

COMPARATIVE EFFECTIVENESS OF STRETCHING EXERCISES AND WEIGHT BEARING EXERCISES IN THE MANAGEMENT OF POST-STROKE SPASTICITY

¹Dr. Charu Kotai, ²Dr. Shubham Menaria, ³Dr. Jafar Khan

¹ Research Scholar MPT, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India

² Associate professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India

³ Dean And HOD, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India

Corresponding Author: Dr. Charu Kotai

Email: kotaicharu0@gmail.com

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Abstract

Background

Stroke is one of the most common causes of long-term disability and is frequently associated with spasticity resulting from upper motor neuron lesions. Spasticity interferes with voluntary movement, reduces functional ability, and limits independence in activities of daily living. Physiotherapy plays a major role in managing spasticity and improving functional outcomes. Among the various rehabilitation techniques, stretching exercises and weight bearing exercises are widely used to reduce muscle tone and enhance motor recovery. However, there is still a need to determine which intervention provides greater clinical benefit in patients with post stroke spasticity.

Objective

To compare the effectiveness of stretching exercises and weight bearing exercises in reducing spasticity and improving health related quality of life in patients with post stroke spasticity.

Methods

A comparative experimental study was conducted on fifty patients diagnosed with post stroke spasticity. Participants were selected based on the inclusion and exclusion criteria and were divided into two groups consisting of twenty five subjects each. Group A received stretching exercises while Group B received weight bearing exercises. The Modified Ashworth Scale was used to assess spasticity and the Health Related Quality of Life questionnaire was used to evaluate the well-being of the participants. Pre-treatment and post-treatment assessments were conducted and the collected data were analyzed using statistical methods.

Results

Both groups demonstrated improvement after the intervention period. The stretching exercise group showed reduction in muscle tone and improvement in functional health status. However, the weight bearing exercise group showed greater improvement in Modified Ashworth Scale scores and better improvement in HRQOL outcomes. These findings suggest that weight bearing exercises may be more effective in managing spasticity compared to stretching exercises alone.

Conclusion

Both stretching exercises and weight bearing exercises are beneficial in the management of post stroke spasticity. However, weight bearing exercises demonstrated greater improvement in reducing muscle tone and improving quality of life. Incorporating weight bearing exercises into stroke rehabilitation programs may enhance functional recovery.

INTRODUCTION

Stroke is a major neurological condition that results from an interruption in the blood supply to the brain, leading to loss of neurological function. It is one of the leading causes of disability worldwide and

affects millions of individuals every year. Survivors of stroke often experience a variety of motor impairments including muscle weakness, abnormal movement patterns, loss of coordination, and spasticity. Among these complications,

spasticity is one of the most commonly observed motor abnormalities.

traditionally been used to maintain muscle length and prevent contractures.

Spasticity is defined as a velocity dependent increase in muscle tone associated with exaggerated stretch reflexes. It occurs as a result of damage to the upper motor neuron pathways, which leads to imbalance between excitatory and inhibitory signals within the central nervous system. Increased muscle tone and involuntary muscle contractions interfere with voluntary movement and make it difficult for patients to perform daily activities such as walking, standing, dressing, and self-care.

The presence of spasticity can lead to secondary complications including joint stiffness, muscle shortening, contractures, and pain. These complications further limit mobility and negatively affect the quality of life of stroke survivors. Effective management of spasticity is therefore an essential component of stroke rehabilitation.

Physiotherapy interventions play a significant role in the management of post stroke spasticity. Various techniques such as stretching, positioning, strengthening exercises, weight bearing activities, and functional training are commonly used to reduce abnormal muscle tone and improve motor performance. Among these interventions, stretching exercises have

Stretching exercises involve elongation of muscles and connective tissues to increase flexibility and reduce resistance to passive movement. Regular stretching may help improve the mechanical properties of muscles and reduce stiffness in spastic limbs. However, the effects of stretching may be temporary and may require repeated sessions to maintain improvement.

