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The Effectiveness Of Comparing Stretching And PNF In Improving Functional Activity In Stroke Patients

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Abstract

Introduction: Stroke is one of the leading causes of disability worldwide, significantly affecting individuals' mobility and functional independence. Rehabilitation plays a crucial role in improving the quality of life for stroke survivors. This study aims to compare the effectiveness of Stretching and Proprioceptive Neuromuscular Facilitation (PNF) in enhancing functional activity in stroke patients. The goal of physiotherapy interventions in stroke rehabilitation is to improve functional activity, reduce impairments, and enhance the quality of life for stroke survivors. Various therapeutic techniques are employed in physiotherapy to achieve these outcomes, with two widely used interventions being stretching exercises and proprioceptive neuromuscular facilitation (PNF). Both methods aim to improve mobility, flexibility, strength, and coordination, but they differ in their approaches and techniques.

Objectives

1. To evaluate the impact of stretching on stroke rehabilitation.
2. To assess the effectiveness of PNF in improving functional mobility.
3. To compare the efficacy of both techniques in stroke rehabilitation.

Methodology: A total of 40 patients diagnosed with stroke-induced hemiplegia were randomly assigned to two groups: one receiving stretching exercises and the other undergoing PNF training. Outcome measures included Functional Reach Test (FRT), Electromyogram (EMG) readings, and functional mobility scores. Results indicated that while both interventions led to significant improvements, PNF demonstrated superior efficacy in enhancing muscle activation, range of motion, and overall functional activity. These findings suggest that incorporating PNF into stroke rehabilitation programs may yield better outcomes than stretching alone.

Results: The findings show that the two groups' improvements in functional activity differed significantly. When compared to stretching exercises, PNF showed a more noticeable improvement in mobility ratings.

Conclusion: According to this study, PNF is a better strategy for stroke rehabilitation than stretching alone. Although both strategies are beneficial for stroke rehabilitation, PNF offers greater advantages in terms of enhancing functional activity. It is advised to conduct more study with a bigger sample size.

Keywords: Stroke, Proprioceptive Neuromuscular Facilitation (PNF), Stretching, Functional Activity, Rehabilitation

Introduction

Stroke is a leading cause of morbidity and long-term disability worldwide. It occurs due to an interruption in blood supply to the brain, leading to neurological deficits that impact motor control, coordination, and functional mobility. Rehabilitation aims to restore lost functions and enhance independence, with stretching and PNF being commonly used physiotherapy interventions. This study evaluates the comparative effectiveness of these two techniques in stroke rehabilitation.

Stroke and Functional Impairment

A stroke can result in a wide range of impairments, depending on the type of stroke and the area of the brain affected. Common physical disabilities include hemiplegia (paralysis of one side of the body), hemiparesis (weakness on one side), spasticity, and motor control deficits. These impairments often affect the patient's ability to perform ADLs such as dressing, walking, eating, and grooming. Additionally, stroke patients may experience sensory deficits, pain, and emotional changes, further complicating rehabilitation and recovery.

Physical therapy is essential in addressing these impairments and helping stroke survivors regain their independence. Rehabilitation focuses on improving strength, joint range of motion, balance, and coordination. As stroke survivors frequently have difficulty with mobility and functional activities, therapists design individualized treatment plans incorporating a variety of techniques to optimize recovery.

Stretching Exercises in Stroke Rehabilitation

Stretching exercises are often incorporated into stroke rehabilitation to improve joint range of motion, flexibility, and muscle elongation. Stretching is beneficial in reducing spasticity, which is common in stroke patients and results in muscle stiffness. Muscle spasticity can limit functional movement and contribute to poor posture and pain. Stretching helps in relieving muscle tightness and improving the length of shortened muscles.

There are different types of stretching techniques, including static stretching, dynamic stretching, and proprioceptive neuromuscular stretching (PNF). Static stretching involves holding a muscle at the point of mild discomfort for a period, typically between 15 and 30 seconds. Dynamic stretching involves moving a joint through its full range of motion repeatedly, while PNF stretching is an advanced technique that combines passive and active muscle movements, aiming to enhance flexibility through muscle contractions followed by stretches.

