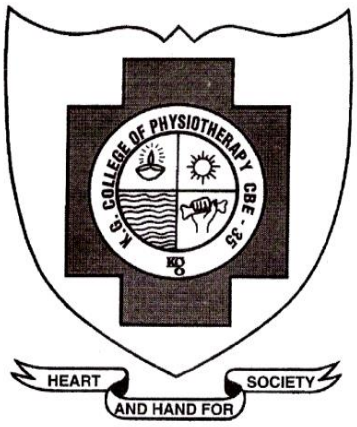
EFFICACY OF MOTOR IMAGERYTRAINING WITH GAIT TRAINING TO IMPROVE DYNAMIC BALANCE AND GAIT SPEED IN POST STROKE PATIENTS



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ELECTIVE: PHYSIOTHERAPY IN NEUROLOGY

A DISSERTATION SUBMITTED TO

THETAMILNADU

Dr. M. G. R MEDICAL UNIVERSITY, CHENNAI,

AS PARTIAL FULFILLMENT OF THE

MASTER OF PHYSIOTHERAPY DEGREE

MAY 2018

CERTIFICATE

Certified that this is the bonafide work of **Ms.ASWINI.G**of K.G.College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for Master of Physiotherapy Degree course from the Tamil Nadu Dr. M. G. R Medical University under the **Registration No: 271620301** for the May 2018 Examination.

Date: Principal

Place: Coimbatore

Date:

EFFICACY OF MOTOR IMAGERYTRAINING WITH GAIT TRAINING TO IMPROVE DYNAMIC BALANCE AND GAIT SPEED IN POST STROKE PATIENTS

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Has been submitted in partial fulfillment for the requirement of the

MASTER OF PHYSIOTHERAPYDEGREE,

May 2018

Internal examiner

External examiner

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I INTRODUCTION

Stroke is a common neuromuscular disorder due to abnormal blood circulation in the brain with a completely developed nervous system. It is a major cause of impairment and functional disability in people who have been affected. Common impairments being paralysis of the unilateral side including the trunk, reduction in muscle control and body movements, balance, inability to perform functional tasks, inability to stand up and walk. Stroke caused an estimated 5-7 million deaths in 2005 were recorded and 87% of these deaths occurred in underdeveloped countries. Without intervention, the number of global deaths is projected to rise to 6·5 million in 2015 and to 7·8 million in 2030. (Dr.Katheleen and Colin Mathers, 2007).

Balance is a complex task involving the detection and integration of sensory information to assess the position and motion of the body in space and the execution of appropriate musculoskeletal responses to control body position within the context of the environment and task. It is the result of integration among visual system, vestibular system, proprioceptive system, muscular system, cognitive ability etc..(Cynthia C. Norkin). Stroke survivors have difficulty in balance and postural control for standing upright because they are subjected to have asymmetric posture, abnormal body balance and deficit of weight transfer.

(Eun-Jung Chung 2013).In addition stroke patients also suffer from balance disability due to abnormalities in proprioceptive system, sensory system, trunk muscles, and muscles of the limbs.

Gait or human locomotion may be described as a translatory progression of the body as a whole, produced by coordinated, rotatory movements of body segments. (Cynthia C. Norkin). The common feature of gait after stroke includes decreased gait velocity and asymmetrical gait pattern. In stroke due to extensor synergy of lower limbs patient is unable to clear the ground unless compensated by cirumduction at the affected side, gait is slow with short step length, decrease in gait speed and cadence. Balance impairments and risk of fall are major problem in post stroke patient which leads to decreased functional mobility and they are a barrier to functional performance (Darekar et al., 2015)

In a study by Rust Dickstein, 2013 it has been estimated that 6 months after stroke, 30% individuals with residual hemiparesis will require some kind of assistance to walk. Gait velocity is also decreased by 50%.Chances of fear of falling as well as high rate of falling is also increased In addition to a decrease in community ambulation (Lord SE et al.,2004).

Motor imitation is a cognitive process. It involves neural network and action observation, motor imagery and motor execution. Motor imitation is frequently used for motor recovery in rehabilitation .Motor imagery refers to the process of

obtaining indirect experiences of motor sensation by imagining the act of performance in the mind (Daehee lee et al., 2013) Motor imagery can be defined as the covert cognitive process of imagining a movement of your own body (-part) without actually moving that body (-part). Imagination of a movement activates more or less the same brain areas as the actual execution of a movement (Sjoerd de vries et al., 2007)

Neuroimaging studies have also revealed that identical neural structures subserve physical and imagined movements. Consequently, Mental practice has been effectively applied as an adjunct practice strategy to during physical practice in exercise and rehabilitation (Andy j et al., 2010).Motor imagery (The imaging of action without their execution) Practice of locomotion activities is one program that can be implemented to improve the gait of post stroke patients (Rust Dickstein 2013)

Hence this study tends to find out whether a combined gait training and Motor Imagery training has an effect on improvement in balance and gait ability in post stroke hemiplegic patients.

1.1NEED FOR THE STUDY

The literature identifies Motor Imagery training to be useful in treating patients with stroke. There are limited studies citing the evidence of Motor Imagery training in improving balance and gait ability in post stroke hemiparetic patients. Motor imagery training applied to stroke patients may improve the motor function of lower extremities. It has also been found that motor imagery training along with gait training might improve balance and gait ability. A detailed study is needed to find out the effectiveness of Motor Imagery training to improve balance and gait ability in post stroke hemi paretic patients.

It has also been founded that imagery training along with gait training might improve gait ability and balance so this study aims to find out whether of Motor Imagery training applied to stroke patients improves the motor function of the lower extremities.

1.2 AIM OF THE STUDY

The purpose of the study is to find out the effect of Motor Imagery training combined with gait training in improving balance and gait ability in post stroke hemiparetic patients.

1.3 KEYWORDS

- Balance
- Gait
- Motor Imagery training
- Gait training

1.4 OBJECTIVES OF THE STUDY

- To find out the effect of Motor Imagery training combined with Gait training in improving dynamic balance and gait speed in patients with post stroke hemi paresis.
- To find out the effect of Gait training in improving dynamic balance and gait speed in patients with post stroke hemi paresis.
- To compare the effect of Motor Imagery training combined with Gait training versus Gait training alone in improving dynamic balance and gait speed in patients with post stroke hemi paresis.

1.5. HYPOTHESIS

(a) NULL HYPOTHESIS

There is no significant improvement in Motor Imagery training combined with gait training in improving balance and gait ability in patients with post stroke hemiparesis

(b) ALTERNATE HYPOTHESIS

There is significant improvement in Motor Imagery training combined with gait training in improving balance and gait ability in patients with post stroke hemiparesis.

II REVIEW OF LITERATURE

STROKE

REVIEWS ON BALANCE AND GAIT IN STROKE PATIENTS

Susan O Sullivan 1986

Balance is disturbed following stroke with impairments in steadiness, symmetry, and dynamic stability being common .Demonstrates asymmetry with most of the weight in sitting or standing shifted toward a stronger side, and postural sway in standing. Delay in the onset of motor activity, abnormal timing and sequencing of muscle activity and abnormal co-contraction result in disorganization of postural synergies.

Niam et al., (1999)

Conducted a study to assess some of the clinical and laboratory balance Assessments were related, indicating that some components of the tests are similar, but some measured different aspects of balance. Postural sway was related to visual condition, stance position, and proprioception.

Pei-yi lin et al.,(2006).,

Conducted a study to assess Gait velocity and temporal asymmetry, which are mainly affected by the dorsiflexors strength, whereas dynamic spasticity of plantorflexors influenced the degree of spatial gait asymmetry in patients who were

able to walk outdoors. Treatment aiming to improve different aspect of gait performance should emphasize on different ankle impairments.

Mulroy et al.,(2003)

Conducted a study to examine Quantitated gait analysis was conducted for 47 individuals at admission to in-patient rehabilitation and again at 6 months post-stroke for 42 subjects. Four clusters of patients were identified at both assessment intervals. At the admission test walking velocity, peak knee extension in mid stance and peak dorsiflexion in swing were the three factors that best characterized the groups. At 6 months the explanatory variables were velocity, knee extension in terminal stance, and knee flexion in pre swing. Differences in muscle strength and muscle activation patterns during walking were identified between groups.

MOTOR IMAGERY TRAINING

Vijaya k kumar et al., (2016)

Conducted a study additional task specific Motor imagery training improves paretic muscle strength and gait performance in ambulant stroke patients

Hochstenbach J, Mulder T et al.,(2007)

Conducted a study the information provided by motor imagery or motor observation can lead to functional recovery and plastic changes in patients after stroke. This article reviews the evidence for motor imagery or observation as methods in stroke rehabilitation.

Sun L, Yin D, et al.,(2013)

Conducted a study examined the neural mechanisms of motor imagery training (MIT) on 20 chronic stroke subjects for 4 weeks. They found that different cortical reorganization patterns (increases in or focusing of recruitment to the the contralateral sensorimotor cortex (CSMC) region) exist in chronic stroke patients after interventions using MIT

Sjoerd de Vries, et al., (2007),

Conducted a study in their review hypothesized that if motor imagery training results in significant changes in task performance, then it seemed plausible that at the neural level a reorganization should have taken place, similar to the one related to normal (physical) training. Thus the literature reviewed here showed that imagery and/or observation-based training may be valuable new methods for acute and chronic post-stroke motor rehabilitation.

Lafleur MF et al., (2002),

Conducted a study examined finally, as predicted, a similar pattern of dynamic changes was observed in both phases of learning during the motor imagery conditions. This last finding suggests that the cerebral plasticity occurring during the incremental acquisition of a motor sequence executed physically is reflected by the covert production of this skilled behavior using motor imagery.

MOTOR IMAGERY QUESTIONNAIRE

Hall, C. R, & Martin, K. A. (1997)

It is concluded that the Motor imagery questionnaire-Revised is an appropriate instrument for the assessment for visual and kinesthetic movement imagery abilities. Finally, directions for future research are suggested.

FUNCTION REACH TEST

Scoot Bennie et al., (2003)

The study suggests that the time up and goes test along or a combination of time up and go and functional reach test can be used as a simple measure of balance comparable to the Berg balance scale.

Jose Antonio et al.,(2014)

The main conclusion could be that the inertial sensors are a tool with excellent reliability and validity in the parameterization of the FRT in people who have had a stroke.

TIMED UP AND GO TEST

Shamay S et al., (2005)

Timed up and go test showed excellent reliability and were able to differentiate the patients from the healthy elderly subjects and correlated well with plantar flexor strength, gait performance and walking endurance in subjects with chronic stroke.

10 METER WALK TEST

Park et al., (2011)

Conducted a randomised, single blinded, controlled pilot study to investigate the effectiveness of community based rehabilitation training on walking function in post stroke hemiparetic patients. 25 subjects were randomly assigned to the experimental group, who received community based ambulation training and control group. Main measure were 6 minute walk test , 10 meter walk test , community walk test , activities specific balance confidence scale and walking ability questionnaire. At post test 10 meter walk test was significantly higher in experimental group than in control group.

Tyson et al., (2009)

Conducted a study to identify the psychometrically strong and clinically feasible measures of walking and mobility in people with neurological impairments. 17 measures were chosen. Of these 10 meter ,5 meter and 6 minute walk test, high level mobility assessment tool and Rivermead mobility index are psychometrically healthy measures of walking and mobility and practicable for use clinical practice.

