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Effects of cognitive sensory motor training versus repetitive facilitation exercises on quality of movement of upper limb, functional activity and range of motion of upper limb in hemiparetic patients.-a comparative study

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Abstract
Background: Stroke [CVA] is the sudden loss of neurological function caused by an interruption of blood flow to the brain. Large numbers of people who survive a stroke are left with permanent impairment of arm and hand function, even after completion of conventional rehabilitation programs. The standard neurophysiological facilitation technique use for hemiplegic upper limb have not been confirmed to promote functional recovery of hemiplegic limb. This promote that more research needs to be conducted for same. Cognitive Sensory Motor Training Therapy & The repetitive facilitation exercises (RFEs) Both techniques will promote functional recovery of hemiparetic upper limb and hand by improving joint perception and realization of movement. Hence, this study aims to compare the effectiveness of cognitive sensory motor training versus repetitive facilitation exercises on quality of movement of upper limb, functional activity and Range of motion of upper limb in hemiparetic patients
Method: 38 patients with hemiparesis were selected and assessed by using MESUPES Scale, Barthel index and ROM. They were divided randomly into two groups Group A & B. Group A received cognitive sensory motor training & group B received repetitive facilitation exercise.
Result: Both Cognitive Sensory Motor Training and Repetitive Facilitation Exercise are equally effective in improving Quality of movement of upper limb, functional activity and ROM in Hemiparetic patients.
Conclusion: Both Cognitive Sensory Motor Training and Repetitive Facilitation Exercise are equally effective in improving Quality of movement of upper limb, functional activity and ROM in Hemiparetic patients.

Keywords: patients.-a comparative study, Physiotherapy, functional activity

1. Introduction
Stroke (cerebrovascular accident [CVA]) is the sudden loss of neurological function caused by an interruption of blood flow to the brain. Ischemic stroke is the most common type, affecting about 80 % of individuals with stroke. Clinically, variety of focal deficit are possible, including changes in the level of consciousness an impairment of sensory, motor, cognitive, perceptual, and language functions [1].
Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/ 100,000 in urban areas.
The incidence rate is 119-145/100,000 based on the recent population based studies [2] Ischemic stroke is the most common type, affecting about 80% of individuals with stroke and results when a clot blocks or impairs blood flow, depriving the brain of essential oxygen and nutrients. Haemorrhagic stroke occurs when the blood vessels rupture, causing leakage of blood in or around the brain [1].
Atherosclerosis is a major contributory factor in cerebrovascular disease. Approximately 80% of all stroke cases are ischemic and the remaining 20% are haemorrhagic [1].
The term cerebrovascular accident (CVA) is used interchangeably with stroke to refer to the vascular conditions of the brain.

Stroke causes tissue damage due to ruptured blood vessels or blood clots that may block oxygen and nutrient supply, which results in symptoms such as facial muscle weakness, one-sided extremity muscle weakness, gait difficulty, dizziness, and loss of balance and [3] control.

Diminished motor skills lead to use of non-paretic extremities for extended periods of time, which causes muscle weakening on the paretic side relative to the non-paretic side. This [4, 5] results in muscle imbalances, body asymmetry, and impaired balance.

Stroke is the most common cause of chronic disability. Of survivors, majority will experience difficulty with activities of daily living (ADLs), ambulation, speech, motor disturbance, sensory disturbance, perceptual disturbance, language disturbance, cognitive [6] disorder, and urinary incontinence depending on the area of the brain lesion. Hemiplegia is commonly associated with a decrease in balance ability [7]. 50% to 65% of stroke patients are left with functional impairments [8, 9]. Most patients are still significantly disabled beyond 6 months after stroke, and do not return to social activities within the community [10].

Large numbers of people who survive a stroke are left with permanent impairment of arm and hand function, even after completion of conventional rehabilitation programs. It has been reported that only 5–20% of patients regain full arm and hand function with a number of prospective cohort studies suggesting that 33–66% of stroke patients with a paretic arm do not show any recovery of upper limb function six months after stroke [3].

