Original Article

Comparing the Effect of Proprioceptive Neuromuscular Facilitation (PNF) Exercise and Focused Regimen Program to Assess Balance and Quality of Life for Acute Stroke Rehabilitation

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Abstract

Background: Stroke is a leading cause of long-term disability worldwide, resulting in significant physical impairments, including hemiparesis and loss of motor control. Rehabilitation plays a crucial role in aiding stroke patients' recovery, and various approaches have been used to improve their functional abilities. Two widely practiced methods are Proprioceptive Neuromuscular Facilitation (PNF) exercises and focused regimen programs.

Purpose: To compare the effectiveness of PNF exercises and focused regimen programs in improving motor function, mobility and quality of life in stroke patients.

Materials and Methods: The total of 30 subjects with acute stroke were taken from Saicharan physio Center-Arakkonam. The subjects are selected based on inclusion and exclusion criteria The intervention was given for 6 weeks. The entire process was performed from November 2022 to February 2023.

Result: According to the statistical analysis, PNF exercises revealed significant in improving both balance and quality of life measures for acute stroke patients compared to focused regimen program.

Conclusion: This study finally concluded that the PNF exercises has a high impact in improving both balance and may enhance neuroplasticity.

Keywords: PNF Exercise, Focused regimen program, Berg balance scale.

Introduction

The most frequent cause of death and disability in India is stroke, a neurological condition. Hemiplegia or hemiparesis, which result in partial paralysis of one side of the body, greatly restricts the ability of stroke survivors to live independently and participate in social activities. In addition to difficulty speaking or comprehending speech, vision issues, difficulty walking, dizziness, and loss of balance, a stroke can suddenly paralyze or numb one side of the face, arm, or leg.[1]

In addition to affecting limb function, stroke also impairs trunk function. Clinical observations of ambulatory stroke patients reveal issues with balance, coordination, and performing activities like getting out of bed or standing up from a chair.

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A recent clinical trial suggests that poor balance and reduced quality of life in post-stroke cases are linked to weakness in the trunk muscles. Therefore, it is crucial to strengthen the trunk muscles to improve balance and mobility in stroke patients.[2,3]

Rehabilitation plays a vital role in promoting recovery and optimizing functional outcomes for stroke patients. Different approaches have been employed in stroke rehabilitation, including Proprioceptive Neuromuscular Facilitation (PNF) exercises and focused regimen programs. These approaches aim to enhance motor function, mobility, and overall standard of living in stroke survivors.[4,5] But, there is a scarcity of comprehensive evidence comparing the effectiveness of PNF exercises and focused regimen programs in stroke rehabilitation. Physiotherapy treatments after stroke can be categorized into approaches based on neurophysiological, motor learning, or orthopaedic principles.[6]

The focused regimen exercise program is a structured and intensive intervention designed to target specific motor tasks and functional goals in stroke rehabilitation. This approach places emphasis on task-oriented training, progressive resistance exercises, and targeted strengthening activities to improve balance control, stability, and functional mobility.[7]

The Strength training of the afflicted lower limb combined with task-oriented training appears to help physiotherapy intervention for postural control dysfunctions after stroke. The findings suggest that lower limb strengthening activities may be beneficial for stroke patients who have muscle weakness. Lower limb muscle group strengthening activities appear to contribute to increased strength and activity without increasing spasticity and should be included in intervention regimens.[8]

Task-specific training focuses on practicing activities relevant to the individuals' goals, such as reaching, grasping, and walking. Progressive resistance training involves gradually increasing resistance to challenge the muscles and promote strength gains. Functional activities aim to improve overall mobility, balance, and coordination, enabling stroke survivors to perform daily tasks more independently and efficiently. [9] The primary outcome measure for assessing the effectiveness of these interventions will be balance, as it plays a vital role in enabling stroke survivors to regain independence in daily activities. The Berg Balance Scale, a widely utilized tool for evaluating balance and mobility, will be used to calculate balance performance before and after the interventions. Quality of life will be the secondary outcome measure, taking into account the physical, psychological, and social difficulties faced by stroke survivors.[10]

Aim

To evaluate the comparing the effect of proprioceptive neuromuscular facilitation (PNF) exercise and focused regimen program to assess balance and quality of life for acute stroke rehabilitation.

Material and Method

The total of 30 subjects with acute stroke were taken from Saicharan physio Center-Arakkonam. The subjects are selected based on inclusion and exclusion criteria The intervention was given for 6 weeks.The entire process was performe from November 2022 to February 2023.

Inclusion Criteria

- Subjects who had been diagnosed with Balance Assessed with Romberg`s Test among Acute Stroke Patients.
- Patients will be Included if Berg Balance Scale less than 20.
- Ability to Understand and Follow Commands.

Exclusion Criteria

- Severe cognitive impairment.
- Presence of severe musculoskeletal or neurological conditions, other than stroke.
- Uncontrolled cardiovascular conditions.
- Recent lower limb injuries.