Desiree et al., (2005)

Conducted a study to determine the responsiveness of 10 Meter Walk Test in evaluating the walking ability of hemiparetic stroke patients . The responsiveness

of two other measures Berg Balance Scale and Motricity index were evaluated. Results indicate that 10 Meter Walk Test is a more responsive assessment tool than other commonly used tests.

Green et al., (2002)

Conducted a study to assess the reliability of gait speed for stroke patients in their later stages. 22 stroke patients with mobility problem were recruited and gait speed was the outcome measure. There was a trend for decreased time taken to walk 10 meters both within each assessment and between assessments and conclude that with in assessment, gait speed measured with 10 meters at home was highly reliable.

III METHODOLOGY

3.1. STUDY DESIGN

Two group pre-test and post-test experimental study design.

3.2. STUDY SETTING

Study was conducted in Department of Physiotherapy KG Hospital and Physiotherapy Outpatient Department, KG College of Physiotherapy, Coimbatore.

3.3. STUDY SAMPLE

Based on the selection criteria 20 subjects were selected and they were allotted into 2 groups by simple random sampling method with ten subjects in each group.

- 10 patients in group A
- 10 patients in group B

3.4. STUDY DURATION

The study was conducted for a period of 6 months.

3.5. CRITERIA FOR SELECTION:

3.5.1 INCLUSION CRITERIA

- Both sexes were included in this study.
- Age group between 40 to 60 years of age.
- Subjects with stroke onset duration of more than 6 months.

- Subjects were capable of performing motor imagination tasks as evaluated by the motor imagery questionnaire revised.(Kinesthetic and Visual Imagery Questionnaire (KVIQ))
- Subjects with ability to walk more than 10 m based on functional ambulatory category level 3 and above.
- Patients with Mini mental state examination score 24 and above were included.
- Patients with Brunnstom recovery stage 5 and above for lower extremity.

3.5.2 EXCLUSION CRITERIA

- Patients with neurological deficits in cerebellum or brainstem.
- Patients with hemineglect.
- Patients with visual deficits.
- Patients with loss of sensation.
- Patients with hypersensitivity.
- Patients with brain tumours.
- Patients with history of disease with vertigo or vestibular dysfuction.
- Patients who had traumatic brain injury.
- Uncontrolled diabetes mellitus, hypertension and postural hypotension.
- Subjects with musculoskeletal problems and psychiatric illness.

3.6. VARIABLES.

3.6.1 INDEPENDENT VARIABLES

- Motor imagery training
- Gait training

3.6.2 DEPENDENT VARIABLES

- Balance
- Gait

3.7. OUTCOME MEASURES

- Functional reach test.
- Timed up and go test.
- 10 meter walk test.

3.8 PARAMETERS

- Balance
- Gait

3.9 MATERIALS REQUIRED

- Table
- Arm chair
- Inch tape
- Yard stick
- Stop watch

- Lap top
- Grading scale assessment sheets

3.10. ORIENTATION OF THE SUBJECTS

Before treatment all subjects were explained about the study and procedure to be applied and were asked to inform if they felt any discomfort during the course of treatment. All the subjects who were interested to participate in the study were asked to sign the consent form before the treatment.

3.11. PROCEDURE

Based on selection criteria 20 stroke subjects were selected. They were assigned into two groups by simple random sampling method, with 10 subjects in each group

- All 20 subjects were involved for pre-test assessment for balance ability and gait.

The 6 weeks treatment program was given for 60 minutes per session, 3 days per week.

❖ **GROUP A (EXPERIMENTAL GROUP)** :

- Warm-up exercise for 5 minutes.
- Motor imagery training with gait training for 50 minutes.
- Cool down exercises for 5 minutes.

❖ **GROUP B (CONTROL GROUP) :**

- Warm-up exercise for 5 minutes.
- Gait training for 35 minutes.
- Cool down exercises for 5 minutes.

After 6 weeks of treatment, all subjects from 2 groups were involved for the post test assessment.

3.12. STATISTICAL TOOL USED

Paired "t" test.

Formula: Paired "t"-test

$$S = \sqrt{\frac{\sum d^2 - [\sum d]^2}{n-1}}$$

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

d = Difference between the pre-test and post-test

$\overline{d}$ = Mean difference

n = Number of subjects

s = Standard deviation

Unpaired "t" test

Formula:

$$S = \sqrt{\frac{\sum (x_1 - \bar{x}_1)^2 + \sum (x_2 - \bar{x}_2)^2}{n1 + n2 - 2}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

n_1 = Total number of subjects in Group A

n_2 = Total number of subjects in Group B

x_1 = Difference between pre-test and post-test of Group A

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

x_2 = Difference between pre-test and post-test of Group B

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

IV DATA ANALYSIS AND INTERPRETATION

TABLE I

FUNCTIONAL REACH TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B USING UNPAIRED "t" TEST.

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	3.700	±0.537	0.350	1.2439
2.	GROUP B	3.350	±0.709		

For 18 degrees of freedom at 5 % level of significance, the calculated pre test 't' value of group A and group B was 1.2439 which is less than the critical value 2.101 which states that there is no significant difference between the pre test values of group A and group B.

GRAPH I

FUNCTIONAL REACH TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

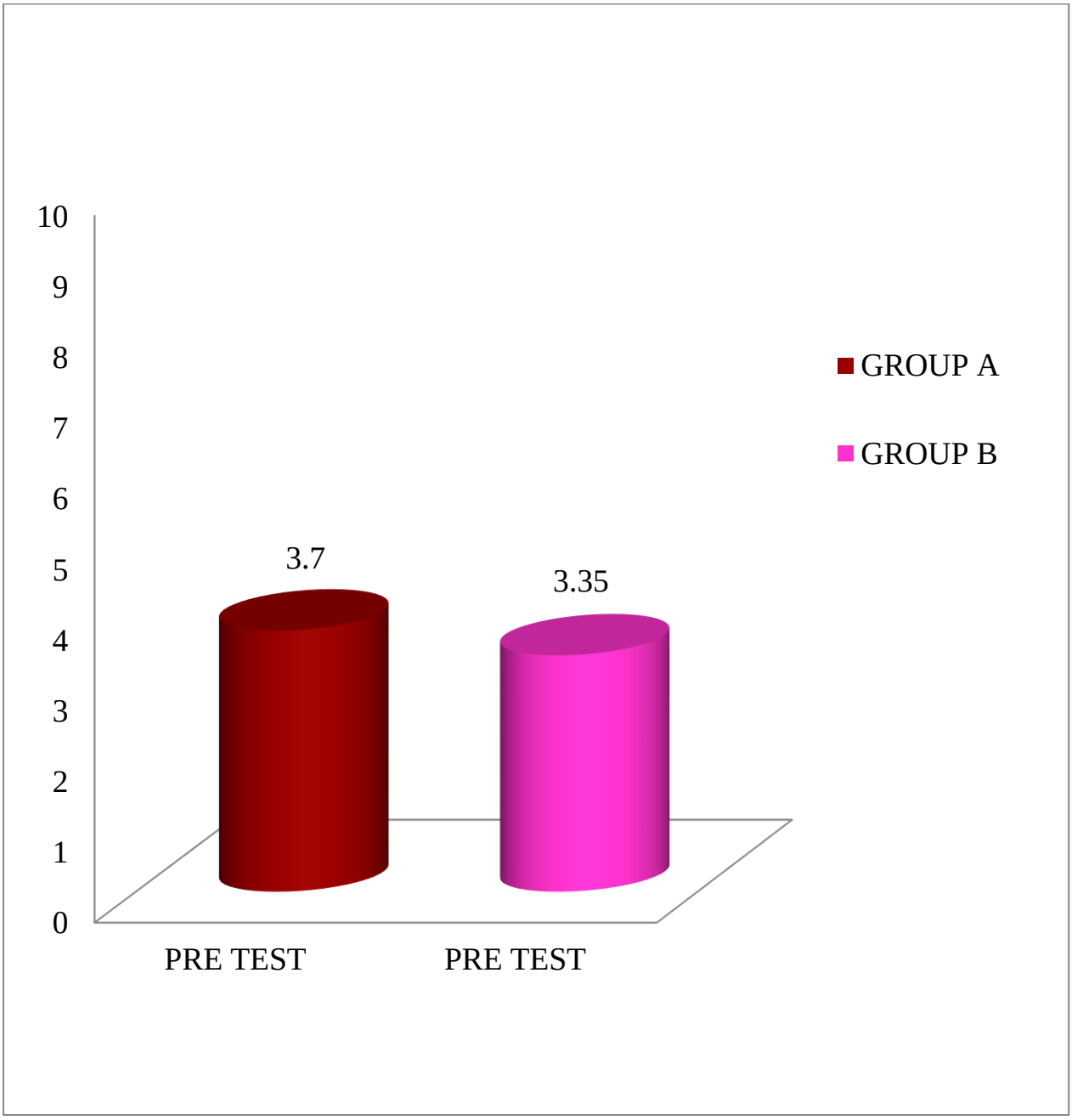


TABLE II

FUNCTIONAL REACH TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "A" (EXPERIMENTAL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN 'FRT' FROM INITIAL VALUE
1.	PRE TEST	3.700	±0.537	3.35	9.7961	25.77%
2.	POST TEST	7.050	±0.762			

For 9 degrees of freedom at 5 % level of significance, the calculated post test 't' value between control and experimental group was 9.7961 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group A.

GRAPH II

FUNCTIONAL REACH TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "A"

(EXPERIMENTAL GROUP)

