EFFECTS OF UNILATERAL STEP TRAINING ON GAIT SYMMETRY IN PATIENTS WITH HEMIPARESIS – AN EXPERIMENTAL STUDY

Dissertation submitted to

The Tamil Nadu Dr. M. G. R. Medical University

Chennai

In partial fulfillment of the requirements for the degree of

MASTER OF PHYSIOTHERAPY

(ADVANCED PHYSIOTHERAPY IN NEUROLOGY)

REG. NO. 27101107

APRIL 2012

COLLEGE OF PHYSIOTHERAPY

SRI RAMAKRISHNA INSTITUTE OF PARAMEDICAL SCIENCES

COIMBATORE - 641 044.

CERTIFICATE

This is to certify that the dissertation work entitled **Effects of Unilateral Step Training on Gait Symmetry in Patients With Hemiparesis – An Experimental Study** was carried out by the candidate bearing the **Register No. 27101107 (April 2012)** in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to The Tamilnadu Dr. M.G.R Medical University, Chennai towards partial fulfillment of the **Master of Physiotherapy (Advanced Physiotherapy in Neurology).**

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CERTIFICATE

This is to certify that the dissertation work entitled **Effects of Unilateral Step Training on Gait Symmetry in Patients With Hemiparesis – An Experimental Study** was carried out in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to The Tamilnadu Dr. MGR Medical University, Chennai towards partial fulfillment of the **Master of Physiotherapy** (Advanced Physiotherapy in Neurology) under my direct supervision and guidance.

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CERTIFICATE

This is to certify that the dissertation work entitled

Effects of Unilateral Step Training on Gait Symmetry in Patients with Hemiparesis – An Experimental Study

Submitted By

Reg. No. 27101107

April 2012

To The Tamil Nadu Dr. M.G.R. Medical University, Chennai in Partial fulfillment of the requirement for the award of degree of **MASTER OF PHYSIOTHERAPY (Advanced Physiotherapy in Neurology)** was evaluated.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

Place: Coimbatore
Date:

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CONTENTS

1. INTRODUCTION

Stroke is defined as a clinical syndrome and or signs of focal and at times global (applied to patients in deep coma and to there with Subcranial hemorrhage) loss of comfort friction with symptoms lasting more than 24 hours bleeding to death with no other apparent. Cause other then that of vascular origin. The 24 hours threshold in the definition excludes Transient Ischemic Attacks (IIA).

Stroke is a World Wide health problem. It is an important case for morbidity, mortality and disability. In developed as well as developing countries.

Stroke is an acute onset of neurological dysfunction due to an abnormality. In cerebral circulation with resultant signs and symptoms that correspond to an involvement of focal area of brain. The term cerebrovascular accident is used interchangeably with stroke to refer to the cerebrovascular conditions which is also known as ischemic or hemorrhagic lesions.

Stroke may be categorized by etiological categories. (Thrombosis, embolus or hemorrhage) management categories (TIA, Minor stroke, deteriorating stroke, young stroke) and anatomical categories (specific vascular territory).

Dysfunction of the brain manifests itself by various neurological signs and symptoms which include hemiplegia, paraplegia, monoplegia, multiple paralysis, speech disturbances, cranial nerve paralysis, sensory impairments etc.

Motor deficits are characterized by paralysis, hemiplegia or weakness, hemiparesis, typically on the side of the body. Opposite to the site of lesion.

The terms hemiplegia is often used generically to refer to the wide variety of the problems that result from the stroke. The location and extent of the lesion, the amount collateral blood flow and early acute care management determine the severity of neurological deficit in an individual patient.

AMBULATION

Common problems which occur after stroke are impaired motor function that includes walking, sensory deficits, cognitive problem, visual deficits, speech problems and depression.

Ambulation can be defined as type of locomotion. Any injury or disease of the nervous system or of the musculoskeletal system can disrupt the normal pattern of walking. A variety of compensatory mechanism takes place in order to maintain functional ambulation. These compensatory movements manifest themselves as abnormal

patterns of walking and are invariably less efficient and more costly in terms of energy expenditure that the normal mechanisms.

HEMIPLEGIC GAIT

Patients with stroke can walk independently but the patients very rarely return to the pre stroke status. During ordinary walking speeds the stance phase is usually 60% and swing phase occupies 40% during a single gait cycle. Gait speed, stride length and cadence are usually less than normal values. Various other kinematic deviations during stroke phase of gait cycle are observed in stroke patients.

Stroke causes deficits in motor control which is characterized by abnormal synergetic organization of movements, weakness of muscles, sensory deficits and loss of range of motion. It is very common that hemiplegic patients exhibit asymmetry in standing positions and during movements. These asymmetry patterns are associated with impairments in balance and thus contribute to disordered gait. Hence it is important that proper walking training is given before abnormal pattern become redundant.

There is variety of movement therapy available for retraining motor skills for stroke patients. Proprioceptive Neuromuscular Facilitation (PNF) Bobath therapy, Brunstrom, Rood and Motor Relearning Program (MRP) are some techniques used commonly by

physiotherapist for treating patients with stroke. Conventional physiotherapy is found: beneficial in gait training in patient with stroke.

TREADMILL GAIT TRAINING

Treadmill gait training is found beneficial in training patients with stroke. This approach facilitates walking movements on the treadmill by activation of the spinal locomotion centers. This strategy integrates 3 important components weight bearing stepping and balance.

To improve mobility and gait velocity in patients with stroke and to reduce the disability and poor walking performance, treadmill gait training and conventional therapy were given. Although physiotherapy for patients with mobility problem after stroke has been shown to be effective, improvements gained are not maintain after cessation of treatment. Treadmill training may be very useful to improve velocity as well as mobility in such patients with stroke. Treadmill training shows increase in strength speed and decreased in energy expenditure.

Treadmill walking is used to improve quality as well as quantity of walking. Treadmill stimulates repetitive rhythmic stepping with the patients. In upright position and bearing weight on lower limbs.

This study is designed to compare gait re training in unilateral step training with treadmill and traditional gait retraining to improve spatiotemporal patterns. In people with substantial gait asymmetry post stroke.

1.1 NEED FOR STUDY

Since the common problems after stroke are impaired motor function including gait and balance, appropriate gait training is required. There are various studies which reported unilateral step training is beneficial. They are very few studies which studied unilateral step training with treadmill and hence this study is designed to compare the effectiveness of gait retraining with unilateral step training with treadmill and traditional gait retraining for patients with stroke.

1.2 STATEMENT OF THE PROBLEM

An experimental study of traditional gait retraining and gait retraining with unilateral step training in treadmill improve the postural control, gait speed, endurance in hemiparesis patients.

1.3 OBJECTIVES OF THE STUDY

To determine the effect of treadmill gait retraining to improve the postural control, speed, endurance in hemiparesis patients.

To determine the effect of traditional gait retraining to improve the postural control, speed endurance in hemiparesis patients.

To compare traditional gait retraining and gait retraining with unilateral step training in treadmill to improve postural control, speed and endurance in hemiparesis patients.

