjad F, Fauz R. To compare the effectiveness of constraint induced movement therapy versus motor relearning programme to improve motor function of hemiplegic upper extremity after stroke. Pak J Med Sci. 2015 Sep-Oct;31(5):1167-71. doi: 10.12669/pjms.315.7910.

3. Todhunter-Brown A, Sellers CE, Baer GD, Choo PL, Cowie J, Cheyne JD, Langhorne P, Brown J, Morris J, Campbell P. Physical rehabilitation approaches for the recovery of function and mobility following stroke. Cochrane Database Syst Rev. 2025 Feb 11;2(2):CD001920. doi: 10.1002/14651858.CD001920.

4. Occupational therapy upper limb splinting practice for clients with acquired brain injuries: A cross-sectional study from South Africa. Van Wyk MB, de Klerk S, Jacobs-Nzuzi Khuabi LJ.Br J Occup Ther. 2024 Apr; 87(4):251-262. doi: 10.1177/03080226231206674. Epub 2023 Nov 29.

5. Pollock A, Baer G, Campbell P, Choo PL, Forster A, Morris J, Pomeroy VM, Langhorne P Physical rehabilitation approaches for the recovery of function and mobility following stroke.

6. Cochrane DatabaseSyst Rev.2014Apr 22;2014(4):CD001920. doi:10.1002/ 14651858.CD001920.

7. Carr JH, Shepherd RB. A motor relearning program for stroke. Heinemann; 1987.

8. Tyson SF, et al. The effect of balance training on functional outcome after stroke. Clin Rehabil. 2006;20(7):579-592.

9. Pollock A, et al. Interventions for improving balance after stroke. Cochrane Database Syst Rev. 2014; (11):CD008349.

10. Ada L, et al. Task-specific training of walking in stroke patients. Stroke. 2010;41(4):731735.

11. Turton A, Cuningham P, Heron E, Fv W, Sackley C, Rogers C, et al. A feasibility study fora randomised controlled trial of home based reach to grasp training for people after stroke. Trials. (2013) 14:109. doi: 10.1186/1745-6215-14-109.

12. Coupar F, vanVliet P, Legg L, Pollock A, Sackley C. Home-based therapy programmes forupper limb functional recovery following stroke. Cochrane Database Syst Rev. (2012) 2012:CD006755. doi: 10.1002/14651858.CD006755.

13. Arya KN, Verma R, Garg RK, Sharma VP, Argarwal M, Arggarwal G. Meaningful taskspecific training (MTST) for stroke rehabilitation: a randomized controlled trial. Top Stroke Rehabil. (2012) 19:193–211. doi: 10.1310/tsr1903-193.