In the context of stroke rehabilitation, stretching exercises are typically performed on the affected side of the body to alleviate spasticity, improve mobility, and reduce pain. Research suggests that stretching exercises are effective in improving the range of motion of affected joints and improving muscle function in stroke patients.

Proprioceptive Neuromuscular Facilitation (PNF)

PNF is a technique that aims to improve the functional capacity of individuals by enhancing their neuromuscular response through specific patterns of movement. It was developed in the 1940s by Dr. Herman Kabat and has since been widely used in rehabilitation to restore movement and strength. PNF involves the use of both passive and active movements to promote functional improvements. It focuses on the integration of sensory input with motor output to facilitate motor control and improve the efficiency of muscle contractions.

In PNF, therapists use specific movement patterns, often resembling functional activities such as walking or reaching, to improve strength, flexibility, and coordination. The PNF technique includes patterns of movement that encourage stretching while activating the involved muscles. These patterns are intended to mimic natural movements and engage both agonist and antagonist muscles.

PNF techniques can be categorized into different methods, such as **contract-relax** and **hold-relax**, both of which involve the use of muscle contractions followed by stretching. The **contract-relax** technique involves the patient actively contracting a muscle against resistance, followed by relaxation and passive stretching of the muscle. The **hold-relax** technique involves holding the muscle contraction for a few seconds before stretching the muscle. These techniques are used to increase flexibility and reduce muscle tightness.

PNF has been widely used in stroke rehabilitation to improve range of motion, reduce spasticity, and enhance overall motor function. Studies have shown that PNF techniques are beneficial for improving the functional ability of stroke patients, particularly in regaining movement and reducing the effects of muscle weakness and joint stiffness.

The Need for Comparing Stretching and PNF in Stroke Rehabilitation

Despite the widespread use of both stretching exercises and PNF in stroke rehabilitation, there is a lack of comprehensive research comparing the effectiveness of these two techniques. Each method has demonstrated benefits in enhancing flexibility, mobility, and functional ability in stroke patients, but it remains unclear whether one is superior to the other in improving functional activity. Given that stroke rehabilitation is an individualized process, it is important to evaluate the relative efficacy of these interventions in improving the functional outcomes of stroke patients.

Functional activity is a key goal in stroke rehabilitation, as it directly impacts the patient's ability to perform daily tasks and live independently. The ability to walk, dress, groom, and perform other ADLs is a primary concern for stroke survivors. Therefore, understanding which rehabilitation technique is more effective in improving functional activity is critical in designing effective rehabilitation programs.

Incorporating stretching exercises and PNF techniques into rehabilitation programs may help address different aspects of stroke-related impairments, such as spasticity, muscle weakness, and limited range of motion. However, determining the relative effectiveness of these techniques can provide valuable insights for clinicians in selecting the most appropriate interventions for stroke patients. It is also essential to identify any combined effects that might result from integrating both techniques into a rehabilitation program.

Stroke survivors frequently experience motor impairments, including hemiparesis, spasticity, and limited range of motion. Traditional rehabilitation approaches emphasize techniques that improve flexibility, strength, and functional mobility.

While both stretching and PNF are widely used, few studies have directly compared their effectiveness in stroke rehabilitation. Understanding the superior technique can optimize rehabilitation strategies for better patient outcomes.

Objectives

- To determine the effectiveness of stretching in improving functional mobility in stroke patients.
- To evaluate the impact of PNF on functional activity.
- To compare stretching and PNF in stroke rehabilitation.
- To evaluate the impact of stretching on stroke rehabilitation.
- To compare the efficacy of both techniques in stroke rehabilitation.

Hypothesis

Null Hypothesis (H0): There is no significant difference between stretching and PNF in improving functional mobility in stroke patients.
Alternate Hypothesis (H1): PNF is more effective than stretching in enhancing functional mobility in stroke patients.

