A COMPARATIVE STUDY ON THE EFFECTIVENESS OF BOBATH APPROACH AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUE IN GAIT TRAINING AND BALANCE AMONG CHRONIC STROKE PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

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(ELECTIVE – PHYSIOTHERAPY IN NEUROLOGY)

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CERTIFICATE

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DECLARATION

I hereby declare and present my thesis work entitled "**A COMPARATIVE STUDY ON THE EFFECTIVENESS OF BOBATH APPROACH AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUES IN GAIT TRAINING AND BALANCE AMONG CHRONIC STROKE PATIENTS**

The outcome of the original research work under taken and carried out by me, under the guidance of **Mrs.S.Seema,M.P.T.,** Professor, RVS College of Physiotherapy, Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the **Tamil Nadu Dr. M.G.R Medical University.**

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CHAPTER I

INTRODUCTION

Stroke, also known as cerebrovascular accident (CVA) is an acute neurologic injury in which the blood supply to a part of the brain is interrupted. It is reported that 1.2% of total deaths occur in India due to stroke. ***(O'Sullivan & Scmitz,(2012)et al.,*** Stroke is the 3rd leading cause of death and the 2nd leading cause of disability . Major risk factors are Hypertension, Heart disease and Diabetes . Apart from these, other risk factors for stroke are cigarette smoking, blood cholesterols, oral contraceptives, obesity, alcohol, social deprivation and physical inactivity. Recent studies showed that the age adjusted annual incidence rate was 105 per 100,000 in the urban community and 262 per 100,000 in the rural community. Stroke represented 1.2% of total deaths in India. `

Common problems after stroke are impaired motor functions including balance and gait, sensory deficits, perceptual deficits, cognitive limitations, visual deficits, aphasia and depression . Cerebrovascular disease is a leading cause of gait impairment and balance resulting in long-term disability and handicap . **(Collin ann Wade,2009) et al**

A middle cerebral artery stroke causes a language deficit, weakness on the opposite side of the body, a sensory deficit on the opposite side of the body and vision defects the most common characteristics of MCA are upper extremities is involved than lower extremities.

Posterior cerebellar artery syndrome: Infartion of the dorsolateral aspect of the medulla due to occlusion of the vertebral artery and/or the posterior cerbellar artery. Clinical manifestations vary with the size of infarction, but may include loss of pain and temperature

sensation in the ipsilateral face and contralateral body below the chin; ipsilateral horner syndrome; ipsilateral ataxia; dysartria; vertigo; nausea, hiccup; dysphagia;

The Anterior cerebral artery (ACA) may be occluded by embolus or thrombus.Occlusion proximal to anterior communicating artery is normally well tolerated because of the cross flow.Distal occlusion results in weakness and cortical sensory loss in the contralateral lower limb with associated incontinence.Occasionally a contralateral grasp reflex is present.Proximal occlusion when both anterior cerebral vessels arise from the same side results in cerebral paraplegia with lower limb weakness,sensory loss,incontinence and presence of grasp,snout and palmomental reflexes.Bilateral frontal lobe infraction may result in akinetic mutism or deterioration in conscious level.Contralateral hemiparesis and Contralateral hemisensory loss involing mainly the lower extremity .

Stroke patients show various kinds of deficits in perception, muscle strength, motor control, passive mobility, sensation, tone and balance. These impairments have significant effects upon walking ability. Walking is possible for the majority of patients following stroke, but it is very rare that it returns to normal ***(Jorgenson et al, 1995)***. Although the reported figures vary, approximately 50-80% of patients who survive a stroke will eventually regain some degree of walking ability ***(Skilbeck et al, 1983)***. Nevertheless, outcome studies on rehabilitation of patients who are stroke survivors reveal that 93% of patients have difficulty in walking independently in the community after being discharged from hospital.

Thus, the ability to walk is the major factor that determines whether the patient will return to the previous level of activity or not, because independent ambulation is essential for community reintegration and social participation. Thus, gait training accounts for a large proportion of time spent in stroke rehabilitation. Gait correction and re-education, therefore, is an important physical therapy intervention for patients following stroke. Therefore, basic

purpose of any rehabilitation process in stroke is to make the person ambulatory and thus reduce his disability. This apparently indicates that there is a dire need to analyze the gait patterns of these patients so as to formulate and then effectively execute the strategies to correct and re-educate it. The walking patterns of both individuals without mobility problems ***(Winter et al, 1990)*** and patients with hemiplegia have been well documented ***(Olney & Richards, 1996)***. The gait of people following stroke is characterized by problems with generating, timing, and grading of muscle activity, hypertonicity, and mechanical changes in soft tissues . Gait speed, stride length, and cadence are lower than normal values. Common kinematic deviations during the stance phase of the gait cycle are decreased peak hip extension angles, decreased lateral pelvic displacement, changed knee extension, and decreased plantar-flexion angles ***(Moseley et al, 1993)***. Common kinematic deviations during the swing phase of the gait cycle are decreased hip flexion, knee extension, and dorsiflexion

There are various scales used to measure lower limb function which includes Functional ambulatory category, Rivermead motor assessment, modified Ashworth spasticity scale, Berg balance scale and gait cycle paremeters.(stride length, step length, cadence etc,). In this present study gait training measurement tool is Wisconsin Gait Scale and balance measurement study is Tinetti Balance Assessment Tool.

In physiotherapy a variety of movement therapy approaches are available for retraining motor skills in adult patients with hemiplegia. Certain approaches like Proprioceptive Neuromuscular Facilitation, Rood's, Brunnstrom, and Bobath rely on reflex and hierarchinal theories of motor control, while others like Motor Relearning Programme (MRP) and system theory approaches derive clinical implications from more recent theories of motor control and motor learning as well as from the principles of neural plasticity.

Motor rehabilitation of adults with hemiplegia uses a number of physiotherapy approaches developed by authors such as Bobath, Rood, Kabat, Brunnstrom and Perfetti. The Bobath concept, also known as neurodevelopmental treatment.

Bobath approach is a widely used approach in the rehabilitation of hemiparetic subjects in many countries effectiveness is questionable *(**Paci, 2003**).* Till now, very few researches have been done exploring the efficacy of NDT in hemiparetic patients, particularly in gait correction and rehabilitation. Whatever studies have been done, they have been case reports comprising one or two subjects and do not clearly support NDT as an effective therapeutic procedure in gait rehabilitation. Thus, most effective treatment strategies to use in gait re-education following stroke, seems to remain unknown *(**Ashburn et al, 1993**).* Given the popularity of NDT in treatment of adults with post-stroke hemiplegia, an overview of effective evidence for the NDT in rehabilitation of post- stroke hemiplegic patients is necessary in order to justify its wider use by physiotherapists. This study describes gait re-education based on the NDT concept, which is one of the leading treatment approaches in Europe for rehabilitation of patients with stroke. The primary aim of this study is to investigate the efficacy of NDT based gait training in improving both, the quantitative as well as qualitative gait parameters in post stroke hemiparetic patients.

Proprioceptive Neuromuscular Facilitation (PNF) is one approach commonly used to improve the gait of patients with hemipglegia PNF technique stimulates proprioceptors within the muscles and tendons, thereby improving their functions and increasing muscle strength, flexibility, balance[8)], and coordination, effectively maximizing responses of the motor units

1.1 Statement of study

A comparative study on the effectiveness of bobath approach and proprioceptive neuromuscular facilitation technique in gait training and balance among chronic stroke patients

1.2 Objectives of study

To evaluate the effectiveness of Bobath approach in gait training and Balance among chronic stroke patients.

