



EFFECT OF MOTOR RELEARNING PROGRAMME AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON FUNCTIONAL MOBILITY AND BALANCE IN STROKE PATIENTS

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ABSTRACT

Background: Stroke is a leading cause of disability worldwide, often resulting in impaired mobility and balance. Physiotherapy approaches such as the Motor Relearning Programme (MRP) and Proprioceptive Neuromuscular Facilitation (PNF) are widely used, yet their comparative effectiveness remains uncertain. **Objective:** To compare the effects of MRP and PNF on functional mobility and balance in stroke patients. **Methods:** A quasi-experimental study was conducted on 45 stroke patients (aged 45–65 years) at University College of Physiotherapy, Faridkot, and Guru Gobind Singh Medical College and Hospital, Punjab. Patients were divided into three groups: Group A (MRP), Group B (PNF), and Group C (conventional physiotherapy). Interventions were given three times per week for 8 weeks (24 sessions). Outcome measures included the Timed Up and Go (TUG) test and Berg Balance Scale (BBS). **Results:** Group A demonstrated significant improvements in TUG and BBS ($p < 0.0001$) compared to Groups B and C. **Conclusion:** MRP was more effective than PNF and conventional therapy in enhancing mobility and balance in stroke patients.

KEYWORDS : Motor Relearning Programme, Proprioceptive Neuromuscular Facilitation, Stroke.

1. INTRODUCTION

The term "stroke" was first introduced by William Cole in 1689. In 1970, the WHO defined it as a sudden onset of cerebral dysfunction lasting over 24 hours or causing death, due to a vascular cause.¹ Stroke is a major global cause of death and disability, affecting about 203 per 100,000 adults in India, with nearly 1 million cases nationwide.² Stroke risk in India varies by age and gender, peaking at 46–65 years, with younger adults (especially males under 45) more prone to hemorrhages and men over 65 at higher overall risk.³ Strokes are either ischemic, with gradual onset from vessel blockages causing paralysis or ataxia, or hemorrhagic, with sudden onset from vessel rupture causing headache, vomiting, hypertension, and rapid decline.⁴ Stroke risk involves modifiable and non-modifiable factors, presents with motor, speech, or visual deficits, requires imaging for diagnosis, and can lead to serious complications.⁵ Various physiotherapy techniques, such as Bobath, PNF, and CIMT, aim to improve mobility tasks like sit-to-stand and gait in stroke patients. However, there is limited evidence on their long-term effectiveness in home settings.⁶

2. METHODS

2.1. Ethical Clearance

The Institutional ethical committee of University College of Physiotherapy at Baba Farid University of Health Sciences in Faridkot, Punjab, provided ethical clearance for the study.

2.1.1 Participant

A total of 45 patients were selected using a convenience sampling method. Participants, aged 45–65, both male and female, had experienced their first-ever stroke, Modified Rankin Scale score of less than 3, Brunnstrom stage of motor recovery of 4, and an MMSE score above 24, had a Modified Ashworth score of less than 2, and were capable of providing informed consent. Exclusion criteria included patients with visuospatial or visual field deficits, cardiac conditions like myocardial infarction, musculoskeletal disorders, multiple strokes, peripheral arterial occlusive disease, prior neurosurgical interventions, cognitive dysfunction, or respiratory conditions.

2.2 Study Procedure

Patients were selected for the study based on predefined inclusion and exclusion criteria. Informed written consent was obtained from each participant after providing a clear explanation of the study protocol. Following initial assessment using a structured assessment form, participants were allocated into two experimental groups through convenient sampling: Group A ($n=15$) Group B and Group C ($n=15$). Group A received the Motor Relearning Programme (MRP), while Group B received Proprioceptive Neuromuscular Facilitation (PNF) and Group C received conventional physiotherapy. These interventions were administered over 8 weeks, with three sessions per week, total 24 sessions. All participants were assessed for motor function, Functional mobility and daily living independence, at baseline, 4 weeks, and 8 weeks using TUG and BBS, with outcomes recorded at each stage.