1.4 NULL HYPOTHESIS

There is no significant difference of gait in hemiparesis patients with unilateral step training in treadmill with traditional gate retraining when compared with traditional gait retraining.

II. REVIEW OF LITERATURE

- **Ray-Yau Wang et. al, 2008**, the American society of neuro rehabilitation stated that after physiotherapy treatment patients improved in walking speed and cadence but there was no change in corticomotor excitability but after additional gait training, patients improved in motor performance which might be related to change in corticomotor excitability.
- **Particia S, Smith et. al.,2008,** archives of physical medicine and Rehabilitation- stated that effects of unilateral step training, is effective in weakness of the lower limb.
- **Pederson T (2011)** for post stroke walking, strength training as good as treadmill. Psych central retrieved on June 6th, 2011.
- **Duencan PW, Sullinvan KJ, Hayden SK, et al**., for investigative team body weight supported treadmill rehabilitation after stroke, stated that treadmill training program alongwith traditional gait retraining increases walking speed and step length.
- **T. George Homphy et al., 2008,** American Heart Association Journals stated that therapist assisted locomotor training facilitators greater improvements in working ability in ambulatory stroke patients.

- **Cecily Partridge, 2007,** stated treadmill training programs along with over general walking increases walking speed and step length.
- **Cecily Partridge, 2007**, proved that treadmill walking component was structured to increase step length and speed in lower limb weakness.
- **Cecily Partidge, 2007,** compared 3 treadmill speeds during training with body weight support that could walk but slowly and formed that fastest treadmill speed increased over ground walking speed.
- **Pamela W. Duncan, Katherine J et al.,** improved gait symmetry in hemiparetic stroke patients inducing body weight supported treadmill stepping. New England Journal of Medicine 2011; 364 (21); 2026.
- **Sridar Alla et. al., 2007** The journal of Indian Association of physiotherapist stated that retraining of gait in patients with mild to moderate hemiplegia with 0% body weight support on a treadmill resulted in improvement in balance, standing and walking.

- **Jean - Phillippe Regnaux et. al., 2006** Archives of physical medicine and rehabilitation stated that compare with floor walking, gait trainer assistance increased walking time duration and increased VO_2 in patients with severe hemiplegia.
- **Mary Wainwright et. al., 2005,** Archives of physical medicine and rehabilitation stated that treadmill and conventional treatments were given to Individuals with stroke and concluded that both treatments groups middle improvement in velocity, but treadmill training with partial body weight support conferred no additional benefit compared with conventional training.
- **Barbaru J. Knowlton et. al, 2002**, American congress of Rehabilitation Medicine - Stated that training at speed comparable with normal walking velocity was more effective in improving gait in hemiparesis patients.
- **Michael J. Reding et. al., 2002**, Neurorehabilitation neural repair, stated that partial body weight support treadmill gait training is effective in gait training technique.
- **Sinikka H. Pearula, 2005**, stated that gait training improved gait in patients with chronic stroke and may lead to increased option for daily activities.

- **Frederick M. Ivery et. al., 2003**, Archives of physical medicine and rehabilitation - stated that peak effort treadmill testing provides highly reliable oxygen consumption measures. In chronic hemispheric stroke patients using minimal handrail support.
- **Sullivan KJ, Knowlton BJ, et al.,** step training with body weight support; effect of treadmill speed and practice paradigms on post stroke locomotor recovery arch phy S med. Rehabil. 2010; 83: 683: 91.
- **Catherine M. Dean et al., 2003,** stated that treadmill and over general walking were effective in improving walking speed and capacity in persons in community after stroke.
- **Hastiel E, Rose D. Commisarow J et. al,** improved gait symmetry in hemiparetic stroke patients induced during body weight supported treadmill stepping J neural rehabilitation, 1997; 26: 976- 981.

III. MATERIALS AND METHODOLOGY

3.1 AIM OF STUDY

To compare the effectiveness of traditional gait retraining and gait retraining with unilateral step training in treadmill.

3.2 MATERIALS

- Treadmill
- Wheel Chair
- Stopwatch

3.3 METHODOLOGY

- **Study Design**

30 subjects with mild to moderate were assigned in two groups.

GROUP A: Control group

15 subjects traditional gait retraining.

GROUP B: Experimental group

15 subjects traditional gait retraining with unilateral step training in treadmill.

- **Study Setting**

This is proposed to be carried out in the Department of Neurology, Special Wards, Department of Physiotherapy, Sri Ramakrishna Hospital, Coimbatore.

3.4 TREATMENT DURATION

Group A: Control Group

Traditional gait retraining

A time period of 20-30 minutes / session: 2 sessions / per day

Group B: Experimental Group

Gait training with unilateral step training in treadmill.

A time period of 20 - 30 minutes / session. 2 session / day.

- **Study duration**

This study implies for a period of 6 months.

- **Sampling**

Two groups containing 30 patients selected through convenient random sampling.

Inclusion Criteria

- 40-60 years age group.
- Hemi paretic post stroke for > 6 months.
- Ability to follow instruction.
- Both genders were included.
- Stable medical condition.
- Unilateral involvement.

Exclusion criteria

- Lower extremity contractures
- Orthopaedic injuries limits ROM
- Uncontrolled hypertension and diabetes mellitus
- Cardiac arrhythmias and angina
- Bilateral Brunstrom and cerebellar stroke
- Presence of untreated decubitus

3.5 PARAMETERS

- Berg balance scale
- Step length
- Stride length

3.6 STATISTICAL TOOLS

Pretest values and posttest values are collected and assessed for variation in improvement and their results are analysed using independent 't' test.

Combined standard deviation

$$S = \sqrt{\frac{\sum\left(X_1 - \overline{X_1}\right)^2 + \left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

where,

S = Combined standard deviation.

x_1 = Difference of post values and pre values of Group A

$\overline{X_1}$ = Mean Difference of Group A.

x_2 = Difference of post values and pre values of Group B.

$\overline{X_2}$ = Mean Difference of Group B.

n_1 = Number of patients in Group A.

n_2 = Number of patient in Group B.

With the combined standard deviation value 's' obtained from the values of Group A and Group B the independent 't' test is performed to show the effectiveness. The obtained independent 't' values is compared with 28 degrees of freedom of one tailed table value. If the 't' value is greater than table value of 28 degrees of freedom are can reject the null hypothesis and accept the alternative hypothesis and to show the effectiveness of the study.

Independent 't' test was performed with the formula

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

Where

$\overline{x_1}$ = Mean difference of group A

$\overline{x_2}$ = Mean difference of group B

S = Combined standard deviation

n_1 = Number of patient in Group A

n_2 = Number of patient in Group B

IV. TREATMENT TECHNIQUES

PROCEDURE

I a) PARALLEL BAR

- These treatment sessions can be given 2 times/ day for a period of 6 months.
- Each treatment session can be given for 20-30 min. The patient is made to stand on a parallel bar with a mirror in front.
- The therapist stand at the back of the patient and assists the patient.
- Verbal commands are provided for the patient such as walk straight, be erect.
- This helps in stabilizing the lack and thus provides erect posture and maintains gait.

b) STAIR CLIMBING

- This may be provided for maintaining balance and gait symmetry.
- During stair climbing the patient is made to climb up using the unaffected extremity and affected extremity next.
- Stair climbing helps in improving steregnosis ; balance and gait.

c) RESISTANCE TRAINING

Resistance training helps in providing resistance to the calf muscle thereby helps in providing stability.