Outcome Measures

- Berg Balance Scale.
- Stroke Specific Quality Of Life.

Procedure

A total of 30 subjects were recruited for this study through the convenient sampling method. Subjects were taken from the Saicharan physio center. All subjects were recruited based on the inclusion and exclusion criteria. The recruited subjects were assigned to two groups (Group A: 15 Subjects) and (Group B: 15 Subjects) underwent pre-test analysis on the Berg Balance Scale and stroke-specific quality of life scale (SS: QoL) to analyse the impact of the interventions on the overall quality of life for stroke patients. After the pre- test analysis, Group A received PNF Exercises of 3 sessions per week for the period of 12 weeks, Whereas Group B received a Focused Regimen program of 3 sessions per week for the period of 12 weeks.

After 12 weeks, the Post-test analysis was carried out, and the data were tabulated through Statistical Package for the Social Science [SPSS].

Group A: PNF Exercise Program

- Warm-up exercises: Joint mobilization and range of motion exercises for upper and lower extremities.
- PNF techniques: Utilize diagonal patterns, rhythmic initiation, and repeated contractions to facilitate motor control and coordination.

PNF Techniques:

D1 and D2 flexion and extension patterns are specific movement patterns used in Proprioceptive Neuromuscular Facilitation (PNF) exercises for the lower limb. These patterns involve diagonal movements that can help improve muscle coordination, range of motion, and functional mobility. Here 'show to perform D1 and D2 flexion and extension for the lower limb in PNF patterns:

1. D1 Flexion:

Starting Position:

- Position the patient lying on their back with the affected leg extended.
- The therapist stands on the side of the affected.

Movement Sequence:

- Initiate the movement by supporting the foot and ankle of the affected leg and guiding it into hip flexion, knee flexion, and ankle dorsiflexion.
- Simultaneously, guide the patient's upper body into a diagonal pattern by flexing the trunk towards the opposite side and rotating it towards the affected side.

Resistance and Assistance:

- Apply appropriate resistance or assistance during the movement to engage the targeted muscles.
- To provide resistance, the therapist can apply pressure against the foot or ankle in the direction of extension while the patient resists.
- To assist the movement, the therapist can provide gentle guidance and support to ensure proper form and alignment.

Repetitions and Sets:

- Perform a designated number of repetitions (e.g., 8-10) in a controlled and coordinated manner.
- Repeat for the recommended number of sets according to the patient's tolerance and therapeutic goals.

2. D2 Flexion:

Starting Position:

- Position the patient lying on their back with the affected leg extended.
- The therapist stands on the side of the affected leg.

Movement Sequence:

- Initiate the movement by supporting the foot and ankle of the affected leg and guiding it into hip flexion, knee extension, and ankle plantar flexion.
- Simultaneously, guide the patient's upper body into a diagonal pattern by flexing the trunk towards the affected side and rotating it towards the opposite side.

3. D1 and D2 Extension:

The extension patterns for D1 and D2 follow a similar approach to the flexion patterns but in the opposite direction. The therapist will guide the patient through the extension movements while considering the diagonal patterns and applying resistance or assistance as necessary. The key is to focus on coordinated and controlled movements that align with the specific D1 or D2 pattern.

Group B: Focused Regimen Program:

- Warm-up exercises: General cardio vascular warm-up (e.g., walking, cycling) to increase blood flow.
- Task-specific training: Focused practice on specific motor tasks related to daily activities, such as grasping objects, walking, or balance exercises.
- Progressive resistance training: Strengthening exercises targeting affected muscles and compensatory strategies.
- Cool-down exercises: Incorporate stretching and relaxation exercises.

Balance and Postural Control Training:

- Balance and postural control training focus on improving standing balance, weight shifting, and maintaining stability during functional tasks.
- Examples include standing on one leg, tandem stance, heel-to-toe walking, and reaching tasks that challenge balance control. Patients practice activities that challenge their balance, such as reaching in different directions, reaching while standing on foam or unstable surfaces, or performing dynamic weight shifting exercises.

Weight Shifting:

- Weight shifting exercises involve shifting the centre of gravity and redistributing body weight to improve postural control.
- Examples include lateral weight shifts, forward and backward weight transfers, and weight shifts in multiple directions.

Static Balance Exercises:

- Static balance exercises focus on maintaining balance while remaining stationary.
- Examples include standing on one leg (single-leg stance), standing with feet together (tandem stance), or standing on foam or an unstable surface.

Dynamic Balance Exercises:

- Dynamic balance exercises involve maintaining balance during controlled movements or weight shifts.
- Examples include stepping forward and backward, side stepping, and performing multidirectional reaching tasks while maintaining balance.