To evaluate the effectiveness of Proprioceptive Neuromuscular Facilitation in Gait training and balance among chronic patients.

To compare the effects of Bobath approach and Proprioceptive Neuromusular Facilitation Techniques in Gait training and Balance among chronic stroke patients.

1.3 Hypothesis

The following hypothesis is framed for the study

There is no significant difference in Bobath approach in Gait training and balance among chronic patients.

There is no significant difference in Proprioceptive Neuromuscular Facilitation in Gait training and balance among chronic patients.

There is significant difference between Bobath approach and Proprioceptive Neuromuscular Facilitation in Gait training and balance among chronic stroke patients.

1.4 Operational Definitions

Stroke:

Stroke is define as "rapidly developing clinical sign of focal / global neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours" **(World Health Organisation**).

Gait:

Gait described as translatory progression of the body as a whole produced by coordinate, rotatory movements of body segments, and characterised by propulsive and retropropulsive motion of lower extremities(**Cynthia Norkin 2010**).

Balance:

Balance is defined as a complex process involving the reception and integration of sensory inputs, planning and execution of movements, to achieve a goal requiring upright posture (**Cynthia Norkin 2010**).

Bobath-Approach

Bobath Approach/Neurodevelopment Technique (Bobath 1978) the goal of NDT is to normalize tone, to inhibit primitive patterns of movement, and to facilitate automatic, voluntary reactions and subsequent normal movement patterns. Based on the concept that pathologic movement patterns (limb synergies and primitive reflexes) must not be used for training because continuous use of these pathologic pathways may make it too readily available at the expense of the normal pathways. The goal is to suppress abnormal muscle patterns before normal patterns are introduced Mass synergies are avoided, although they may strengthen weak, unresponsive muscles, because these reinforce abnormally

increased tonic reflexes, spasticity. Abnormal patterns modified at proximal key points of control (e.g., shoulder and pelvic girdle).

Bobath approach is to reduce spasticity and synergies by using inhibitory postures and movements in order to facilitate normal autonomic responses that are involved in voluntary movement(**Bobath 2010)**

Proprioceptive Neuromuscular Facilitation

PNF is an approach to therapeutic exercise that combines functionally based diagonal patterns of movement with techniques of neuromuscular facilitation to evoke motor responses and improve neuromuscular control and function.This widely used approach to exercise was developed in the 1940s by the pioneering work of **Kabat,Knott,and Voss**. PNF Techniques can be used to develop muscular strength and endurance,facilitate stability,mobility,neuromuscular control,and coordinated movements.

Emphasis on using the patient's stronger movement patterns for strengthening the weaker motions.Pnf techniques use manual stimulation and verbal instructions to induce desired movement patterns and enhance motor function (**Myers1995**)

CHAPTER - II

REVIEW OF LITERATURE

SECTIONS

2.1 Section A : Studies related Bobath Therapy.

2.2 Section B : Studies related Proprioceptive Neuromuscular Facilitation.

2.3 Section C : Studies related to Gait training and Balance measurement tools.

2.1 Section A : Studies related Bobath Therapy

Alex Pollock (2005) et al., stated that the systematic review aims to assess the effects of Physiotherapy treatment which based on motor learning or neurophysiological principles (Bobath), or on a mixture of these treatment principle. It is considered randomized or quasi randomised controlled trials of Physiotherapy treatment approaches aimed promote the recovery of postural control and lower limb function in chronic stroke. Outcomes included measures of disability (global dependency scales or functional independence scales) and motor impairment (relating to postural control or lower limb function). A statistically significant result was found in the comparison of a mixed approach with no treatment or placebo control for the recovery of functional independence**.**

Richards (1993) et al., stated that 27 patients randomized to receive one of three therapies: 1) Early intensive therapy incorporating the use of a tilt table, resisted exercises and treadmill, beginning ~ 8 days post stroke, for 1.7 hrs/day x 5 weeks (experimental); 2) Early conventional therapy included traditional approach with therapy beginning ~9 days post stroke, for 1.8 hrs/day x 5 wks (control 1); or 3) Conventional therapy beginning 13 days post stroke, 0.72 hrs x 5 wks (control 2). At week 6, gait speed in the 2 control groups

was similar and lower than the experimental group. By months 3 and 6, the gait speed between all groups was similar.

Geber (1995) et al., stated that 20 patients with pure motor hemiparesis following a stroke within the previous month were randomized to neurodevelopmental technique (NDT) (Bobath) or traditional functional retraining (TRF) treatment approaches for the period of inpatient rehabilitation. FIM, gait velocity and stride length were evaluated at admission, discharge, 6 and 12 months. There were significant differences between the groups at any of the testing intervals, other than a difference in gait velocity at discharge, which favoured the NDT approach.

Wagenaar(1990) et al., stated that 7 patients alternated between 2 therapy approaches 5-9 days post stroke: 1) Brunnstrom approach and 2) Bobath (Neuro-developmental treatment- NDT). Therapies were provided for 30 min/ session for 21 weeks. Starting order was randomized. Barthel Index and gait parameters were assessed. The only significant difference found between the groups at the end of the treatment period was for comfortable walking speed .

Mudie (2002) et al., stated that 20 patients with recent stroke and who bore the majority of their weight consistently to one side while sitting were randomized to one of 4 groups: task specific reach , Bobath method, balance performance monitor (BPM) feedback training and control. Patients were measured on weight distribution measurements using BPM daily treatment session, 2 weeks after cessation of treatment and 12 weeks post – study. Bobath method was most effective for retraining sitting symmetry after stroke in the short term. The BPM and the non-training control group also demonstrated significant improvement. After 12 weeks 83% of BMP group, 38% of task – specific group, 29% of Bobath and 0% of controls were found to be distributing weight to both sides.

Wang (2005) et al., stated that 21 patients admitted to a stroke rehabilitation ward were randomized to two rehabilitation approaches Bobath based (BB) or movement science based(MSB). Rivermead Motor Assessment (RMA) and Motor Assessment Scale(MAS) scores were assessed at 1,3 and 6 months . There were no significant differences between the two groups. Scores on the subsections of both RAM and MAS associated with lower extremity function were similar.

Salbach (2006) et al., Conducted that the study to find efficacy of bobath approach in promoting physical function and task performance for patients after a stroke. 30 outpatients with either a thrombotic or haemorrhagic stroke who completed either the study or control group.The patients received 18 2-h sessions in six weeks of either the bobath or a conventional therapy programme. Patients in the bobath group showed significantly better performance on all but the Timed Up and Go Test when compared with the control group. Bobath was found to be effective for enhancing functional recovery of patients who had a stroke. Both'sequential' and'function-based' concepts are important in applying the bobath approach to the rehabilitation of stroke patients.

Chen jc (2013) et al., conducted that Study about the recent progress in physical therapy of the lower-limb rehabilitation after stroke Poor recovery of arm function after stroke can often have a negative impact on the patient and his/her family. These patients often need assistance from the society and may need to rely on government resources. Numerous therapeutic treatments are currently available for stroke rehabilitation. Traditional rehabilitation strategies (Bobath, Brunnstrom, proprioception neuromuscular facilitation, and motor relearning) have been used for many years to improve function. Recently, we demonstrated that a novel intervention, with trunk restraint facilitated upper-limb functional recovery after stroke. We found that thermal stimulation in combination with bobath program was of great benefit to

stroke patients. Development of a better rehabilitation paradigm that maximizes rapid recovery of arm function is a priority to help stroke patients and society.