Resistance training can be provided by using sandbags, rollers for calf muscles.

It helps in improving gait and co- ordination.

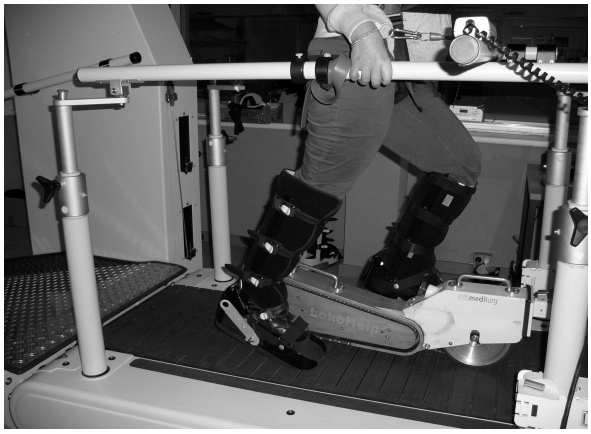
II. UNILATERAL STEP TRAINING IN TREADMILL (UST)

The treatment session consists of 2 phases of UST with traditional gait retraining.

In both phases UST was performed for 20 min (1 session – phase I and 10 session – Phase II) with stepping (unimpaired limb) positional on the treadmill belt and non stepping (impaired limb) off the belt at the same height.

- Patients were instructed to step continuously with their unimpaired limb while the other leg (affected) remained stationery.
- Visual and Verbal instructions were provided at the initial training sessions so as to facilitate continuous stepping, maintaining upright posture and minimize Upper extremity support.

PHASE –I

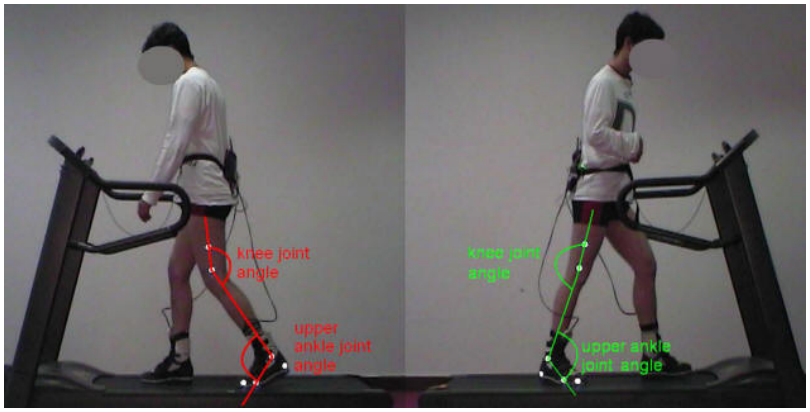


- It consists of one 20 min session followed by 2 follow up testing session.

- Initially treadmill speed was determined by the patient – over ground walking speed which was increased gradually by 25% every 5 min.
- Following sessions of UST, the patient was allowed to sit on a wheel chair and was not allowed to walk with in treatment sessions.

Follow up was seen after 24 hours following the single UST session and at 1 week post training.

PHASE II



It consists of ten 20 min session of UST for a period of 2-3 weeks.

Stepping for the 1st 2 days → same as phase I

After continuous training, for training session of 3-10 days the starting speed was increased by 25% every 2 sessions and increments of 25% every 5 min. Maximum starting speed was during 9-10 sessions were 100% greater than the starting speed.

V. DATA ANALYSIS AND INTERPRETATION

BERG BALANCE SCALE
Group A

S.No.	Pre test	Post test	$\overline{X_1}$	$\left(X_1 - \overline{X_1}\right)$	$\left(X_1 - \overline{X_1}\right)^2$
1	18	20	2	0.73	0.53
2	24	27	3	0.27	0.07
3	25	28	3	0.27	0.07
4	32	34	2	0.73	0.53
5	27	30	3	0.27	0.07
6	32	35	3	0.27	0.07
7	36	42	6	3.27	10.69
8	45	49	4	1.27	1.61
9	45	47	2	0.73	0.53
10	30	32	2	0.73	0.53
11	52	54	2	0.73	0.53
12	22	24	2	0.73	0.53
13	24	27	3	0.27	0.07
14	30	32	2	0.73	0.53
15	32	34	2	0.73	0.53

