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The Efficacy Of Repetitive Passive Movement And Joint Compression On Shoulder In Stroke Patients

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Abstract:

Methods:

The purpose and nature of study was explained to the participants and consent form was filled by the participants. Willing participants were given a consent form. Participants were stroke patients between 47 to 77 ages. Based upon the inclusion and exclusion criteria a total of 14 students were included in study. The test results were recorded, and statistical analysis was done.

Results:

The study shows that there is improvement in joint proprioception after the intervention. The reduced joint proprioception led to other shoulder complications after stroke. The intervention showed that increasing the proprioception leads to stability of the shoulder and increases the learning capability of motor functions.

Conclusion:

Following the intervention of repetitive passive movement and joint compression, both the contralateral and ipsilateral shoulders of stroke patients demonstrate increased joint proprioception. As a result of the intervention, passive reproduction of joint position was increased. These findings, as well as the activation of proprioceptors, could be explained by the control of muscle spindles of afferent signals provided by muscle spindles. The shoulder instability that was a complication of the reduced proprioception was also improved. Thus, in the subacute stage of a stroke, joint compression and repetitive passive movements should be given. As a result, this intervention can be effectively employed to improve shoulder proprioception in the early stages of a stroke.

I. INTRODUCTION

Proprioception is the body's ability to sense movement, location, and action. It is what makes you do things without thinking about where your foot should be next. It is often measured through joint position sense. Joint position sense determines the ability of a person to perceive a presented joint angle and then, after the limb has been moved, to actively or passively reproduces the same joint angle (Clinically measured as a joint matching task)[1]. The conscious movement may help minimize the loss of proprioception and potential somatosensory cortex reorganization. Proprioception is the ability needed to learn a new skill, it allows us to interact with the environment without thinking about the dependence of the visual feedback and what next movement should be. This particularly is affected in patients who have had a stroke. Stroke has profound effect on upper limb movement and stability. Complications such as subluxation, spasticity and rotator cuff injury and impingement syndrome. These complications can affect joint position sense. An affected shoulder proprioception could impede rehabilitation because of a chronically unstable shoulder. Proprioception is impaired because of stroke, this has consequences for shoulder movement and positioning, which may impede rehabilitation [2]. Next to training functional movements, proprioception could also be trained. A longitudinal intervention study is necessary to show whether training proprioception is beneficial for shoulder functioning and if it decreases the occurrence of shoulder pain [2]. Exercise increases in elasticity of muscle tissue and facilitates the supply of oxygen [3]. It also heightens body temperature and improves the sensitivity of mechanoreceptors, thereby positively influencing JPS. However, excessive exercise generates metabolites through the direct action of muscle spindles, disables afferent feedback, and causes fatigue of the body. This may adversely affect proprioception [3]. Proprioceptive training can yield meaningful improvements in somatosensory and sensorimotor function [4].

II. Methodology.

- Permission was taken from the authorities in the area where the study was conducted.
- The procedure and purpose of the study was explained to the participants.
- Consent form was filled by those who were willing to participate in the study. Based on the inclusion and exclusion criteria, sample population was selected.
- The subjects were examined by manual muscle testing, modified Ashworth scale. It was seen that the subjects can perform all physical, cognitive and communicative tests for this study.
- Subjects with Ashworth score less than 1 or 0 and manual muscle grade more than 3.
- Mini- mental status was also examined and subjects with score more than 25 were selected.
- The subjects were evaluated, and their joint proprioception was taken. Pre-test and post-test were assessed by Thumb Localization test and Box and Block Test.
- For thumb localization test, the reaching limb is on the ipsilateral knee at the start of the test. Participants are instructed to pinch the opposite thumb.

  The limb position of the fixed limb: (a) The forearm in the neutral position, with the elbow at 90˚of flexion and the shoulder at 0˚of flexion. (b) The forearm in the neutral position, with the elbow at 90˚of flexion and the shoulder flexed so that the thumb is at the same level as the mouth. (c) The forearm in the neutral position, with the elbow at 90˚of flexion and the shoulder internally rotated so that the thumb is over the midline of the trunk.