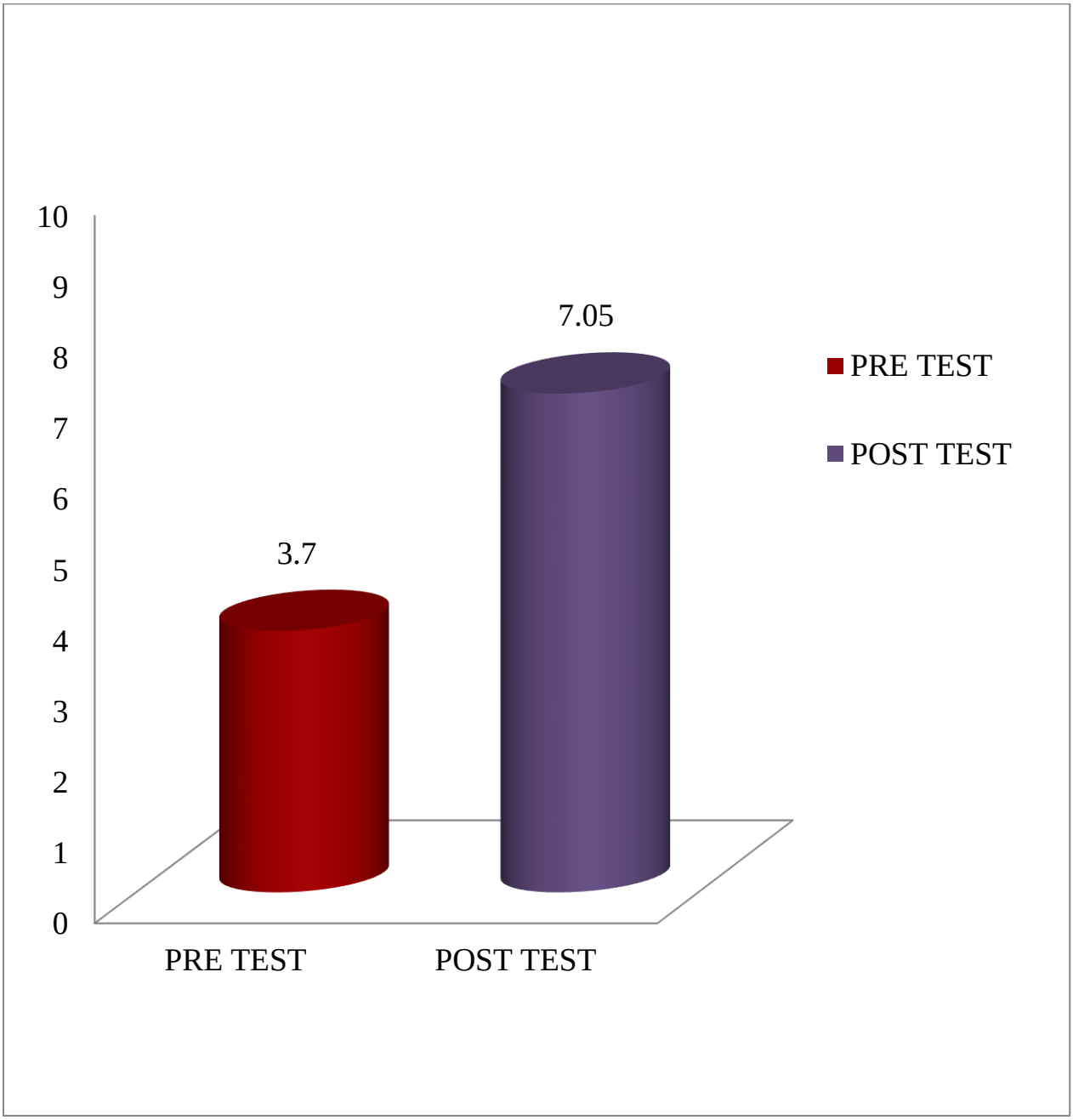


TABLE III

TIMED UP AND GO TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "B" (CONTROL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN 'FRT' FROM INITIAL VALUE
1.	PRE TEST	22.30	±2.11	2.8	7.7992	21.54%
2.	POST TEST	19.50	±1.58			

For 9 degrees of freedom at 5 % level of significance, the calculated post-test 't' value between control and experimental group was 7.7992 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group B.

GRAPH III

FUNCTIONAL REACH TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "B"

(CONTROL GROUP)

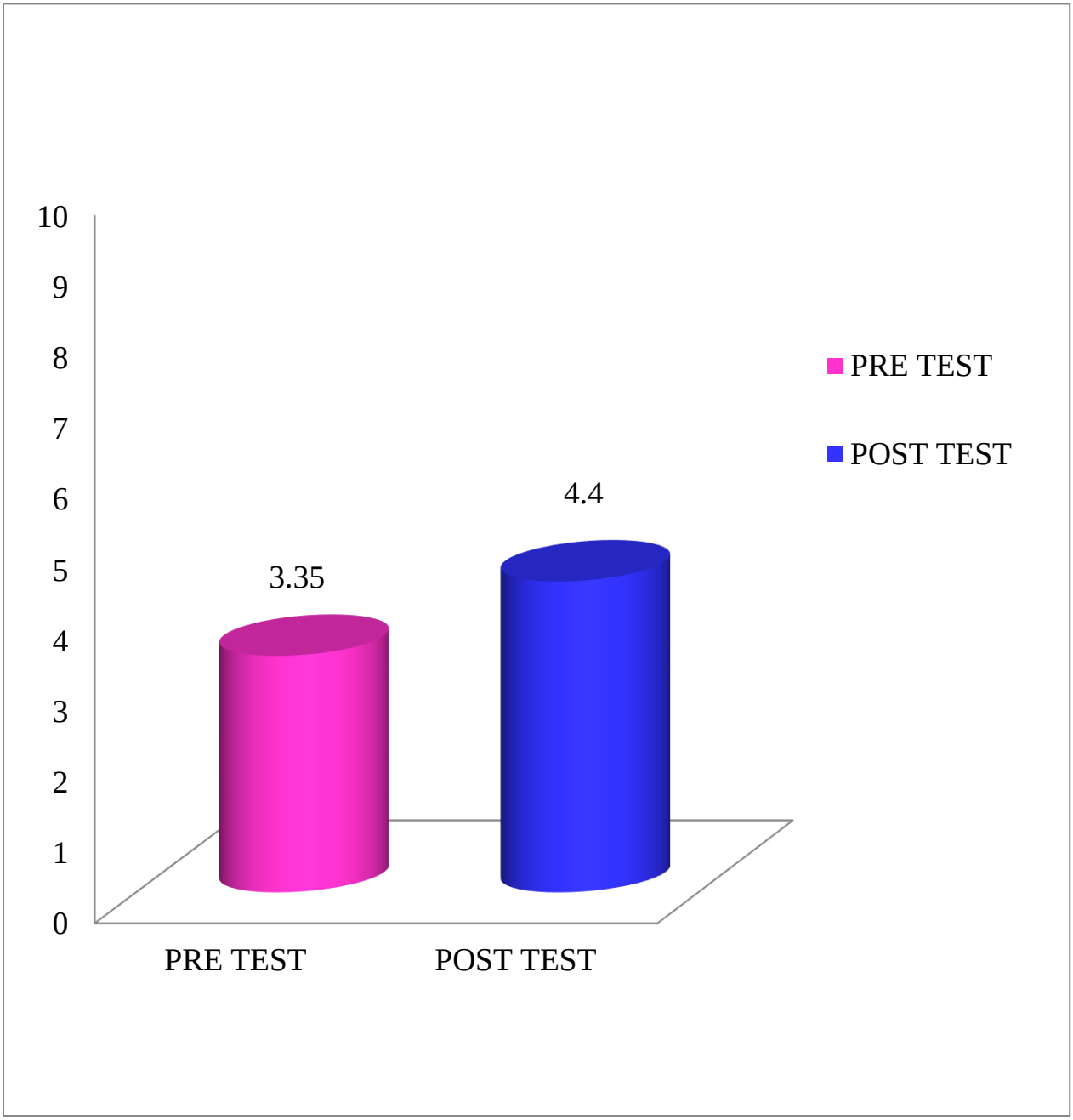


TABLE IV

TIMED UP AND GO TEST

COMPARISON OF POST TEST VALUES OF GROUP “A” AND GROUP “B” USING UNPAIRED “t” TEST

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	16.50	±1.78	3	3.9853
2.	GROUP B	19.50	±1.58		

For 18 degrees of freedom at 5 % level of significance the ,calculated pre test ‘t’ value of group A and group B was 3.9853 which is greater than the critical value 2.101 which states that there is significant difference between the post test values of group A and group B.

GRAPH IV

FUNCTIONAL REACH TEST

COMPARISON OF POST TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

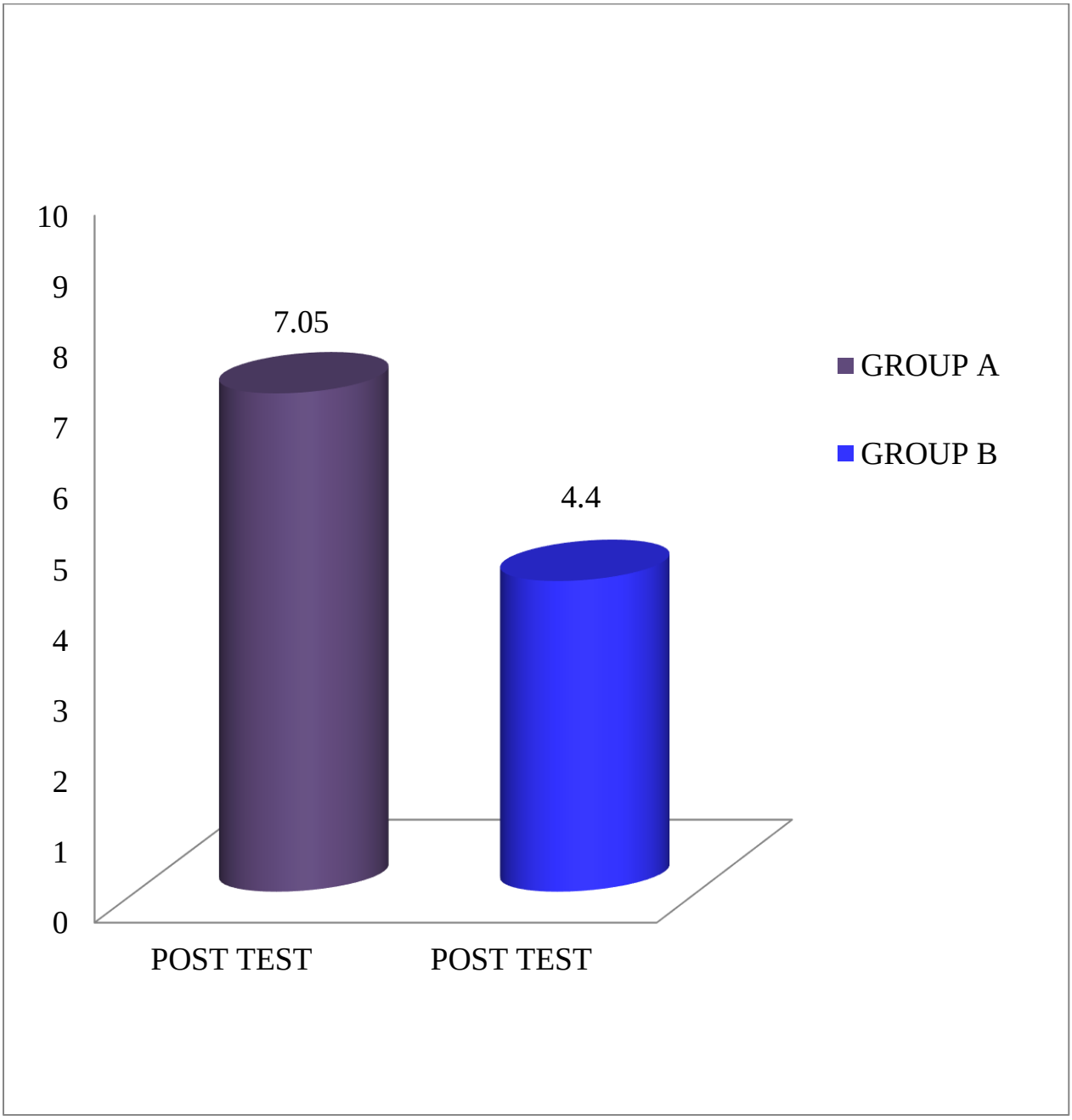


TABLE V

TIMED UP AND GO TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED “t” TEST

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	21.60	±2.01	1.30	0.7593
2.	GROUP B	22.30	±2.11		

For 18 degrees of freedom at 5 % level of significance, the calculated pre test ‘t’ value of group A and group B was 0.7593 which is less than the critical value 2.101 which states that there is no significant difference between the pre test values of group A and group B.