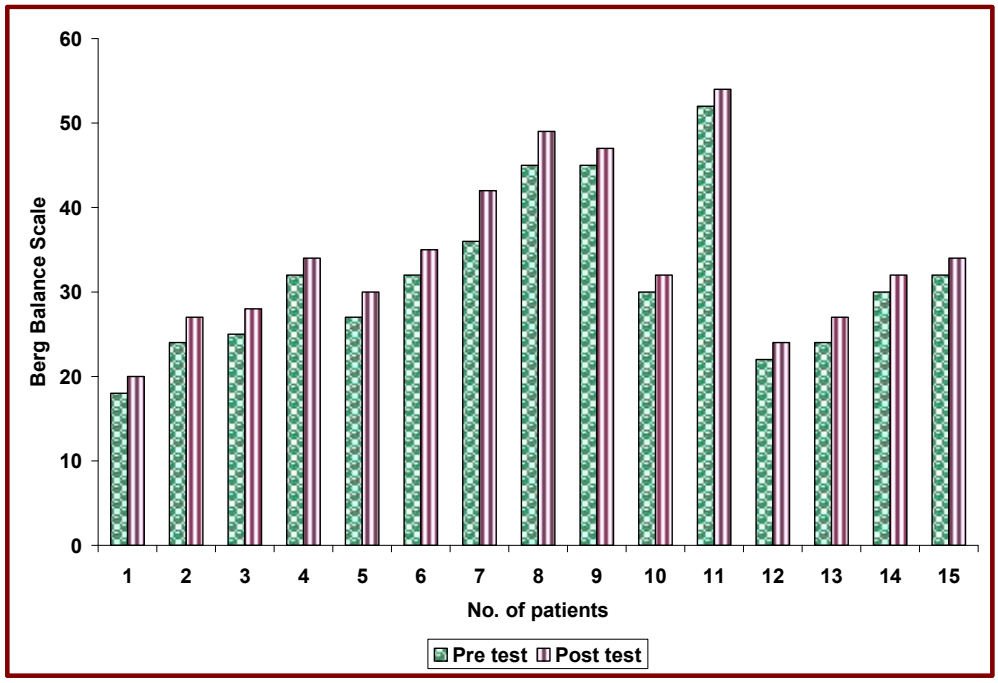
Mean : 2.73

BERG BALANCE SCALE
Group B

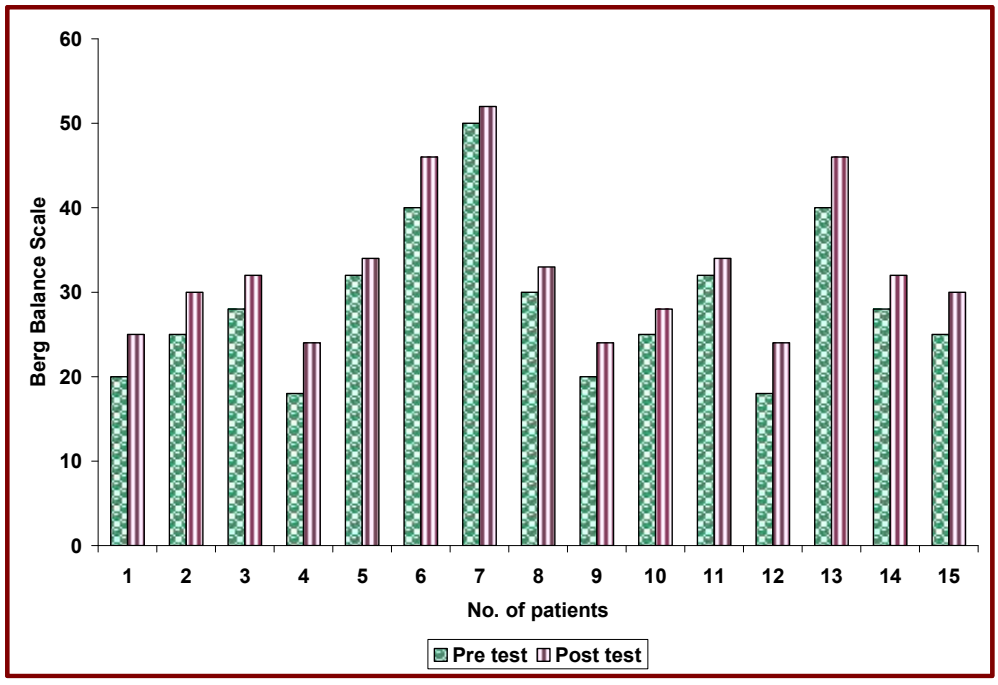
S.No.	Pre test	Post test	$\overline{X_2}$	$\left(X_2 - \overline{X_2}\right)$	$\left(X_2 - \overline{X_2}\right)^2$
1	20	25	5	0.8	0.64
2	25	30	5	0.8	0.64
3	28	32	4	0.2	0.04
4	18	24	6	1.8	3.24
5	32	34	2	2.2	4.84
6	40	46	6	1.8	3.24
7	50	52	2	2.2	4.84
8	30	33	3	1.2	1.44
9	20	24	4	0.2	0.04
10	25	28	3	1.2	1.44
11	32	34	2	2.2	4.84
12	18	24	6	1.8	3.24
13	40	46	6	1.8	3.24
14	28	32	4	0.2	0.04
15	25	30	5	0.8	0.64

Mean : 4.2
S.D : 1.32
‘t’ value : 3.03

BERG BALANCE SCALE
GROUP A



BERG BALANCE SCALE
GROUP B



STRIDE LENGTH
Group A

S.No.	Pre test	Post test	$\overline{X_1}$	$\left(X_1 - \overline{X_1}\right)$	$\left(X_1 - \overline{X_1}\right)^2$
1	15	16	1	0.06	0.0036
2	17	16.5	0.5	0.56	0.31
3	19	20.5	1.5	0.44	0.19
4	17	17	0	0	0
5	18	18.5	0.5	0.56	0.31
6	22	23	1	0.06	0.0036
7	15	17	2	0.94	0.88
8	20	20.5	0.5	0.56	0.31
9	18	20	2	0.94	0.88
10	19.5	20.5	1	0.06	0.00
11	20	20.5	0.5	0.56	0.31
12	18	20	2	0.94	0.88
13	19	20.5	1.5	0.44	0.19
14	15	16	1	0.06	0.0036
15	22	23	1	0.06	0.0036

Mean : 1.06

STRIDE LENGTH
Group B

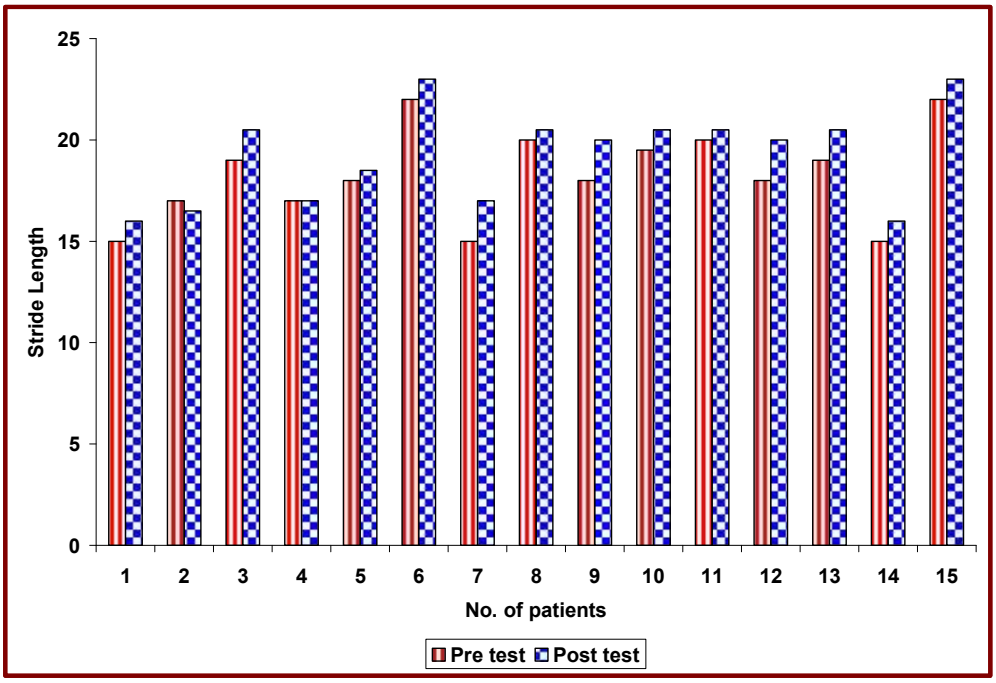
S.No.	Pre test	Post test	$\overline{X_2}$	$\left(X_2 - \overline{X_2}\right)$	$\left(X_2 - \overline{X_2}\right)^2$
1	23	22	1	1.76	3.09
2	10	12	2	0.76	0.57
3	18	20	2	0.76	0.57
4	18	20	2	0.76	0.57
5	15	21.5	6.5	3.74	13.98
6	22	22	0	0	0
7	17.5	18.5	1	1.76	3.09
8	14	19	5	2.24	5.01
9	18.5	21	2.5	0.26	0.06
10	10	15	5	2.24	5.01
11	22	22	0	0	0
12	15	21.5	6.5	3.74	13.98
13	10	12	2	0.76	0.57
14	23	22	1	1.76	3.09
15	14	19	5	2.24	5.01

