COMPARTIVE STUDY BETWEEN EFFICTIVENESS OF TREADMILL TRAINING WITH PARTIAL BODY WEIGHT SUPPORT AND PHYSIOTHERAPY VERSUS TREADMILL TRAINING IN IMPROVING GAIT ABILITY OF HEMIPARATIC PATIENTS

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI

in partial fulfillment of the requirements

for the award of the

MASTER OF PHYSIOTHERAPY

(ADVANCED PHYSIOTHERAPY IN NEUROLOGY)

DEGREE

Submitted by

Reg. No. 27102006

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THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

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The dissertation entitled

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DR. V. VIJAYARAJ, M.P.T. (Neuro)

A Dissertation submitted to

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Dissertation evaluated on ----------

Internal Examiner External Examiner

CERTIFICATE BY THE HEAD OF THE INSTITUTION

This is certify that the dissertation entitled " **COMPARTIVE STUDY BETWEEN EFFICTIVENESS OF TREADMILL TRAINING WITH PARTIAL BODY WEIGHT SUPPORT AND PHYSIOTHERAPY VERSUS TREADMILL TRAINING IN IMPROVING GAIT ABILITY OF HEMIPARATIC PATIENTS "** is a bonafide compiled work, carried out by Register No. **27102006** , Nandha College of Physiotherapy Erode – 638 052, in partial fulfillment for the award of Degree in Master of Physiotherapy as per the doctrines of requirements for the degree of the TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY CHENNAI – 32. This work was guided and supervised by **DR. V. VIJAYARAJ, M.P.T.(Neuro)**

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CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled " **COMPARTIVE STUDY BETWEEN EFFICTIVENESS OF TREADMILL TRAINING WITH PARTIAL BODY WEIGHT SUPPORT AND PHYSIOTHERAPY VERSUS TREADMILL TRAINING IN IMPROVING GAIT ABILITY OF HEMIPARATIC PATIENTS "** submitted by **(Reg No. 27102006)** is a record of original and independent work done by the candidate during the period of study under my supervision and guidance. The dissertation represents entirely an independent work on the part of the candidate but for the general guidance by me.

Guide

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ACKNOWLEDGEMENT

"AT THE VERY OUSET, I THANK THE ALMIGHTY FOR HIS BLESSINGS TO ENABLE ME TO COMPLETE THIS PROJECT AND I OFFER THIS PROJECT AT HIS FEET AS MY HUMBLE PRAYER"

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This project is dedicate to my parents

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CHAPTER-1

INTRODUCTION

INTRODUCTION

1.1INTRODUCTION

Stroke refers to the sudden death of some brain cells due to a lack of oxygen when the blood flow to the brain is impaired by blockage or rupture of an artery to the brain.

Stroke may be manifested as Hemiplegia, which is the paralysis of muscles of one side of the body, contralateral to the side of the brain in which CVA occurred. Clinically a variety of deficits are possible including the changes in the level of consciousness, impairments of sensory, motor, cognitive, perceptual and language functions. The locations of lesion, the extent of lesion, and the amount of collateral blood flow and early acute care management determine the severity of neurological deficits.

The incidence of Stroke increase dramatically with age, doubling every decade after 55 years of age. 28 % of stroke occurs in individuals under the age of 65 years. The incidence of Stroke is about 19% higher for males than females.

Stroke can be classified by aetiological basis (Ischameic or Haemorrhagic), vascular basis (territory involvement), anatomical basis (cortical or brainstem or capsular or cerebellar or spinal), severity basis (minor or major) progression basis (completed or evolving) and onset basis
(infantile or young or elderly stroke)

Stroke usually results in some degree of muscle weakness. It may lead to difficulty with producing force effectively within the context of a task and slowness to produce force is few of the commonest problems faced by the stroke patients . Moreover several studies have shown that muscle weakness is associated with reduced walking speed and endurance. And also muscle weakness has been suggested as a signinficant predictor of walking ability in stroke patients.

STATEMENT OF PROBLEM

Study on Analysing the effectiveness of Treeadmil training with partial body weight support and physiotherapy in improving gait ability after stroke

1.2NEED FOR THE STUDY

Locomotion is one of the commonest problems after stroke in terms of asymmetry and reduction of speed etc. The most often stated goal for stroke patients is to improve walking. For the improvement of walking, good strength of the lower extremity muscles is essential irrespective of the presence of spasticity because of growing evidence that muscle weakness rather abnormal reflex activity is a major limiting factor in physical function particularly for locomotor tasks following stroke.