GRAPH V

TIMED UP AND GO TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

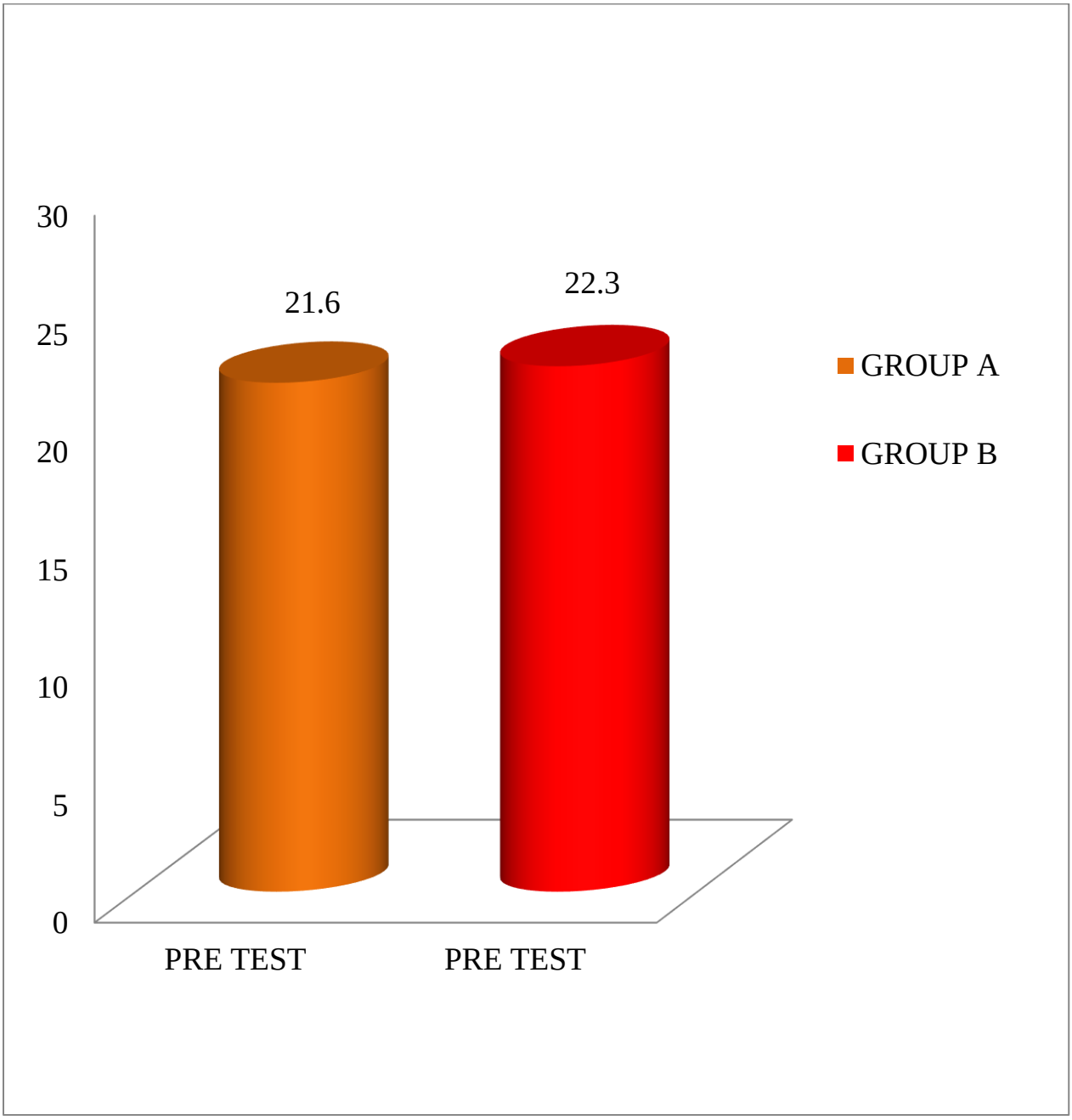


TABLE VI

TIMED UP AND GO TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "A" (EXPERIMENTAL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN 'TUG' FROM INITIAL VALUE
1.	PRE TEST	21.60	±2.01	5.10	8.7039	25.5%
2.	POST TEST	16.50	±2.28			

For 9 degrees of freedom at 5 % level of significance, the calculated post test't' value between control and experimental group was 8.7039 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group A.

GRAPH VI

TIMED UP AND GO TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "A"

(EXPERIMENTAL GROUP)

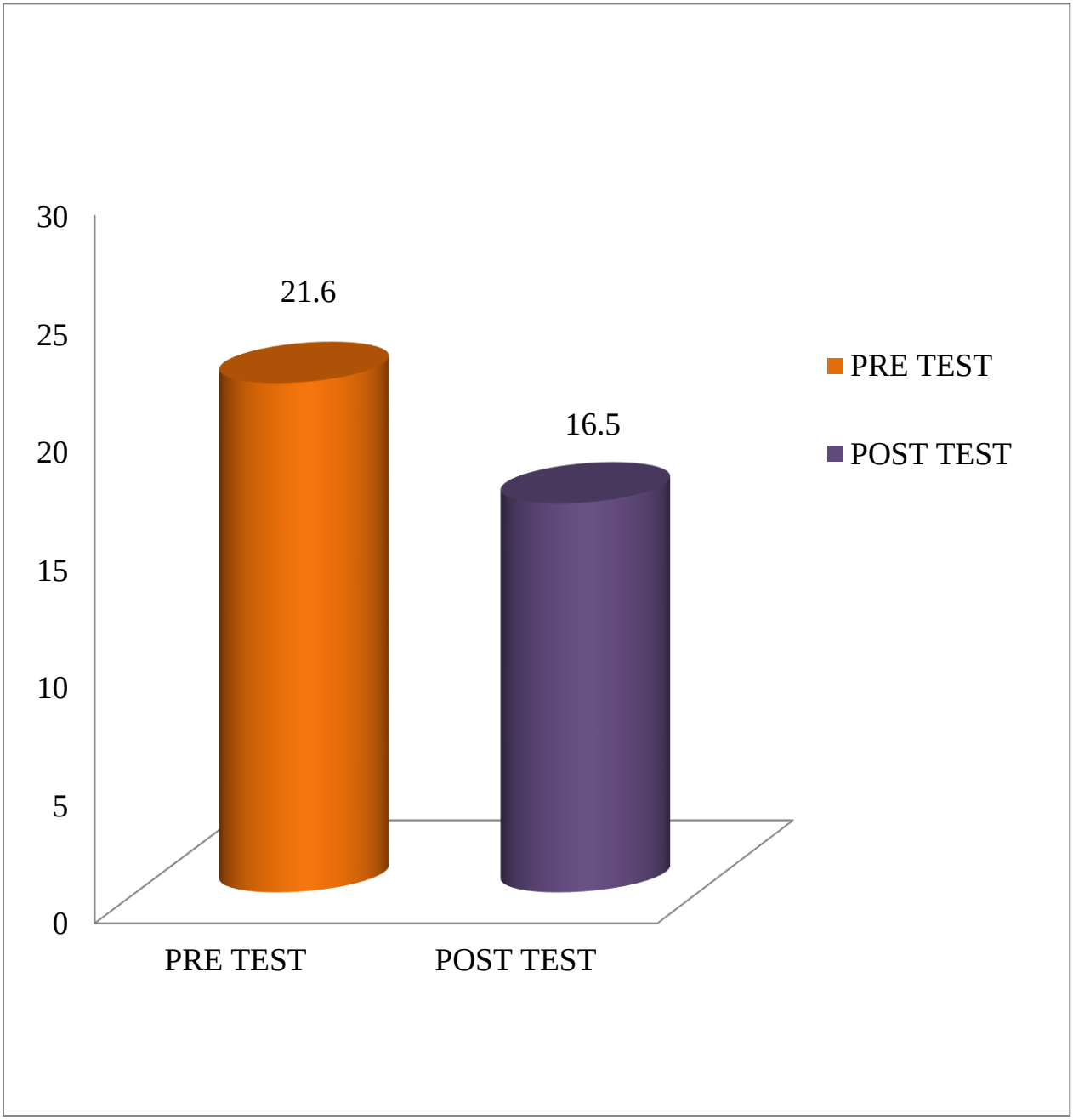


TABLE VII

TIMED UP AND GO TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "B" (CONTROL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN 'TUG' FROM INITIAL VALUE
1.	PRE TEST	22.30	±2.11	2.8	7.7992	14%
2.	POST TEST	19.50	±1.58			

For 9 degrees of freedom at 5 % level of significance, the calculated post test 't' value between control and experimental group was 7.7992 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group B.

GRAPH VII

TIMED UP AND GO TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP "B"

(CONTROL GROUP)

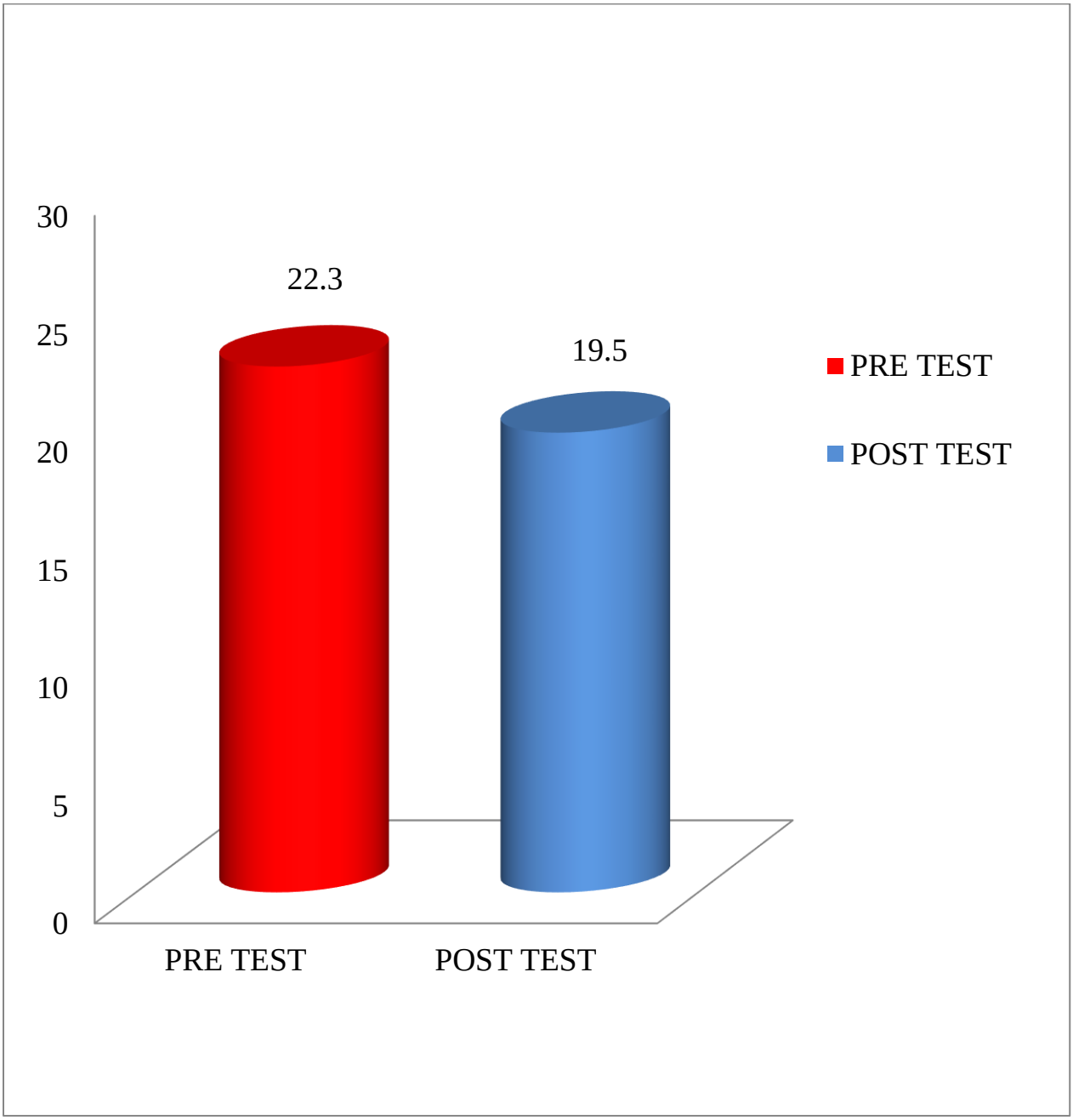


TABLE VIII

TIMED UP AND GO TEST

COMPARISON OF POST TEST VALUES OF GROUP “A” AND GROUP “B” USING UNPAIRED “t” TEST

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	16.50	±1.78	3	3.9853
2.	GROUP B	19.50	±1.58		

For 18 degrees of freedom at 5 % level of significance the ,calculated pre test ‘t’ value of group A and group B was 3.9853 which is greater than the critical value 2.101 which states that there is significant difference between the post test values of group A and group B.

