International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Effects of Cognitive Sensory Motor Training Versus Repetitive Facilitation Exercises of Upper Limb in Hemiparetic Patients

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ABSTRACT
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 neuro physiological 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 limbin hemiparetic patients.

A blinded randomized clinical trial was conducted 30 patients were divided into 2 groups (GROUP A and GROUP B)- those who performed cognitive Sensory Motor exercises(GROUP A- experimental group) and those who performed repetitive facilitation exercises (GROUP B-control group) Data for measures quality of movement performance of the hemiparetic arm and hand on MESUPES scale, Barthel Index (BI) measures the extent to which somebody can function independently and has mobility in their &, goniometer measuring the joint ranges in each plane of the joint was collected on day 1 (pretreatment session), and on 190 day after the experiment.

This study produced a stastically significant increase in overall on quality of movement, functional activity and range of motion in both the group of upper limb in hemiplegic patients. This research also provides evidence that training exercise may be a valuable and important tool in clinical practice and is consistent with the current use by clinical physiotherapist in the treatment of upper limb in hemiplegic patients.

Keywords: Stroke, Barthel Index, MESUPES scale

INTRODUCTION

Stroke (cerebrovascular accident [CVA]) is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. 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. Hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in or around the brain. Clinically, a variety of focal deficits are possible, including changes in the level of consciousness and impairments of sensory, motor, cognitive, perceptual, and language functions. To be classified as stroke, neurological deficits must persist for at least 24 hours. Motor deficits are characterized by paralysis(hemiplegia)orweakness (hemiparesis),typicallyonthesideofthe body opposite the side of the lesion. he term hemiplegia is often used generically to refer to the wide variety of motor problems that result from stroke. he location and extent of brain injury, the amount of collateral blood flow, and early acute care management determine the severity of neurological deficits in an individual patient. Impairments may resolve spontaneously as brain swelling subsides (reversible ischemic neurological deficit), generally within 3 weeks. Residual neurological impairments are those that persist longer than 3 weeks and may lead to lasting disability. Strokesareclassifiedbyetiologicalcategories(thrombosis,embolus,or hemorrhage), specific vascular territory (anterior cerebral artery syndrome, middle cerebral artery syndrome, and so forth), and management categories (transient ischemic attack, minor stroke, major stroke, deteriorating stroke, young stroke).

PREVALENCEANDINCIDENCEOFSTROKE

Stroke is the fourth leading cause of death and the leading cause of long- term disability among adults in the United States. An estimated 7,000,000 Americans older than 20 years of age have experienced a stroke. Each year approximately 795,000 individuals experience a stroke; approximately 610,000 are first attacks and 185,000 are recurrent strokes. Women have a lower age-adjusted stroke incidence than men. However, this is reversed in older ages; women over 65 years of age have an elevated risk compared to men. Compared to whites, African Americans have twice the risk of first- ever stroke; rates are also higher in Mexican Americans, American Indians, and Alaska Natives. he incidence of stroke increases dramatically with age, doubling in the decade after 65 years of age. Twenty-eight percent of strokes occur in individuals younger than 65 years of age. Between 5% and 14% of persons who survive an initial stroke will experience another one within 1 year; within 5 years stroke will recur in 24% of women and 42% of men. Current data reveal that stroke incidence has been declining in recent yearsin a largely white adult cohort.1 he incidence of stroke deaths is greater than 143,000 annually, and strokes account for 1 of every 18 deaths in the United States. he type of stroke is significant in determining survival. Of patients with stroke, hemorrhagic stroke accounts for the largest number of deaths, with mortality rates of 37% to 38% at 1 month, whereas ischemic strokes have a mortality rate of only 8% to 12% at 1 month. Survival rates are dramatically lessened by increased age, hypertension, heart disease, and diabetes. Loss of consciousness at stroke onset, lesion size, persistent severe hemiplegia, multiple neurological deficits, and history of previous stroke are also important predictors of mortality.

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 disorder, and urinary incontinence depending on the area of the brain lesion. Hemiplegia is commonly associated with a decrease in balance ability 50% to 65% of stroke patients are left with functional impairments. Most patients are still significantly disabled beyond 6 months after stroke, and do not return to social activities within the community. Large numbers of people whosurvive 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.

Thesignsandsymptomsofstrokeareasfollows

- Hemiparesisandweaknessoffacialmuscles
- Numbness
- Alteredsensation
- Initial flaccidity of muscles (decreased tone of muscles) which is later replaced byspasticity(increasein toneofmuscles),exaggerated reflexes and development of synergies.

Majority of the cases of stroke represent unilateral weakness that isweakness on one side of the body. Due to inter-crossing of the fibres of the brain the symptoms usually appear on the opposite side of the area of brain being affected. The human brain is divided into forebrain, midbrain and hindbrain. Forebrain consists of the cerebrum and hindbrain comprises of medulla oblongata, pons verolli and cerebellum. Depending on the severity and extent of damage occurred in the brain different signs and symptoms are seen which are explained as follows-

- Alteredordisturbedsenseofsmell,taste,hearingorvision.
- Disturbedvisualfields
- Weaknessofocularmuscles,characterisedbydroopingofeyelids
- Decreasedreflexesprimarily- thegagreflex,swallowandreactivityof pupil towards light
- Altered sensation on extremities and weakness of the facial and axial musculature.
- Difficultyinbalancinganddevelopmentofnystagmus
- Difficultyin articulation
- Droolingofsaliva

Large numbers of people who survive a stroke are left with permanent impairment of armand 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.

TREATMENTOFHEMIPLEGICUPPERLIMB

Understanding upper limb impairment after stroke isessential to planning therapeutic efforts to restore function. However, determining which upper limb impairment to treat and how is complex for two reasons:-

1) Theimpairmentsarenotstatic,i.e.,asmotorrecoveryproceeds,thetypebandnatureoftheimpairmentsmaychange;therefore,thetreatmentneedsto

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 presentwithweaknessofthearmandhandimmediatelyafterastroke,which may not have resolved when spasticity sets in a few weeks or months later; hencetheremaybealayeringof impairmentsovertimemakingitdifficultto 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 rehabilitationprogramme incorporating systematic coaching and retraining of sensory guided motor control.

First proposed by Professor Carlo Perfetti, this rehabilitation programme is nowknownasPerfetti"sMethod.Perfetti"sCognitiveSensoryMotor

Training Therapy is that it focuses on sensory retraining, with particular emphasis on joint position perception.