Understanding upper limb impairment after stroke is essential to planning therapeutic efforts to restore function. However determining which upper limb impairment to treat and how is complex for two reasons: 1) the impairments are not static, i.e. as motor recovery proceeds, the type and nature of the impairments may change; therefore the treatment needs to evolve to target the impairment contributing to dysfunction at a given point in time. 2) multiple impairments may be present simultaneously, i.e., a patient may present with weakness of the arm and hand immediately after a stroke, which may not have resolved when spasticity sets in a few weeks or months later; hence there may be a layering of impairments over time making it difficult to decide what to treat first. The most useful way to understand how impairments contribute to upper limb dysfunction may be to examine them from the perspective of their functional consequences. There are three main functional consequences of impairments on upper limb function are: (1) learned nonuse, (2) learned bad-use, and (3) forgetting as determined by behavioral analysis of tasks. The impairments that contribute to each of these functional limitations are described.

Cognitive Sensory Motor Training Therapy is a unique comprehensive rehabilitation programme incorporating systematic coaching and retraining of sensory guided motor control.

First proposed by Professor Carlo Perfetti, this rehabilitation programme is now known as Perfetti's Method. Perfetti's Cognitive Sensory Motor Training Therapy is that it focuses on sensory retraining, with particular emphasis on joint position perception [3].

The repetitive facilitation exercises (RFEs) using novel facilitation methods for the upper limb and fingers, give sufficient physical stimulation, such as by the stretch reflex or skin– muscle reflex that is elicited immediately before or at the same time as when the patient makes an effort to move his hemiplegic hand or finger, in order to elevate the level of excitation of the corresponding injured descending motor tracts and it allows the patient to initiate movements of the hemiplegic hand or finger in response to his intention [4].

Limitations in arm and hand function are a major problem after stroke and cause difficulties in patients' daily lives. Recent research has demonstrated that the adult central nervous system retains a much higher capacity for plasticity and reorganization than earlier believed, therefore, an important goal of stroke rehabilitation is to substantially increase the functional use of the affected arm while minimizing compensatory strategies and avoiding learned disuse [3].

In order to evaluate rehabilitative interventions, therapists need accurate and reliable measurements which also capture the movement quality. Although achieving good quality of movement is proclaimed as an important goal in modern stroke rehabilitation there are few appropriate measures to evaluate this in the upper extremity [4-6]. The existing measurements usually have a quantitative approach (for example measures time to perform a movement, the number of possible repetitions of a movement, and active range of motion) without identifying whether the movement is similar to premorbid movements or whether the action occurs through compensatory movements. In addition, there is a lack of standardization of passive range of motion and movement quality of active range especially when there is a low level of arm function [7].

This approach has been used in the development of the new assessment tool, the Motor Evaluation Scale of Upper Extremity in Stroke Patients (MESUPES) [8-10]. This is a scale that purposely measures quality of movement of the hemiparetic upper extremity and it was translated by Van de Winckel *et al* from its' original Italian version into English in collaboration with the original authors [6].

The MESUPES was divided into two sub scales: the MESUPES-arm test and the MESUPES-hand test.

The Barthel activities of daily living (ADL) index (BI) is one standardized scale widely used by clinicians and researchers to assess disability. It includes 10 fundamental items of ADL: feeding, grooming bathing, dressing, bowel and bladder care, toilet use, ambulation, transfers, and stair climbing. The total score ranges from 0 to 20, with higher scores signifying better degrees of function.

Subjects and method

Study design was experimental study and type of sampling was simple random sampling. Patients with hemiparesis (age 18 to 79 years) were included for this study

Inclusion criteria

1. Gender : Both male and female
2. Age : 18-79 years
3. Patient with stroke confirmed by MRI No previous history of stroke
4. Mini Mental State Examination Score should be >21 OUT OF 30
5. Brunnstrom Recovery Stage Score should be ≥4 6.

Exclusion criteria

1. Patient with severe sensory disturbance, pain and contracture.

2. Patient with hemi neglect
3. Presence of any other musculoskeletal condition. e.g. (Frozen shoulder, any recent fractures of upper limb.

Over 38 patients were screened out of which those who were willing to participate and fulfilling the inclusion and exclusion criteria were included in the study. Detailed information sheet was given and informed consent was taken from all the patients. The procedure was explained in detail.