Through this study I would like to find out the effectiveness of treadmill training with partial body weight support and physiotherapy in improving gait ability of stroke patients

1.3AIM OF STUDY

To compare the effectiveness of treadmill training with partial body weight support and physiotherapy in improving gait ability of stroke patients . Treadmill training alone.

1.4OBJECTIVES

- To determine the effect if treadmill training with partial body weight support and physiotherapy in improving gait ability of stroke patients in group A subjects
- To determine the effect of treadmill training alone in improving gait ability of stroke patients in group B
- To determine the difference between the effectiveness of treadmill training with partial body weight support and physiotherapy in improving gait ability of stroke patients

HYPOTHESIS

NULL HYPOTHESIS

The null Hypothesis states that there is no significant difference between effect of treadmill training with partial body weights support and physiotherapy in improving gait ability of stroke patients

ALTERNATE HYPOTHESIS

The alternate Hypothesis states that there is significant difference between effect of treadmill training with partial body weights support and physiotherapy in improving gait ability of stroke patients

OPERATIONAL DEFINITIONS

STROKE

Stroke is defined as 'focal neurological (or at times global) neurological impairment of sudden onset and lasting more than 24 hours (or leading to death) and of presumed vascular origin - By World Health Organization

HEMIPLEGIA

Hemiplegia is defined as partial paralysis or weakness on one side of the body and is the term most commonly used in stroke survivors – By Suzanne Ryan

Treadmill

A Treadmill is a low impact indoor Exercise machine that allows a person to walk, jog, run in place by providing a moving running belt over a deck.

A treadmill is an exercise machine for running and walkins stayings in one place. The word Treadmill traditionally refers to a type of will which was operated by a person trading steps of a wheel to grind grain where power was input into the mechanical system.

Among the users of treadmills today are medical facilities (hospitals, rehabilitation center, medical and physiotherapy clinics, institutes of higher education) sports club, Bio Mechanics

CHAPTER II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

S. Hesse

The study intended to investigate its efficiency empared with gait training within regular physiotherapy in nonambulatory patients with chronic hemiparesis. Gait ability assessed by the Functional Ambulation Category, motor functions tested by the Rivermead Motor Assessment, Treadmill training was more effective with regard to restoration of gait ability ($p < .05$) and walking velocity ($p<.05$) Treadmill training therefore become an adjunctive tool to regain walking ability in a shorter period of time

Klinik Berlin, Department Neurological Rehabilitation, Charite – University Medicine Berlin, Germany,

This study evaluated The influence of the degree of treadmill belt inclination for training of ambulatory patients with hemiparetic stroke. Twelve patients were instructed to walk at 5 different levels of inclination (0% - 8%) while harness – secured on the treadmill. The gait velocity was kept constant during all conditions Dependent variable were heart rate, gait cycle – dependent parameters, and electromyorgraphic activation patterns of the weight – bearing muscles. This protocol appeared to be safe in this selected group subjects.

A.R. Lindquist, PhD

Department of Physical Thearpy, Natal, RN, Brazil

This was a randomized, controlled study with a crossover design following an A-B- A versus a B-A-B Pattern. A consisted of 2 weeks of gait trainer therapy, and B consisted of 2 weeks of treadmill therapy. Thirty nonambulatory hemiparteic patients, 4 to 12 weeks after for 15 to 20 minutes for 6 weeks. The groups did not differ at study onset with respect to the clinical characteristics and effectors variables. During treatment, The FAC, giat velocity, and Rivermead scores improved in both groups,

Martha Visintin, MSc; Hugues Barbeau, PhD; Nicol Korner-Bitensky, PhD; ;Nancy E. Mayo, PhD

A new gait training strategy for patients with stroke proposes to support a percentage of the patient's body weight while retraining gait on a treadmill. This research project intended to compare the effects of gait training with body weight support (BWS) and with no body weight support (no-BWS) on clinical outcome measures for patients with stroke. After a 6-week training period, the BWS group scored significantly higher than the no-BWS group for functional balance (P=0.001), motor recovery (P=0.001), overground walking speed (P=0.029), and overground walking endurance (P=0.018). The follow-up evaluation, 3 months after training, revealed that the BWS group continued to have significantly higher scores for overground walking speed (P=0.006) and motor recovery (P=0.039).