3. Intervention

Group A The Motor Relearning Programme (MRP) was delivered over 8 weeks, with three 1-hour sessions per week. Each session focused on bed mobility, balanced sitting, sit-to-stand transitions, balanced standing, and walking practice. Tasks were progressively adjusted in difficulty to improve balance, posture, gait, and functional mobility, with daily walking routines integrated into the home environment. Physiotherapists and family members provided continuous support and feedback tailored to individual progress.^{6,7}

Group B In this group, patients received three Proprioceptive Neuromuscular Facilitation (PNF) techniques: rhythmic initiation, slow reversal, and agonistic reversal for the pelvis, with each technique administered for 10 minutes, total 30 minutes of therapy. These techniques were designed to facilitate pelvic anterior elevation and posterior depression while the patient was lying on their side. The treatment program incorporated PNF components such as manual touch, stretching, resistance, and verbal cuing to enhance motor control and promote functional movement patterns.⁸

Group C All exercises were performed once daily under physiotherapist supervision, with 10 repetitions, 2 sets, and a 10-second hold. The program included full ROM exercises for upper and lower limbs, spasticity management techniques and common mat activities like rolling, kneeling, and supported standing.⁸

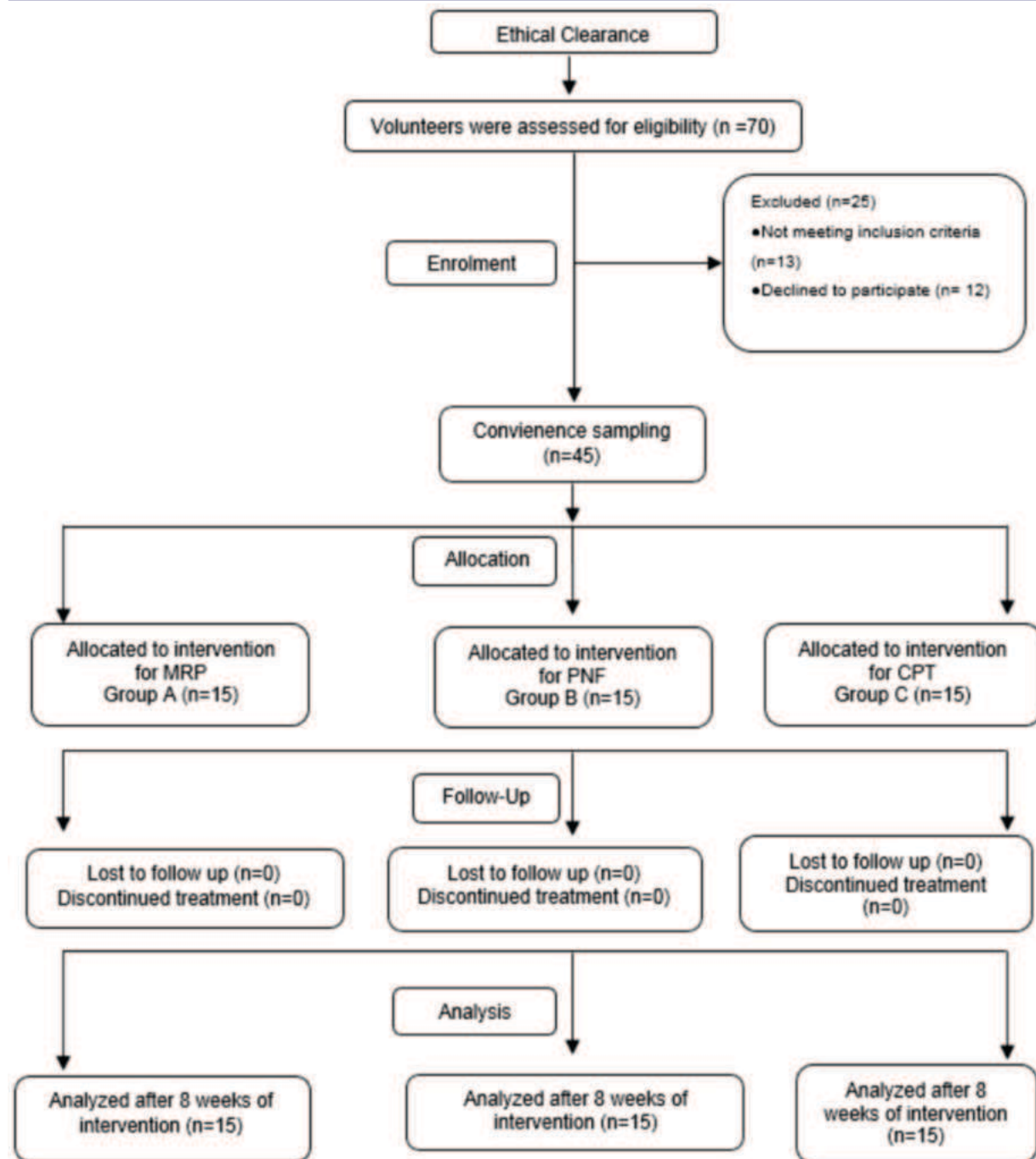


Figure 1: Consort Flow Diagram

4. Data Analysis

Table 1: Shows that Age and Samples are Matched Between the Three Groups A, B and C Respectively.