Group A: cognitive sensory motor training

1. The participants will be blindfolded during the exercises and ask to concentrate on sensing the position of the limb.
2. The therapist will passively move the shoulder, elbow, wrist, and finger to different positions in proximal to distal manner.
3. In the beginning, only one joint will move at a time. Once the therapist finished repositioning the joint, ask the participants to report their perception of the joint position. Initially, ask the participant to discriminate between just two positions. If they could reliably answer correctly, then ask to differentiate between three, four or five points.
4. For joints with many possible planes of movement, training will be conducted separately for each plane. For example, forward flexion and backward extension of the shoulder will be trained separately from abduction/adduction and internal/ external rotation of the shoulder.
5. at this stage therapist will passively move the patient's arm up and down while it resting on a table top or other firm object which can be tilted to desired angles.
6. Ask the patient to sense the tilt. Again, only two positions will be distinguish in the beginning. Up to five different positions will be offered to the patients. Similar training was applied to the wrist, fingers and forearms.

Fig 1: Cognitive sensory Motor Training for right sided hemiparesis

Fig 2: Rom mesurement in group a

Procedure for Group B: Repetitive facilitation exercise

- Each RFE session includes eight specific exercise patterns

(1) Shoulder flexion with 90 elbow flexion in the supine position. When the therapist said 'Flex' the patient attempts to flex the hemiparetic shoulder. Then, to facilitate shoulder flexion, the therapist tapped the anterior part of the deltoid muscle with his fingers and then pushed on the humeral head to avoid impingement in the shoulder.

(2) Shoulder horizontal extension/flexion with elbow flexion in the supine position. When the therapist will give commands to 'Extend' or 'Flex', the patient attempts to extend or flex his shoulder, respectively. To facilitate shoulder horizontal extension/flexion, rapid stretching and rubbing of the deltoid muscle were applied by the therapist.

(3) Shoulder flexion/adduction/external rotation with flexion of the elbow and forearm supination with wrist flexion, finger flexion followed by shoulder extension/abduction/internal rotation while extending the elbow and pronating the forearm accompanied by wrist dorsiflexion and finger extension in the supine position. When the therapist ask to 'Hold my hand and carry it to the top of your head', the patient attempts to perform this movement, which involves shoulder flexion/adduction/external rotation. Then ask to 'Extend your fingers and push my hand to the side of your torso', the patient attempts to perform this movement, which involves shoulder extension/abduction/internal rotation. To facilitate the movements, tapping, rubbing and rapid stretching of the muscles were applied by the therapist.

(4) Shoulder flexion/abduction/external rotation with elbow extension accompanied by wrist extension and finger extension (modified PNF). Ask the patient to, 'Raise your hand over your head as if you were wiping your face with your forearm', the patient attempted to perform this movement, which involves shoulder flexion/ abduction/ external rotation. The therapist will uses his hand to hold the patient's upper limb in a posture of shoulder extension/ adduction/internal rotation, elbow extension and forearm pronation. The therapist will then quickly pulls the patient's upper limb to achieve shoulder extension/ adduction/internal rotation and tapped and rubbed the inside of the deltoid muscle using his fingers to elicit shoulder flexion, while his thumb provided resistance to facilitate the shoulder

external rotation. During these movements, the therapist supported the patient's arm with his other hand.

(5) Forearm supination/pronation with 90 elbow flexion in the sitting position When the therapist will give commands 'Turn your hand (palm) upward', the patient attempts to perform forearm supination and then ask to 'Turn your hand (palm) down- ward', the patient attempts to perform forearm pronation. To facilitate the movements, tapping, rubbing and rapid stretching of the muscles will be apply by the therapist.

(6) Wrist extension and forearm pronation with extension of the fingers in the supine position. the therapist will give commands to 'Turn your forearm as if you were fanning wind to your face with the back of your hand' or 'Turn your forearm and hand as if you were fanning wind to your face with the back of your hand', the patient attempts to perform wrist extension and forearm pronation. The therapist will hold the abductor pollicis brevis in his hand and hold fingers two-to-five in the wrist flexion position.

(7) Finger extension with wrist flexion in the supine position. The therapist will ask to 'Extend', the patient attempts to extend his finger. This exercise will be performed by each of the five fingers of the hemiparetic hand. To facilitate isolated volar abduction of the thumb, tapping, rubbing and rapid stretching of the muscles will be applied by the therapist.

(8) Finger extension/flexion with wrist flexion in the sitting position. Therapist will give commands 'Flex your finger', 'Extend your finger', the patient attempts to flex and extend his finger.
To facilitate isolated finger extension/flexion, tapping, rubbing, rapid stretching of the muscles and slight resistance against finger movements will be applied by the therapist.