Matthias Konrad, MD

To Compare the gait of hemiparetic subjects walking on treadmill with various body weight supports and walking on the floor. Hemiparetic subjects walked on a treadmill, secured in a harness, with no body weight support and with 15% and 30% body weight relief, and walked on a floor. Treadmill training with partial body weight support in hemiparetic subjects allows them to practice a favorable gait characterized by a greater stimulus for balance training because of the prolonged single stance period of the affected limb, a higher symmetry, less plantar flexor spasticity, and a more regular activation pattern of the shank muscles as compared with floor walking.

Judy M. Simpson PhD.,
Pesi Katrak, MD

The main objective of this randomized trial was to determine whether treadmill walking with body weight support was effective at establishing independent walking more often and earlier than current physiotherapy intervention for nonambulatory stroke patients. The study concluded the treadmill walking with body weight support is feasible, safe and tends to result in more people walking independently and earlier after stroke.

Louise Ada Catherine M Dean and Meg E Morris

It has been reported that only half of the non-ambulatory stroke patients admitted to inpatient rehabilitation in Australia learn to walk again (1). Treadmil walking with partial weight support via an overhead harness is a relatively new intervention that is designed to train walking. The mainonjective of this randomized controlled trial is to determine whether treadmill walking with partial weight support via an overhead harness is effective at establishing independent walking with partial weight support via an overhead harness is effective at establishing independent walking (i) more often, (ii) earlier and (iii) with a better quality of walking, than current physiotherapy intervention for non – ambulatory stroke patients.

Meg E Morris

This study conducted to determine weather Fast treadmill training improves walking speed to a greater extent than training at a self-selected speed after stroke Significant improvements in paretic - and nonparetic - limb step length and in single - double - limb support were found. This study concluded that Faster treadmill walking facilitates a more normal walking pattern after stroke , without concomitant increases in common gait compensations, such as circumduction. The improvements in gait deviations were observed with small increases in walking speed

CHAPTER III

METHODS AND METHODOLOGY

MATERIALS AND METHODOLOGY

MATERIALS USED IN THIS STUDY :

- Treadmill
- Supporting Harness
- Set of pulleys
- Couch
- Pillows
- Towels
- Sand Bags
- Swiss Ball
- Parallel Bar

METHODOLOGY :

RESEARCH DESIGN :

The design that is used for this study is experimental study design

STUDY SETTING :

The study setting was conducted at the

- Nandha Colleage of physiotherapy out patient department, Perundurai, Erode
- Immanuvel Physiotherapy Clinic, Erode
- Arise Physiotherapy and Rehabilitation Center, Erode

STUDY SAMPLE :

A total Number of 30 patient with stroke were selected by random sampling method with consideration of inclusion criteria and exclusion criteria and they were divided in to Group A and Group B.

STUDY DURATION :

All patients participated in comprehensive 6 months Rehabilitation program

- A three week baseline study consisted of daily physiotherapy, occupation therapy, speech and neuro physiological therapy according to individual needs.
- During the subsequent 3 weeks of specific intervention
- Group A - Treadmill training with partial body weight support for 30 minutes 5 time a week plus single treatment session of physiotherapy for 40 minutes 5 times a week For 3 weeks
- Group B - Treadmill training with partial body weight support for 30 minutes 5 times a week for 3 weeks

EXPERIMENTAL GROUP(GROUP A)

It consists of 15 patients who underwent treadmill training and physiotherapy

CONTROL GROUP(GROUP B)

It consists of 15 patients who underwent only partial body weight supported treadmill training

CERTERIA FOR SELECTION

INCLUSION CRITERIA :

- Patients with all types of stroke
- Age group between 29 – 40 years
- Patients of willingness of participate in the study
- Patients with both right and left hemiplegia
- Both genders
- Able to understand at least simple instructions
- No other orthopaedic or neurological diseases impairing mobility

EXCLUSION CRITERIA :

- Patients with other musculoskeletal disorder
- Medically unstable
- Non Co - operative patients

PARAMETER USED :

- Functional ambulation category (FAC)

INTERVENTIONS:

- The purpose of the treatment and aim of the study were explained patients who are selected for the treatment.
- All patient signed the consent form before undergoing treatment program

. Patients in group A was treated with treadmill training with partial body weight support and physiotherapy.