GRAPH VIII

TIMED UP AND GO TEST

COMPARISON OF POST TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

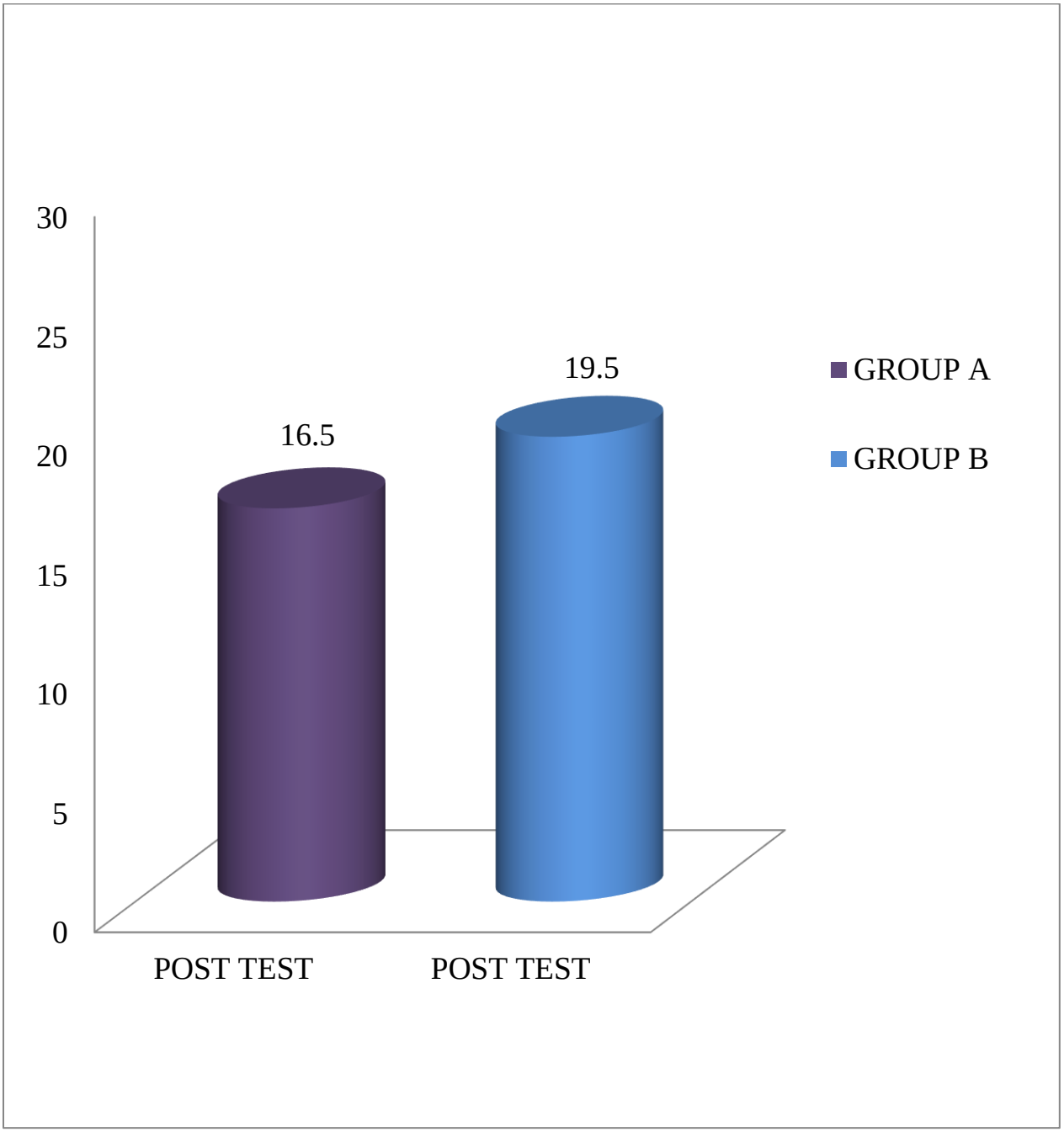


TABLE IX

10 METER WALK TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	21.49	±1.54	1.07	1.8826
2.,	GROUP B	22.56	±0.93		

For 18 degrees of freedom at 5 % level of significance, the calculated pre test 't' value of group A and group B was 1.8826 which is less than the critical value 2.101 which states that there is no significant difference between the pre test values of group A and group B.

GRAPH IX

10 METER WALK TEST

COMPARISON OF PRE TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST

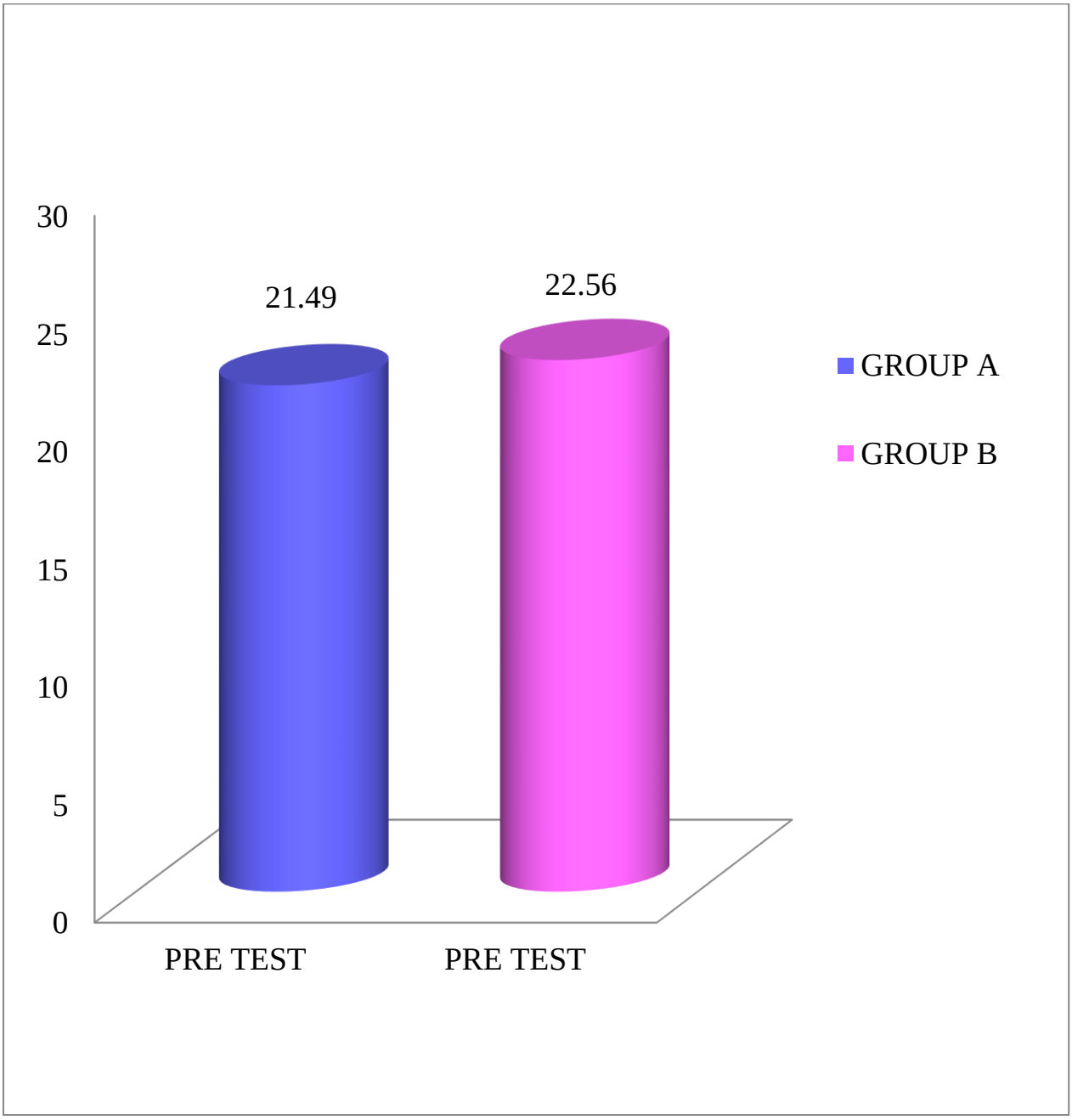


TABLE X

10 METER WALK TEST

COMPARISON OF PRE AND POST TEST VALUES OF

GROUP "A" (EXPERIMENTAL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN ' 10MWT' FROM INITIAL VALUE
1.	PRE TEST	21.49	±1.65	6.16	8.9637	30%
2.	POST TEST	27.65	±1.56			

For 9 degrees of freedom at 5 % level of significance, the calculated post test 't' value between control and experimental group was 8.9637 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group A.