Fig 3: Repetitive Facilitation Exercise [1]

Fig 4: RFE [2]

Fig 5: Rom Measurement In Group B

Conventional therapy

- Control activities consisted of self- range of motion (SROM) stretches and active range of motion (AROM) strengthening exercises throughout the hemiparetic upper extremity.
- During SROM stretches, participants clasped the hands or arms together and used the strength of the less-affected arm to move the affected arm through the available ROM at each joint.
- During AROM exercises, the hemiparetic arm was supported against gravity by a tabletop, and a towel was placed under the arm to decrease friction as subjects completed specified movements unilaterally.
- Additional activities consisted of using the affected arm as a functional assist during a prescribed list of activities of daily living (ADL) tasks (such as wiping a table or holding a container while the less-affected hand opened the lid) as well

as hemiparetic upper extremity weight bearing on an open hand with the affected arm extended at the side of the body.

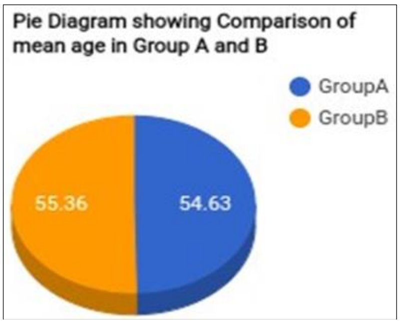
Data analysis and results

The data was collected by primary investigator to find out the effect of cognitive sensory motor training and repetitive facilitation exercise on quality of movement of upper limb, functional activity of hemiparetic patient and was entered into excel spread sheet, tabulated and subjected to statistical analysis.

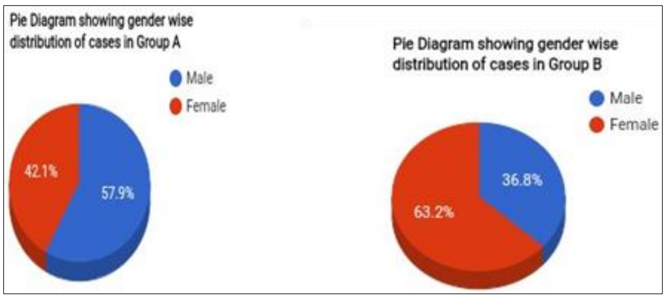
The Data was analyzed with the help of WinPepi (Version 11.65) and Primer (Version 7). Normality of the data was checked and appropriate statistical test was applied.

1) The effect of Cognitive sensory motor training within Group A on quality of movement by MESUPES scale was analyzed by using Wilcoxen signed rank test.
2) The effect of Cognitive sensory motor training within Group A on functional activity by barthel index was analyzed by using Wilcoxen signed rank test.
3) The effect of repetitive facilitation exercise within Group B on quality of movement by MESUPES scale was analyzed by using Wilcoxen signed rank test.
4) The effect of repetitive facilitation exercise within Group B on functional activity by barthel index was analyzed by using Wilcoxen Signed Rank test.
5) The effect of cognitive sensory motor Training (Group A) versus repetitive facilitation exercise (Group B) on MESUPES was analyzed by using Man Whitney U test.
6) The effect of cognitive sensory motor Training (Group A) versus repetitive facilitation exercise (Group B) on Barthel Index was analyzed by using Mann Whitney U test.

Various statistical measures such as mean, standard deviation (SD) and test of significance were utilized to analyze the data. The results were concluded to be statistically significant if, p
<0.05.



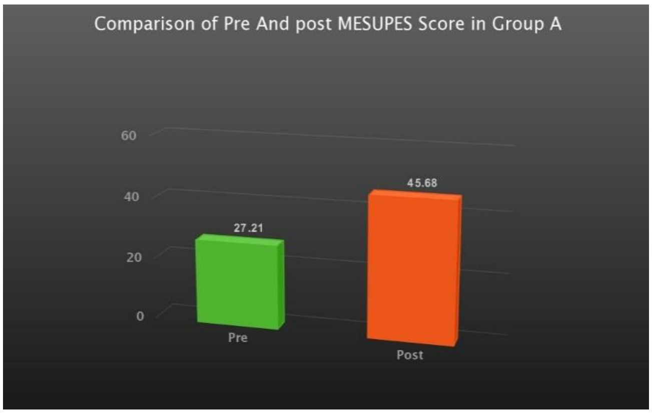
Graph 1: Group A (CSMT) included 19 subjects with mean age (5463) and Group B (RFE) included 19 participants with mean age (55.36). There was no significant difference between the mean age of the groups



Graph 2: Pie diagram showing gender wise distribution of subjects in group A and group B.