- Patients in group B was treated with exclusive treadmill training with partial body weight support.

The treatment was given for both groups for periods of 6 months

PROCEDURE :

- Patients were supported in a modified parachute harness suspended Centrally by a set of pulleys connected to a flexible spring.

- At the beginning of the therapy, two therapists provided manual help to correct gait deviations. One therapist sitting by the paretic side facilitated the swing of the paretic limb, determined that its initial ground contact was made with the heel, prevented knee hyperextension during midstance and encouraged symmetry of step length and stance symmetry.

- The second therapist stood on the treadmill behind the patient and facilitated weight – shift onto the stance limb, hip extension and trunk erection. Mean treadmill speed was 0.21 (range 0.15 – 0.30 m/s was reached and kept constant until the end. The mean BWS was 27 % (range 20 – 30) of body weight at the beginning. The support whilst 10 subjects needed a support of 5 – 15% BWS until the end. Net walking a support of treadmill was approximately 20 min per session with a brief rest in the middle.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

DATE PRESENTATION AND ANALYSIS

For this pre and post and test experimental study, both paired and unpaired ‘t’ tests were used. Paired ‘t’ test was used for each parameter in an intra-group analysis to find out the significance of improvement achieved through intervention. Then unpaired ‘t’ test was used to find out the significance of the changes between two groups i.e. inter group analysis.

The statistical tests were performed by using the following formula

Mean $\overset{s_1}{\underset{n_2}{}} X = \sum \overline{X} / n$

x = Sum of observation

n = Number of observation

To Compare the effects between two groups students ‘t’ test for paired values.

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

d = Mean Difference

S = Standard deviation (S.D)

n = Number of observation

To compare the effects between two groups, students ‘t’ test for unpaired values

$$t = \left[t = \frac{\overline{X_1} - \overline{X_2}}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \right]$$