Scoring – 0 - Normal
1 - Slightly Impaired
2 - Moderately impaired
3 - Severely Impaired

- For the Box and Block Test, Individuals are seated at a table, facing a rectangular box that is divided into two square compartments of equal dimension by means of a partition.
  The individual is instructed to move as many blocks as possible, one at a time, from one compartment to the other for a period of 60 seconds.
  The BBT is scored by counting the number of blocks carried over the partition from one compartment to the other during the one-minute trial period.
  Patient's hand must cross over the partition for a point to be given, and blocks that drop or bounce out of the second compartment onto the floor are still rewarded with a point.
  Multiple blocks carried over at the same time count as a single point.
- Then the subjects were treated with repetitive passive movements and joint compression for following 4 weeks.
- The subjects were again evaluated after the 4 weeks of intervention and scores were compared.

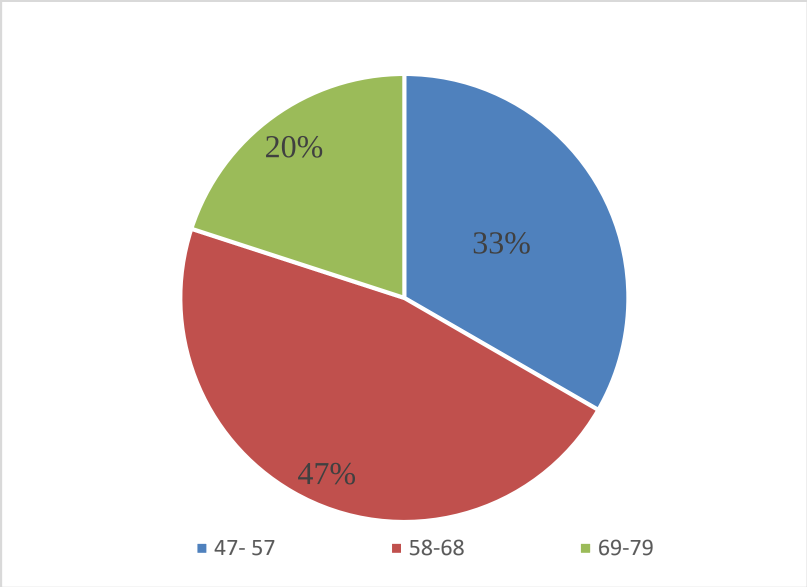
III. Data collection tools:

A consent form was signed by the participants before filling the data collection sheet with all the details explained in Marathi. The respondents were informed about the aim of the study as well as the fact that participation in the survey was totally voluntary. Data collection sheets were distributed to the participants.

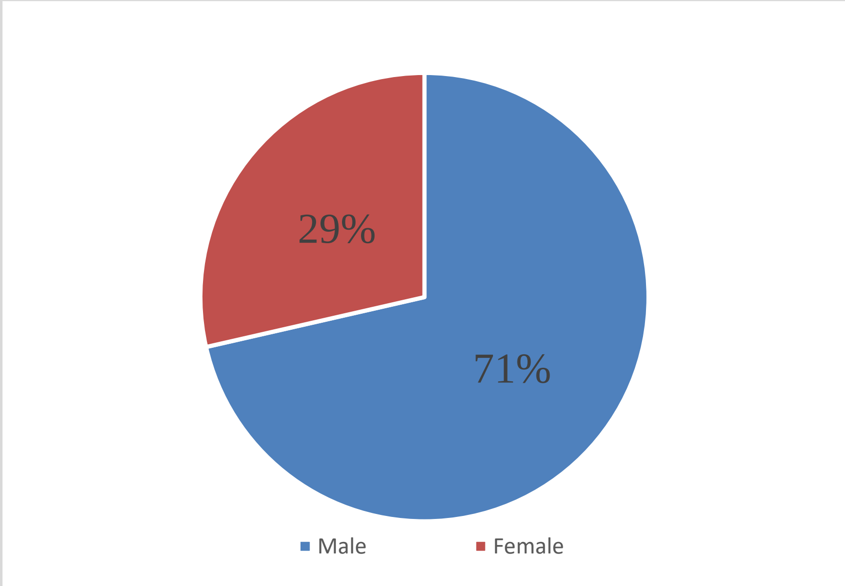
IV. Results:

Statistical analysis of the recorded data was done by using the software Instat.
Percentages for each demographic data variable was calculated.
Data was calculated.
MS Excel was used for drawing various graphs with given frequencies and for master chart.
The two tailed p- value for box and block test and thumb localization test was <0.0001 which is extremely significant for both.

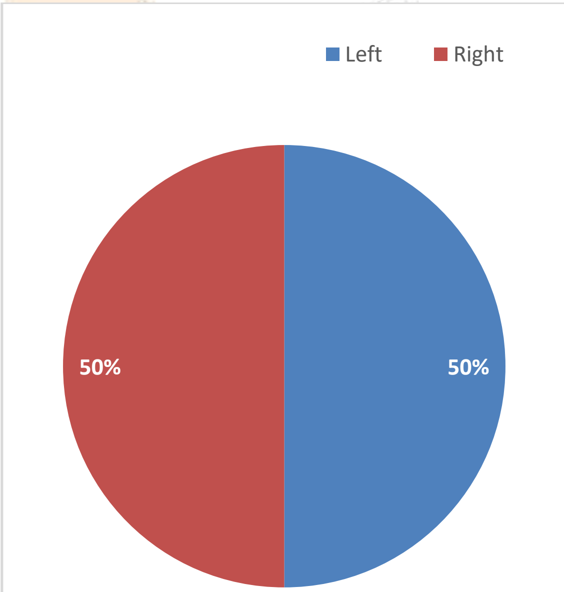
Graph no.1: Age Distribution



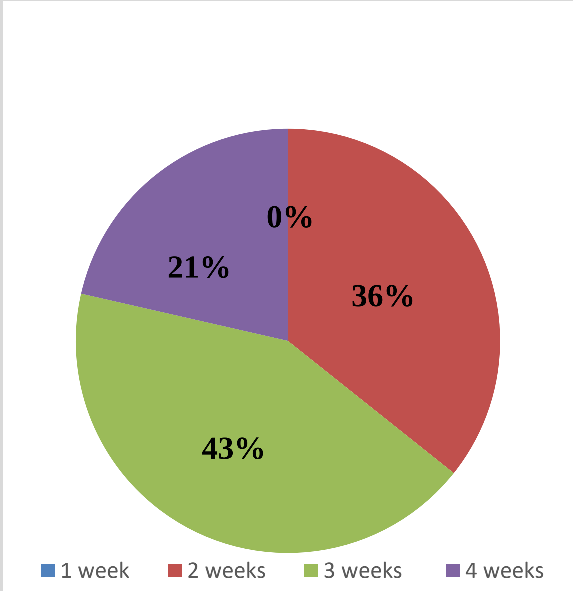
Graph no.2: Gender Distribution



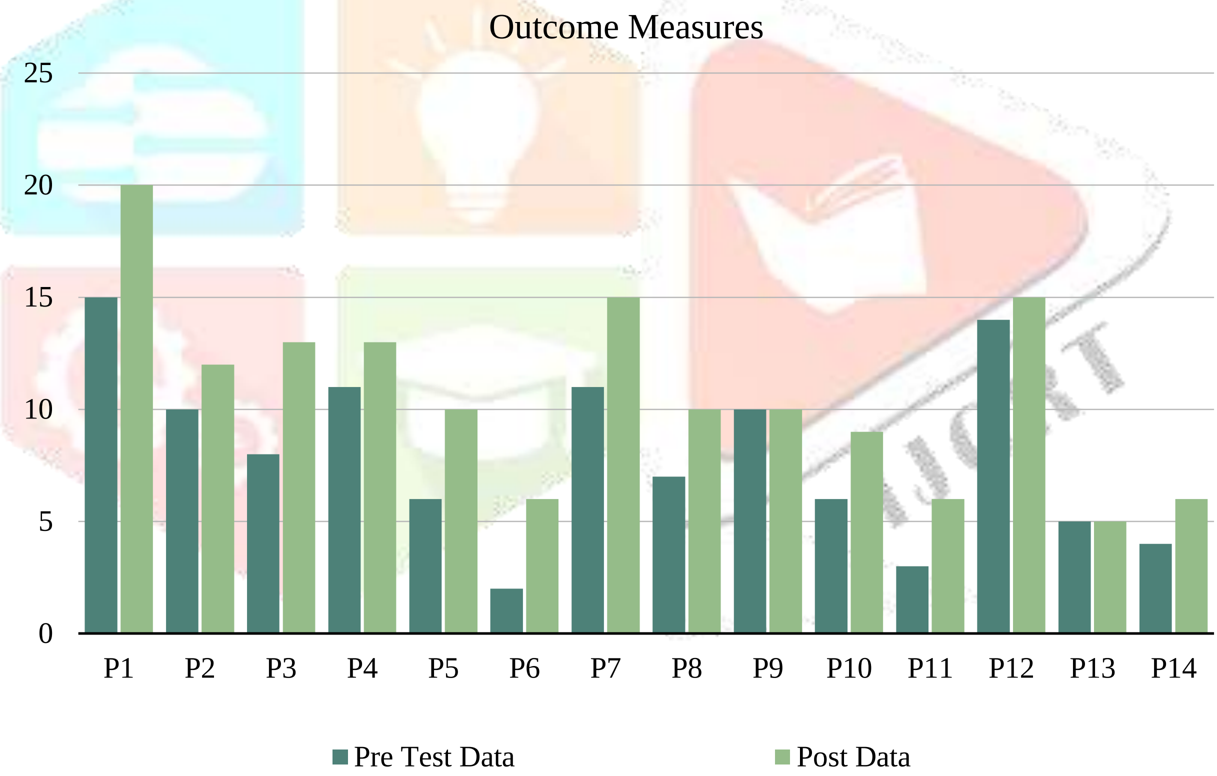
Graph no.2 Side of the Brain Affected



Graph no.4 Time since Stroke Occurred