Mean : 2.76

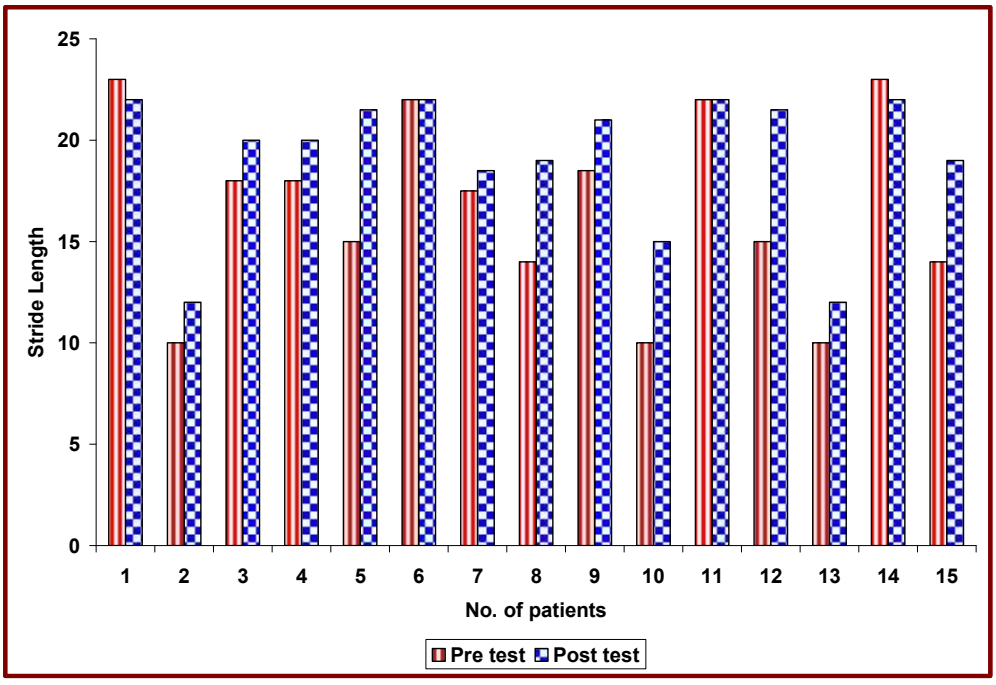
SD : 1.4

‘t’ value : 3.3

STRIDE LENGTH
GROUP A



STRIDE LENGTH
GROUP B



STEP LENGTH
Group A

S.No.	Pre test	Post test	$\overline{X_1}$	$\left(X_1 - \overline{X_1}\right)$	$\left(X_1 - \overline{X_1}\right)^2$
1	3	7	4	3.04	9.24
2	9	9	0	0	0
3	7.5	8.5	1	0.04	0.0016
4	7	7.5	0.5	0.46	0.21
5	8	9	1	0.04	0.0016
6	10.5	11	0.5	0.46	0.21
7	7	8.5	1.5	0.54	0.29
8	10	10.5	0.5	0.46	0.21
9	8	9.5	1.5	0.54	0.29
10	10	10	0	0.96	0.92
11	9	9	0	0	0
12	5	7	2	1.04	1.08
13	10.5	11	0.5	0.46	0.21
14	7.5	8.5	1	0.04	0.0016
15	7	7.5	0.5	0.46	0.21