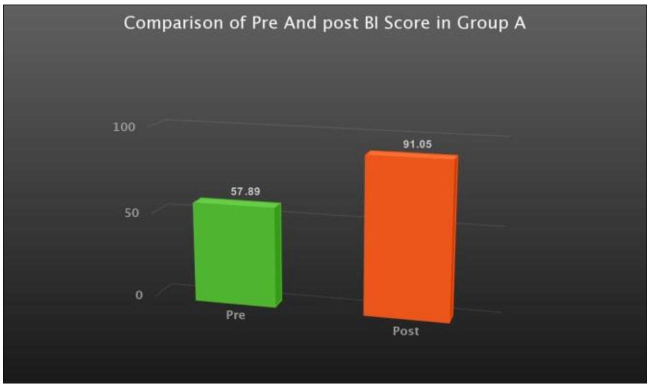
Graph 3: Comparison of pre and post MESUPES score for in group A

The pre and post intervention data in group A (CSMT)) was analyzed using Wilcoxen Sign Rank test, there was significant difference (p < 0.0001) in pre (27.21) and post (45.68) mean score of MESUPES Scale in group A. Thus (CSMT) Training is effective in improving Quality of movement in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks.

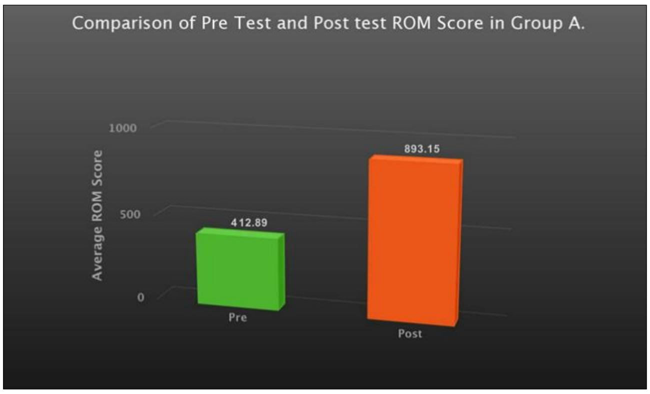


Graph 4: Comparison of pre and post Test BI score for Functional activity in group A.

The pre and post intervention data in group A (CSMT) was analyzed using Wilcoxon Sign Rank test, there was significant difference (p < 0.0001) in pre (57.89) and post (91.05) mean score of BI Scale in group A. Thus CSMT is effective in improving Functional activity in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks.



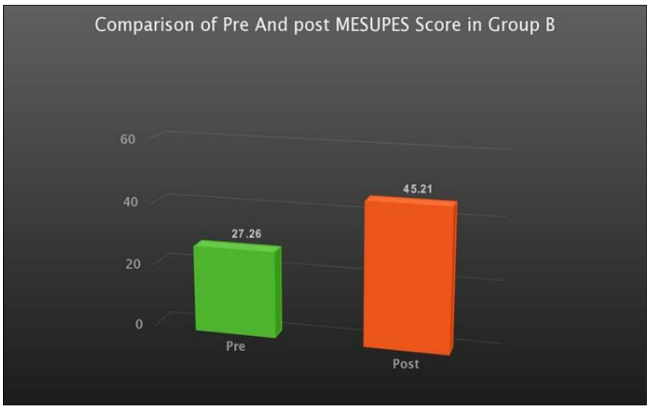
Graph 5: Comparison of pre and post Test Total ROM score for Upper extremity joint in group A. The pre and post intervention data in group A (CSMT) was analyzed using Wilcoxon Sign Rank test, there was significant difference (p < 0.0001) in pre (412.89) and post (893.15) mean score of ROM in group A. Thus CSMT is effective in improving ROM in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks



Graph 6: Comparison of pre and post MESUPES score for in group B.