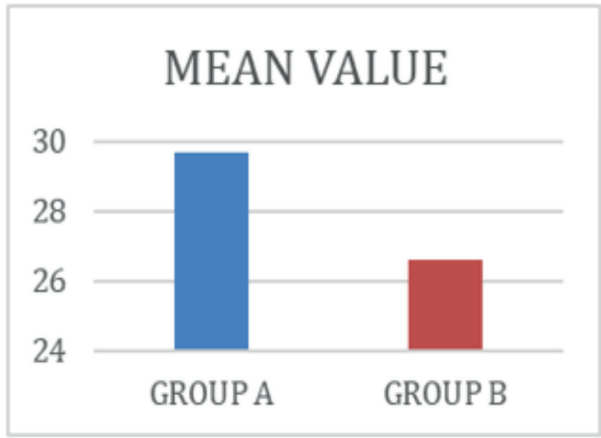
Wobble Board Training:

- Using a balance board or wobble board challenges balance control by introducing an unstable surface.
- Patients perform various exercises while standing on the board, such as weight shifts, reaching tasks, or controlled movements.

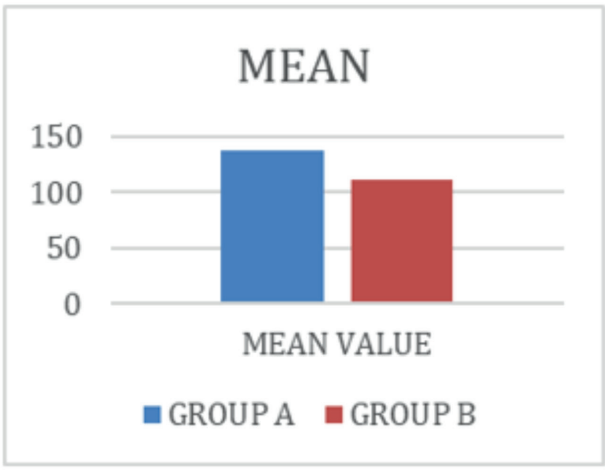
Mobility Training:

- Mobility training involves practicing functional mobility tasks, such as sitting up, standing, walking, and navigating obstacles.

Data Analysis



Graph-1 Comparison between post test values of berg balance scale for group A and group B.



Graph-2 Comparison between post test values of Stroke specific quality of life for group A and group B.

Result

Statistical analysis made with quantitative data indicated statistically significant differences in the values of PNF and focused regimen program.

Graph 1 represents The comparison of post mean value of Berg Balance Scale for Group A PNF Exercise Program and Group B Tailored Exercise Program. Group-A was 29.67 and Group B was 26.60 which shows gradual increase with p value <0.0001 statistically significant.

Graph 2 represents The comparison of post mean value of Stroke Specific Quality Of Life (SS:QoL) for Group A PNF Exercise Program and Group B Tailored Exercise Program. Group-A was 136.93 and Group B was 110.67 which shows gradual increase with p value <0.0001 statistically significant.

Discussion

PNF exercise utilizes movement patterns and principles to promote neuromuscular re-education, strength, and functional movement. On the other hand, the Focused Regimen Program involves targeted exercises focusing on balance, postural control, and functional activities. The results of the study imply that PNF training is superior in improving balance and quality of life. To improve patient outcomes and general wellbeing, clinicians should think about using PNF exercise as a main intervention in acute stroke rehabilitation. An Early study conducted by Chaturvedi P, Singh AK et.al. (2018) stated that PNF is a noninvasive stroke rehabilitation technique. If the patient is able to follow orders, PNF should be started on the first day after the stroke. Increased functional activity will increase quality of life and neuroplasticity. The research concerning PNF intervention in stroke are both contradictory and they are helpful, however they have not been explored in acute stroke. Therefore, the findings indicate PNF is effective in improving functional outcome following stroke.[1]

An experimental study conducted by Minjeong An et.al. (2011) stated that Aerobic exercise has been shown in this review to enhance balance in chronic stroke survivors. This discovery contradicts prior systematic review findings indicating balance or gait-oriented trainings had little benefit (Teasell, Foley, Bhogal, & Speechley, 2003; van de Port et al., 2007). Furthermore, this review adds to the body of knowledge on balance and falls in stroke survivors. Aerobic exercise improves chronic survivors' balance and, presumably, their level of activity.[5] A Pilot study conducted by Beatriz Fernandes et.al. (2015) states that Strength training of the afflicted lower limb combined with task-oriented training appears to help physiotherapy intervention for postural control dysfunctions after stroke. The findings suggest that lower limb strengthening activities may be beneficial for stroke patients who have muscle weakness. Lower limb muscle group strengthening activities appear to contribute to increased strength and activity without increasing spasticity and should be included in intervention regimens.[8]

Conclusion

This study finally concluded that the PNF exercise is more effective than the Focused Regimen Program in improving balance and quality of life for acute stroke patients. Clinicians should consider incorporating PNF exercise as a primary intervention in acute stroke rehabilitation to optimize patient outcomes and enhance overall well-being.

Ethical Clearance: The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws institutional regulations. (Application number 03/074/2022/ISRB/SR/SCPT).

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Conflict of Interest: The Author State That There is No Conflict of Interest.

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