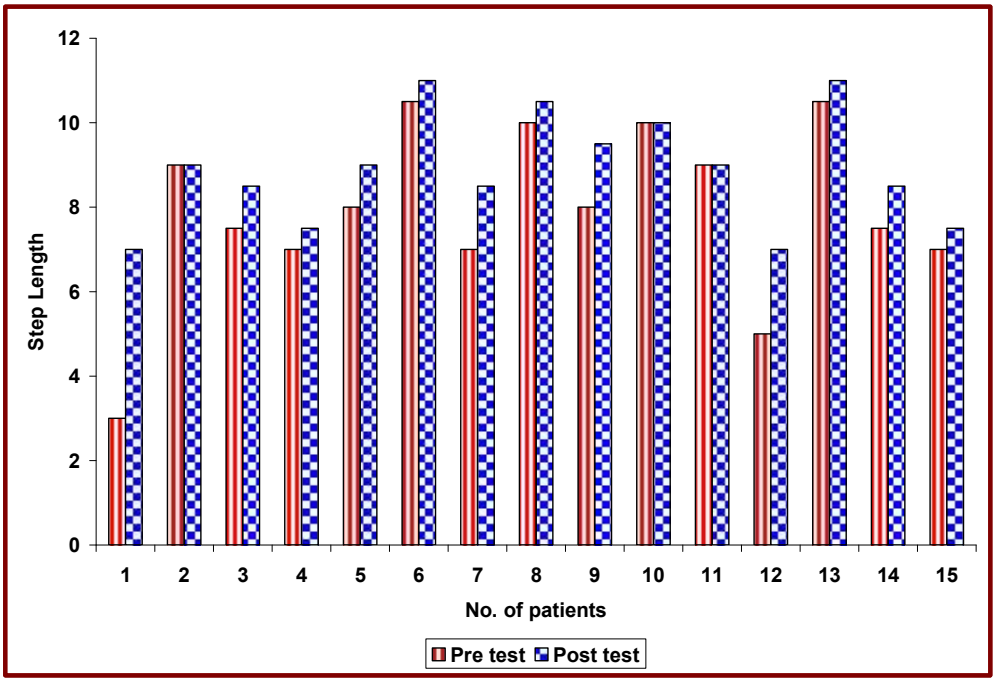
Mean : 0.96

STEP LENGTH
Group B

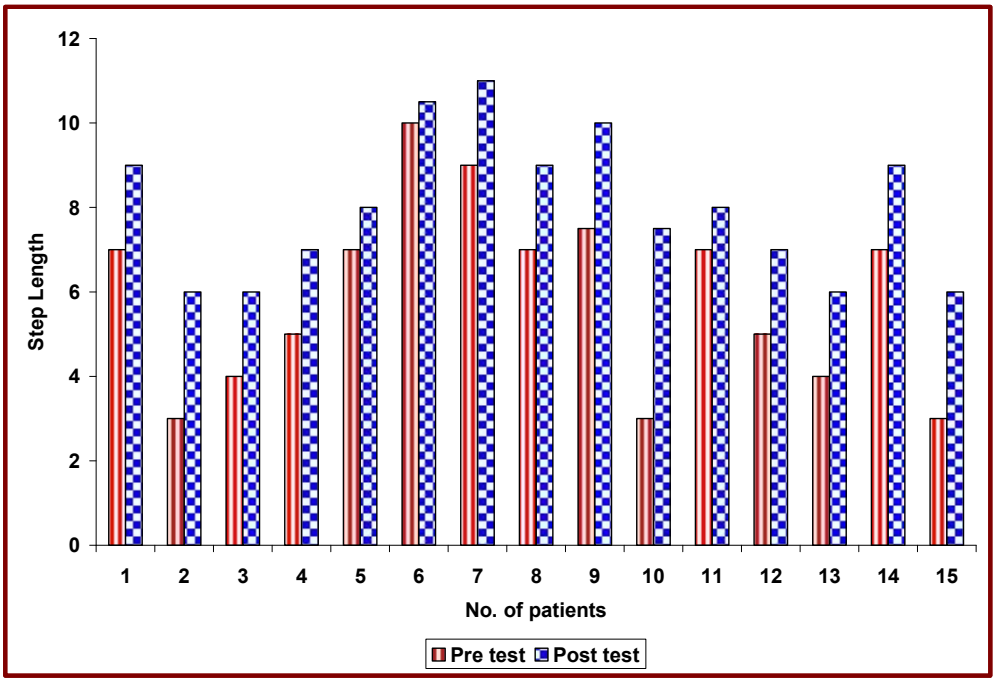
S.No.	Pre test	Post test	$\overline{X_2}$	$\left(X_2 - \overline{X_2}\right)$	$\left(X_2 - \overline{X_2}\right)^2$
1	7	9	2	0.1	0.01
2	3	6	3	0.9	0.81
3	4	6	2	0.1	0.01
4	5	7	2	0.1	0.01
5	7	8	1	1.1	1.21
6	10	10.5	0.5	1.6	2.56
7	9	11	2	0.1	0.01
8	7	9	2	0.1	0.01
9	7.5	10	2.5	0.4	0.16
10	3	7.5	4.5	2.4	5.76
11	7	8	1	1.1	1.21
12	5	7	2	0.1	0.01
13	4	6	2	0.1	0.01
14	7	9	2	0.1	0.01
15	3	6	3	0.9	0.81

Mean : 2.1
S.D. : 0.94
‘t’ value : 3.3

STEP LENGTH
GROUP A



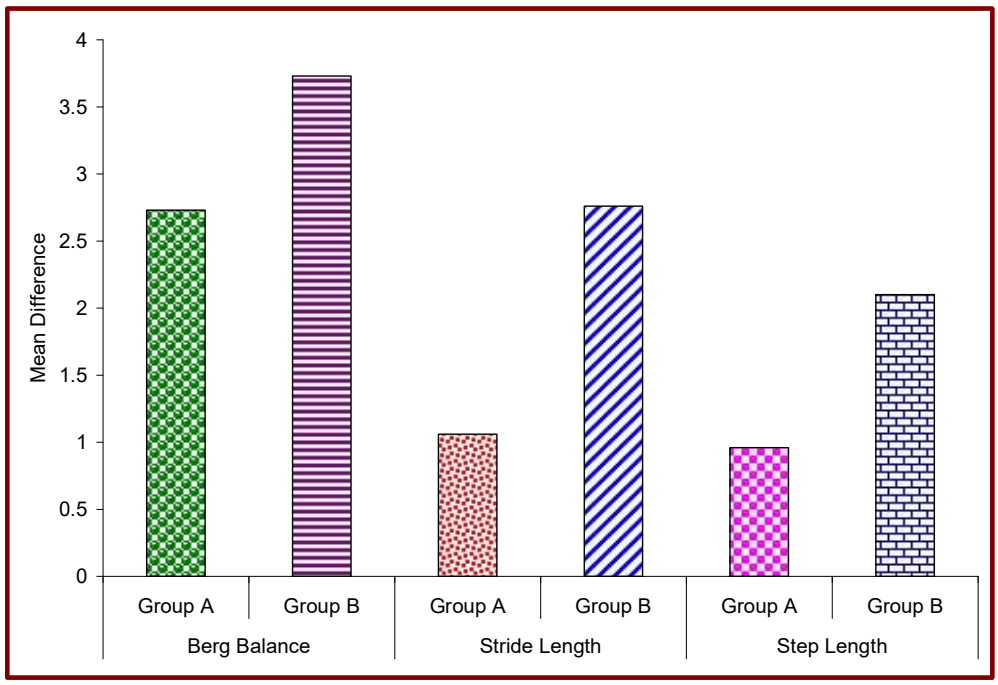
STEP LENGTH
GROUP B



MEAN DIFFERENCES FOR 3 SCALES

S. No.	Parameters	Groups	Mean	S.D	t value
1	Berg balance scale	A	2.73	1.32	3.03
		B	3.73		
2	Stride Length	A	1.06	1.46	3.3
		B	2.76		
3	Step length	A	0.96	0.94	3.3
		B	2.1		

MEAN DIFFERENCES FOR 3 SCALES



VI. DISCUSSION

This was an experimental study conducted to evaluate the effectiveness of unilateral step training along with traditional gait training for acute hemiparesis. 30 stroke patients wee assigned for treatment. They were divided into 2 groups each contains 15 patients.

One group received traditional gait training such as parallel bar, stair climbing; another group received unilateral step training such as treadmill along with traditional gait training.

Mean differences for 3 scales

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		B	2.1		

The patients who received unilateral step training with traditional gait retraining (Group B) gained more postural control, speed, balance than the other group.

The ‘t’ value (calculated value) for UST is 3.3 which is larger than the tabulated value. The tabulated value with 28° of freedom with 5% of level of significant is 2.76.

Therefore treatment given in group B is more effective than group A. Hence we can reject null hypothesis and accept the alternate hypothesis.

LIMITATION AND SUGGESTIONS

There are certain limitations associated with this study. In spite of connections in certain gait deviations associated with hemiplegia during treadmill walking; there may not be improvement in the individual's locomotor ability over ground by the improved gait practice. Severely impaired hemiplegic individuals may not suit the training. This study shows limited sample size and failure to assess the functional outcome of subjects following gait training intervention, and failure to use additional control over groups. It also lacks follow up data.

A more significant data towards the overall functional activity may be provided by evaluation of functional outcome ambulating hemiplegic subjects after a gait training by reliable measures. Better results can be gained by introducing a control group with more than one outcome measure in assessing the gait speed, voluntary movement and basic mobility finding methodology.

Further studies may have inclusion criteria of subjects in chronic stage and have a longer duration and larger sample size. A promotion in restoration of mobility and independence of subject may be brought about by a follow up study carried out to find the long term effect of gait training after stroke. Restoration of gait in stroke by better methods due to further research and development of therapy may be better, though these treadmill training results are impressive.

VII. CONCLUSION

Hemiplegic persons showed locomotor function improvement with mobility and speed on being trained intensively on a treadmill. A better modulation pattern of activity. In lower extremity muscles and the increased ability to support body weight were the most important features. After stroke, most people are able to walk, slowly and hesitantly.

This study resulted in showing improvement in walking speed and basic mobility on patients with stroke who were given treadmill training program focussing on increasing speed and improving the postural control and balance. Improving step length as well as stride length.