The repetitive facilitation exercises (RFEs) using novel facilitation methods for the upper limb and fingers, give sufficient physical stimulation, such as bythestretch reflex or skin–musclereflex that is elicited immediatelybefore 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.

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.

METHODOLOGY

AIM

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.

OBJECTIVE

To identify the effect of Cognitive Sensory Motor Training in individuals with Hemiparetic patients. To identify the effect of Repetitive Facilitation Exercise in individuals with Hemiparetic patients. Toinvestigatetheeffectofcognitivesensorymotortrainingversusrepetitive facilitation exercises on quality of movement of upper limb, functional activity and Range of motion of upper limb in hemiparetic patients.

SAMPLING

Study Design

A comparative study **Sample Method** Experimental

Sample size

The sample size will consist of 30 hemiparesis patients with equal size of 15 patients in each of the two groups.

Sample setting

The study will be originated at career hospital bhopal.

Study Duration

3month

Inclusion criteria

- Gender : Both male and female
- Age:25-65years
- Patient with stroke confirmed by MRI No previous history of stroke
- Mini Mental State Examination Score should be>21OUTOF30
- BrunnstromRecoveryStageScoreshouldbe≥4
- Strokewithinlessthan4weeksbeforethestudy.
- Confirmed by clinical examination and magnetic resonance imaging (MRI).
- Ability to follow simple direction of commands.

Exclusion criteria

- Patient with severe sensory disturbance, pain and contracture.
- Patient with hemineglect pre-existing upper extremity impairment.
- Patient without motor deficits.
- Presence of any other musculoskeletal condition. e.g. (Frozen shoulder, any recent fractures of upper limb.
- Any accompanying diseases or disorders, other than stroke, that could interfere with upper extremity training.
- Uncontrolled health conditions for which exercise was contraindicated.
- Cerebellar lesion.

VARIABLES

Dependent variables

1. MESUPES scale
2. Modified Barthel Index(MBI)

3. Goniometer

Independent variables
1. Arm Function
2. Visual Analogue Scale
3. Muscle power

INSTRUMENTATIONANDFUNCTIONALSCALESUSED
1. MESUPES Scale
2. Barthel index
3. Goniometer set
4. Chair
5. Table
6. Dice

PROCEDURE
Exercise protocols
A blinded randomized clinical trial was conducted 30 patients were divided into 2 groups (GROUP A and GROUP B)- those who performed cognitive Sensory Motor exercises(GROUP A- experimental group) and those who performed repetitive facilitation exercises (GROUP B- controlled group) Data for measures quality of movement performance of the hemiparetic arm and hand on MESUPES scale, Modified Barthel Index (MBI) measures the extent to which somebody can function independently and has mobility in their&,Goniometermeasuringthejointrangesineachplaneofthejointwas collected on day 1 (pretreatment session), and on 90 day after theexperiment.
Both groups underwent their respective interventions for 30 min each in the morning and 30 min in the afternoon to minimize the physical fatigue.

Measurements
MESUPE Sscale
This is approach has been used in the development of the new assessment tool, the Motor Evaluation Scale for Upper Extremity in Stroke Patients (MESUPES).A 17-items into two sub scales ; MESUPES-Arm function; 8items(score 0-5) MESUPES-Hand function;9items(score0-2) objective evaluation scale designed to assess quality of movement of armand hand function after stoke.

Modified Barthel Index (MBI)
The MBI, which consists of 10 items describing activities of daily living (ADL) and mobility, was scored to measure the degree of assistance required by an individual and was used to assess ADL in patients with stroke . Each item is rated 5-Likert scale, with weights added according to the item. The higher the total score, the more independent on performing ADLs.

Goniometer
The range of motion is the measurement of movement around a specific joint range of motion, A universal goniometer has three parts. A body- It is designed like a protractor and may form a full or a

half-circle. It has a scale for the measurement of the angle. The scale can extend either from 0 to 180 degrees or 180 to 0 degrees for half circle models or 0 to 360 degrees on full circle models. The moving arm is the arm of the goniometer, which aligns with the mobile part of the joint measured.

Intervention

GroupA (experimental Group) Cognitive Exercise Therapy

PRE

Day1

20reps x2 set

1. Shoulder joint recognition training by motor imagery
2. Shoulder and elbow joint recognition training using acircular track plate.
3. Training on awareness of elbow and wrist joint angles using a Bogen. Training on pressure awareness of the elbow and wrist using a sponge.
4. Finger tactile recognition training using a tactile plate.

Group A (experimental Group) Cognitive Exercise Therapy

POST

Day90

20reps x2 set

1. Shoulderjointrecognitiontrainingbymotorimagery
2. Shoulderandelbowjointrecognitiontrainingusingacirculartrack plate
3. TrainingonawarenessofelbowandwristjointanglesusingaBogen.
4. Trainingonpressureawarenessoftheelbowandwristusingasponge.
5. Fingertactilerecognitiontrainingusingatactileplate.

GROUPB(controlgroup)RepetitiveFacilitationExercises

EachRFEsessionincludeseightspecificexercisepatterns. PRE

DAY1

20reps x2 set

1. Shoulderflexionwith90elbowflexion.
2. Shoulderhorizontalextension/flexionwithelbowflexion.
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 elbowandpronatingtheforearmaccompanied by wrist dorsiflexion and finger extension in the supine position.
4. Shoulder flexion/abduction/external rotation with elbow extension accompanied by wrist extension and finger extension (modified PNF).
5. Forearm supination/pronation with 90 elbow flexion in the sitting positionWhenthetherapistwillgivecommands,,Turnyourhand

(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.

1. Wrist extension and forearm pronation with extension of the fingers in the supine position.

2. Fingerextensionwithwristflexioninthesupineposition.
3. Fingerextension/flexionwithwristflexioninthesittingposition.

GROUPB(controlgroup)RepetitiveFacilitationExercises

POST DAY90

1. shoulderflexionwiththeelbowbentat90°inthesupineposition
2. shoulder horizontal extension/flexion in the supine position with the elbow ranging in flexion from about 70° to 110°
3. shoulder flexion/adduction/external rotation with flexion of the elbow and forearm supination accompanied by wrist flexion, finger flexion, and shoulder extension/ abduction/internal rotation while extending the elbowand pronatingtheforearmaccompanied bywrist dorsiflexion and finger extension in the supine position
4. shoulder flexion/abduction/external rotation with elbow extension accompanied by wrist dorsiflexion and finger extension
5. forearmsupination/pronationwith90°elbowflexioninthesitting position
6. wristdorsiflexionandforearmpronationwithextensionofthefingersin the supine position
7. fingerextensionwithwristflexioninthesupineposition
8. fingerextension/flexionwithwristflexioninthesittingposition

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.

POST INTERVENTION DATA COLLECTION

Data was collected in a quiet room in the data collection form, along with other details of the subject by the same investigator. Two readings were taken on 1st and 90th day.

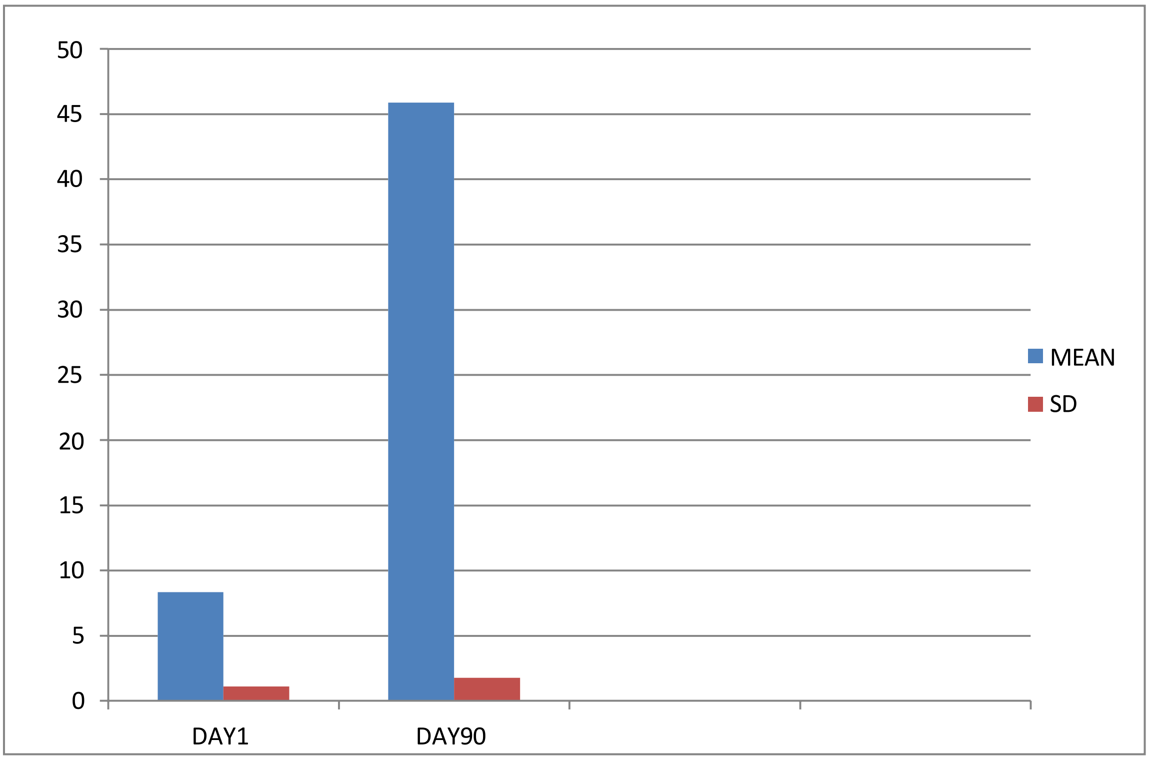
3.7 STATISTICALANDDATAANALYSIS

Analysis of the data collected of the MESUPES Scale, Modified Barthal Index and ROM by Goniometer of 30 subjects was done by several suitable statistical analysis tests by using MS Office Excel software 10.0 version in order to verify the investigation of the study. The results were considered statistically significant if the p-value ≤ 0.01. The characteristics of the data were presented through tables and graphs.

WITHIN GROUP ANALYSIS OF MESUPES SCORE OF GROUPA (EXPERIMENTAL GROUP)

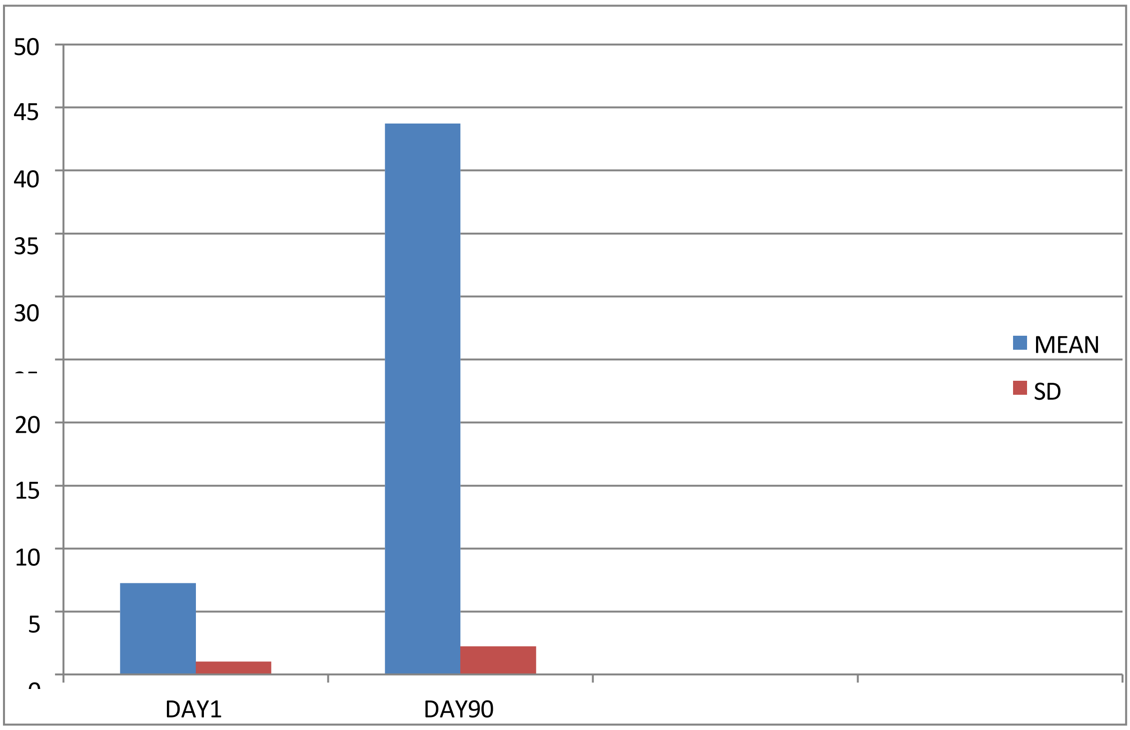
GROUP A EPERIMENTAL	MEAN±SD	tvalue	pvalue
Day1	8.33±1.112		

Day 90	45.8+1.78	-7.24	0.0001



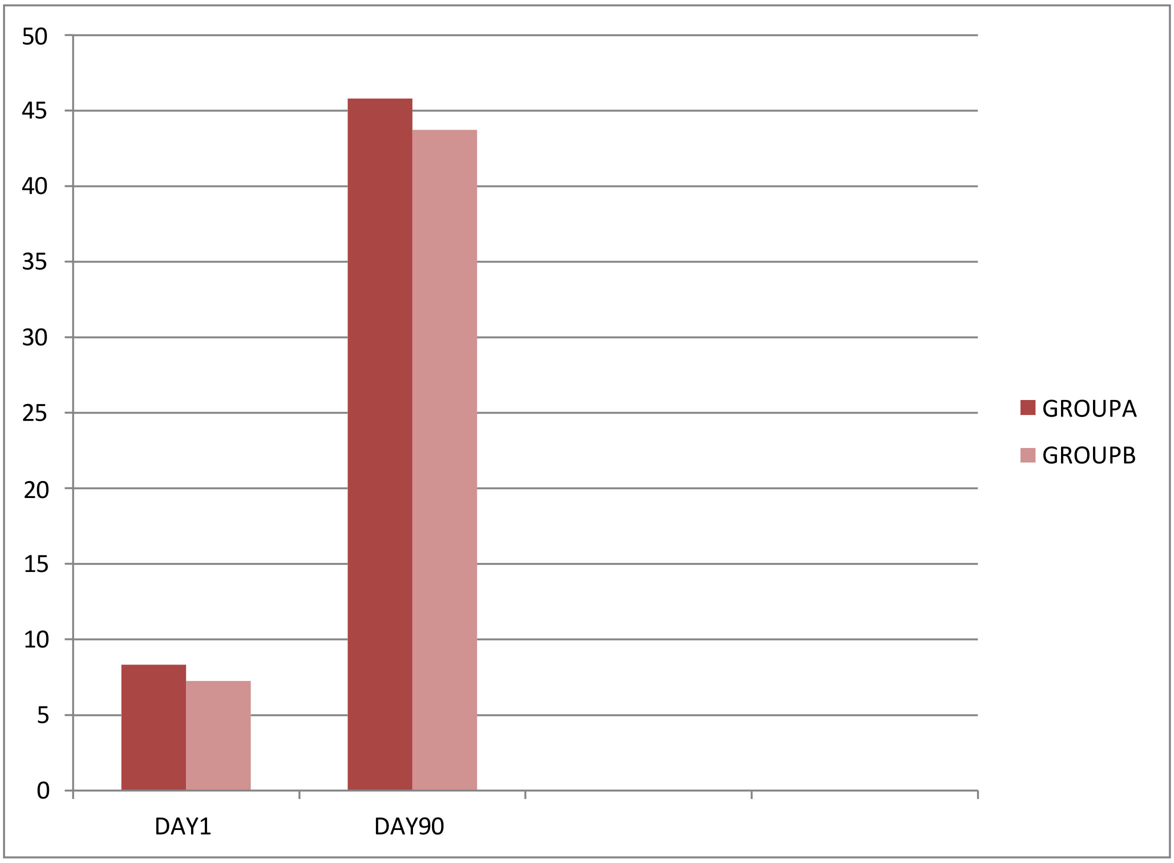
WITHIN GROUP ANALYSIS OF MESUPES SCORE OF GROUPB (CONTROL GROUP)

GROUP B CONTROL	MEAN+SD	tvalue	pvalue
Day1	7.266+1.03	-5.517	0.001
Day 90	43.733+2.25		



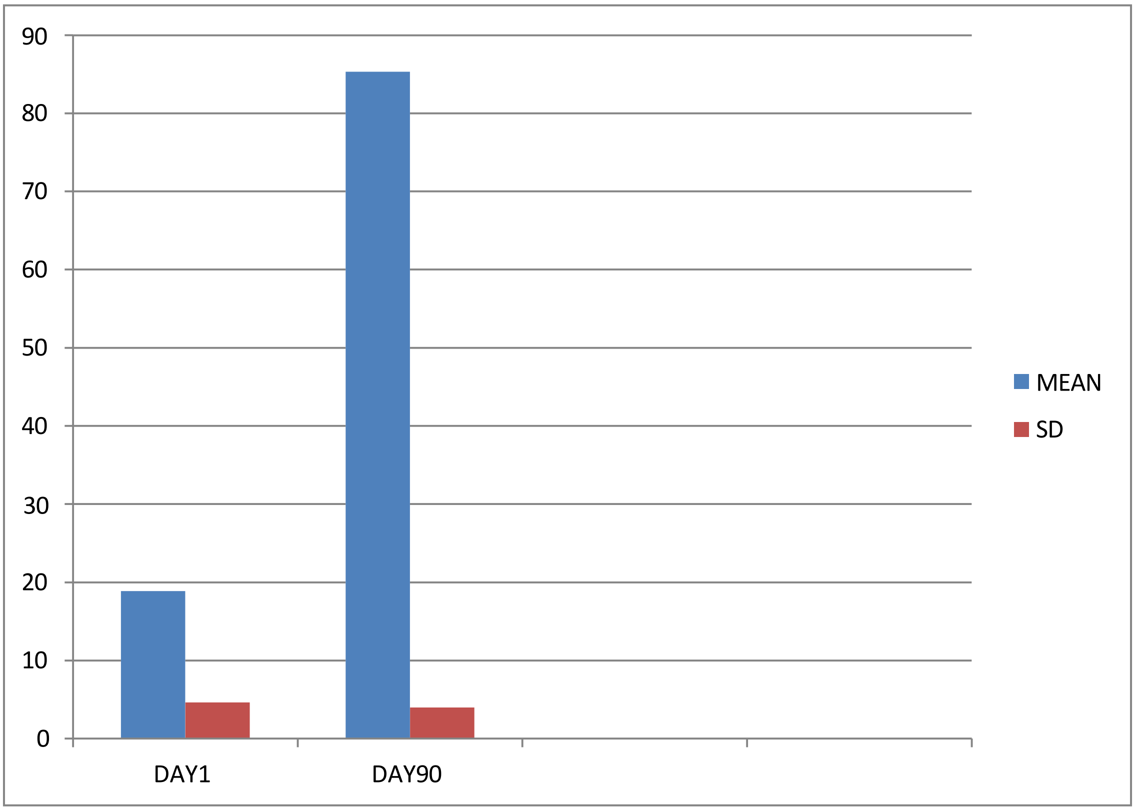
COMPARISON OF MESUPES SCORE BETWEEN GROUP A (EXPERIMENTALGROUP)ANDGROUPB(CONTROLLED GROUP)

	GROUP A M+SDN=15	GROUP B M+SDN=15	t value	p value
DAY1	8.33±1.112	7.266+1.03	2.46	0.02
DAY 90	45.8±1.78	43.733+2.25	2.78	0.004



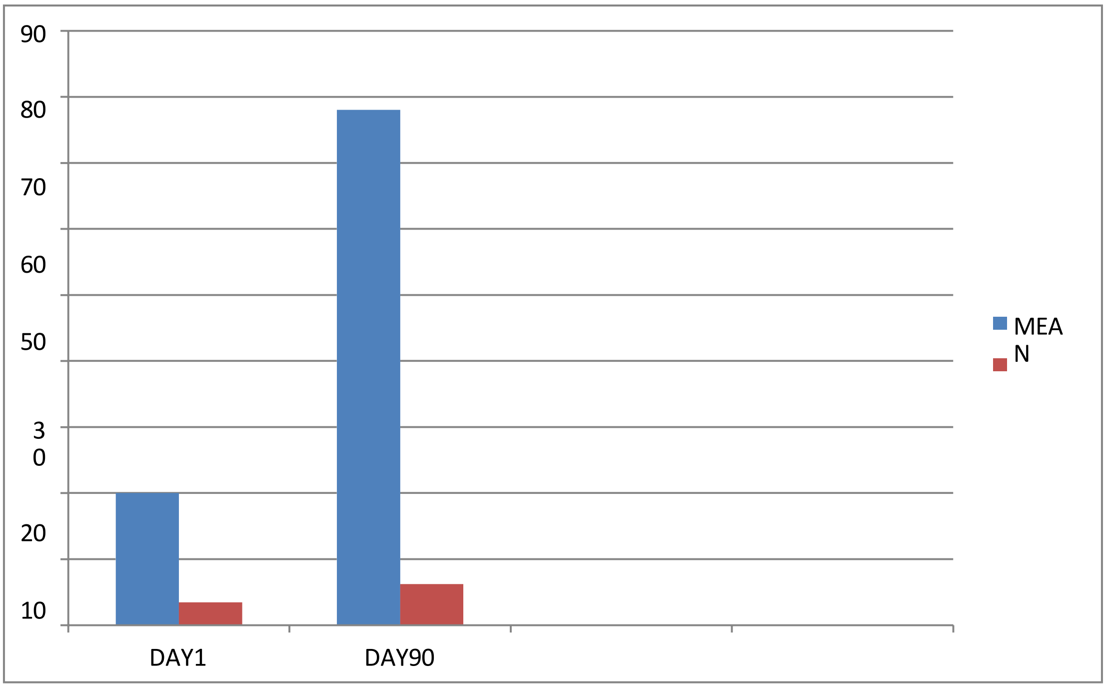
WITHINGROUPANALYSISOFMODIFIEDBARTHALINDEX SCORE OF GROUP A (EXPERIMENTAL GROUP)

GROUP A EPERIMENTAL	MEAN±SD	t value	p value
DAY1	18.8+4.64	-4.25	0.0001
DAY 90	85.33+3.99		



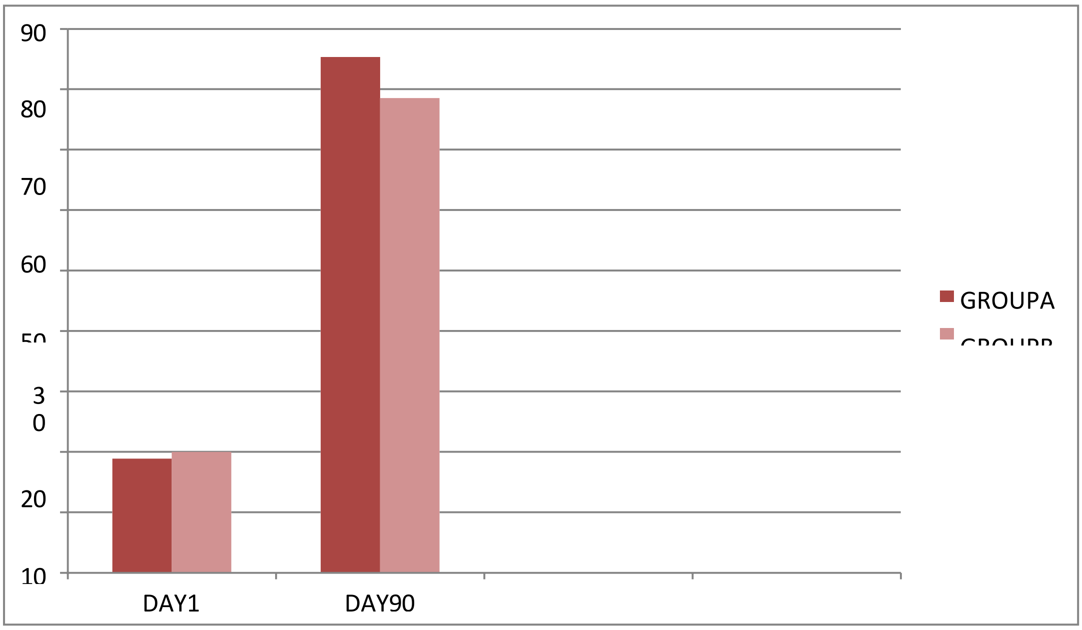
WITHINGROUPANALYSISOFMODIFIEDBARTHALINDEX SCORE OF GROUP B (CONTROL GROUP)

GROUP B CONTROL	MEAN+SD	t value	p value
DAY1	20+0	-3.13	0.574
DAY 90	78+6.21		



COMPARISONOFMODIFIEDBARTHALINDEXBETWEEN GROUP A (EXPERIMENTAL GROUP) AND GROUP B (CONTROLLED GROUP)

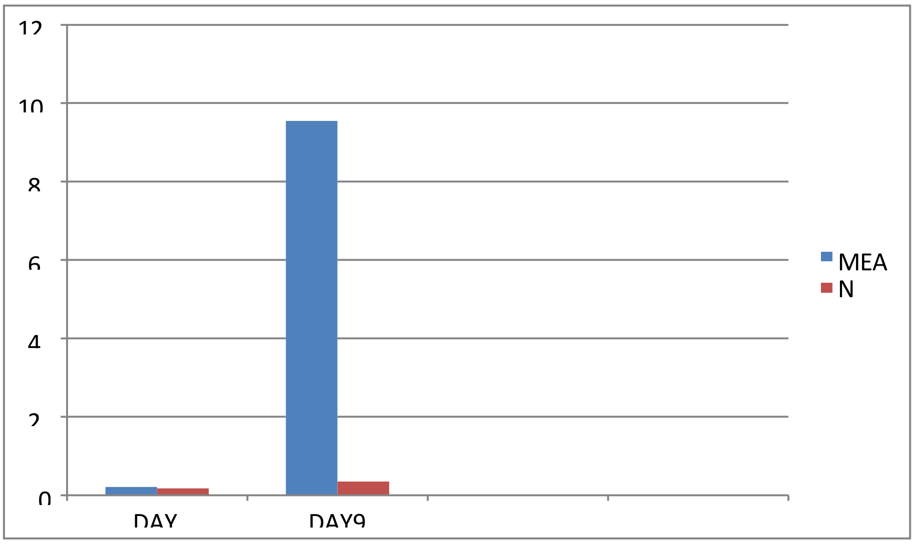
	GROUP A M+SDN=15	GROUPB M + SD N=15	t value	p value
DAY1	18.8+4.64	20+0	6.55	0.003
DAY 90	85.33+3.99	78+6.21	3.85	0.000



WITHIN GROUP ANALYSIS OF FLEXION RANGE ON

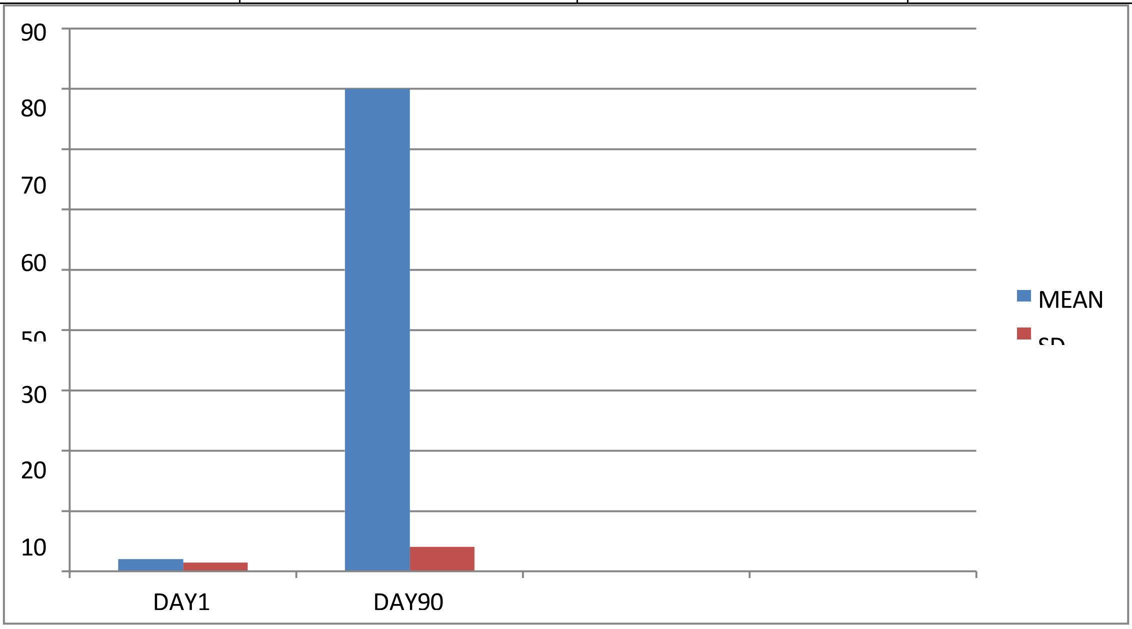
GONIOMETEROFGROUPA(EXPERIMENTALGROUP)

GROUPA EPERIMENTAL	MEAN+SD	t value	p value
DAY1	2.13+1.76	-10.8	0.021
DAY 90	95.46+3.52		



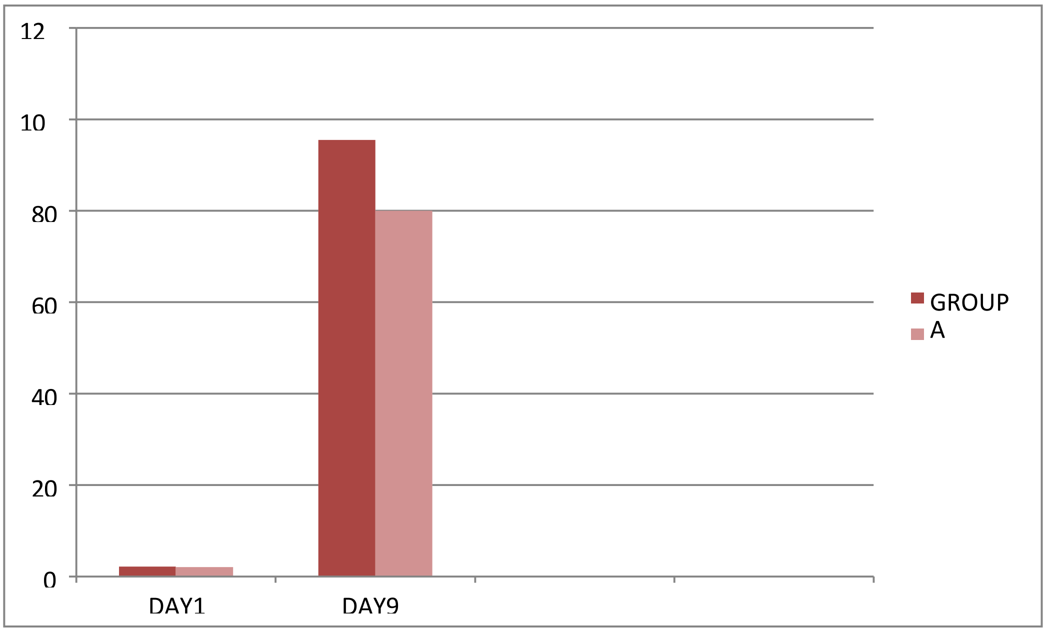
WITHINGROUPANALYSISOFFLEXIONRANGEON GONIOMETER OF GROUP B (CONTROL GROUP)

GROUP B CONTROL	MEAN+SD	t value	p value
DAY1	1.8+1.47	2.07	0.1005
DAY 90	80+4.05		



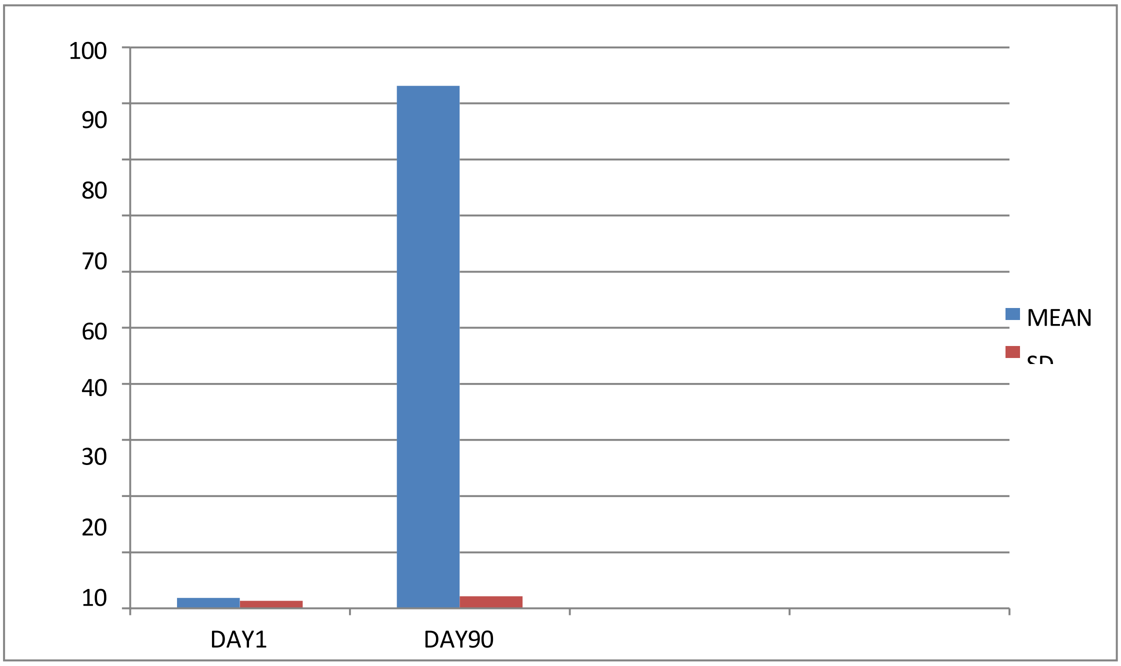
COMPARISON OF FLEXION RANGE ON GONIOMETER BETWEEN GROUPA (EXPERIMENTALGROUP)ANDGROUPB (CONTROLLED GROUP)

	GROUP A M+SDN=15	GROUPBM + SDN=15	t value	p value
DAY1	2.13+1.76	1.8+1.47	0.566	0.02
DAY 90	95.46+3.52	80+4.05	11.05	0.005



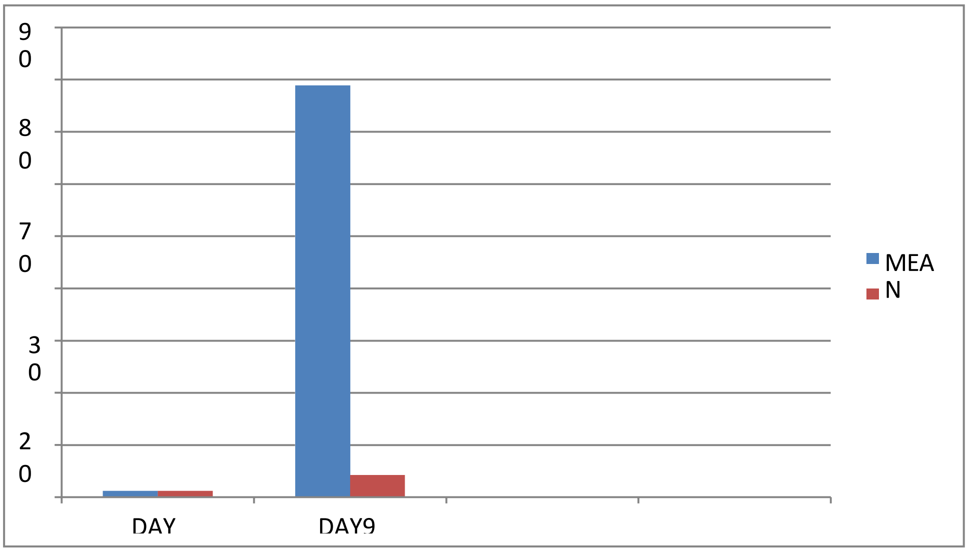
WITHINGROUPANALYSISOFABDUCTIONRANGEON GONIOMETEROFGROUPA(EXPERIMENTALGROUP)

GROUP A EPERIMENTAL	MEAN+SD	t value	p value
DAY1	1.86+1.30	-17.22	0.0001
DAY 90	93.13+2.13		



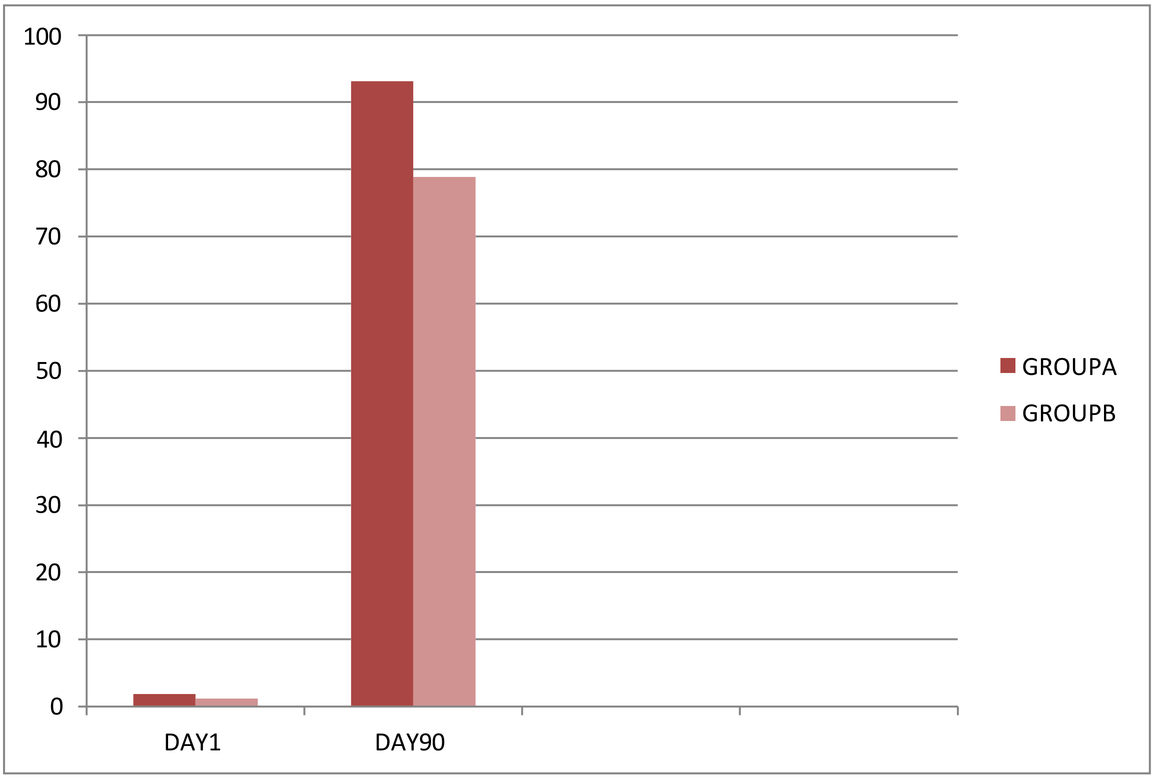
WITHINGROUPANALYSISOFABDUCTIONRANGEON GONIOMETER OF GROUP B (CONTROL GROUP)

GROUP B CONTROL	MEAN+SD	t value	p value
DAY1	1.20+1.24	-2.13	0.022
DAY 90	78.86+4.24		


9
0
8
0
7
0
3
0
2
0
DAY
DAY9
MEA
N

COMPARISON OF ABDUCTION RANGE ON GONIOMETER BETWEEN GROUPA (EXPERIMENTALGROUP)ANDGROUPB (CONTROLLED GROUP)

	GROUP A M+SDN=15	GROUPBM + SDN=15	t value	p value
DAY1	1.86+1.30	1.20+1.24	1.45	0.07
DAY 90	93.13+2.13	1.78.86+4.24	1.64	0.0001



RESULTS

This study was done on 30 subjects, 15 subjects grouped for cognitive sensory motor exercise and 15 subjects grouped for repetitive facilitation exercise.

Efforts were made in this study to examine the efficacy of cognitive sensory motor exercise versus repetitive facilitation using parameters like- MESUPES score, modified barthel index, goniometer and compare their results.

Researchhypothesishasbeenacceptedthatcognitivesensorymotorexercise is more significant than repetitive facilitation exercise in Quality of movement of upper limb, functional activity and ROM in Hemiparetic patients.

Null hypothesis is rejected that there is no significant difference between the cognitive sensory motor exerciseand repetitive facilitation exercise in Quality of movement of upper limb, functional activity and ROM in Hemiparetic patients.To perform statistical analysis of data thus collected within group analysis of all the parameters namely MESUPES score, modified barthel index, goniometer will be performed.

Moreover, between groups analysis of all the above-mentioned four parameterswillalsobeperformedtoobtaintheresults.Comparingthe

graphsbetween theexperimental and control groupsithas been deduced that there has been a significant increase quality of movement of upper limb, functional activity and ROM in Hemiparetic patients of experimental group as compared to that of the control group within the period of three months. This therefore, indicates that the cognitive sensory motor exercise iseffective than repetitive facilitation exercise on quality of movement ofupper limb, functional activity and ROM in Hemiparetic patients.
Hence,theexperimentalhypothesisisbeingprovedbythis.

DISCUSSION

The present study was undertaken with the intention to see the effectiveness of Cognitive SensoryMotor Training VersusRepetitive FacilitationExercise for Quality of movement, ADL and ROM in Subjects with Hemiparesis(age 25to 65 years)usingMESUPES and BIscales. TheMESUPESis atool 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 30 subjects both males and females aged 25 to65 years with stroke (Hemiparesis) were included with 15 participants in each group out of which a total of 15subjects in group A and 15 subjects in group B completed the 12 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 ($p \leq 0.0001$))inHemipareticpatients.Similarly,RepetitiveFacilitation
Exercise for is also effective but not more then cognitive sensory motor exercise in improving Quality of movement of upper limb, functionalactivity and ROM($p<0.0001$)) in Hemiparetic patients.

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

The better improvement in cognitive sensory motor training 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

The common trend of the treatment of functional activity in hemiparetic upper limb. Exercises for hemiparetic upper limb concentrate on increasing rangr of motion with the assumption that functional improvement will follow. In this study, the cognitive sensory motor group demonstrated a increase in quality of movement level by (75%) when compared to the repetitivefacilitation exercisegroup (50%), which thus could account forthe functional ability differences seen between groups. In addition to this the observed group effect for functional activity and ROM in favor of the cognitivesensorymotorexercise mayhavebeenkeyin improvingfunctional stability.

It isnecessaryto recognizeifdeficits attheimpairment levelarecausativein limiting activities, so that if strength is an issue, dealing with the impairment at a more functional level may be more effective in the long term. Effectiveness of strengthening exercises can be maximized by introducing flexibility, coordination, balance, and mobility, which may transfer to an overall improvement in function. Repetition and task practice not only improves strength but reduces activity limitations associated with the impairment of decreased muscle strength. Ultimately, the inability to participate in activities at a social level has an impact on the qualityof life in individualswithhemiplegicpatients.Addressingtheimpairmentsan
activity limitations associated with this disease in middle-aged individuals may delay and/or prevent the disabilities encountered in the elderly. One can also suggest that the repetition of the star exercise contributed to proprioceptive acuity and increased balance and stability in the cognititive sensory motor group as it involves balancing on upper limb while reaching out with the other upper limb to touch all points of an outlined star. The data from this study support that cognitive sensory motor exercise is a better option in improving quality of movement of upper limb, functional activity and ROM in this 25-65 year old population with Hemiparetic patients.

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