Weight bearing exercises are another important component of neurological rehabilitation. These exercises involve transferring body weight through the limbs while maintaining joint alignment and muscle activation. Weight bearing activities stimulate proprioceptors in muscles and joints, which provide sensory input to the central nervous system. This sensory feedback may help regulate muscle tone and improve motor control.

Weight bearing exercises also promote activation of postural muscles and encourage functional movement patterns that are required for standing and walking. Through repeated practice of weight bearing tasks, patients may develop better balance, coordination, and functional mobility.

Although both stretching and weight bearing exercises are commonly used in

physiotherapy practice, there is still limited evidence comparing their effectiveness in managing post stroke spasticity. Understanding the relative effectiveness of these interventions may help clinicians design more effective rehabilitation programs.

Therefore, the present study was conducted to compare the effectiveness of stretching exercises and weight bearing exercises in reducing spasticity and improving quality of life in patients with post stroke spasticity.

NEED FOR THE STUDY

Stroke is one of the major causes of long-term disability worldwide and frequently results in neurological impairments that significantly affect the functional independence of individuals. One of the most common complications following stroke is spasticity, which is characterized by increased muscle tone, exaggerated stretch reflexes, and resistance to passive movement. Spasticity interferes with voluntary motor control and restricts the ability of patients to perform activities of daily living. If not managed properly, it may lead to secondary complications such as muscle shortening, joint stiffness, contractures, pain, and deformities that further limit mobility and independence.

Physiotherapy plays a crucial role in the management of post-stroke spasticity and in improving functional recovery. Various

therapeutic techniques are used to reduce muscle tone and enhance motor performance in stroke patients. Among these interventions, stretching exercises and weight bearing exercises are widely used in clinical practice. Stretching exercises are commonly applied to improve muscle flexibility, maintain joint mobility, and prevent the development of contractures. Weight bearing exercises, on the other hand, provide proprioceptive input through joint compression and stimulate neuromuscular mechanisms that may help regulate muscle tone and improve postural control.

Although both stretching and weight bearing exercises are frequently used as part of stroke rehabilitation programs, there is still limited evidence comparing their effectiveness in reducing spasticity and improving functional health outcomes. Understanding which intervention provides greater clinical benefit can help physiotherapists design more effective rehabilitation strategies for stroke patients. Therefore, the present study was undertaken to compare the effectiveness of stretching exercises and weight bearing exercises in patients with post stroke spasticity and to determine which intervention is more beneficial in reducing spasticity and improving health related quality of life.

OBJECTIVES OF THE STUDY

The primary objective of the study was to compare the effectiveness of stretching exercises and weight bearing exercises in reducing spasticity in patients with post stroke spasticity.

The secondary objective of the study was to evaluate the effect of stretching exercises and weight bearing exercises on the health related quality of life of patients with post stroke spasticity.

Another objective of the study was to determine which intervention provides greater improvement in functional outcomes among stroke patients undergoing physiotherapy rehabilitation.

RESEARCH QUESTIONS

Is stretching exercise effective in reducing spasticity in patients with post stroke spasticity?

Do weight bearing exercises produce greater reduction in spasticity compared to stretching exercises?

Which intervention is more effective in improving health related quality of life in patients with post stroke spasticity?

HYPOTHESIS

Null Hypothesis (H0)

There will be no significant difference between stretching exercises and weight bearing exercises in reducing spasticity and improving quality of life in patients with post stroke spasticity.

Alternative Hypothesis (H1)

There will be a significant difference between stretching exercises and weight bearing exercises in reducing spasticity and improving quality of life in patients with post stroke spasticity.

MATERIALS AND METHOD

MATERIALS AND METHODS

Study Design

The present study was designed as a comparative experimental study to evaluate the effectiveness of stretching exercises and weight bearing exercises in patients with post stroke spasticity. The study aimed to compare the changes in spasticity and health related quality of life following the intervention.

Study Setting

The study was conducted in the Department of Physiotherapy at Pacific Medical College and Hospital, Bedla, Udaipur, Rajasthan.

Study Population

Patients diagnosed with post stroke spasticity who were attending the physiotherapy department for rehabilitation were considered for participation in the study.