GRAPH X

10 METER WALK TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP A

(EXPREMENTAL GROUP)

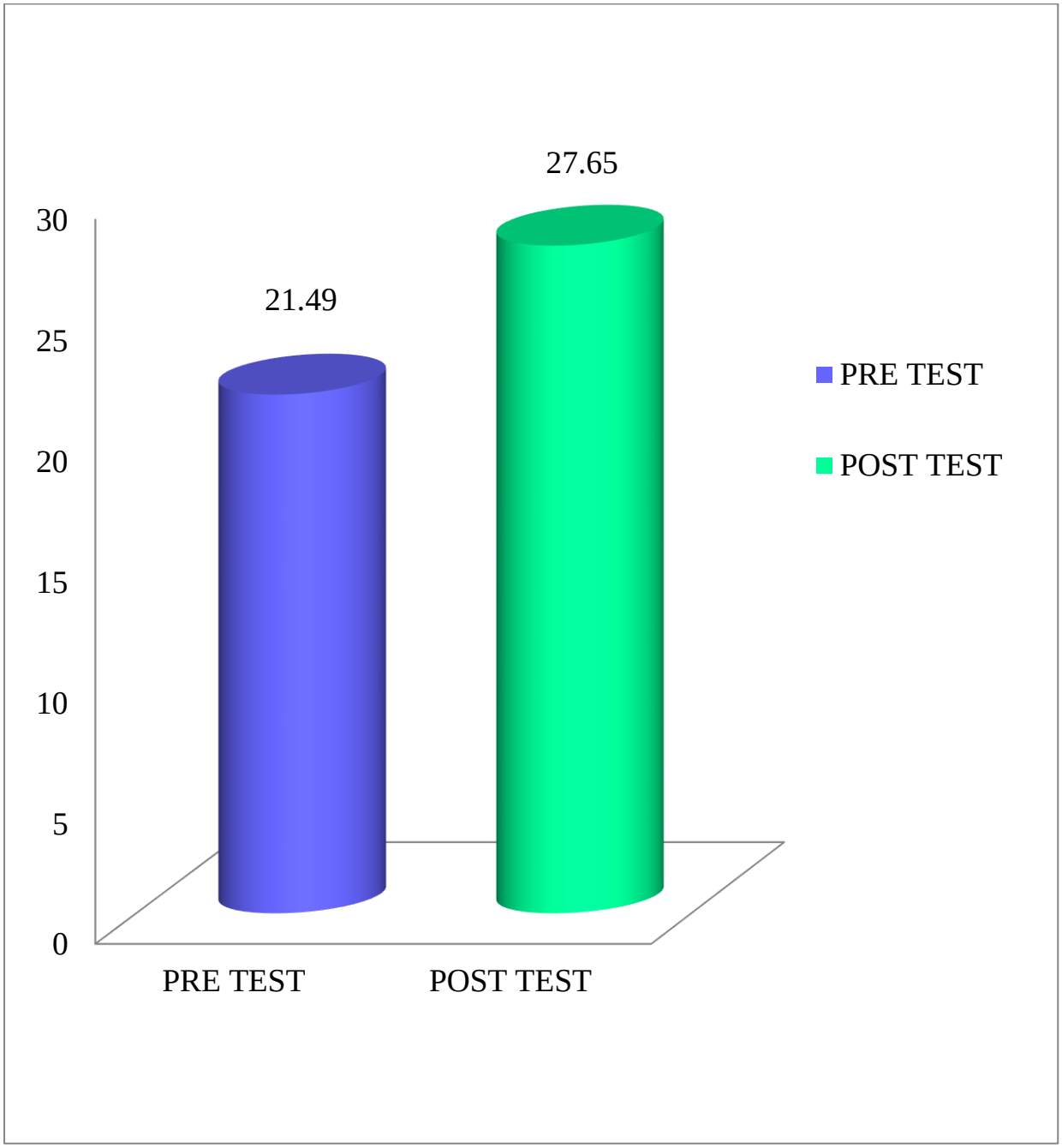


TABLE XI

10 METER WALK TEST

COMPARISON OF PRE AND POST TEST VALUES OF

GROUP "B" (CONTROL GROUP)

S.NO	GROUP A	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' VALUE	PERCENTILE INCREASE IN ' 10MWT' FROM INITIAL VALUE
1.	PRE TEST	22.56	±0.93	2.2	4.7655	11%
2.	POST TEST	24.36	±0.87			

For 9 degrees of freedom at 5 % level of significance, the calculated post test 't' value between control and experimental group was 4.7655 and the critical value was 2.262 which states that there is significant improvement between the pre and post test values of group B.

GRAPH XI

10 METER WALK TEST

COMPARISON OF PRE AND POST TEST VALUES OF GROUP B

(CONTROL GROUP)

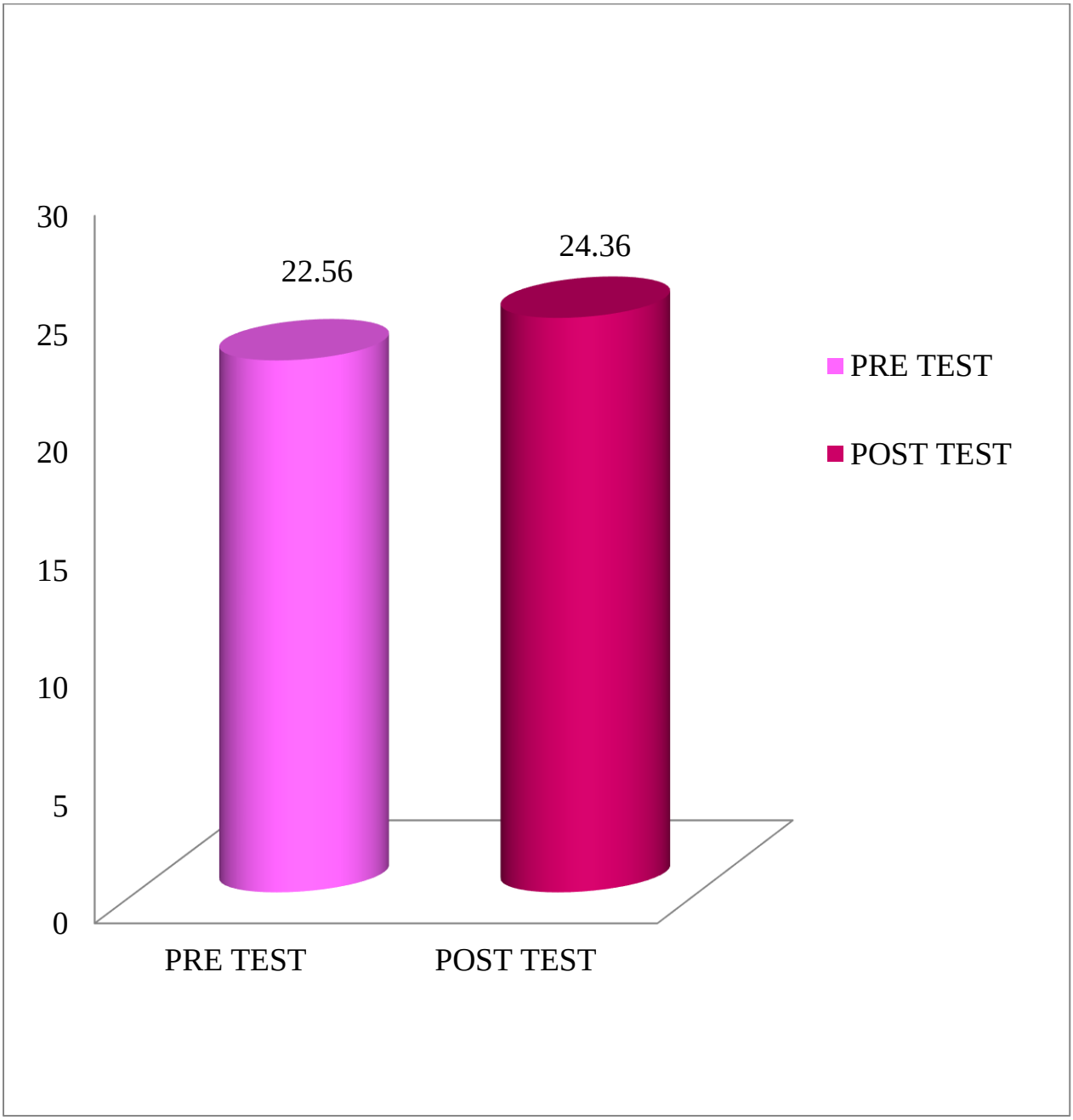


TABLE XII

10 METER WALK TEST

COMPARISON OF POST TEST VALUES OF GROUP "A" AND GROUP "B" USING UNPAIRED "t" TEST

S.NO	GROUP	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED 't' VALUE
1.	GROUP A	27.65	±1.564	3.29	5.8090
2.	GROUP B	24.36	±0.872		

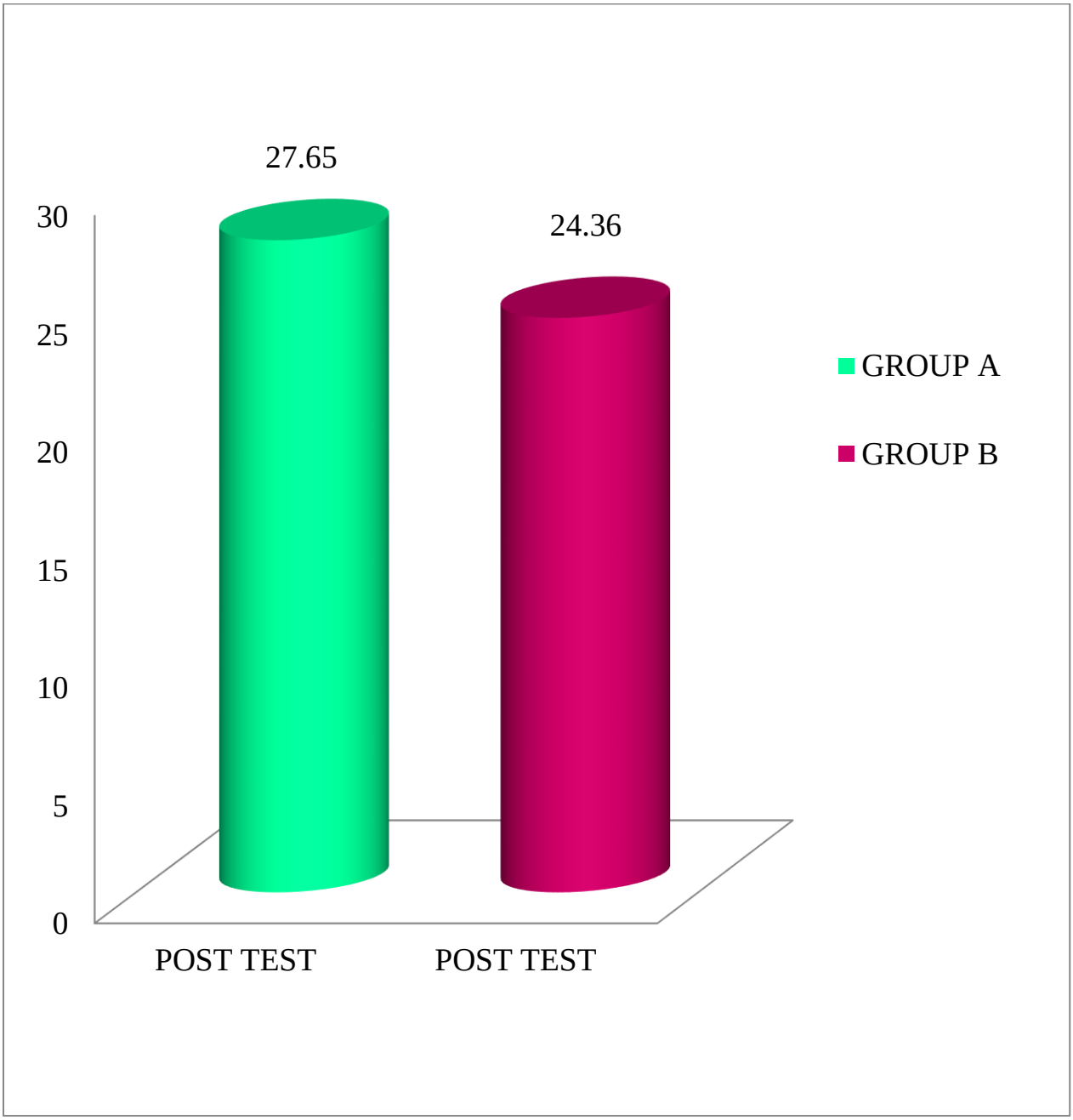
For 18 degrees of freedom at 5 % level of significance the ,calculated pre test 't' value of group A and group B was 5.8090 which is greater than the critical value 2.101 which states that there is significant difference between the post test values of group A and group B.