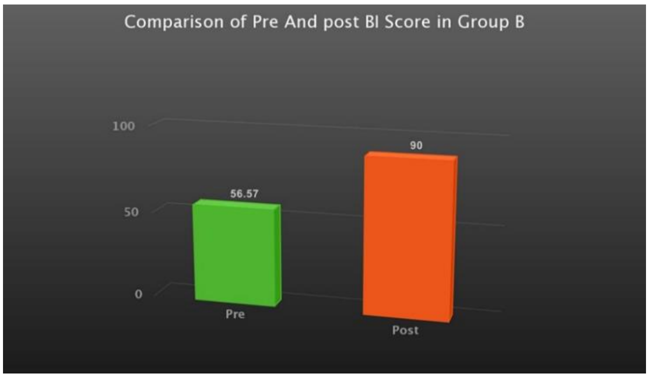
The pre and post intervention data in group A (RFE) was analyzed using Wilcoxon Sign Rank test, there was significant difference (p < 0.0001) in pre (27.23) and post (45.21) mean score of MESUPES Scale in group A. Thus

RFE Training is effective in improving Quality of movement in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks.



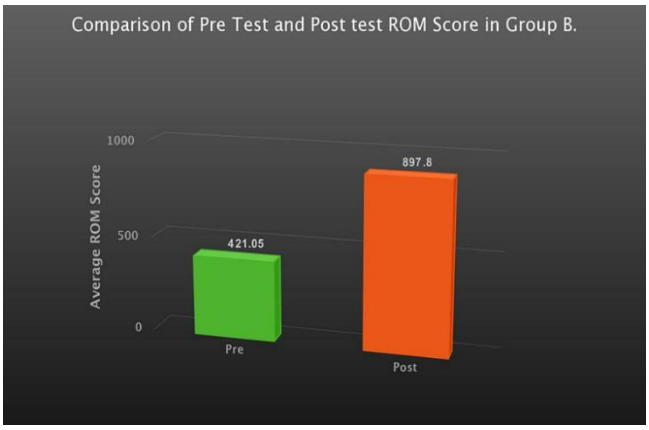
Graph 7: Comparison of pre and post Test BI score for Functional activity in group B.

The pre and post intervention data in group B (RFE) was analyzed using Wilcoxon Sign Rank test, there was significant difference (p < 0.0001) in pre (56.57) and post (90) mean score of BI Scale in group B. Thus RFEis effective in improving Functional activity in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks.



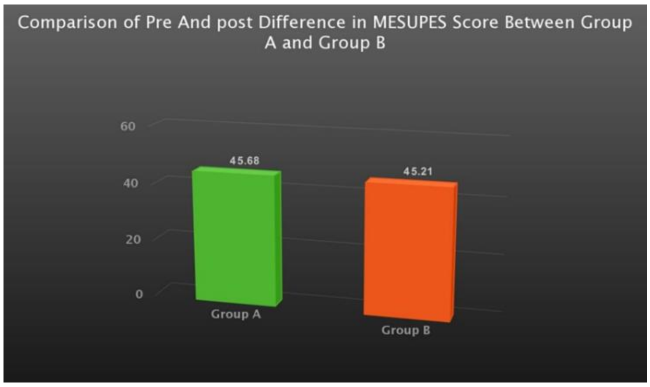
Graph 8: Comparison of pre and post Test Total ROM score for Upper extremity joint in group B.

The pre and post intervention data in group B (RFE) was analyzed using Wilcoxon Sign Rank test, there was significant difference (p < 0.0001) in pre (412.05) and post (897.89) mean score of ROM in group B. Thus RFE is effective in improving ROM in hemiparetic patients aged (18 to 79 years) at the end of 4 weeks.



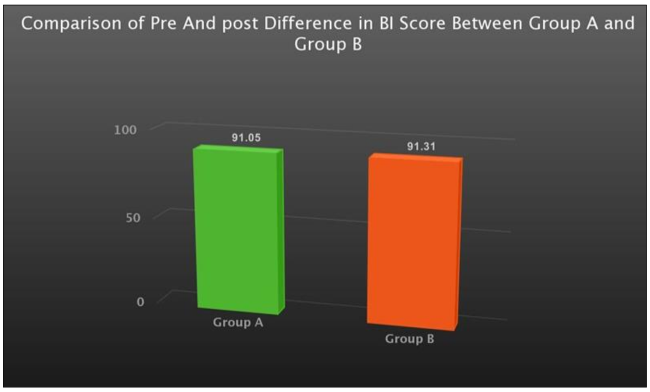
Graph 9: Comparison of pre and post test difference score on MESUPES in group A and group B The pre and post intervention score difference of MESUPES between data in group A An group B was analysed using Mann Whitney test.