Langhammer B JK (2000) et al, conducted that Study about the Bobath approach or Motor Relearning Program (MRP) in rehabilitation of acute stroke cause any difference in motor function, activity of daily living (ADL) or quality of life. The two physiotherapy programs were standardised according to background literature. Workshops and discussions were organised with the physiotherapists to co-ordinate treatment according to the two different approaches. The patients in both groups received physiotherapy five days a week for a minimum of 40 minutes while hospitalised. Besides physiotherapy, all patients received the same multidisciplinary treatment according to recommendations for stroke units. After discharge, the aim was to continue the same physiotherapy approach in different settings. Bobath has small short term benefits in motor function compared with the MRP approach, and shortens hospital stay.

Section B : Studies related Proprioceptive Neuromuscular Facilitation

Ray- Yau Wang et al., (2007) conducted that the study on convenience sample of 20 patients with hemiplegia of short duration or long duration. Each subjects received a total of 12 sessions of PNF (three times per week) with each treatment lasting for 30 minutes. All subject undergone physical examination at baseline and 4 th week. Examination conducted by using various gait parameter like step length , stride length by using inch tape measurement, cadence measured by using stop watch. He concluded that (1) in both groups of patients with hemiplegia, the cumulative effects of PNF is more beneficial than the immediate effects, and (2) patients with hemiplegia of short duration respond to training sooner than do patients with hemiplegia of long duration , although the cumulative effects are similar both groups.

Lynne Glasser (2009) et al., stated that the purpose of this study was to determine the effects of isokinetic training on the rate of movement during ambulation in hemiparetic patients. 10 male and 10 female subjects, aged 40 to 75 years participated in the study. The 20 hemiparetic subjects were assigned randomly to either a control group or an experimental group. All of the subjects participated in a conventional therapeutic exercise program i.e PNF technique and gait training. The experimental group also received isokinetic training on the kinetron exercise machine as part of their program. Functional ambulation profile tests were administered to each subject before and after the five week experimental period. All of the subjects showed improvement in the rate of ambulation and in overall ambulation

performance. The difference in ambulation times and functional ambulation profiles scores between the two groups were shown to be insignificant.

Kumar (2011) et al., stated that the objective of the present study is to evaluate the effect of PNF techniques onthe gait parameters and functional mobility in hemiplegic patients. Two group pre test- post test design. A sample of convenience of 30 subjects affected by cerebrovascular accident of ischemic injury took part in this study. They were divided into two groups i.e. an Experimental group and a control group with 15 patients in each group. The subjects of this study were the residents of northern Haryana and the mean age of the patients was 59.30 years. Patients were assessed before commencement and after the completion of treatment sessions by a fixed battery of tests on Stride length , Gait Velocity, Cadence and Functional Mobility parameters with measuring tape, stop watch and Rivermead Mobility Index respectively. The results of this study demonstrated that the PNF techniques has siginificant effect on gait parameters & functional mobility as compared to conventional therapy in patients with hemipegia. The findings show that the walking speed has a significant effect on functional mobility in stroke patient.

Kyochul Seo (2011) et al., conducted that the purpose of study aims to examine stroke patients changes in dynamic balance ability through stair gait training where in proprioceptive neuromuscular facilitation (PNF) was applied (Subjects and Methods) In total 30 stroke patients participated in this experiment and were randomly and equally allocated to an experimental group and a control group. The experimental group received exercise treatment for 30 min and stair gait training where in PNF was applied for 30 min and the control group received exercise treatment for 30 min and ground gait training where in PNF was applied for 30 min . For the four weeks of the experiment, each group received training three times per week, for 30 min each time. Berg Balance Scale (BBS) values were measured and a time up and go (TUG) test and a functional reach test (FRT) were performed for a comparison before and after the experiment. (Results) According to the result of the stroke patients balance performance through stair gait training, the BBS and FRT results significantly increased and the TUG test result significantly decreased in the experimental group. In conclusion, the gait training group to which PNF was applied saw improvements in their balance ability, and a good result is expected when neurological disease patients receive stair gait training applying PNF.

Young-mi kim, (2010) et al., stated that the purpose of study investigated the effect of aquatic proprioceptive neuromuscular facilitation (PNF) patterns in the lower extremity on balance and activities of daily living (ADL) in stroke patients. (Subjects) Twenty post stroke participants were randomly assigned to an experimental group (n=10) or a control group (n=10). The experimental group performed lower extremity patterns in an aquatic environment, and the control group performed lower extremity patterns on the ground. Both exercises were conducted for 30 minutes/day, 5 days/week for 6 weeks. Balance was measured with the Berg Balance Scale (BBS), Timed Up and Go Test (TUGT), Functional

Reach Test (FRT), and One Leg Stand Test (OLST). Activities of daily living were measured with the Functional Independence Measure(FIM). These results indicate that performing aquatic propriceptive neuromuscular facilitation patterns in the lower extremity enhances balance and ADL in stroke patients.

Ribeiro (2010) et al., concluded that the preliminary study sought to analyze the effects of a training program based on the Propriceptive Neuromuscular Facilitation (PNF) method on motor on motor recovery of individuals with chronic post-stroke hemiparesis. Eleven individuals with chronic hemiparesis (mean lesion time of 19.64 months) after unilateral and non-recurrent stroke underwent training based on PNF method for twelve sessions, being evaluated for motor function- using the Stroke Rehabilitation Assessment of Movement (STREAM) instrument; functionality, by the Functional Independence Measure(FIM); and gait kinematic (using the Qualisys Motion Capture System), at baseline and post-training. Significant changes in FIM (from median 67 to median 68; P=.043) and STREAM scores (from median 47 to median 55; P=.003) were observed. Data showed significant changes in motor function and functionality after training, suggesting that this program can be useful for rehabilita tion of chronic stroke survivors.

2.3 Section C: Studies related to Gait training and Balance measurement tools

Diane u Jette (2005), et al., conducted that the purpose of this study was describe physical theraphy provided to patients with stroke in inpatient rehabilitation facilities. Data were collected from 972 Patients. Descriptive statistics were derived to describe physical theraphy sessions, including proportion of theraphy time. The study results shows that mean length of stay was 18.7 days (SD= 10.3) and patients received physical theraphy, on average, 13.6 days (SD =7.8). Patients attended on average, 1.5 (SD =0.3) physical theraphy sessions per day, with each sessions lasting 38.1 minutes (SD= 17.1). Gait and pre functional activities

were performed most frequently (31.3% and 19.7% of total treatment time, respectively). For gait activity, physical therapists used balance and postural awareness training in more than 50% of sessions and used strength and postural awareness training for more than 50% of sessions and used strength training for more than 50% sessions of prefunctional activities. 86% of the patients received evaluation and 84% of the patients and families received education.

Clen Ic, (2002) et al., conducted that the purpose of this study was to evaluate the delayed effects of balance training program on hemiplegic patients. A total of 41 ambulatory hemiplegic stroke patients were recruited and randomly assigned two groups. The study concluded that Dynamic balance function of patients in the visual feedback training group had significant improvements when compared with the control group. Activities of daily living(ADL) function in self- care also had significant improvements at 6 months of follow up in the trained group. The results showed that balance training was beneficial for patients after hemiplegic stroke.

Clarissa Barros de Oliveira(2010) et al., concluded that balance problems in hemiparetic patients after stroke can be caused by different impairments in the physiological systems involved in postura control, including sensory afferents, movement strategies, biomechanical constraints, cognitive processing and perception of verticality. Tinetti Assessment Tool mainly assesses body structure and it evaluates mainly activities, mobility, changing and maintaining body position.