GRAPH XII

10 METER WALK TEST

COMPARISON OF POST TEST VALUES OF GROUP A AND GROUP B

USING UNPAIRED "t" TEST



V DISCUSSION

The primary goal in any stroke rehabilitation is to improve the recovery of walking. In post stroke patients it has been found out that 30 %, individuals require assistance to walk and they might have at least 50% decrease in gait speed when compared to normal individuals of the same age. In addition, they might also find difficulty in community ambulation (Lafleur MF et al., 2002)

Motor imagery is the imagining of actions without execution. In a study conducted by Butler AJ et al.2006, during brain imaging studies, same parts of the brain are found be activated both in imagining a task and in actual performance of the task. Studies have also indicated that imagery training improved motor functions of the lower extremities (Liu KP et al., 2004).Very few studies have been conducted to understand the effectiveness of motor imagery training to improve balance and gait ability (Hari-young cho et al.,). Hence this study was conducted to find out the effectiveness of Motor imagery training in post stroke patients. Primary outcome measures used were Functional reach test, Timed up and go test to assess the dynamic balance and 10 Meter walk test to assess the gait speed.

Statistical analysis of pre test means of the experimental and control group reveal that there is no significant difference between two groups indicates that they are unmatched group of subjects undergoing different exercise programs but were selected from the same population. Statistical analysis between pre test and post

test values of experimental group at 5 % level of significance showed significant improvement in Functional reach test, Timed up and go test and in 10 Meter walk test following Motor imagery technique along with gait training. Hence this permits the rejection of null hypothesis.

Analysis of results also showed that there is an increase of about 25.77% in experimental group when compared with the control group that has only 21.54% increase in Functional reach test and in Timed up and go test, there is an increase about 25.5% in experimental group and 14% in control group, and in 10 Meter walk test also there is an increase of about 30.8% in experimental group and 11% in control group. This shows the superiority of the Motor imagery training with Gait training over Gait training alone in stroke patients.

In Motor imagery, neural reorganization might take place in a similar manner as it would occur in actual physical practice and also in brain regions associated with the motor plan which may be involved in performing Motor imagery training. Achievements of great benefits might be due to the intense focus on imagery of impairment on the affected side. In addition motor imagery training strengthens motivation, improves self confidence. Also accompanying with motor imagery, kinematic and visual imagery increases in gait rehabilitation.(Fansler CL et al.,1985) .It can also be noted d that Motor imagery is a low cost and low risk motor rehabilitation intervention for individuals with stroke.

VI SUMMARY AND CONCLUSION

This study compares the effectiveness of Motor imagery training combined with Gait training versus Gait training to improve dynamic balance and gait speed of patients with post stroke hemiparesis. In twenty patients with moderate stroke dynamic balance was tested by Functional reach test and Time up and go test and gait speed was tested by 10 Meter Walk test. They were divided into experimental and control group, with 10 subjects in each group.

Experimental group subjects were given warm up exercises for 5 minutes, Motor imagery training combined with Gait training 50 minutes and cool down exercises for 5 minutes. Control group subjects were given warm up exercises for 5 minutes, Gait training for 50 minutes and cool down exercises for 5 minutes. The duration of the exercises program was six weeks. At the end of the program on the 42 day, dynamic balance and gait speed was done again.

The results were analyzed using students ‘t’ test. The analysis of results showed that Motor imagery training combined with Gait training improved the dynamic balance and gait speed in patients with post stroke. Hence it can be concluded that Motor imagery training combined with Gait training given to the experimental group proved to be superior than Gait training alone given to the control group.

The exercise program is brief and simple. Risks are also minimal if patients are taught properly and made to do at home after initial supervision by the therapist. This exercise program can be prescribed for post stroke patients whose dynamic balance and gait speed is affected and related secondary injuries.

VII LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS

1. The period allotted for the study was found to be insufficient for the inclusion of greater number of subjects.
2. Influence of drug, nutritional, psychological state and climate cannot be controlled.
3. Though Functional reach test, Timed up and go test and 10 meter walk test were administered, bias is possible.
4. The difference in individual interest shown towards to the treatment sessions and further practice.
5. Small study 20 subjects were only included in the study.

RECOMMENDATIONS

1. Study under large population is recommended.
2. Further analysis in balance and gait could be done using EMG biofeedback.
3. Subjects with different age groups can be included.
4. The study can be extended to all other types of stroke.
5. Follow up study can be done to know the long term effects.

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IX APPENDIX

APPENDIX-I

NEUROLOGICAL ASSESSMENT

SUBJECTIVE ASSESSMENT

Name

Age

Sex

Occupation

Handedness

Date of assessment

Date of admission

Chief Complaints

Present medical history

Past medical history

Personal history

Occupational history

Family history

Socioeconomic status

Environmental history

Risk factors

Associated problems

Pain history

- Side
- Site
- Onset
- Duration
- Quality
- Intensity
- Aggravating factors
- Relieving factors

Vital signs

- Temperature
- Pulse rate
- Respiratory rate
- BP

OBJECTIVE ASSESSMENT

ON OBSERVATION

- Built
- Posture
- Attitude of limbs

- Muscle wasting
- Edema
- Involuntary movements
- Tropical changes
- Deformities
- Gait
- Pressure sores
- Respiration
- External appliances

ON PALPATION:

- Edema
- Tenderness
- Warmth

ON EXAMINATION:

Higher mental function

- Consciousness
- Orientation
- Attention
- Memory
- Communication

- Emotional status

Higher cortical function

- Cognition
- Perception

Mental Status Assessment

- Affect
- Mood
- Behavior
- Speech
- Thought process
- Thought content

Speech

- Sound production
- Articulation
- Understanding & Experiencing

Hearing

Vision

Cranial nerve examination

Sensory system

- Superficial sensation

- Deep sensation
- Cortical sensation

Motor system

- Muscle tone
- Muscle girth
- Functional range of motion

Reflexes

- Superficial reflexes
- Deep reflexes
- Pathological reflexes

Voluntary movements

Involuntary movements

- Type
- Aggravating factors
- Limiting factors
- Quality

Balance

- Static balance
- Dynamic balance
- Balance reactions

Posture

- Lying
- Sitting
- Standing
- Gait

Hand functions

Other systems

Musculoskeletal system

- Fracture
- Muscle contracture
- Joint stiffness
- Joint subluxation
- Osteoporosis
- Limb length discrepancy

- **Integumentary system**
- **Autonomic nervous system**
- **Bladder function**
- **Bowel function**
- **Functional assessment**

ADL

Functional status

DIAGNOSIS

Physiotherapy management:

Problem list

Short term & Long term goals

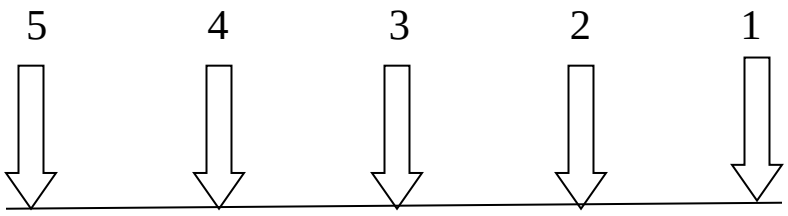
Means

APPENDIX-II

KINESTHETIC AND VISUAL IMAGERY QUESTIONNAIRE (KVIQ)

Motor imagery descriptors and scales

Visual imagery scale



5 -Image as clear as seeing

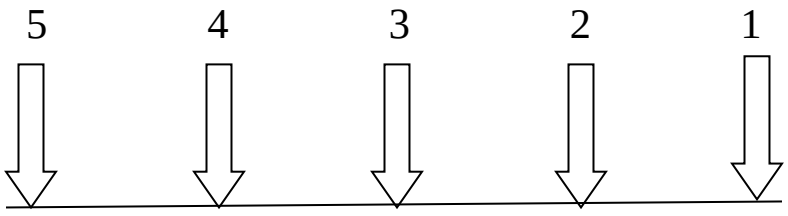
4-Clear image

3- Moderately clear image

2- Blurred image

1-No image

Kinesthetic imagery scale



5-As intense as executing the action

4-Intense

3-Moderately intense

2-Mildly intense

1-No sensation

KVIQ-20	Movements	KVIQ-10
1V 1K	Neck flexion/extension	
2V 2K	Shoulder shrugging	
3Vnd 3Knd	Forward shoulder flexion	**3Vnd 3Knd**
4Vd 4Kd	Elbow flexion	
5Vd 5Kd	Thumb to finger tips	**5Vd 5Kd**

- **Repeat #3, #4, #5 on the other side**

6V 6K	Forward trunk flexion	**6V 6K**
7Vnd 7Knd	Knee extension	
8Vd 8Kd	Hip abduction	**8Vd 8Kd**
9Vnd 9Knd	Foot tapping	**9Vnd 9Knd**
10Vd 10Kd	Foot external rotation	

- **Repeat #7, #8, #9, #10 on the other side**
- d: dominant
- nd: non-dominant

For bilateral assessment of limb movements.

APPENDIX-III

FUNCTIONAL AMBULATION CATEGORY

Purpose of the measure

The Functional Ambulation Category (FAC) is a functional walking test that evaluates ambulation ability. This 6-point scale assesses ambulation status by determining how much human support the patient requires when walking, regardless of whether or not they use a personal assistive device. The Functional Ambulation Category can be used with, but is not limited to, patients with stroke.

Features of the measure

Item

To use the Functional Ambulation Category, an assessor asks the subject various questions and briefly observes their walking ability to provide a rating from 0 to 5.

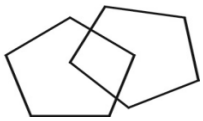
- A score of 0 indicates that the patient is a non-function ambulatory (cannot walk);
- A score of 1,2 or 3 denotes a depended ambulatory who require assistance from another person in the form of continuous manual contact (1), continuous or intermittent manual contact (2), or verbal supervision/guarding (3)
- A score of 4 or 5 describes an independent ambulatory who can walk freely on: level surfaces only (4) or any surface (5=maximum score)

Scoring and score interpretation

Score category		Interpretation
0	Nonfunctional Ambulation	Subject cannot ambulate, ambulates in parallel bars only, or requires supervision or physical assistance from more than one person to ambulate safely outside of parallel bars.
1	Ambulatory-Dependent for Physical Assistance Level II	Subject requires manual contacts of no more than one person during ambulation on level surfaces to prevent falling. Manual contacts are continuous and necessary to support body weight as well as maintain balance and/or assist coordination
2	Ambulatory-Dependent for Physical Assistance Level I	Subject requires manual contact of no more than one person during ambulation on level surfaces to prevent falling. Manual contact consists of continuous or intermittent light touch to assist balance or coordination
3	Ambulatory-Dependent for Supervision	Subject can physically ambulate on level surfaces without manual contact of another person but for safety requires standby guarding on no more than one person because of poor judgment, questionable cardiac status, or the need for verbal cuing to complete the task.
4	Ambulatory-Independent Level Surfaces only	Subject can ambulate independently on level surfaces but requires supervision or physical assistance to negotiate any of the following: stairs, inclines, or non-level surfaces.
5	Ambulatory-Independent	Subject can ambulate independently on non level and level surfaces, stairs, and inclines.

APPENDIX-IV

MINI MENTAL STATE EXAMINATION		
Maximum score	Patients score	Questions
5		**ORIENTATION** "What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		**REGISTRATION** The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		**ATTENTION AND CALCULATION** "I would like you to count backward from 100 by sevens." (93, 86, 79,72, 65, …) Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		**RECALL** "Earlier I told you the names of three things. Can you tell me what those were?"