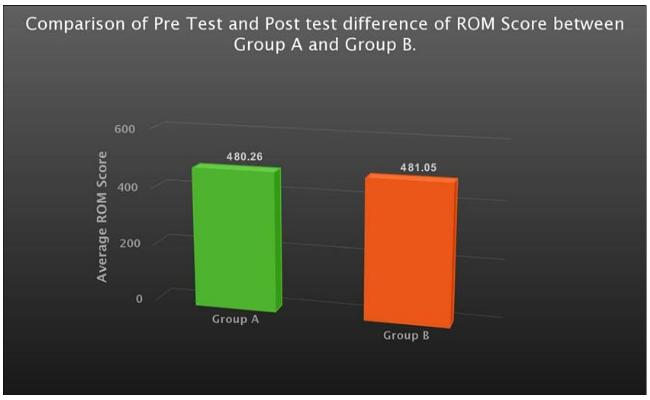
The pre and post intervention mean score difference of MESUPES in group A (45.68) and group B (45.21). There was significant difference p<0.0001. It was seen that both the techniques was effective in hemiparetic patients (aged 18 to 79years) at the end of 4 week.



Graph 10: Comparison of pre and post test difference score on BI in group A and group B.

The pre and post intervention score difference of BI between data in group A An group B was analysed using Mann Whitney test. The pre and post intervention mean score difference of BI in group A (9.05) and group B (931). There was significant difference p<0.0001. It was seen that both the techniques was effective in hemiparetic patients (aged 18 to 79years) at the end of 4 week.





Graph 11: Comparison of pre and post test difference score on ROM in group A and group B.

The pre and post intervention score difference of ROM between data in group A An group B was analysed using Mann Whitney test. The pre and post intervention mean score difference of ROM in groupA (480.26) and group B (481.05). There was significant difference p<0.0001. It was seen that both the techniques was effective in hemiparetic patients (aged 18 to 79years) at the end of 4 week.

Discussion

The present study was undertaken with the intention to see the effectiveness of Cognitive Sensory Motor Training Versus Repetitive Facilitation Exercise for Quality of movement, ADL and ROM in Subjects with Hemiparesis (age 18 to 79 years) using MESUPES and BI scales. The MESUPES is a tool used to checked quality of movement in hemiparetic upper limb, while the BI provides guidelines for determining Daily living activities and functional levels and treatment. A total of 40 subjects both males and females aged 18 to 79 years with stroke (Hemiparesis) were included with 20 participants in each group out of which a total of 19 subjects in group A and 19 subjects in group B completed the 4 weeks of program.

In this study we found that Cognitive Sensory Motor Training is effective in improving Quality of movement of upper limb, functional activity and ROM (p<0.0001)) in Hemiparetic patients. Similarly, Repetitive Facilitation Exercise for is also effective in improving Quality of movement of upper limb, functional activity and ROM (p<0.0001)) in Hemiparetic patients.

The results of the present study are in agreement with the study conducted by Ratanapat Chanubol *et al*, (2012) studied the effectiveness of Cognitive Sensory Motor Training Therapy (Perfetti's method) vis-à-vis conventional occupational therapy in the recovery of arm function after acute stroke by Prospective randomized controlled trial in rehabilitation centers in Bangkok, Thailand.

Forty first-time acute stroke patients without severe cognitive or language impairment were selected for the study. All subjects were randomly divided into two groups; one was treated using Perfetti's method and the other using conventional occupational therapy. Each group underwent therapy for 30 minutes, five times a week for four weeks. The primary variable was arm function as assessed by the Action Research Arm Test; secondary variables were the extended Barthel Index and the box and block test score All 40 participants had very good compliance and could follow every training section completely.

The intention-to-treat analysis of all functional outcome variables (ARAT and box and block test for arm function; Extended Barthel Index for selfcare) All tested outcome variable showed significant improvement from baseline to follow-up (*P* < 0.001) for both treatment groups. The improvements in ARAT and box and block test scores were higher for Perfetti's method, with the median ARAT score increasing by 17 points and the median box and block test score increasing by 13 points. This level of improvement approximates the minimum clinically important difference in ARAT values, which were 12 and 17mpoints for the dominant and non-dominant hand, respectively.18 Median improvements in scores for conventional occupational therapy were lower, with 6.5 points for ARAT and 2.5 points for box and block test, but there was no significant statistical difference between the two groups (*P* = 0.26(ARAT); 0.17 (box and block test)). Both groups had the same Extended Barthel Index, with *P*-value = 0.96. The complete case analyses had also given the same results.

For further analysis, participants were divided into subgroups based on the severity of arm function impairment. The authors define the ARAT score less than 10 as severe impairment because the ARAT score equal or more than 10 represents the opportunity to use hand and fingers in the tasks.19 Of the 40 participants, 22 had sever impairment, defined by an initial ARAT score of <10; group compositions were 12 severely impaired out of 22 in group A and 10 severely impaired out of 22 in group B. Another noteworthy difference in the functional outcome between severely affected patients in the two groups is that while 0% of group B patients had good recovery (defined as ARAT score change greater than 15 points), 42% of group A patients had good recovery. Analysis of subgroups showed significant difference (*P* = 0.02).

Our study is also in conjugation with Study conducted by Kazumi Kawahira *et al*. studied. Effects on the hemiplegic upper limb of repetitive facilitation exercises (RFEs) using a novel facilitation technique, in which the patient's intention to move the hemiplegic upper limb or finger was followed by realization of the movement using multiple sensory stimulations. Twenty-three stroke patients were enrolled in a cross-over study in which 2-week RFE sessions (100 repetitions each of five-to-eight types of facilitation exercise per day) were alternated with 2 week conventional rehabilitation (CR) sessions, for a total of four sessions. Treatments were begun with the 2-week RFE session in one group and the 2-week CRsession in the second group After the first 2-week RFE session, both groups showed improvements in the Brunnstrom stages of the upper limb and the hand, in contrast to the small improvements observed during the first CR session. The Simple Test for Evaluating Hand Function (STEF) score, which evaluates the ability of manipulating objects, in both groups improved during both sessions. After the second 2-week RFE and CR sessions, both groups showed little further improvement except in the STEF score. The novel RFEs promoted the functional recovery of the hemiplegic upper limb and hand to a greater extent than the CR sessions.

Study conducted by Gudrun johansson & charlotte häger investigate interrater reliability of the Motor Evaluation Scale for Upper Extremity in Stroke patients (MESUPES), to provide estimates of the minimal detectable change (MDC) of the MESUPES, and to investigate concurrent validity in relation to the arm scores of the Modified Motor Assessment Scale (M MAS). Forty-two stroke patients (mean age 56+12 years) were independently assessed within a 48 hours window by two raters in different pairs (total raters = 4). Forty-two stroke patients (mean age 56+12 years) were independently assessed within a 48 hours window by two raters in different pairs (total raters = 4). Weighted kappa analysis indicated good to very good agreement at item level (range 0.63-0.96). The relative and absolute reliability of the total score of MESUPES (maximum 58) was high according to the intraclass correlation coefficients (ICC=0.98) and the standard error of measurement (SEM=2.68). The MDC for three levels of confidence was calculated: A score change of 8, 7 and 5 is necessary for a MDC to have confidence of 95%, 90% and 80% respectively of a genuine change. Correlation between the MESUPES and M MAS was high (rs=0.87).

The better improvement in both cognitive sensory motor training and even in repetitive facilitation exercise is because it focuses on sensory retraining, with particular emphasis on joint position perception, incorporating systematic coaching and retraining of sensory guided motor control. And The repetitive facilitation exercises (RFEs) using novel facilitation methods for the upper limb and fingers, give sufficient physical stimulation, such as by the stretch reflex or skin–muscle reflex that is elicited immediately before or at the same time as when the patient makes an effort to move his hemiplegic hand or finger, in order to elevate the level of excitation of the corresponding injured descending motor tracts and it allows the patient to initiate movements of the hemiplegic hand or finger in response to his intention

Conclusion
Both Cognitive Sensory Motor Training and Repetitive Facilitation Exercise are equally effective in improving Quality of movement of upper limb, functional activity and ROM in Hemiparetic patients

Limitations
1. Age group
2. Effect of intervention on voluntary control was not analysed. 3.

Clinical implication-suggestions
Both Cognitive sensory motor training and Repetitive facilitation exercises are recommended to be included in the Rehabilitation program carried out for patients with hemiparesis (age 18 to 79 years) to Quality of movement, Functional activity and ROM. Suggestions for further research:

- Comparison with different treatment approaches can be consider.
- Comparison with different variables

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