On the basis of Analysis of the study the null hypothesis is here by rejected and alternate hypothesis is accepted, which can be stated as **"*THERE IS A SIGNIFICANT DIFFERENCE WHEN TRADITIONAL GAIT RETRAINING ALONG WITH UNILATERAL STEP TRAINING IN TREADMILL IN PATIENTS WITH HEMIPARESIS*"**.

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APPENDICES

APPENDIX I

ASSESSMENT FORM

A. Demographic data

Name — Date of admission

Age — Date of assessment

Sex

Occupation

Marital status

B. History

(a) PAST MEDICAL HISTORY

1. a) CVA
   b) TIA
   c) RIND
   d) Complete stroke
2. Hyper tension yes/no

   Duration of detected now……..year

   Medication yes/no…….regular or irregular

   Present status: controlled/uncontrolled
3. Cardiac disease : yes/no

   Congenital / valvular

   Congestive heart disease

   Duration

4. Peripheral vascular disease

   Duration

   Site

   Treatment

5. Diabetes mellitus yes/no

   Duration:

   Treatment: regular/irregular

   Present status : controlled/uncontrolled

6. Any other relevant illness yes/no

(b) PRESENT MEDICAL HISTORY

Onset – sudden /acute /gradual

Duration……

Symptoms

- Headache
- Vomiting
- Convulsion
- Unconsciousness
- Sensory disturbance yes/no
- Language disturbance yes/no
- Gait disturbances yes/no
- Paralysis

- Partial/total
- Face
- Upper limb
- Lower limb

(c) FAMILY HISTORY

- History of ischemic heart disease
- Myocardial infraction
- Hyper tension
- Cerebrovascular accidents

(d) PERSONAL HISTORY

- Physical activities active/inactive
- Smoking
- Alcohol intake yes/no
- Personality typecalm/anxious

C. General examination

1. General physical examination

- Built
- Nutrition : good /fair /poor

2. Vital signs

- Heart rate

- Blood pressure
- Respiratory rate
- Temperature

D. Neurological examination

1. Level of consciousness
2. Higher mental function: normal/impaired
3. Minimental status test (MMSE)

- Orientation
- Registration
- Attention & concentration
- Recall
- Language

E. Sensory assessment

1. Superficial sensation
2. Deep sensation
3. Cortical sensation

F. Motor assessment

1. Power

- Upper limb proximal distal
- Lower limb proximal distal

2. Tone

- Upper limb
- Lower limb

3. Reflexes

- Superficial reflex
- Deep tendon reflex

4. Voluntary control
5. Modified ashworth scale

G. Gait assessment

- Type – normal /spastic /ataxic /hemiplegic
- Cadence: normal/asymmetrical
- Arm swing
- Base: narrow/broad
- Stride length: short/asymmetrical

H. Cranial nerve examination

I. Cerebellar sign- yes/no

J. Bladder and bowel function

K. Hand functions

L. Investigations

M. Diagnosis

N. Treatment

APPENDIX – II

BERG BALANCE SCALE:

I. SITTING TO STANDING:

Instruction : Please standup, try not to use your hands for support.

4 : Able to stand without using hands and stabilize immediately
3 : Able to stand independently using hands
2 : Able to stand using hands after several tries
1 : Needs minimal aid to stand or stabilize
0 : Needs moderate or max assistance to stand

II. Standing Unsupported:

Instruction : Please stand for 2 min without holding

4 : Able to stand safely 2 min

3 : Able to stand 2 min with supervision

2 : Able to stand 30 sec unsupported

1 : Needs several tries to stand unsupported for 30 sec

0 : Unable to stand 30 sec without support

III. Sitting with back unsupported but feet supported on the floor or stool.

Instruction : please sit with arms folded for 2 min

4 : Able to sit safely and securely 2 min

3 : Able to sit 2 min with supervision

2 : Able to sit 30 sec.

1 : Able to sit 10 sec

0 : Unable to sit without support 10 sec

IV. Standing to Sitting:

Instruction : Please sit down.

4 : Sits safely with minimal use of hands

3 : Controls descent by using hands.

2 : Uses backup of leg against chair to control descent

1 : Sits independently but has uncontrolled descent 0: needs assistance to sit.

V. Transfer:

Instruction :

Arrange chairs for a pivot transfer. Ask the patient to transfer one way towards a seat without arm rests and one way towards a seat with arms. You use 2 chairs or a bed / mat and a chair.

4 : Able to transfer safely with minor use of hands.

3 : Able to transfer safely with definite need of hands.

2 : Able to transfer with verbal cuing and / or supervision.

1 : Needs one person to assist.

0 : Needs 2 people to assist or supervise to be safe.

VI. Standing unsupported with eyes closed.

Instruction : Please close your eyes and stand still for 10 sec.

4 : Able to stand 10 sec safely.

3 : Able to stand 10 sec with supervision.

2 : Able to stand 3 sec.

1 : Unable to keep eyes closed for 3 sec but stands safely.

0 : Needs help to keep from falling.

VII. Standing unsupported with feet together.

Instruction : Place your feet together and stand without holding.

4 : Able to place feet together independently and stand safely 1min.

3 : Able to place feet together independently and stand with supervision for 1 min.

2 : Able to place feet together independently but unable to hold for 30 sec.

1 : Needs help to assume that position but can stand for 15 sec. feet together.

0 : Needs help to assume the position and unable to stand for 15 sec.

VIII. Reaching forward and outstretching arm while standing:

4 : Can reach forward confidently 20 -30 cm

3 : Can reach forward safely 12 cm (5 inch)

2 : Can reach forward 5 cm

1 : Reaches forward but needs supervision

0 : Loses balance when trying, require external support.

IX. Pick up object from the floor from a standing position:

4 : Able to pick up the slipper safely and easily.

3 : Able to pick up the slipper but needs supervision.

2 : Unable to pick up the slipper but reaches 2 - 5 cm (1-2 inches) from the slipper and keeps balance independently.

1 : Unable to pick up and needs supervision while trying.

0 : Unable to try / needs assistance to keep from losing balance / falling.

X. Turning to look behind over your left and right shoulder while standing:

4 : Looks behind from both sides and weight shifts well.

3 : Looks behind one side only, other side shows less weight shifts.

2 : Turns sideways only but maintains balance.

1 : Needs close supervision or verbal

0 : Needs assistance while turning.

XL Turn 360°.

4 : Able to turn 360° in 4 sec or less.

3 : Able to turn 360° safely, one side only, 4 sec or less.

2 : Able to turn 360° safely but slowly.

1 : Needs close supervision or verbal cuing

0 : Needs assistance while turning.

XII. Place alternate foot on step on stool while standing unsupported

4 : Able to stand independently and safely and complete 8 steps in 20 sec.

3 : Able to stand independently and complete 8 steps > 20 sec.

2 : Able to complete 4 steps without aid with supervision.

1 : Able to complete > 2 steps needs minimal assistance.

0 : Needs assistance to keep from falling / unable to try.

XIII. Standing unsupported one foot in front:

4 : Able to place foot tandem independently and hold 30 sec.