2		**LANGUAGE** Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts."
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		**COPYING** "Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		**TOTAL**

INTERPRETATION

24-30 No cognitive impairment

18-23 mild cognitive impairment

0-17 severe cognitive impairment

APPENDIX-V

BRUNNSTROM MOTOR RECOVERY STAGES-LOWER EXTERMITY

Describe the process of recovery following stroke-induced hemiplegia the process is divided into a number of stages:

Stage 1:

Flaccidity (immediately after the onset)

No “voluntary” movements on the affected side can be initiated

Stage 2:

Spasticity appears

Basic synergy patterns appear

Minimal voluntary movement of lower limb.

Stage 3:

Hip Knee ankle flexion in lying and standing.

Stage 4:

Sitting knee flexion beyond 90 degree with the foot sliding backward on the floor.

Voluntary dorsiflexion of the ankle without lifting the foot of the floor.

Stage 5:

Standing isolated non weight bearing knee flexion with hip in extension or nearly extended.

Standing isolated dorsiflexion of the ankle with knee in extension

Stage 6:

Standing, hip abduction beyond range obtained from elevation of the pelvis.

Sitting reciprocal action of the inner and outer hams muscles, combined with inversion.

Stage 7:

Normal function is restored.

APPENDIX-VI

THE FUNCTIONAL REACH TEST

The Functional Reach Test is a single item test developed as a quick screen for balance problems in adults.

Interpretation:

A score of 6 or less indicates a significant increased risk for falls. A score between 6-10 inches indicates a moderate risk for falls

Age related norms for the functional reach test:

Age	Men (in inches)	Women (in inches)
20-40yrs	16.7 ± 1.9	14.6 ± 2.2
41-69yrs	14.9 ± 2.2	13.8 ± 2.2
70-87	13.2 ± 1.6	10.5 ± 3.5

Requirements:

The patient must be able to stand independently for at least 30 seconds without support, and be able to flex the shoulder to at least 90 degrees.

Equipment and set up:

A yard stick is attached to a wall at about shoulder height. The patient is positioned in front of this so that upon flexing the shoulder to 90 degrees, an initial reading on the yard stick can be taken. The examiner takes a position 5-10 feet away from the patient, viewing the patient from the side.

Instructions:

Position the patient close to the wall so that they may reach forward along the length of the yardstick. The patient is instructed stand with feet shoulder distance apart then make a fist and raise the arm up so that it's parallel to the floor. At this time the examiner takes an initial reading on the yard stick, usually spotting the knuckle of the third metacarpal. The patient is instructed to reach forward along the yardstick without moving the feet. Any reaching strategy is allowed but the hand should remain in a fist. The therapist takes a reading on the yardstick of the farthest reach attained by the patient without taking a step. The initial reading is subtracted from the final to obtain the functional reach score.

APPENDIX-VII

THE TIMED UP AND GO TEST

Timed Up and Go (TUG) Test

Name:_____ MR: _____

Date:_____

1. **Equipment**: arm chair, tape measure, tape, stop watch.

2. Begin the test with the subject sitting correctly (hips all of the way to the back of the seat) in a chair with arm rests. The chair should be stable and positioned such that it will not move when the subject moves from sit to stand. The subject is allowed to use the arm rests during the sit – stand and stand – sit movements.

3. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject

4. **Instructions**: "On the word GO you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.

5. Start timing on the word "GO" and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

6. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

7. Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more.

8. The subject should be given a practice trial that is not timed before testing.

9. Results correlate with gait speed, balance, functional level, the ability to go out, and can follow change over time. Normative Reference Values by Age 1 Age Group Time in Seconds (95% Confidence Interval) 60 – 69 years 8.1 (7.1 – 9.0) 70 – 79 years 9.2 (8.2 – 10.2) 80 – 99 years 11.3 (10.0 – 12.7) Cut-off

Values Predictive of Falls by Group Time in Seconds Community Dwelling Frail Older Adults 2 > 14 associated with high fall risk Post-op hip fracture patients at time of discharge3 > 24 predictive of falls within 6 months after hip fracture Frail older adults > 30 predictive of requiring assistive device for ambulation and being dependent in ADLs Date Time References 1. Bohannon RW.

APPENDIX-VIII

10 METER WALK TEST

Timing a 10-meter walk, which provides a snapshot of gait velocity, is considered a scientifically reliable and valid test. This test of self –selected walking speed (the directions to the patient are simple "walk as fast as you feel safe and comfortable") is safe, cost – effective (it takes just few minutes), easy to learn and administer, and results are easy to interpret.

The 10 Meter Walking Test Rules

Setting up the Ten Meter Walking Test is easy. Simply mark off a straight line, 20 meters long. Then mark off the first and last 5 meters. Although you ask the patient to walk the entire 20 meters, only the middle 10 meters are recorded. The first and last 5 meters are used to eliminate period of acceleration and deceleration. The timing is best done when the patient is free of the distraction of the test itself.

Making subtle start and stop-timing lines on floor and choosing the silent stopwatch is recommended. As previously mentioned, the patients instructed to walk at a self-selected speed. The instructions are simply "walk to (mention a landmark), as fast as you feel comfortable and safe".

Timing starts as soon as the first part of either lower extremity passes the five meter mark. Timing end soon as the first part of either lower extremity passes the 15-meter line.

Velocity is calculated as distance divided by time. For instance, if the patient walks 10 meters in nine second, the calculation is 10(distance in meters) divided by nine(the number of seconds).The velocity of this patient is 1.1meter per second.

Patient Instructions:

Normal comfortable speed: “I will say ready, set, go. When I say go, walk at your normal comfortable speed until I say stop”

Maximum speed trials: “I will say ready, set, go. When I say go, walk as fast as you safely can until I say stop”

10 Meter Walk Testing Form

Name:

_____ Assistive Device and/or Bracing Used:_____

Date:_____

Seconds to ambulate 10 meters.

Self-Selected Velocity: Trial 1_____sec.___ Fast Velocity: Trial 1_____sec.___

Self-Selected Velocity: Trial 2_____sec.___ Fast Velocity: Trial 2_____sec.___

Self-Selected Velocity: Trial 3 _____sec.___ Fast Velocity: Trial 3_____sec.___

Self-Selected Velocity: Average time___sec.__ Fast Velocity: Average time___sec.__

Actual velocity: Divide 10 by th e average seconds

Average Self-Selected Velocity:_____m/s

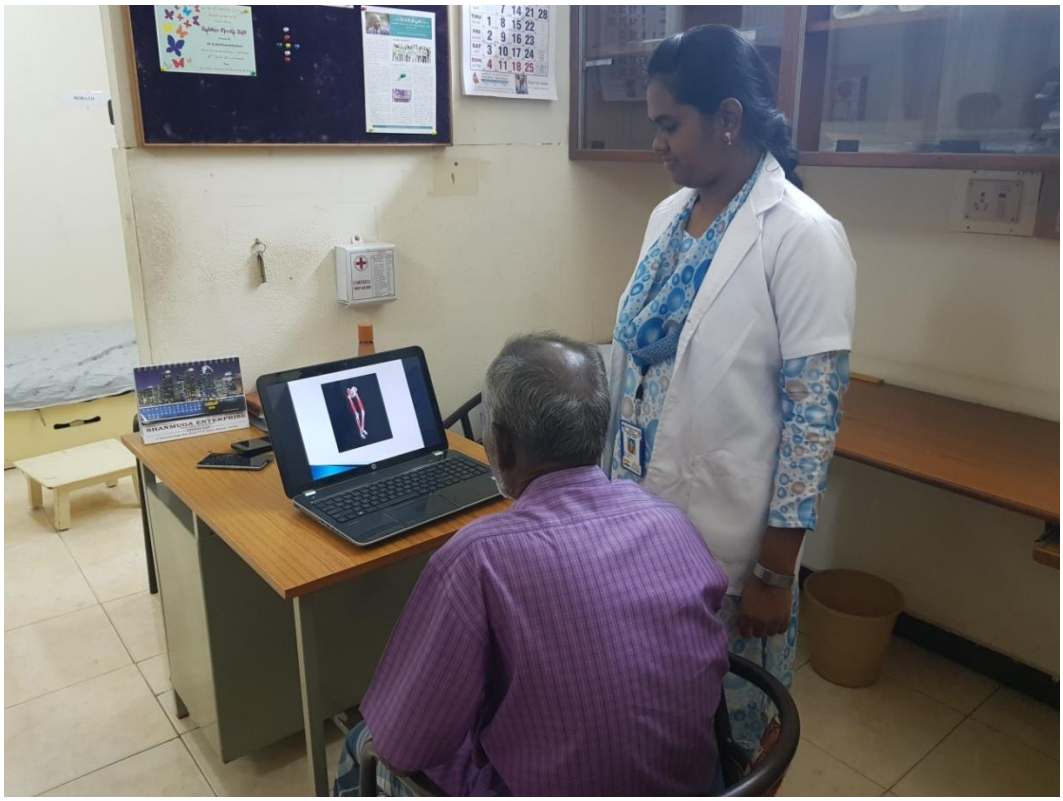
Average Fast-Velocity:_____m/

APPENDIX-IX

MOTOR IMAGERY TRAINING

To perform motor imagery training, videos of normal gait movement were shown to explain the normal gait in two ways visual and kinematic imagery. During an explanation of normal gait movement, subjects imagined normal gait movement based on visual materials. Then, the researcher asked the subjects to explain the movement they were imagining.

Motor imagery training was conducted using visual and kinematic imagery separately. **Visual imagery** is a process in which an individual imagines their physical movement from an external perspective, and **kinematic imagery** is a process in which an individual imagines internal sensory information during physical movement. In visual imagery, subjects imagine normal movement on their non-paretic side and that their paralytic side moves like their non-paretic side. Meanwhile, in kinematic imagery, subjects imagine sensory information that they can get from their non-paretic side when they move normally and then imagine that their paralytic side senses the same sensory information and moves like their non-paretic side.



MOTOR IMAGINATION

APPENDIX X

GAIT TRAINING

IN LYING

- Hip and knee flexion over the side of the bed.

- Knee extension with dorsiflexion

❖ Bilateral pelvic briging.

❖ Straight leg rise.

In sitting:

- ❖ Independent movement of the legs.

- ❖ Raising the hip in sitting with the legs crossed.

- ❖ Moving in sitting with the feet on the floor.

IN STANDING

- ❖ Weight bearing on the affected leg (preparation for the stance phase of gait)

- ❖ Placing the sound leg on the step

❖ Stepping out the side with the sound leg.

❖ Making a figure of eight with the sound leg.

❖ Stepping up with the affected leg on the step.

❖ With the affected leg on the step, step up and over.

❖ Putting the sound leg, further and further back.

Releasing the knee and moving the hemiparetic leg.(preparation for the swing phase of gait).

- ❖ Releasing the knee with hemiparetic leg forward.

- ❖ Taking small step forward with the affected leg

❖ Walking sideways behind a line.

❖ Climbing stairs assisting the affected leg up

❖ Climbing stairs supporting the affected knee to step up

❖ Descending stairs hand supporting the affected knee

APPENDIX-XI

CONSENT FORM

This is to certify that I ---------- freely and voluntarily agree to participate in the study **"EFFICACY OF MOTOR IMAGERY TRAINING WITH GAIT TRAINING TO IMPROVE DYNAMIC BALANCE AND GAIT SPEED IN POST STROKE PATIENTS"**

I have explained about the procedure and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: