EFFECT OF UNSTABLE SURFACE TRAINING ALONG WITH CONVENTIONAL THERAPY ON WALKING ABILITY IN CHRONIC STROKE PATIENTS

Md. Hasanuzzaman

Bachelor of Science in Physiotherapy (B. Sc. PT)

Session: 2009-2010

BHPI, CRP, Savar, Dhaka.

Bangladesh Health Professions Institute (BHPI)

Department of Physiotherapy

CRP, Savar, Dhaka-1343,

Bangladesh

February, 2015.

We the under signed certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled

EFFECT OF UNSTABLE SURFACE TRAINING ALONG WITH CONVENTIONAL THERAPY ON WALKING ABILITY IN CHRONIC STROKE PATIENTS

Submitted by **Md. Hasanuzzaman**, for the partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B. Sc. PT).

………………………….
Muhammad Millat Hossain
B.Sc. PT (Hons.)
Lecturer
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka.
Supervisor.

………………………….
Nasirul Islam
B. Sc. PT (Hons.), MPH
Associate Professor & Coordinator
Masters of Rehabilitation Science Program
BHPI, CRP, Savar, Dhaka.

………………………….
Mohammad Anwar Hossain
B. Sc. PT (Hons.), Dip. Ortho. MED., MPH
Associate Professor, Physiotherapy, BHPI &
Head of the Physiotherapy Department
CRP, Savar, Dhaka.

…………………………..
Md. Shofiqul Islam
B.Sc. PT (Hons.), MPH
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka.

…………………………
Md. Obaidul Haque
B.Sc. PT (Hons.), Dip. Ortho. MED., MPH
Associate Professor & Head
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka.

DECLEARATION

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study. I would be bound to take written consent of my supervisor and Head, Department of Physiotherapy, BHPI.

Signature: **Date:**

Md. Hasanuzzaman

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Acknowledgement

First of all, I would like to pay my gratitude to ALLAH who has given me the ability to complete this project in time with success. The second acknowledgement must go to my family members who have always inspired me for preparing the project properly.

I am extremely grateful to my honorable and praiseworthy Supervisor Muhammad Millat Hossain sir, B.Sc. PT (Hons.) Lecturer, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka for giving me his valuable time, his profound supervision and excellent guidance without which I could not able to complete this project.

I would also like to give my special appreciation to my respected teacher Assistant Professor Md. Shofiqul Islam sir, Department of Physiotherapy, Bangladesh Health Professions Institute (BHPI) for his proficient guidance to carry out this study.

I would like to express my gratitude to Md. Obaidul Haque sir, Associate Professor & Head, Department of Physiotherapy, BHPI, CRP, Savar for recommend me to begin this study procedure and to Mohammad Anwar Hossain sir, Associate professor, BHPI and Head of the Physiotherapy Department, CRP, Chapain, Savar, Dhaka-1343 for providing me excellent guidelines and permit me to collect data from the clinical settings of outdoor Neurology and Stroke Rehabilitation Unit, CRP, Savar.

I would like to express gratitude to all of my teachers for helping me in this study specially Nasirul Islam sir, Associate Professor & Coordinator, Masters of Rehabilitation Science Program, BHPI, CRP, Savar, Dhaka.

My special thanks to all the staffs of Neurology and Stroke Rehabilitation Unit outdoor Physiotherapy Department especially to Ms. Farjana Sharmin Rumana madam, Incharge, Physiotherapy Neurology outdoor for her enthusiastic guidance and support without which I could not initiate this project.

My special thanks to my friends for their continuous suggestions and supports to take challenges which have inspired me throughout the project.

I would like to thank the Librarian of Bangladesh Health Professions Institute (BHPI) and her associates for their kind support to find out related books, journals and also access to internet.

Finally, I would like to thank to all participants of the study for their enormous co-operation.

Acronyms

ADL	Activity of Daily Living
BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralysed
SRU	Stroke Rehabilitation Unit
PT	Physiotherapy
UST	Unstable Surface Training
RCT	Randomized Control Trial
MWT	Meter Walk Test
USA	United States of America
WHO	World Health Organization
BMRC	Bangladesh Medical Research Council
ROM	Range of Motion
NDT	Neurodevelopment Techniques

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ABSTRACT

Purpose: The purpose of the study is to explore the effect of Unstable Surface Training along with Conventional therapy on walking ability of chronic stroke patients. *Objectives:* To identify the effect of Unstable Surface Training along with Conventional therapy on walking ability in chronic stroke patients. *Methodology:* Single blinded; Randomized controlled trial study was used in this study. Total 12 chronic stroke patients were listed from Neurology and Stroke rehabilitation unit of CRP, Savar, Dhaka. The subjects of the experimental group performed Unstable Surface Training (UST), 15 minutes in a session along with conventional therapy and the control group received only conventional therapy. All subjects were evaluated with a 10-meter walk test. *Results:* The finding of the study was carried out by using unrelated t-test, Microsoft Excel Worksheet 2013 and scientific calculator to compare the experimental group and control group and analysed by interpreting the probability level of significance of t value. The result was not found to be significant for t value at probability level 0.05 but it has grater improvement over control group. *Conclusion:* The study concluded as Unstable Surface Training exercises are not statistically effective to improve walking ability of chronic stroke patients but clinically greater improvement was found by observing mean differences.