$S = \sqrt{(n_1 - 1)S^1(n_2 - 1)S^2{}_2} \,/\, n_1 + n_2 - 2$

$\overline{X}_1$ - M.D of Group A

$\overline{X}_2$ - M.D of Group B

s_1 - SD of group A

s_2 - SD of group B

n_1 - Number of observations in group A

n_2 - Number of observation in group

4.2 DATA PRESENTATION AND ANALYSIS

TABLE : 1

MEAN AND MEAN DIFFERENCE VALUE FOR GROUP A AND GROUP B

STUDY GROUP	WALKING ABILITY		
	MEAN		MEAN DIFFERENCE
	PRE	POST	
GROUP A	11	55	3
GROUP B	25	38	1

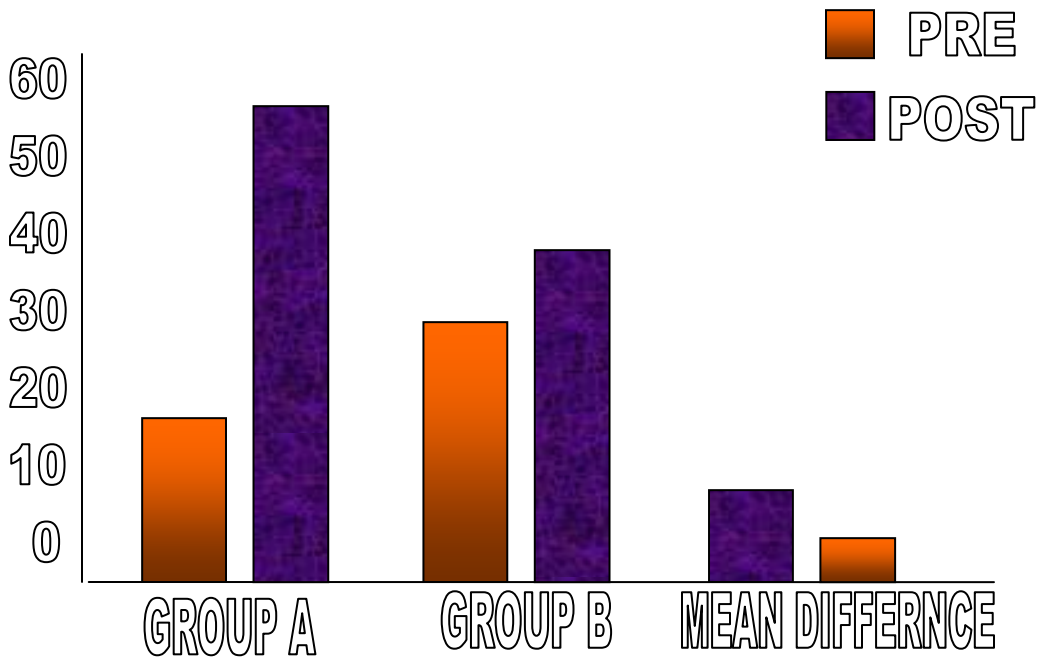

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TABLE : 2

STANDARD DEVIATION VALUE FOR GROUP A AND GROUP B

TABLE : 2

STUDY GROUP	STANDARD DEVIATION
	WALKING ABILITY
GROUP A	0.4
GROUP B	0.85

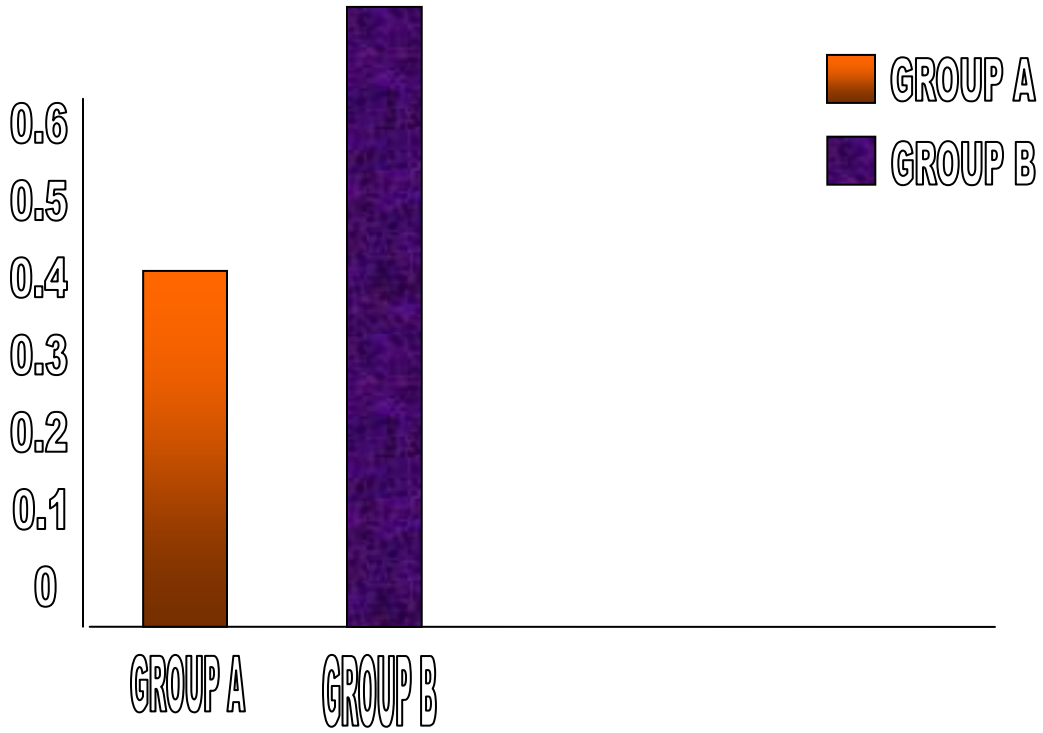


TABLE : 3

PAIRED ‘t’ test VALUES FOR GROUP A AND GROUP B

TABLE 3:

STUDY GROUP	CALCULATED PAIRED ‘t’ VALUES	TABLE VALUE	SIGNIFICANCE
	WALKING ABILITY		
GROUP A	28.5	2.15	SIGNIFICANT
GROUP B	4.5	2.15	SIGNIFICANT