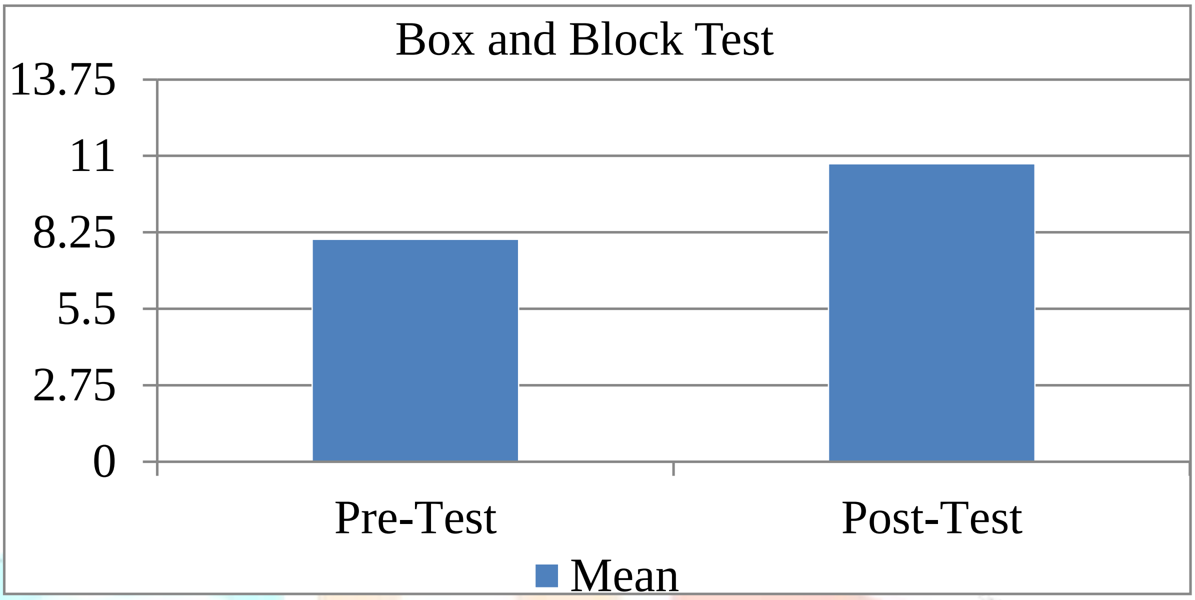


Graph no.5: Outcome Measures (Values)



able no. 1: P-Values for the Outcome Measures

	P- Value
Thumb localization Test	<0.0001
Box and Block Test	<0.0001



Graph no.7: Mean for Thumb Localization Test

Table no. 2: P-Values for Box and Block Test.

Box and Block Test	Mean	SD	P-Value
Pre-Test	8.000	3.981	<0.0001
Post-Test	10.714	4.286	<0.0001

Interpretation: From Graph no. 7 and table no. 3 we can interpret that thumb localization is inversely proportion to joint proprioception. The Score reduced post-test after the intervention. While p-value 0.0001 is considered very significant.

Graph no. 8 Mean for Thumb Localization Test

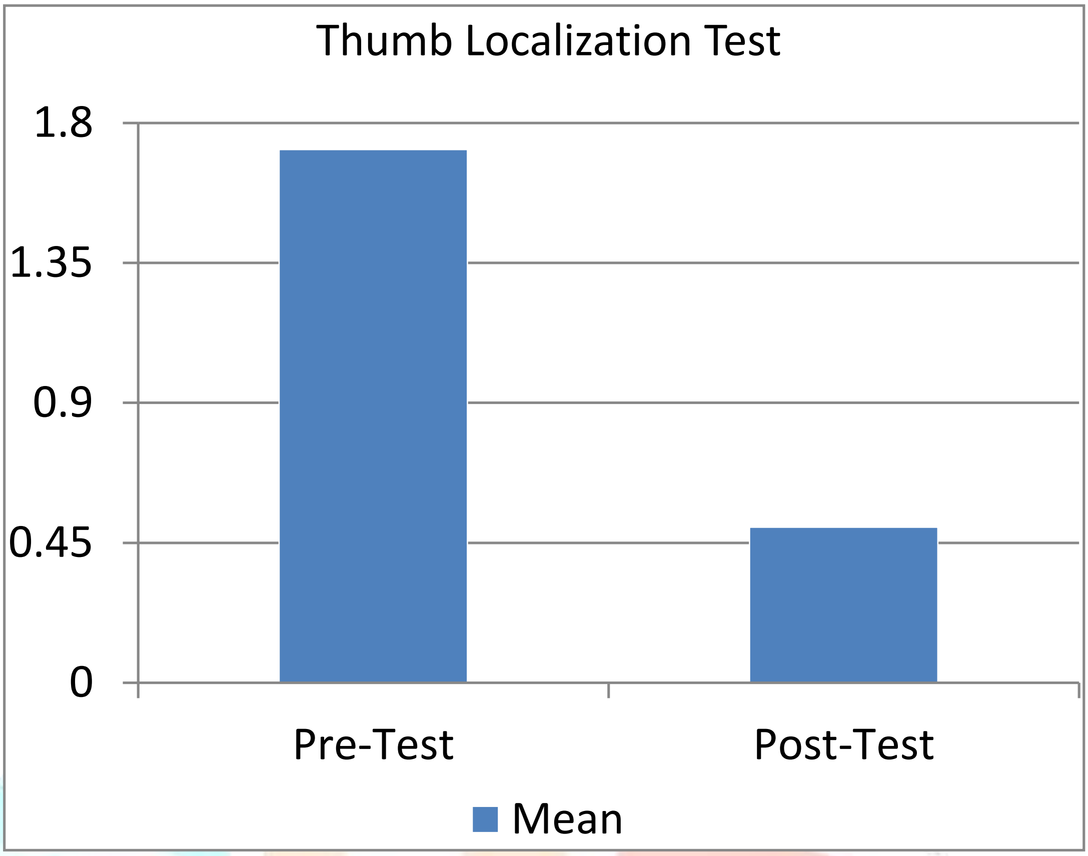


Table no. 3: P-Values for Thumb Localization Test

Box and Block Test	Mean	SD	P-Value
Pre-Test	1.714	0.4688	<0.0001
Post-Test	0.5	0.5189	<0.0001

Interpretation: From Graph no. 8 and table no. 3 we can interpret that thumb localization is inversely proportion to joint proprioception. The Score reduced post-test after the intervention. While p-value 0.0001 is considered very significant.

V. Discussion:

The purpose of this study was to see how effective repetitive passive movement and joint compression are after a stroke, particularly in terms of position sense and kinesthesia. We reasoned those proprioceptive abnormalities could be caused by shoulder instability, which is typical in stroke patients. There have been studies that show a significant reduction in kinesthesia in the contralateral and ipsilateral shoulders of stroke patients when compared to healthy people. Muscle spindles are the primary source of kinesthesia and position information, but mechanoreceptors in ligaments, the subacromial bursa, and capsules have also been reported to play a role in kinesthesia. However, rather than responding to movement, these mechanoreceptors are thought to respond primarily to terminal flexion and extension. Because both the contralateral and ipsilateral sides' kinesthesia is affected, a problem with central integration and processing of muscle spindle feedback in stroke patients appears to be a likely and significant factor. Sensorimotor processing in the brain receives proprioceptive feedback as an input. In the contralateral primary motor and sensory cortices, in the premotor cortical areas, the brain regions responsible for integrative sensorimotor processing are found. Both hemispheres are involved in the processing of proprioceptive feedback, which could explain why the ipsilateral side has affected kinesthesia as well. The human shoulder has been shown to have a small number of