3 : Able to place foot ahead of the other independently and hold 30 sec.

2 : Able to take a small step independently and hold 30 sec.

1 : Needs help to step but can hold 15 sec.

0 : Loses balance while stepping on standing.

XIV. Standing on one leg :

4 : Able to lift leg independently and hold > 10 sec.

3 : Able to lift leg independently and hold 5-10 sec.

2 : Able to lift leg independently and hold = or > 2 sec.

1 : Tries to lift leg unable to hold 3 sec. but remains standing independent.

0 : Unable to try on needs assistance to prevent fall.

Total Score : N / AX : 56.

APPENDIX III

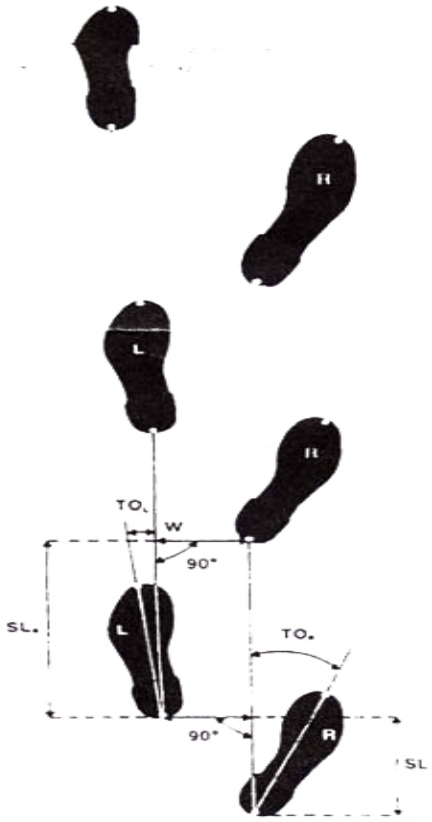
GAIT PHASES

Gait Cycle

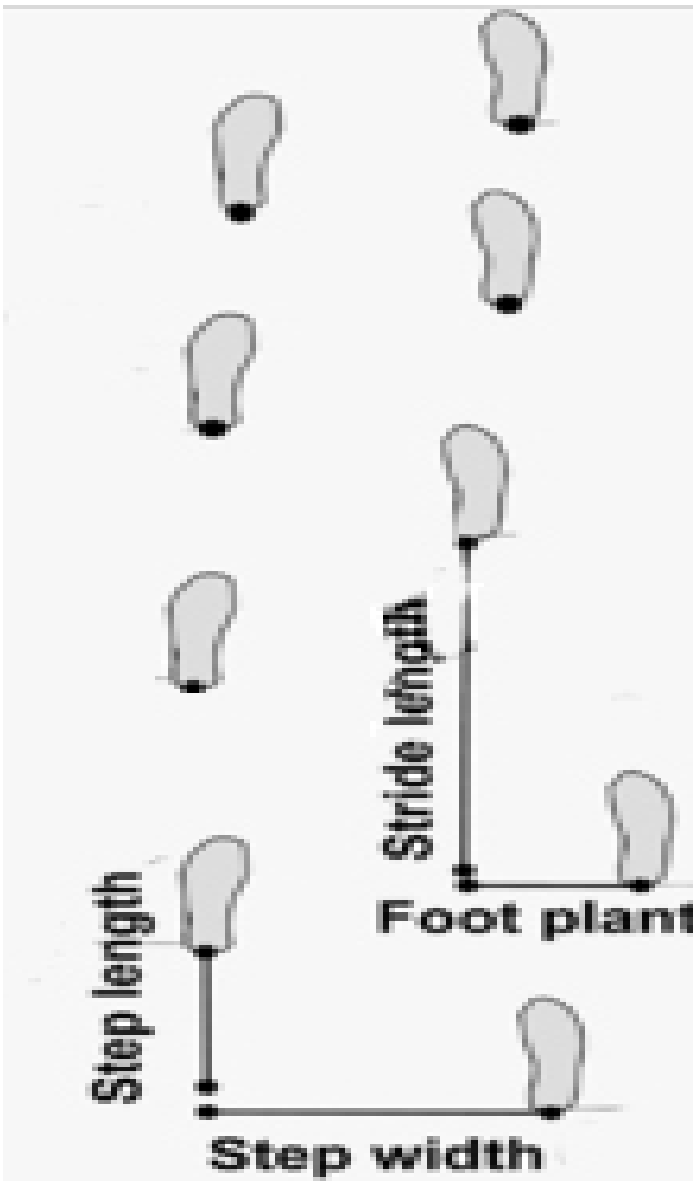
A single sequence of functions of one limb is called a gait cycle. It is essentially the functional unit of gait. The gait cycle has two basic components, the swing phase and the stance phase.

- Stance: phase in which the limb is in contact with the ground
- Swing: phase in which the foot is in the air for limb advancement.

Stride length



Stride (Stride length): Linear distance between corresponding successive points of contact of the same foot (e.g., distance measured from heel strike to heel strike of the same foot)



Step and Stride

Step (Step Length): Linear distance in the plane of progression between corresponding successive contact points of opposite feet (e.g., distance measured from heel strike of one foot to heel strike of the other foot). Normally, the step length is approximately 15–20 inches. Each stride comprises two steps.

COMPONENTS OF GAIT ANALYSIS

Postures & Movements	**Time (seconds)**	**Distance (meters)**	**Other**
Initial contact	Gait Cycle	Step Length	Cadence
Heel contact	Stance phase	Stride length	Stance/swing ratio
Terminal contact	Swing phase	Walking base (stride width)	Natural Cadence/Velocity
Toe-off	Stride period or Cycle time		Velocity
Foot flat	Step Period		
Heel off	Single support		
	Double support		

PHASES OF GAIT CYCLE

STANCE PHASE

Initial Contact (IC)

The moment when the foot contracts the ground

Loading response:

The initial double support stance period which is defined from initial contact (0%) to 10% of the gait cycle.

Mid stance:

The first half of the single support from 10 to 30% of the gait cycle and is defined from the time the opposite limbs leaves the floor until body weight is aligned over the forefoot.

Terminal stance:

The second half of the single support from 30 to 50% of the gait cycle and is defined as the time from heel rise until the other limb makes contact with the floor. During this phase body weight moves ahead of the forefoot.

Pre-swing:

The final double support stance period which is defined from the time of initial contact with the contralateral limb to ipsilateral toe-off.

Initial swing:

The initial third of the swing phase from 60 to 73% of the gait cycle as defined from toe-off to when the swing limb foot is opposite the stance limb.

Mid swing:

The middle third of the swing phase from 73 to 87% of the gait cycle as defined from the time the swing foot is opposite the stance limb to when the tibia is vertical.

Terminal swing:

The final third of the swing phase from 78 to 100% of the gait cycle as defined from the time when the tibia is vertical to initial contact.

Push off:

The period in time in late stance (between 40% of stride and toe-off) when there is an ankle plantar flexor moment and simultaneous power generation of the triceps surae to help advance the limb into swing phase.