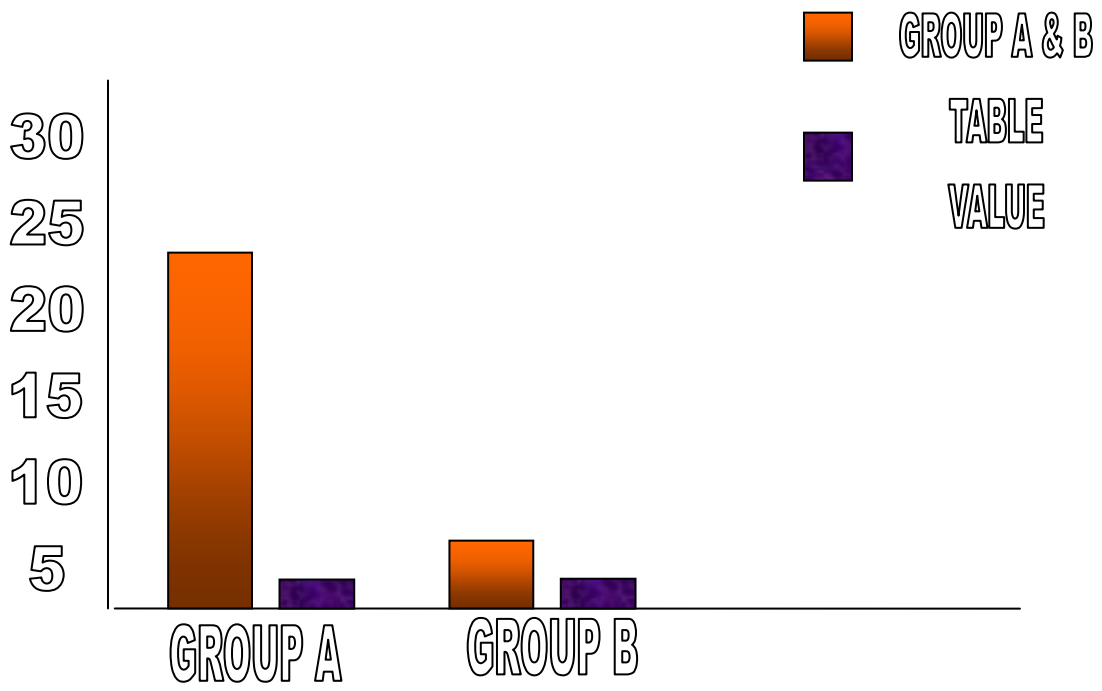
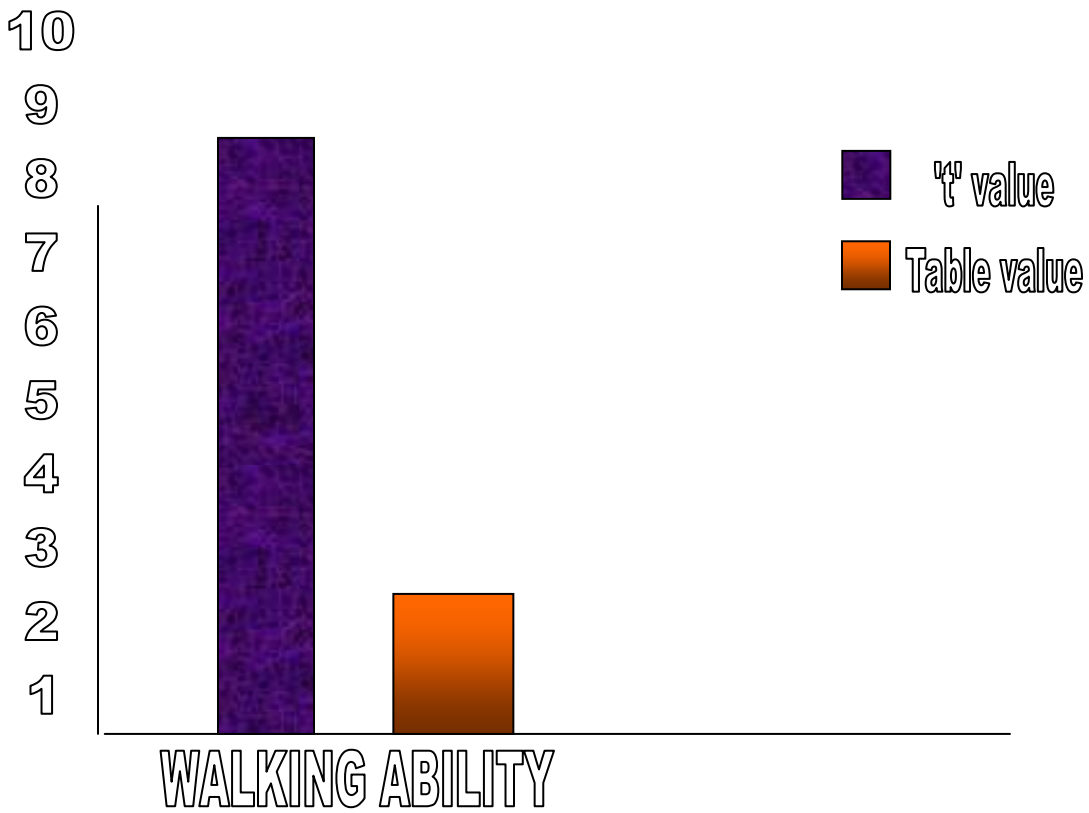