Turain N,(2004) et al., concluded that to document gait improvement at walking performance and to point out the correlations between movement patterns in patients with hemiparesis using the Wisconsin Gait Scale. Thirty Five consecutively treated patients with hemiparesis were included in the study. Statistical analysis revealed that patients was scores

were significantly better after they had completed the rehabilitation programme. The results of WGS showed that this visual scae together with the gait velocity is valuable for assessing gait deviations and monitoring gains in gait performance in patients with hemiparesis.

Snehal Bhupendra Shah,(2006) et al., concluded that the effectiveness of balance training in ambulatory hemipegics on stability trainer. The subject included 10 stroke patients between 40 years to 60 years. All subjects were community and functional ambulators. They were assessed on berg balance scale, Brunstom's stage of lower extremity and routine functional evaluation 14 exercises were performed on 6 challenge levels of stability Trainer depending on their performance. They were on weeks training programme. After 4 weeks of training programme there was significant difference in pre and post assessment and training scores in balance. Improvement was seen on both affected and unaffected side. 2 patients stopped using their cane after the training programme.

Catherine M. Dean (2008) et al., concluded that the randomized placebo - controlled study was to evaluate the effect of a 2 week task – related training program aimed at increasing distance reached and the contribution of the affected lower leg to support and balance. Twenty subjects at least 1 year after stroke were randomized into an experimental or control group. Subjects were tested on sit to stand, walking and cognitive tasks. The study results after training experimental subjects were able to reach faster and further, increase load through the affected foot, and increase activation of affected leg muscles. The control group did not improve in reaching or sit to stand. Neither group improved in walking.

CHAPTER - III

METHODOLOGY

3.1 Study Design

Pre- test and post – test experimental design.comparative study.

3.2 Study Settings

The study was conducted at Outpatient department,Prakash hospital, Udumalpet.

3. 3Sample Size

20 Patients were selected as samples for the study and divided into two groups

3.4 Criteria for Selection

3.4.1 Inclusion Criteria

Both Gender.

Patient between 50 – 60 years.

Brunstrom stage -3.

Patients with ACA ischemic infarction of more than 6 months post – stroke duration.

3.4.2 Exclusion criteria

Patients with severe disabling arthritis

Patients with any cardiac disease

Cognitive dysfunction

Movement disorder patients

Non co-operative patients

Any other neurological deficits like Parkinson's disease

Past history of seizures

Visual, Cognitive - Perceptual problems

3.5 Duration of the Study

Four months.

3.6 Variables of the study

Independent Variables

Bobath approach

Proprioceptive Neuromuscular Facilitation

Dependent Variables

Gait - Wisconsin Gait scale

Balance – Tinetti Balance Assessment tool

3.7 Measurement Tools

Gait -wisconsin gait scale

The Wisconsin gait scale can be used to evaluate the gait problems experienced by a patient with hemiplegia following stroke.This can be used to monitor the effectiveness of rehabilitation training .The WGS consists of 14 submeasures reliable test (score -45) which minimum score (13) and maximum score (42) .The higher the score more affected the gait.

Balance –Tinetti balance assessment tool

The Tinetti assessment tool is a simple, easily administered test that measures a patient's balance. The test is scored on the patient's ability to perform specific tasks. The maximum score for the balance component is 16 points. The 9 submeasures reliable test (score-16) which minimum score (4) and maximum score (12) .The higher the score more affected the gait. Patient's who score in the range of 12 to 14 indicate that the patient has a risk of falls.

Reliability

Reproducibility of the Tinetti has been established, however, reliability of all testers during administration varies. Recommendations are that facilities test interrater and intrarater reliability, as appropriate, in regards to administration and scoring guidelines and clinical application. Following testing, intrarater reliability (K=0.40-1.0) and interrater reliability was 0.8-.95

Validity

The Tinetti has not been validated for use on patients who are less than one week post-stroke. Construct and concurrent validities were studied and confirmed that the Impairment Inventory total score was found to correlate with the BBS($r = 0.91$, $p < 0.001$) and the TUG ($r = 0.75$, $p < 0.05$).

3.8 Test administration

The study was carried out in four steps

STEP1: Pre test of all participants.

STEP2: Divide the subject's randomly into two groups.

STEP 3: Treatment interventions.

STEP 4 : Post test of all participants

The subject was given a detailed explanation of the procedure orally followed by the demonstration. The subject was asked to perform the technique and if any correction was made by thorough observation**.** The treatment program was given for a period of 8 weeks 1 hour per day.

3.9 Treatment Procedure

Two groups

Training program for both groups

Duration - 8 weeks

Session - 5 days per week

Total duration of one session – one hour thirty minutes

Treatment Period – one hour

Rest period - thirty minutes

Each phase of gait given a period of thirty minutes

Group A - Bobath Approach

Patient position : Standing position.

Therapist position: Standing on the patient affected side .

Procedure 1: In stance Phase

- Giving support as much as patient requires.Ask him to take steps forward with patient normal leg.Prevent his knee from snapping back into extension by keeping his hip well forwarded.
- In the same position ask the patient to place his normal foot lightly on and off a step in front of him
- Repeat the activity with the step placed well out to the side.Encourage the patient to keep his affected hip against therapist hip
- Still preventing patient knee from locking back ask the patient to draw large letters on the floor with his normal foot, ensuring weight bearing on mobile leg
- Make the patient stand on his affected leg and lightly place his sound foot at a right angle in front or behind the other foot, without transferring his weight on it .this performance accurately it helps him to gain control of the hip abductors and extensors.
- Place the patient's affected leg on a 15 cm step in front of him. With therapist hand pushing down on his knee and keeping his weight well forward, he steps up on to the step
- Practice stepping down with his sound leg placing it furtherand further back,and tapping it on the floor behind keeping the weight forward on his affected leg
- Put his affected leg on the step and help the patient to push up and step right over and back again

Procedure 2: In swing phase

(Releasing the knee and moving the Hemiplegic Gait)

- The patient stands with his feet close together. Guide his pelvis forward and down to release his knee on the affected side.Instruct him to straighten it again without pushing his whole side back .His heel must remain in contract with the floor,this is only possible if his pelvis drops forward
- The same activity is practised in step standing with his affected leg behind,and the weight forward over his extended sound leg.
- The patient stands with the weight on hisnormal leg.Facilitate small steps backward with the other foot by holding his toes dorsiflexed and instructing him not to push down .
- The patient walks sideways along a line crossing one foot in front of the other.when his sound leg takesa step,his affected hip must be kept well forward so that his knee does not snap back into extension

Procedure 3 : Climbing stairs assisting the affected leg up.

- The patient is taught to perform the activity in a normal manner , i.e.one foot on each step and without the support of the hand- rail
- Support his affected knee as he steps up with his sound leg and keep his weight well forward.
- Guide the pelvis well forward on his affected side as he puts the foot down,preventing the leg pulling into adduction .The therapist's hand on his knee will give support as he steps down with his normal leg.

Figure 1 – Gait training in stance Phase

Figure 2 Gait Training in Swing Phase

Figure 3 Climbing stairs assisting the affected leg up.

GROUP B – Proprioceptive Neuromuscular Facilitation

Patient position: lying position

Therapist position: Stand on the affected side

Procedure 1:

- Distal hand Hold the foot with the palm of therapist hand along the planter surface. Thumb is at the base of the toes to facilitate toe flexion. Therapist fingers hold the medial border of the foot while the heel of therapist hand gives counter pressure along the lateral border.
- Proximal hand holds the posterior lateral side of the thigh
- Traction the entire leg while moving the foot into dorsiflexion and inversion. continue the traction and maintain the internal rotation as therapist lift the leg into flexion and adduction.
- The proximal hand gives a stretch by rapid traction of the thigh. Use the forearm of therapist distal hand to traction up through the shin while therapist stretch the patient's foot farther into dorsiflexion and inversion
- Command to the patient:'point your toes,push your foot down and kick down and out.''"push"!
- The toes flex and the foot and ankle planter flex and evert. The eversion promotes the hip internal rotation ,these motions occur at the same time. The thighs moves down into extension and abduction, maintaining the internal rotation.
- Therapist distal hand combines resistance to eversion with approximation through the bottom of the foot. The approximation resists both the planter flexion and the hip extension.

- ❖ The end position is in planter flexion with inversion and the toes are flexed. The knee remains in full extension.
- ❖ Use apporoximation with repeated contractions or combination of isotonics to exercise the hyperextension hip motion. Lock in the hip at the end of the range and exercise the foot and toes.

Dose : 30mins 3 repetation per day, in five days a week.

Procedure 2: From lying to sitting:

- ❖ Use resistance at the pelvis or pelvis and shoulders for eccentric control.When the patient is able, use combination of isotonics by having the patient stop part way down and then stand again.

Dose : 10mins, 3 repetation per day, in five days a week .

Procedure 3:In standing

- ❖ Using approximation ,stretch,and resistance with weight shift and repeated stepping.

Dose : 10mins ,3 repetation per day, in five days a week .

Procedure 4:Facilitation of gait

- ❖ To keep the affected hip well forward during the stance phase on that side so that the knee does not snap back into extension.Downward pressure on the pelvis during the swing phase helps him to release the knee instead of hitching the hip to bring the leg forward.

Dose: 10 minutes 3 repetation per day, in five days a week

Figure 4- In lying extension –Abduction –Internal Rotation with knee extension

Sit to Stand

3.8 Collection of Data

20 subjects were selected on the basis of inclusion and exclusion criteria. All the subjects were divided equally into two groups, Group A and Group B. Each group consisted of 10 subjects, the study procedures were explained to the subjects and informed consent was obtained prior to study. Before starting the training, pre-test scores were measured by using Wisconsin Gait Scale, Tinetti Balance Assessment Tool.

Group A - Subjects in Group A (n=10) received Bobath Approach.

Group B - Subjects in Group B (n= 10) received Propriceptive Neuromusular Facilitation

3.11 Statistical technique

The collected data were analysed by paired‘t’ test to find out significance difference between pre and post test values of experimental groups and further unpaired ‘t’ test was applied to find out the difference between groups

CHAPTER IV

DATA ANALYSIS AND RESULTS

4.1. Data analysis

This chapter deals with the systematic presentation of the analyzed data followed by the interpretation of the data

a) Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \frac{\sqrt{\sum d^2 - \frac{(\sum d)^2}{n}}}{n-1}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$ Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Un paired t' test

$$S = \sqrt{\frac{\sum(x_{1-}\ \bar{x}_2)^2+\sum(x_{2-}\ \bar{x}_2)^2}{n_1+n_2-2}}$$

$$T = \frac{\bar{x}_{1-}\ \bar{x}_2}{S}\ \sqrt{\frac{n_1 n_2}{n_1+n_2}}$$

Where,

S = Standard deviation

N1 = Number of subjects in Group A

n_2 = Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group- A

$\bar{x}_2$ = Mean of the difference in values between pre-test and post-test in Group- B

Table -1

The table shows mean value, mean difference, standard deviation and paired 't' value between pre test mean, post test scores of Wisconsin Gait scale for group A

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre – test	31.9			
Post test	44	12.1	2.85	13.44*

Analysis of dependent variable in Gait training in Group A : the calculated paired 't' value is 13.44 at 0.005 level of significance and the paired table 't' value is 3.250 at 0.05 level of significance. Hence, the calculated 't' values is greater than the Table 't' value.

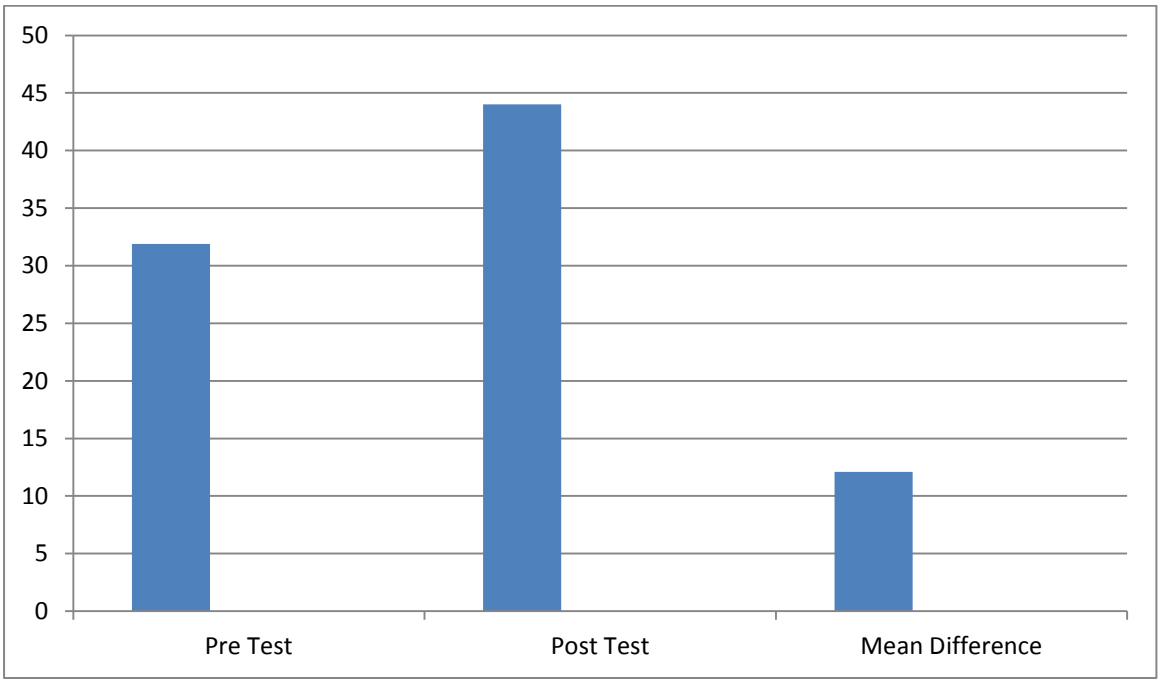

Figure: 5 - Shows the pre test mean, post test mean and mean difference of frequency of of Wisconsin Gait scale in Group A

Table -II

The table shows mean value, mean difference, standard deviation and paired 't' value between pre test mean, post test scores of Wisconsin Gait scale for group B

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre – test	18.3			
Post test	39.0	20.7	3.37	19.44*

Analysis of dependent variable in Gait training in Group B : the calculated paired 't' value is 19.44 at 0.005 level of significance and the paired table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated't' values is greater than the Table't' value.

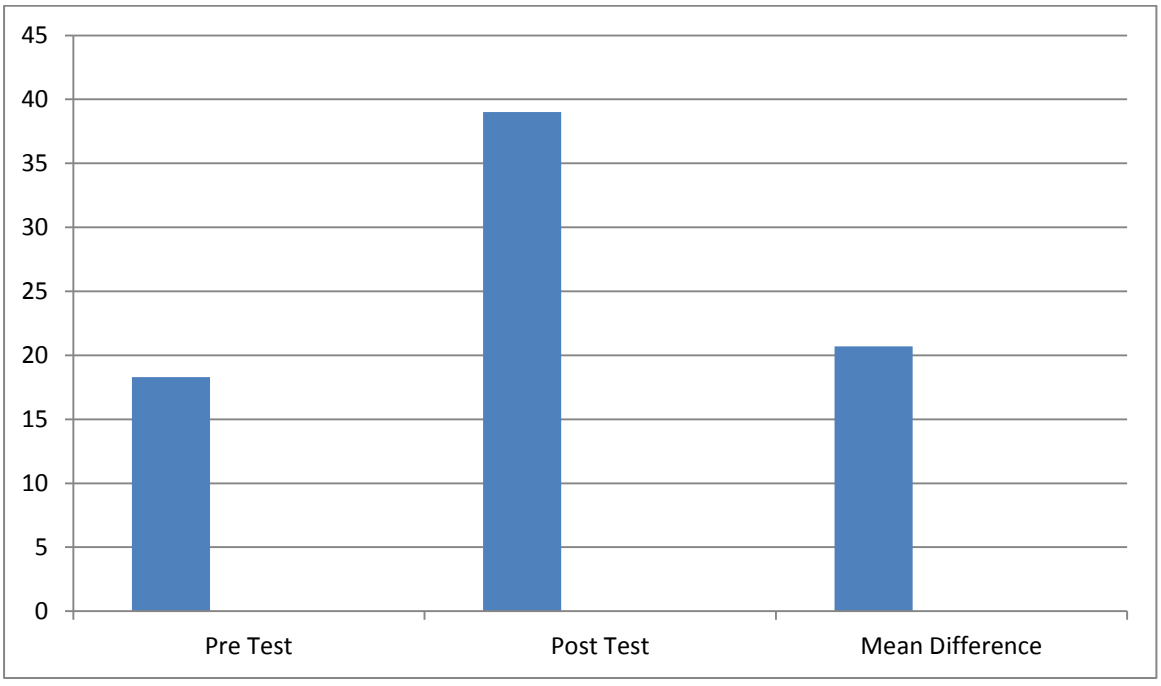

Figure:6 - Shows the pre test mean, post test mean and mean difference of frequency of of Wisconsin Gait scale in Group B

Table -1II

Comparison between Group A and Group B in improving Gait training

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Group A	12.1			
Group B	20.7	8.6	3.24	6.26*

Analysis of dependent variable between Group A and Group B : the calculated paired 't' value is 6.2. at 0.005 level of significance and the paired table 't' value is 2.878 at 0.005 level of significance. Hence, the calculated 't' values is greater than the Table 't' value.

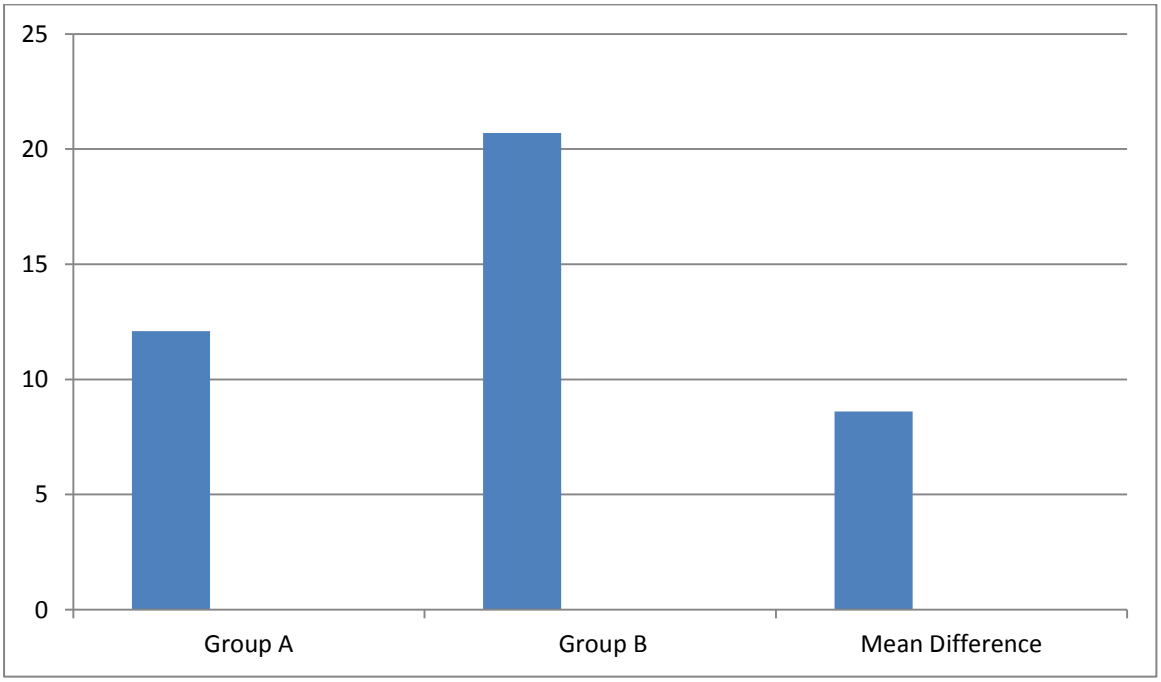

Figure 7 showing the pre and post test mean values of Wisconsin gait scale between Group A and Group B

Table -1V

Tinetti Balance assessment in Group A

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre Test	4.5			
Post Test	13.1	9.4	4.13	11.33*

Analysis of dependent variable in Tinetti Balance Assessment in Group A : the calculated paired 't' value is 11.33 at 0.005 level of significance and the paired table 't' value is 3.250 at 0.05 level of significance. Hence, the calculated 't' values is greater than the Table 't' value.

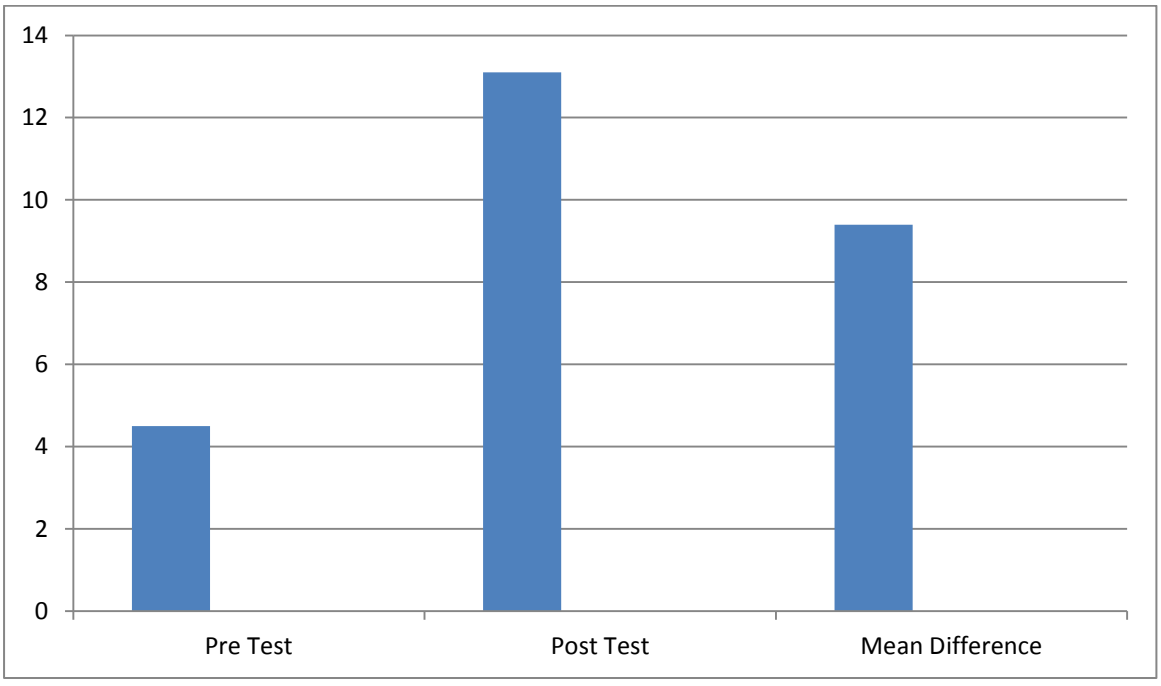

Figure 8 showing the pre and post test mean values of Tinnetti balance Assessment in Group A

Table -V

The table shows mean value, mean difference, standard deviation and paired 't' value between pre test mean, post test scores of Tinetti Balance Assessment scale for group B

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre – test	4.7			
Post test	14.1	5.5	3.35	29.9*

Analysis of dependent variable in Tinetti Balance Assessment scale in Group B : the calculated paired 't' value is 29.9 at 0.005 level of significance and the paired table 't' value is 3.250 at 0.005 level of significance. Hence, the calculated't' values is greater than the Table't' value.

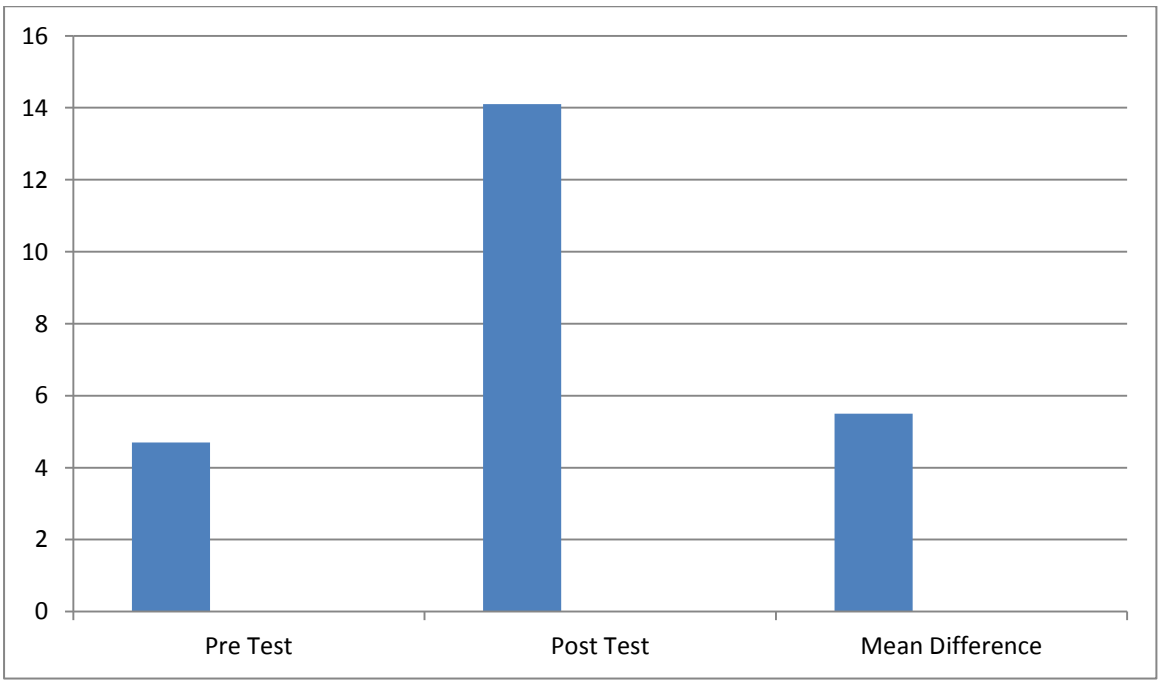

Figure:9 - Shows the pre test mean, post test mean and mean difference of frequency of of Tinnetti Balance Assessment scale in Group B

Table -VI

Comparison between Group A and Group B in improving Balance

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Group A	9.4			
Group B	5.5	4.9	1.36	4.5*

Analysis of dependent variable between Group A and Group B : the calculated paired 't' value is 16.5. at 0.005 level of significance and the paired table 't' value is 1.287 at 0.005 level of significance. Hence, the calculated't' values is greater than the Table 't' value.

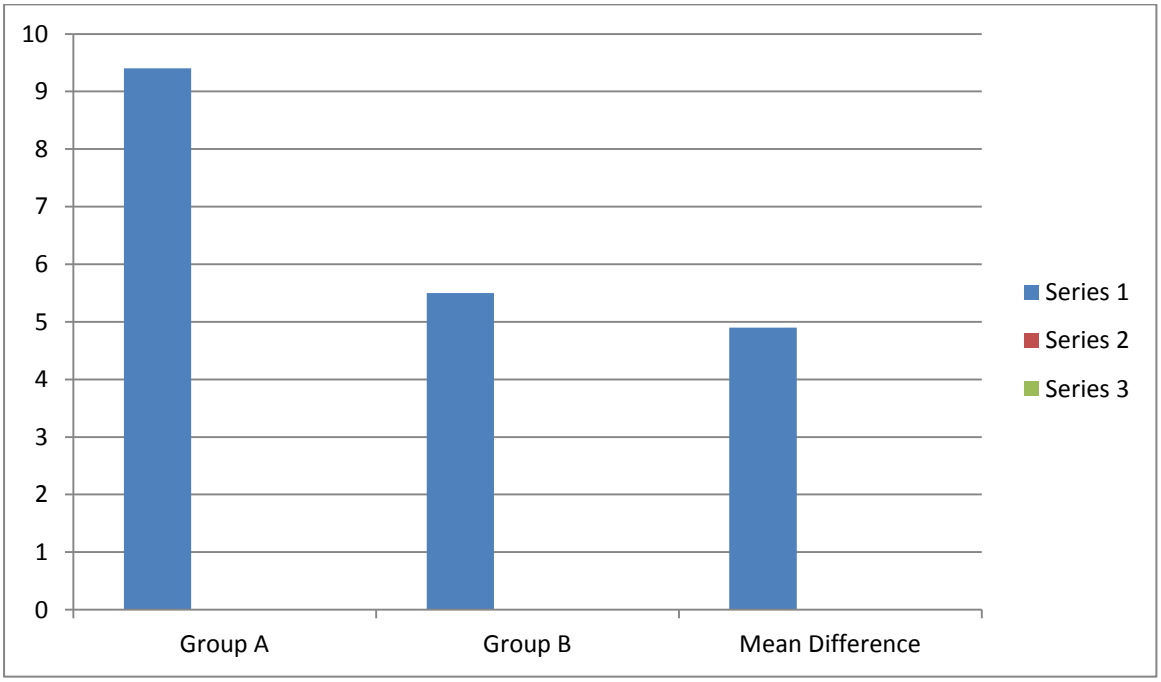

Figure showing the pre and post test mean values of Tinnetti Balance Assessment

4.2 Results :

20 stroke patients was treated for one session a day like that 6 weeks. Before starting the treatment, Assessed by Wisconsin gait scale and Tinnetti balance assessment tool

Analysis of Dependent Variable of bobath approach in Group A: The calculated paired‘t’ value the‘t’ table value is 13.44 at 0.005 level of significance. Hence, the calculated‘t’ value is greater than the table ‘t’ value there is significant difference in upper extremity function following motor relearning programme with trunk restraint among stroke subjects.

Analysis of Dependent variable of proprioceptive neuromuscular technique Group B:

The calculated paired‘t’ value is 19.44 and the table‘t’ value is 3.250 at 0.005 level of significant. Hence, the calculated‘t’ value is greater than the table ‘t’ value there is significant difference in upper extremity function following motor relearning program in stroke subjects.

Analysis of Dependent variable of gait training and balance between Group A and Group B:

The calculated unpaired‘t’ value is 16.5 and table‘t’ value is 2.878 at 0.05 level of significance. Hence, the calculated‘t’ value is greater than table ‘t’ value there is significant difference between motor relearning programme with trunk restraint and motor relearning programme in stroke subjects.

When comparing the mean values of Group A and B, Group A subjects treated with bobath approach showed more difference than Group B. Hence it is concluded proprioceptive neuromuscular technique is more effective in improving gait training and balance among chronic stroke subjects.

CHAPTER V

DISCUSSION

The study was conducted on 20 subjects. The subjects were divided into two groups, Group A and Group B. Group A received Bobath approach. Group B received Proprioceptive Neuromuscular Facilitaion. The study was conducted to compare effectiveness of Bobath approach and Proprioceptive Neuromuscular Facilitaion in improving Gait training and balance in chronic stroke patients.

Vij,J.S and multani (2012) et al., concluded that the study has highlighted that both, the conventional physiotherapy as well as addition of bobath approach based gait training, are effective in improving the step length, stride length, codence velocity and WGS scores in post hemiparetic patients. But in comparison to conventional physiotherapy alone, addition of bobath based Gait training is more effective in improving step length, stide length, spasicity and WGS scores in chronic stoke patients.

Bobath approach emphasizes inhibition of the abnormal reflex patterns, and facilitation of normal, volitional movement patterns. Bobath approach suggests that proper handling of the hemiplegic patient will direct such patterns into the channels of the higher integrated and complex patterns of more normal co ordination. Present study shows that bobath approach having significant different in improving Gait training and balance in chronic stroke patients

Kyochul Seo (2011) et al., concluded that to examine stroke patients changes in dynamic balance ability thorugh stair gait training where in PNF was applied. According to the result of comparing differences between before and after training in each group there was a significant change in the BBS result of the experimental group only. The gait training group to which PNF was applied saw improvements in their balance ability.

Proprioceptive Neuromuscular Facilitation Presumably improving gait training and balance of the lumbo pelvic hip complex corrected postural alignments and increased balance of the whole body. As a result, dynamic balance ability for transfer of center of gravity showed gradual improvement. Improving in static balance, dynamic balance and weight support of the more affected side or ultimately contribute to a more stable gait. Present study shows that PNF having significant different in improving Gait training and balance among chronic stroke patients. So this technique is very useful in the management of improving gait training and balance among chronic stroke patients.

CHAPTER VI

CONCLUSION

An experimental study was conducted to investigate the effectiveness of bobath approach and proprioceptive Neuromuscular Facilitation techniques in gait training and balance among chronic stroke patients.

The study was conducted on 20 subjects. The subjects were divided into two groups, Group A and Group B. Group A received Bobath approach. Group B received Proprioceptive Neuromuscular Facilitation. The study was conducted to compare effectiveness of Bobath approach and Proprioceptive Neuromuscular Facilitation in improving Gait training and balance in chronic stroke patients.

The statistical result shows that there is improvement in both groups. But when comparing both it was found that Proprioceptive neuromuscular Facilitation is more effective than bobath approach among chronic stroke patients.

6.1 Limitations

- This study was limited to age group between45 - 65 yrs only.
- The study sample size was small.
- Study was concluded for short period of time
- No follow ups could be done
- All the measurement were taken manually and this may introduced human error,which could create error in proving the hypothesis

6.2 Recommendation

- A study can also be done for the other age groups.
- A study can also be done using large population.
- A study can also be done with other form of exercise combination to know the effect of combined treatment.
- A study can be done with different variables.
- Number of subject can be increase.

CHAPTER VII

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CHAPTER - VIII

ANNEXURES

ANNEUXURE - 1

ASSESSMENT CHART

Physical Therapy assessment chart

Subjective assessment:

Name

Age

Sex

Occupation

Chief Complaints

Medical history

a) Past medical history:

b) Present illness:

Family/Social Therapy

Associated problems

Vital signs

Temperature	Pulse rate	Respiratory rate	Blood pressure

Objective assessment

On observation

Built

Posture

Attitude of limbs

Muscle wasting

Edema

Involuntary movement

Gait

Deformity

On Palpation

Tenderness

Swelling

Muscle tightness

Warmth

Other if any

Pain assessment

Side

Site

Duration

Nature

Aggravation factor

Relieving factor

Other if any

On examination

Higher function

- Conciousness
- Cognition
- Orientation
- Attention span
- Memory
- Abstract thinking
- Insight, judgement, planning
- Spatial
- Perception.

Speech

- Sound production
- Articulation
- Understanding & expressing words

Hearing

Cranial nerves

- Olfactory
- Optic
- Occulomotor, Trochlear, Abducement
- Trigeminal
- Facial nrve
- Vestibule cochlear
- Glossophayngeal
- Vagus
- Accessory
- Hypoglossal

Musculoskeletal system

- Fracture
- Muscle contracture
- Joint stiffness
- Joint subluxation
- osteoporosis

Reflexes

- Superfacial
- Deep
- Primitive
- Pathological

Co ordination

- Equilibrium assessment
- Non equilibrium assessment

Balance

- Static
- Sitting
- Standing
- Balance reaction

Hand function

- Power and precision grip
- Reaching
- Grasping
- Releasing

Functional Assessment

- ADL
- Functional status (Disease specific scales)

Diagnosis

Problem list

Short term & long term goals.

ANNEXURE -4

The 6 stages of brunnstorm approach:

Stage	Description
1	Immediately following a stroke there is a period of flaccidity whereby no movement of the limbs on the affected side occurs.
2	Recovery begins with developing spasticity, increased reflexes and synergic movement patterns termed **obligatory synergies**. These **obligatorysynergies** may manifest with the inclusion of all or only part of the synergic movement pattern and they occur as a result of reactions to stimuli or minimal movement responses.
3	Spasticity becomes more pronounced and **obligatory synergies** become strong. The patient gains voluntary control through the synergy pattern, but may have a limited range within it.
4	Spasticity and the influence of synergy begins to decline and the patient is able to move with less restrictions. The ease of these movements progresses from difficult to easy within this stage.
5	Spasticity continues to decline, and there is a greater ability for the patient to move freely from the synergy pattern. Here the patient is also able to demonstrate isolated joint movements, and more complex movement combinations.
6	Spasticity is no longer apparent, allowing near-normal to normal movement and coordination

ANNEXURE - 5

PATIENT CONSENT FORM

I . . . . . Voluntarily consent to participate in the research named on **"A COMPARATIVE STUDY ON THE EFFECTIVENESS OF BOBATH APPROACH AND PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION TECHNIQUE IN GAIT TRAINING AND BALANCE AMONG CHRONIC STROKE PATIENTS ".**

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witness

Date :

Place :