GROUP	AGE		N= 15	
	Mean	S.D	Males	Females
GROUP A	55.13	6.022	10	5
GROUP B	51.47	5.927	9	6
GROUP C	53.87	5.357	10	5

Table 2: ANOVA Comparison of 0th Day, 4th Week and 8th Week of TUG Score Between Group A, Group B and Group C.

ANOVA	TUG			4th week			8th week		
	Group A	Group B	Group C	Group A	Group B	Group C	Group A	Group B	Group C
MEAN	53.467	53.533	53.600	36.533	38.600	40.533	19.400	21.667	25.600
P-VALUE	.778			<.0001*			<.0001*		
RESULT	Not-Significant			Significant			Significant		
TUKEY'S METHOD pairwise com.	v/s B	v/s C	v/s A	v/s B	v/s C	v/s A	v/s B	v/s C	v/s A

Result with mean diff.	-.0667 NSig	-.0667 NSig	.1333 NSig	-2.0667 Sig	-1.9333 Sig	4.0000 Sig	-2.2667 Sig	-3.9333 Sig	6.2000 Sig
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Table 3: ANOVA Comparison of 0th Day, 4th Week and 8th Week of BBS Score Between Group A, Group B and Group C.

ANOVA	BBS								
	0th day			4th week			8th week		
	Group A	Group B	Group C	Group A	Group B	Group C	Group A	Group B	Group C
MEAN	15.800	15.600	15.733	31.733	31.000	28.267	44.200	41.733	39.400
P-VALUE	.487			<.0001*			<.0001*		
RESULT	Not-Significant			Significant			Significant		
TUKEY'S METHOD pairwise com.	v/s B	v/s C	v/s A	v/s B	v/s C	v/s A	v/s B	v/s C	v/s A
Result with mean diff.	.2000 NSig	-.1333 NSig	-.0667 NSig	.7333 NSig	2.7333 Sig	-3.4667 Sig	2.4667 Sig	2.3333 Sig	-4.8000 Sig

5. RESULT

The study included a total of 45 patients with Stroke who met the inclusion criteria.

Group (A): 15 were included in this group. The data in table 1 shows the mean age 55.13 ± 6.022

Group (B): 15 were included in this group. The data in table 1 shows the mean age 51.47 ± 5.927

Group (C): 15 were included in this group. The data in table 1 shows the mean age 53.87 ± 5.357

In all the groups, there were significant differences at the 0th day, 4th week and 8th week mean scores of both parameters as shown in tables. However the mean scores of Group A improved significantly more as compared to Group B and Group C.

6. DISCUSSION

Liping Chen et al. (2019) found MRP more effective than Bobath in 488 acute stroke patients, showing significantly less post-stroke apathy over 12 months.¹⁰ The present study aligns with findings by Dora YL Chan et al. (2005), where stroke patients in the Motor Relearning group showed significantly better outcomes than the control group in most measures ($F(1,150) = 6.34-41.86$, $P < 0.015$). Significant group-occasion interactions were also noted ($P(3,150) = 3.60-33.58$, $P < 0.015$). The study confirmed MRP's effectiveness in improving functional recovery. It emphasized the importance of sequential, task-specific rehabilitation.¹¹ However, this study contrasts with findings by Preeti Gazbare et al. (2017), who compared MRP and PNF for upper limb function in stroke patients. While both groups showed significant improvement, between-group comparisons revealed no statistical difference (Fugl-Meyer: $p=0.738$; STREAM: $p=0.231$). The study concluded that MRP and PNF were equally effective for upper limb recovery.¹²

7. CONCLUSION

The study found that stroke affected more males than females across groups. While all three interventions—Motor Relearning Programme (MRP), PNF, and Conventional Physiotherapy—were effective, Group A (MRP) showed significantly greater improvements in functional mobility and balance ($p < 0.001$). MRP led to faster and more effective functional recovery compared to PNF and Conventional Physiotherapy.

8. Limitation of the Study

- Both ischemic and hemorrhagic stroke, patients with ischemic stroke as compared to hemorrhagic was more.
- Study was restricted to small geographical area of Faridkot.

10. Future Scope

- Studies including patients from both rural and urban background should included.
- There is need for a research which includes an equal percentage of males and females participants.

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