TABLE : 4

UNPAIRED ‘t’ test VALUES FOR WALKING ABILITY IN GROUP A AND GROUP B

STUDY GROUP	CALCULATED UNPAIRED ‘t’ VALUES WALKING PATTERN	TABLE VALUE	SIGNIFICANCE
Comparison of Group A and Group B	8.5	2.05	SIGNIFICANT



CHAPTER V

RESULTS AND DISCUSSION

RESULTS

The pre and post test values weres assessed for gait ability in Group A. the standard deviation was 0.4. the ‘t’ values were calculated for gait ability by paired ‘t’ test was 28.5 and it was more than table value 2.15 for 5% level of siginificnace at 14 degrees of freedom.

The pre and post test values were assessed for gait ability in Group B. the standard deviation was 0.85. the ‘t’ vales were calculated for gait ability by paired ‘t’ test was 4.5 and it was more than table value 2.15 for 5% level of siginificance at 14 degrees of freedom.

The calculated ‘t’ values by unpaired ‘t’ test was 8.5. The calculated ‘t’ values were more than the table value 2.05 for 5% level of significance of 28 degrees of freedom.

The paired ‘t’ values have shown that treadmill training with partial body weight support combined with physiotherapy are more effective for the improving gait ability of patients after stroke. The unpaired ‘t’ test values have shown that there is significant difference in showing improvement in gait ability of stroke patients.

This study has proved the 3 week combination of treadmill training with BWS and physiotherapy effected a large improvement of a gait ability of non-ambulatory hemi paretic subjects than an exclusive 3- week treadmill therapy with BWS.

DISCUSSION

This study has proved that The 3 week combination of treadmill training with BWS and physiotherapy effected a large improvement of a gait ability of non-ambulatory hemi paretic subjects than an exclusive 3- week treadmill therapy with BWS.

Recently, Kwakkelet al.(1999) reported that greater intensity of leg rehabilitation improved gait ability and activities of daily living in acute stroke victims. The key elements of their lower limb rehabilitation programme were comparable with the physiotherapy within the present study.

Richards et al (1993) had show that an additionally applied, task-specific programme including treadmill training without body weight support resulted In a larger gait velocity in acute stroke victims 6 weeks after study onset as compared with a conventionally treated group who received less therapy.

The potential for motor recovery after stroke therefore seems to be limited, and patients of group A probably reached this presumed level faster, i.e. the combined treatment of physiotherapy and treadmill training accelerated motor recovery . Richards et al.(1993) also reported in the above mentioned study that differences in gait ability between the high and low-intensity group had waned at follow-up 6 months later, also because of a further improvement of a large extent in the low-intensity group.

CHAPTER VI

CONCULSION

CONCLUSION

From the results of this study 3 weeks of treadmill training with BWS pulls physiotherapy accelerated the restoration of gait ability in chronic hemi paretic subjects; correspondingly, a focused and intense treatment regime including locomotion training seems most promising in gait rehabilitation after stroke.

The result was analyzed using (mean/ mean difference) which proved that the use of treadmill training with partial body weight support combined with physiotherapy to be more effective in improving gait ability in hemi paretic patients.