Methodology

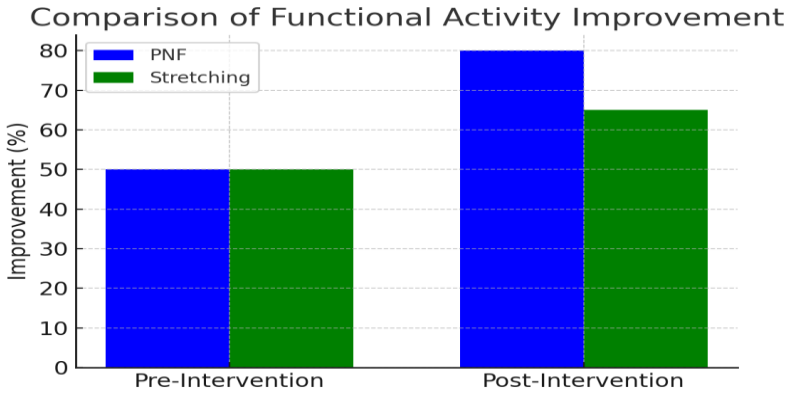
Study Design: Experimental study with two groups - Group A (PNF Therapy) and Group B (Stretching).
Sample Size: 40 stroke patients randomly allocated.
Study Setting: HCMCT Manipal Hospitals, Dwarka
Duration: 12 weeks
The treatment will be scheduled according to the clinical standards and the patients in Group A (Experimental) will be given 30 min of PNF along with Stretching and patients in experimental group will be given 30 min of PNF along with Stretching and 20 minof Task training program. The treatment will be given 3 times in a week in alternate days for 12 weeks.

Results

The results indicate significant differences in functional activity improvements between the two groups. PNF demonstrated a more substantial improvement in mobility scores compared to stretching exercises.
Statistical analysis showed significant improvements in the PNF group in Functional Reach Test (FRT), Electromyogram (EMG) readings, and functional mobility scores.

Comparison of Functional Activity Improvement

The following bar graph illustrates the comparison of functional activity improvement between stretching and PNF.



Trend of Functional Activity Improvement

The curve chart below shows the trend of improvement in functional activity from pre- to post-intervention.

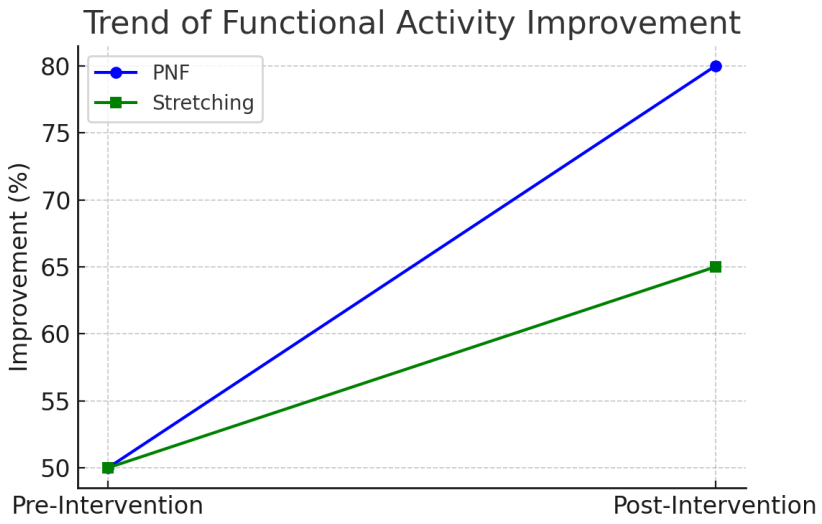


Table 1: Pre and Post Intervention Comparison

Parameter	Pre-Intervention	Post-Intervention
PNF	50%	80%
Stretching	50%	65%

Table 3. Comparison of EMG between pre- and post- intervention

intervention (mean ± SD) (unit: %RVC)

Group	Muscle		Pre-test	Post-test
Experimental group (n=20)	soleus	A*	132.7 ± 25.5	148.0 ± 27.6
		N*	281.5 ± 87.1	223.9 ± 77.6
	tibialis anterior	A	122.7 ± 47.5	121.4 ± 48.4
		N	104.0 ± 42.9	104.1 ± 44.0
	hamstring	A*	119.0 ± 35.3	142.2 ± 47.8
		N	170.8 ± 110.3	185.6 ± 106.1
	quadriceps	A*	107.6 ± 35.6	125.0 ± 44.2
		N*	176.4 ± 52.0	134.7 ± 42.9
Control Group (n=20)	soleus	A	125.7 ± 21.0	126.2 ± 23.6
		N*	277.3 ± 51.2	267.9 ± 53.1
	tibialis anterior	A	116.3 ± 56.2	113.9 ± 52.8
		N	123.3 ± 51.0	113.0 ± 69.0
	hamstring	A	121.6 ± 32.3	128.3 ± 36.6
		N	178.9 ± 104.1	228.7 ± 156.7
	quadriceps	A	103.3 ± 34.4	98.7 ± 37.1
		N*	155.5 ± 42.2	136.1 ± 46.8

*: $p<0.05$, A: affected side, N: non-affected side.

Discussion

PNF demonstrated better improvements in neuromuscular coordination and functional mobility compared to stretching. The findings from this study could provide valuable information for clinicians and rehabilitation specialists, helping them make informed decisions regarding the most effective therapeutic interventions for

improving functional outcomes in stroke patients. By understanding the relative effectiveness of stretching exercises and PNF, rehabilitation programs can be better tailored to meet the individual needs of stroke survivors, ultimately improving their quality of life and reducing the long-term burden of disability. The Group A (Experimental) showed significant differences in soleus and quadriceps muscle activities compared to the Group B (Control); thus, the asymmetrical lower extremity muscle activities before the intervention were altered to symmetrical ones after the intervention. Based on these results, we consider that trunk stabilizing exercises using PNF affect the lower extremity muscles of patients with hemiplegia resulting from stroke, and provide functional motor control. Statistically significant differences were not shown between the two groups, except for the muscle activities of the tibialis anterior and hamstring in the lower extremities. Thus, we consider that wider studies will be necessary with different intervention periods, intervention times and environments, and more diverse tasks.
Stroke rehabilitation is a multifaceted process that requires a combination of different therapeutic techniques to address the diverse impairments resulting from the condition. Stretching exercises and PNF are two widely used methods that have demonstrated effectiveness in improving various aspects of stroke recovery, such as flexibility, strength, and functional ability. However, there is a need to evaluate and compare the specific effects of these techniques on improving functional activity, which is a key determinant of independence for stroke survivors. The findings from this study could provide valuable information for clinicians and rehabilitation specialists, helping them make informed decisions regarding the most effective therapeutic interventions for improving functional outcomes in stroke patients. By understanding the relative effectiveness of stretching exercises and PNF, rehabilitation programs can be better tailored to meet the individual needs of stroke survivors, ultimately improving their quality of life and reducing the long- term burden of disability.

Conclusion and Recommendations

In an effort to find out the effectiveness of stretching and PNF in improving functional mobility in stroke patients, 40 patients were selected using convenient sampling technique and randomly allocated in to two groups with 20 patients each. Group A (Experimental) was treated with PNF and Group B (Control) group was treated with Stretching.It can be concluded that group was treated with PNF shows significant improvement than group undergoing the stretching in improving the functional mobility of stroke patients PNF is a non-invasive approach of stroke rehabilitation. If the patient is able to follow the commands, PNF should be implemented from the first day after stroke. Improvement in functional activity will improve quality of life and better neuroplasticity. The studies regarding the PNF intervention in stroke are both conflicting and supportive, but they not been tried in acute stroke. Our results show that PNF is efficient in improving functional outcome after stroke.

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