Sample Size

A total of fifty subjects diagnosed with

post stroke spasticity were included in the study. The subjects were divided into two groups consisting of twenty five participants in each group.

Sampling

Purposive sampling method was used to select the participants who fulfilled the inclusion and exclusion criteria.

Inclusion

Patients diagnosed with post stroke spasticity

Age group between 20 and 70 years

Patients who were medically stable and able to participate in physiotherapy treatment

Patients who were willing to participate and provided informed consent

Exclusion

Patients with severe cardiac conditions or unstable medical status

Patients with spinal trauma or severe musculoskeletal deformities

Patients with progressive neurological disorders

Patients with severe cognitive impairment that prevented cooperation during assessment or treatment

Patients with open wounds, fractures, or conditions that contraindicated exercise therapy

Grouping of Subjects

The participants were divided into two groups:

Technique

Group A – Stretching Exercise Group

Participants in this group received a structured stretching exercise program targeting the major muscle groups affected by spasticity.

Group B – Weight Bearing Exercise Group

Participants in this group performed weight bearing exercises designed to improve postural stability and neuromuscular control.

Outcome

Two outcome measures were used to evaluate the effectiveness of the interventions.

Measures

Modified Ashworth Scale (MAS)

The Modified Ashworth Scale was used to measure the level of muscle spasticity. It is a commonly used clinical scale that grades resistance encountered during passive muscle stretching.

Health Related Quality of Life Questionnaire (HRQOL)

The HRQOL questionnaire was used to evaluate the overall physical and emotional health status of the participants. It measures the impact of health conditions on daily functioning and well-being.

Procedure

Participants who met the inclusion criteria were informed about the purpose and procedure of the study. Written informed

consent was obtained from all participants before the commencement of the study.

Baseline assessment was performed for all participants using the Modified Ashworth Scale and the Health Related Quality of Life questionnaire. After the initial evaluation, the participants were divided into two groups.

Participants in Group A underwent stretching exercises focusing on spastic muscle groups. These exercises were performed under the supervision of a physiotherapist.

Participants in Group B performed weight bearing exercises such as supported standing, weight shifting, and functional loading activities. These exercises were also supervised by the physiotherapist.

The treatment program was carried out regularly for the specified intervention period. After completion of the treatment program, post-treatment assessments were conducted using the same outcome measures.

Statistical

Analysis

The collected data were organized and analyzed using appropriate statistical methods. Descriptive statistics such as mean and standard deviation were calculated for both groups. The paired t test was used to compare the pre-treatment and post-treatment values within each group, and comparative analysis was performed to evaluate differences between the two groups.

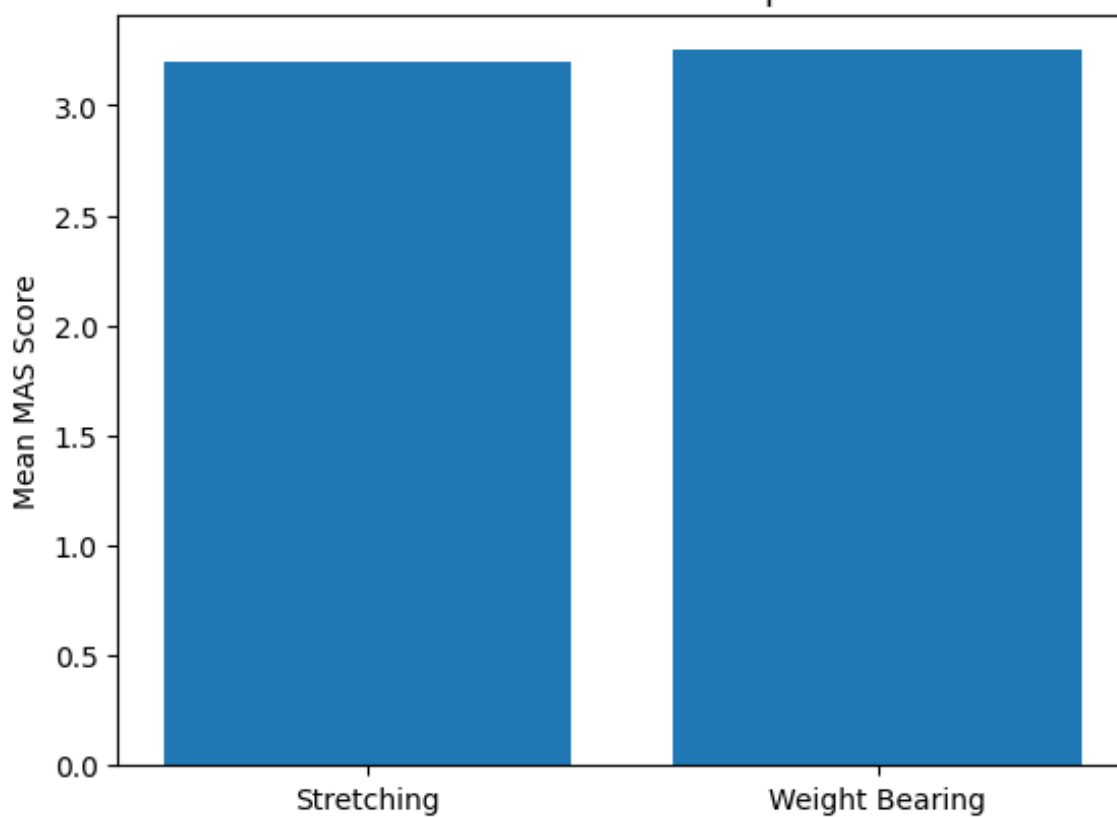
RESULTS

Results Tables and Graphical Representation

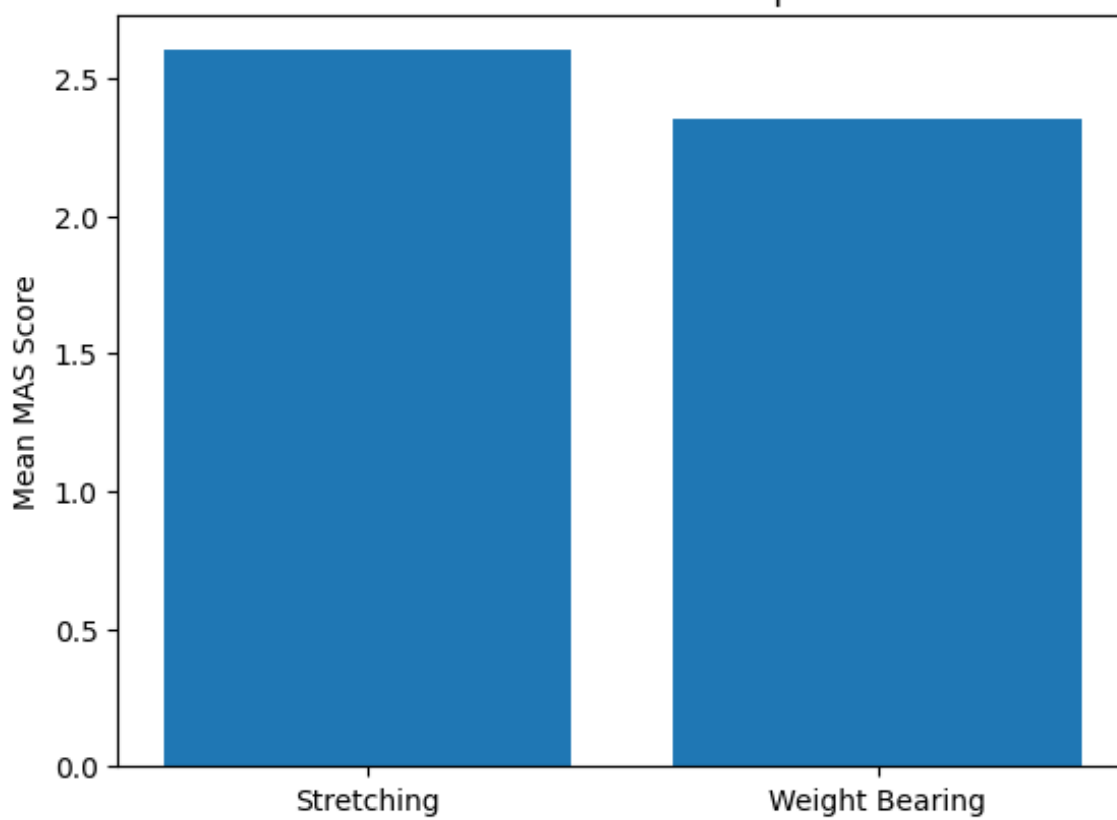
Table: Summary of Results

Group	MAS_Pre_Mean	MAS_Post_Mean	MAS_Improvement	HRQOL_Pre_Mean	HRQOL_Post_Mean	HRQOL_Improvement
Stretching	3.2	2.6	0.6	14	10	4
Weight Bearing	3.25	2.35	0.9	15	9	6

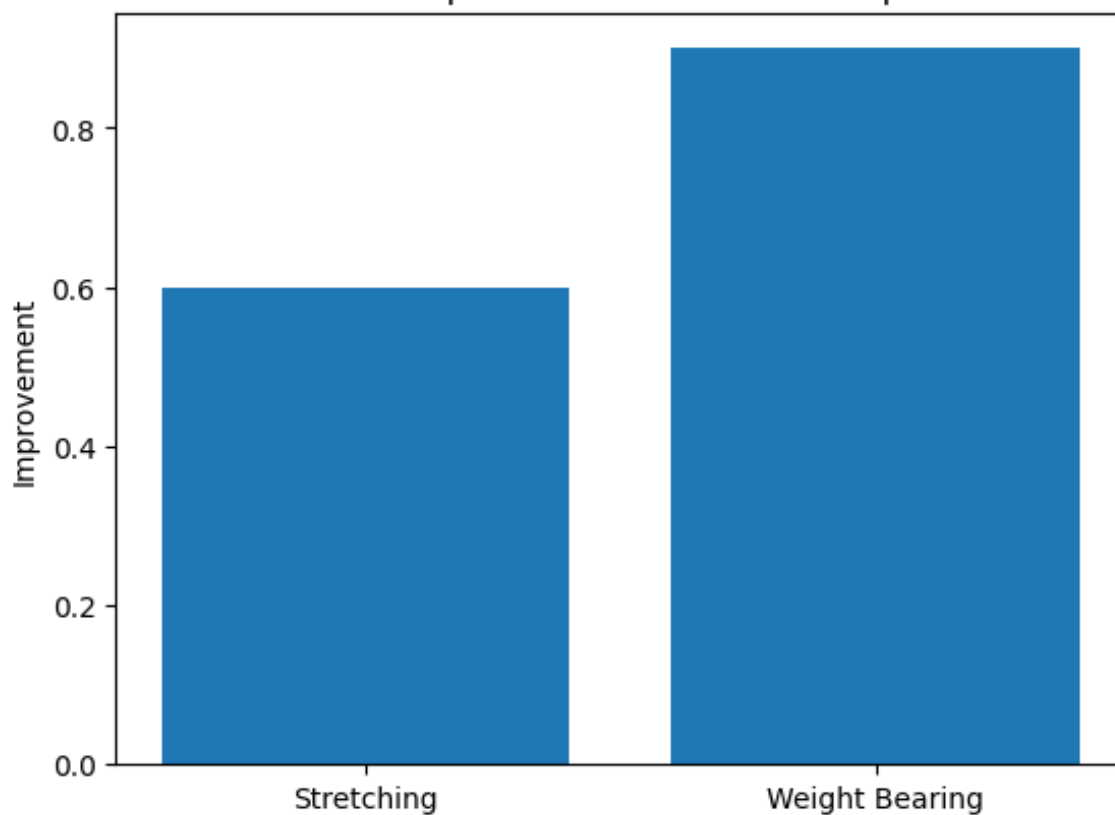
Pre Treatment MAS Comparison



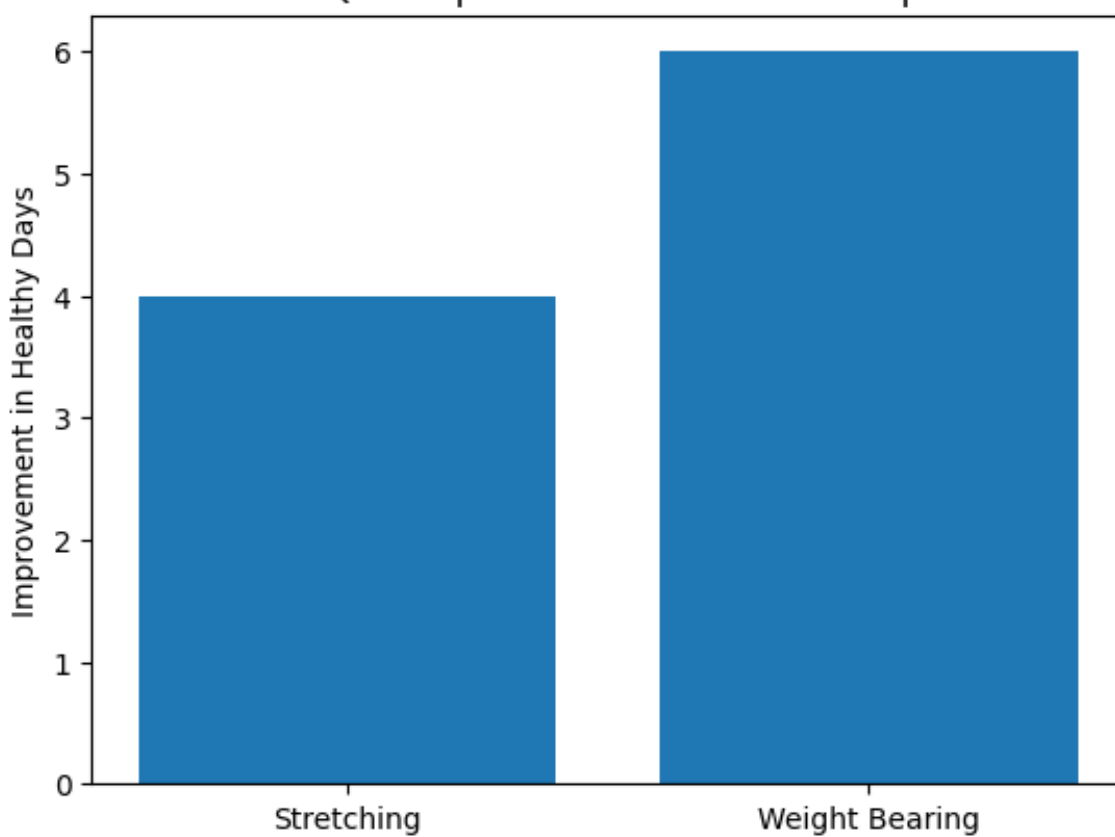
Post Treatment MAS Comparison



MAS Improvement Between Groups



HRQOL Improvement Between Groups



The present study included a total of fifty participants diagnosed with post stroke spasticity. The participants were divided into two groups consisting of twenty five subjects each. Group A received stretching exercises while Group B

Before the intervention, baseline assessment was conducted for both groups. The mean pre treatment MAS score in the stretching group was approximately 3.2 while the mean pre treatment MAS score in the weight bearing group was approximately 3.25. These values indicate that the severity of spasticity was almost similar in both groups at the beginning of the study.

After completion of the intervention period, post treatment MAS scores were recorded. In the stretching exercise group, the mean MAS score reduced to

The improvement in MAS scores within the stretching exercise group was approximately 0.6 points, whereas the improvement observed in the weight bearing exercise group was approximately 0.9 points. These findings suggest that although both treatment approaches were effective, weight bearing exercises produced greater improvement in reducing spasticity.

received weight bearing exercises. The outcome measures used in the study were the Modified Ashworth Scale (MAS) for measuring spasticity and the Health Related Quality of Life (HRQOL) questionnaire for evaluating overall well-being

approximately 2.6. This reduction suggests that stretching exercises helped decrease muscle tone and improve passive movement of the affected limbs.

In the weight bearing exercise group, the mean MAS score reduced from approximately 3.25 to around 2.35. The reduction in spasticity observed in this group was greater compared to the stretching exercise group. This finding indicates that weight bearing exercises may provide stronger neuromuscular stimulation and improved regulation of muscle tone.

Health Related Quality of Life was also assessed before and after the treatment program. The mean HRQOL score representing unhealthy days in the stretching exercise group was approximately fourteen days before treatment. After completion of the intervention period, the average number of unhealthy days decreased to around ten days. This improvement suggests that

stretching exercises contributed to better physical functioning and reduced limitations in daily activities.

In the weight bearing exercise group, the mean HRQOL score decreased from approximately fifteen unhealthy days

The improvement in HRQOL scores within the stretching exercise group was approximately four days, whereas the improvement observed in the weight bearing exercise group was approximately six days. The greater improvement observed in the weight bearing exercise group suggests that these exercises may have a stronger influence on functional recovery and quality of life.

DISCUSSION

The present study was conducted to compare the effectiveness of stretching exercises and weight bearing exercises in the management of post stroke spasticity. Stroke frequently results in neurological impairments such as weakness, abnormal reflex activity, and spasticity due to damage to the upper motor neuron pathways. Spasticity interferes with voluntary motor control and reduces functional independence. Therefore, effective physiotherapy interventions are essential to improve mobility and quality of life in individuals recovering from stroke.

before treatment to around nine unhealthy days after treatment. This improvement indicates that weight bearing exercises contributed to greater enhancement of functional ability and overall well-being.

Overall, both groups demonstrated improvement following physiotherapy intervention. However, the weight bearing exercise group showed greater improvement in both Modified Ashworth Scale scores and HRQOL outcomes. These results indicate that weight bearing exercises may be more effective than stretching exercises alone in managing post stroke spasticity and improving functional health outcomes.

The findings of the present study showed that both stretching exercises and weight bearing exercises produced improvement in patients with post stroke spasticity. Participants in both groups demonstrated reduction in Modified Ashworth Scale scores following the intervention period. This indicates that physiotherapy interventions targeting muscle tone and neuromuscular control are beneficial in managing spasticity.

Stretching exercises have traditionally been used as a primary intervention for reducing spasticity. Stretching helps maintain muscle length, improve joint mobility, and prevent the development of

contractures in patients with neurological impairments. Regular stretching may

movement. This functional stimulation may contribute to improved motor

reduce muscle stiffness and improve passive movement by influencing the mechanical properties of muscle and connective tissue. In the present study, participants who received stretching exercises showed reduction in spasticity and improvement in HRQOL scores, suggesting that stretching contributed to improved flexibility and functional comfort.

However, the results of the study indicated that weight bearing exercises produced greater improvement in spasticity reduction compared to stretching exercises. Participants who performed weight bearing exercises demonstrated a larger decrease in MAS scores. Weight bearing activities provide sensory input through joint compression and stimulate proprioceptors within the muscles and joints. This sensory stimulation plays an important role in regulating muscle tone and improving motor control in stroke patients.

Weight bearing exercises also encourage activation of postural muscles and facilitate functional movement patterns. When patients practice supported standing and weight shifting activities, they stimulate neuromuscular pathways that are essential for balance and coordinated

recovery and reduction in abnormal muscle tone.

Another important finding of the present study was the improvement observed in health related quality of life. Stroke survivors often experience limitations in mobility, self-care, and participation in daily activities. These limitations negatively affect psychological well-being and overall quality of life. The HRQOL scores in both groups improved following the intervention period, indicating that physiotherapy rehabilitation contributed to better functional health status.

The improvement in HRQOL scores was greater in the weight bearing exercise group compared to the stretching group. This suggests that interventions that promote functional movement and postural stability may have a stronger impact on daily activity performance and independence. When patients regain better control over their movements and balance, they are more confident in performing routine activities, which improves their overall quality of life.

The findings of the present study are consistent with previous research suggesting that exercise based rehabilitation interventions can improve

motor recovery following stroke. Weight bearing exercises provide both mechanical and sensory stimulation that can influence neural plasticity and improve neuromuscular coordination. These mechanisms may explain the greater reduction in spasticity observed in the weight bearing exercise group.

CONCLUSION

The present study was conducted to compare the effectiveness of stretching exercises and weight bearing exercises in patients with post stroke spasticity. Based on the findings of the study, it can be concluded that both stretching exercises and weight bearing exercises are effective physiotherapy interventions for reducing spasticity and improving quality of life in stroke patients.

Participants in both groups demonstrated reduction in Modified Ashworth Scale scores and improvement in health related quality of life following the intervention period. However, the weight bearing exercise group showed greater

LIMITATIONS OF THE STUDY

The present study had certain limitations that should be considered when interpreting the findings.

Overall, the results of this study support the use of physiotherapy interventions in managing post stroke spasticity. While stretching exercises remain an important component of rehabilitation to maintain muscle flexibility, weight bearing exercises appear to provide additional benefits by enhancing sensory input and functional motor recovery.

improvement compared to the stretching exercise group.

The greater improvement observed in the weight bearing exercise group may be attributed to increased proprioceptive input, improved postural control, and enhanced neuromuscular coordination during weight bearing activities. These exercises also promote functional movement patterns that are important for daily activities.

Therefore, incorporating weight bearing exercises into rehabilitation programs may provide additional benefits for patients recovering from stroke. Weight bearing exercises may help reduce spasticity more effectively and improve functional independence and quality of life.

The sample size of the study was relatively small, as only fifty participants were included. A larger sample size may provide more reliable and generalizable results.

The duration of the intervention was limited, and long term effects of the interventions were not evaluated. Future studies with longer follow-up periods may provide better understanding of the sustained effects of stretching and weight bearing exercises.

The assessment of spasticity was performed using the Modified Ashworth Scale, which is a subjective clinical tool. Although it is widely used, the results may vary depending on the examiner's interpretation.

The study was conducted in a single rehabilitation center, which may limit the generalizability of the findings to other clinical settings.

RECOMMENDATIONS

Future studies should include a larger sample size in order to increase the reliability and validity of the results.

Long term follow-up studies may help determine whether the improvements observed in spasticity and quality of life are maintained over time.

Future research may also include additional outcome measures such as gait analysis, balance assessment, and functional mobility tests to obtain a more comprehensive understanding of rehabilitation outcomes.

Studies comparing weight bearing exercises with other physiotherapy techniques such as task oriented training, proprioceptive neuromuscular facilitation, and robotic rehabilitation may provide further insight into effective rehabilitation strategies.

Combined rehabilitation programs incorporating stretching, weight bearing, and functional training may also be investigated to determine whether integrated interventions provide greater clinical benefit.

CLINICAL IMPLICATIONS

The findings of this study highlight the importance of physiotherapy interventions in the management of post stroke spasticity.

Stretching exercises remain an essential component of rehabilitation because they help maintain muscle flexibility, prevent contractures, and improve passive joint mobility. Physiotherapists should continue to include stretching techniques in rehabilitation programs for stroke patients.

However, the greater improvement observed in the weight bearing exercise group suggests that these exercises may play a more significant role in regulating muscle tone and improving functional recovery.

Weight bearing exercises stimulate proprioceptive receptors, enhance neuromuscular control, and promote activation of postural muscles. These benefits may help improve balance, coordination, and mobility in stroke patients.

Therefore, physiotherapists may consider incorporating structured weight bearing

activities such as supported standing, weight shifting, and functional training into rehabilitation programs for patients with post stroke spasticity.

Such interventions may contribute to improved motor recovery, greater independence in daily activities, and enhanced quality of life for stroke survivors.

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