CHAPTER VII

LIMITATION AND RECOMENDATIONS

LIMITATION AND RECOMMENDATIONS

LIMITAION OF THE STUDY :

1. **This Study has been conducted on small size sample only.**

2. **The outcome of the study has been limited to improving gait ability only**

RECOMMENDATIONS :

1. Further study may be extended with large sample
2. Other aspect of motor impairment such as balance,strenth may be considered
3. The patient ability to either improve or retain the regained functional capacity may be assessed at regular intervals over a period of time
4. The efficacy of this treatment may be found by altering the frequency and intensity
5. The extended efficacy of these exercise may also be found out by increasing the totaln duration of the treatment
6. The treadmill training with partial body weight support may be applied to other neurological conditions such as Paraplegia.

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APPENDIX

APPENDIX – I

CONSENT FORM

I _____ there by agree to cooperate for the dissertation work of _____ towards his post graduation in physiotherapy knowing the risk and benefits as explained to me by the same. All the details given by me will be kept strictly confidential and will be used for the research purpose.

Date :

Place :

Name :

Signature of the subject **Signature of Administrator**

APPENDIX – II

PATIENT EVALUTATION CHART

DATE OF ASSESMENT :

SUBJECTIVE ASSESSMENT :

AGE :

SEX :

OCCUPATION :

CHIEF COMPLAINTS :

SIDE OF WEAKNESS :

DURATION OF ONSET :

ASSOCIATED PROBLEMS :

MEDICAL HISTORY :

- PAST :

- PRESENT :

PERSONAL HISTORY :

FAMILY HISTORY :

VITIAL SIGNS :

INVESTIGATIONS :

HIGHER FUNCTION ASSESMENT :

ORIENTATION :

COGNITION :

SPEECH :

MEMORY :

PECEPTION :
CRANIAL NERVE EXAMINIATION

12 CRANIAL NERVES :

PAIN ASSESSMENT (DURING EXERCISES)

OBEJCTIVE ASSESSMENT :

MOTOR SYSTEM :

APPERANCE :

MUSCLE TONE :

REFLEXES :

SENSORY ASSESSMENT :

SUPERFICAL SENSES :

DEEP SENSES :

CORTICAL SENSES :

APPENDIX III

0- Nonfunctional Ambulation - Patient cannot ambulate, ambulate in parallel bars only, or requires supervision or physical assistance from more than one person to ambulate safely outside of parallel bars.

1.. Ambulator – Dependent for Physical Assistance level II - Patient requires manual contact 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 - Patient 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 torch to assist balance or coordination

3 -Ambulator – Dependent for sub – pervision - Patient can physically ambulate on level surfaces without manual contact of another person but for safety requires standby guarding of no more than one person because of poor judgment, questionable cardiac status, or the need for verbal cuing to complete the task.

4- Ambulator – Independent Level surfaces only - Patient can ambulate independently on level surfaces but requires supervision or physical assistance to negotiate any of the following: stairs, inclines, or nonlevel surfaces.

5- Ambulator –independent - Patient can ambulate independently on nonlevel and level surfaces, stairs, and inclines.

APPENDIX III

OBSERVATION CHART

GROUP A

GROUP A: experimental group

S.NO	AGE	SEX	HEMIPARESIS L=LEFT R=RIGHT	PRE TEST	POST TEST
1	63	M	L	1	4
2	60	F	L	1	4
3	51	F	L	2	5
4	52	F	R	0	3
5	77	M	L	1	4
6	54	F	L	0	3
7	67	M	L	1	4
8	58	M	L	1	3
9	43	M	R	0	3
10	29	M	R	1	4
11	72	M	L	1	4
12	57	F	L	1	5
13	54	M	R	0	3
14	39	F	R	1	4
15	42	F	L	0	3

GROUP B : Control Group

S.NO	AGE	SEX	HEMIPARESIS L=LEFT R=RIGHT	PRE TEST	POST TEST
1	61	F	R	0	3
2	35	M	L	3	4
3	47	M	L	2	3
4	48	F	R	1	2
5	57	M	L	2	2
6	56	M	R	3	3
7	57	F	L	2	3
8	62	M	L	2	2
9	46	F	R	3	3
10	68	M	L	1	2
11	57	F	R	1	2
12	49	M	R	2	3
13	55	M	L	0	2
14	58	F	R	2	2
15	38	M	L	1	3