mechanoreceptors, which decreases with age. The central nervous system integrates and processes proprioceptive feedback (including kinesthesia and position sense). If these areas are compromised because of a stroke, the patient group may experience changes in kinesthesia and position sensation. Type Ia sensory fibers in the muscle spindle respond to both the velocity and the degree of strain when a muscle is stretched and provide this information to the spinal cord. Similarly, type II sensory fibers detect and send information to the central nervous system about the degree of stretch. The contractile end portions of intrafusal fibers in the muscle spindles are stimulated by gamma motoneurons in the spinal cord. This tightens the spindle and makes it more sensitive to the movement of the muscle spindle. If gamma motor neuron control is not functioning properly due to stroke hemiplegia, muscle spindle sensitivity can be impaired.

In addition to problems with central integration and processing of muscle spindle feedback, this instability can also impair proprioceptive sensation. In the unstable contralateral shoulder, the glenoid ligament can be stretched or dislodged from the glenoid, which has been shown to have a detrimental effect on proprioception. Another factor to consider is the speed of information processing after a stroke. It is well known that reaction time is reduced because of stroke. Stroke has been shown to result in slower decision-making, and this effect is most pronounced in patients with stroke in the right hemisphere.

VI. Conclusion:

The intervention showed that there was a significant improvement in Joint proprioception after the intervention given. The pre-test and post-test data shows the intervention given in initial stages of rehabilitation can improve the results significantly and the patients would have less shoulder complications. The motor learning can also be improved through joint proprioception.

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