Key words: Stroke, Walking ability, Unstable Surface Training, Conventional therapy.

CHAPTER-I INTRODUCTION

1.1 Background

Stroke is the third leading cause of death in Bangladesh. The prevalence of stroke in Bangladesh is 0.3% (Islam et al., 2013). The incidence of stroke increases day by day and in many developing countries, the incidence is rising because of adaptation of unhealthy life style and lack of awareness (Siddiqui et al., 2012). In 2007, the overall mortality rate from stroke was 273 000, which makes stroke the third-leading cause of death in the United States (Summers et al., 2009). With an estimated 700,000 Americans experiencing a new or recurrent stroke each year and more than 1 million Americans with stroke report difficulties with basic activities of daily living (ADL) due to their stroke, and many also experience significant difficulty with mobility (Rosamond et al., 2007). According to the World Health Organization, 15 million people suffer stroke worldwide each year (Taylor, 2010). 5 million die and another 5 million are permanently disabled among the 15 million stroke people every year (Engstrom et al., 2001).

Stroke is defined by WHO as a rapidly developed clinical signs of focal disturbance of cerebral function lasting for more than 24 hours or leading to death without any apparent cause other than vascular origin (Hossain et al., 2011). Stroke is a clinical syndrome divided into two broad categories that define its pathophysiology: Ischaemic strokes are caused by either cerebral thrombosis or embolism and account for 50%–85% of all strokes worldwide and Haemorrhagic strokes are caused by subarachnoid haemorrhage or intra-cerebral haemorrhage and account for 1%-7% and 7%-27% respectively of all strokes worldwide (Feigin et al., 2009).

The ability to walk in stroke patients can be affected by various neurological deficits. These include impaired neuromuscular control, altered sensation, neglect (i.e. failure to respond to stimuli on the affected side) and visual deficits, thus increasing the risk for falls leading to subsequent injuries (Bouyok et al., 2006).

Walking ability may also provide some protective effects against secondary complications common after a stroke such as osteoporosis and heart disease (Pang et al., 2005).

Initially after stroke, two thirds of individuals are not able to walk or require assistance to walk and after three months, one third of individuals who experience a stroke still require assistance or are not able to walk (Jorgensen et al., 1995).

Although 60% of the stroke survivors recover independent walking after 3 months, several have continuing problem with mobility due to impaired balance, motor weakness and decreased walking velocities (Jaffe et al., 2004).

At the time of admission for rehabilitation, 51 % of subjects had no walking function and another 12 % needed assistance in ambulation. After rehabilitation, only 18 % of the participants still had no walking function, and 11 % required assistance. Those who are independent walkers, however, have usually an abnormal walking pattern and they are slow compared to healthy subjects (Titianova et al., 2003).

Speed, distance and stability of gait are very important components for the ADL (Activity of Daily Living) in stroke patients (Dobkin et al., 2004). Decrease in gait cycle, speed, standing phase and swing phase of affected side is distinctively shown in stroke patients (Mauritz et al., 2002). Although some patients can recover their gait function, many stroke patients still have not only the disability of decreased gait speed and endurance but also the limitation in independent transfer in home and society (Chen & Patten, 2006). The gait speed of stroke patients was a third of normal adults, gait speed after 6 month of onset and stroke patients could perform 40% of gait distance comparing with normal adults (Pohl et al., 2004). The improvement and recovery of gait in stroke patients are closely related to the back-to-work and society (Eich et al., 2004). Consequentially, the recovery of balance and gait function of stoke patients becomes the important goal of rehabilitation (Werner et al., 2002).

Hemiparesis is one of the most common impairments after stroke and contributes significantly to reduced gait performance and retraining of locomotor skills in order to improve gait performance is therefore one of the main components in stroke rehabilitation (Flansbjer et al., 2005).

Post-stroke hemiplegic gait is a mixture of deviations and compensatory motion dictated by residual functions, and thus each patient must be examined and his/her unique gait pattern identified and documented. Walking dysfunction is common in neurologically impaired individuals, arising not only from the impairments associated with the lesion but also from secondary cardiovascular and musculoskeletal consequences of disuse and physical inactivity. Muscle weakness and paralysis, poor motor control and soft tissue contracture are major contributors to walking dysfunction after stroke (Balaban & Tak, 2014).

The recovery of walking ability is one of the most relevant functional targets after a stroke, but this goal is generally obtained by only 50–60% of patients (Teasell et al., 2003). To improve the walking ability various studies have been conducted, as recovery of walking ability is a rehabilitation goal for most stroke patients (Borel et al., 2011). Only up to 74% of chronic stroke survivors regain sufficient walking ability to walk outside their homes (Van de Port et al., 2008).

Post-stroke physical rehabilitation interventions have been used to reduce pain and spasticity, as well as to increase range of motion (ROM), muscle force, mobility, walking ability, functional status, physical fitness, and quality of life (Goljar et al., 2010).

Walking is an indispensable element for their self-reliance in hemiplegia patients that will make them independent from others when they perform daily living activities and is something that must be emphasized in treatment processes for these patients (Kim, 2006). Walking and balance in stroke patients ability are very closely related. Therefore, walking training is considered to greatly affect the locomotion of stroke patients (Bohannon et al., 1995).

As balance problems are common after stroke and treatment of balance continues to be standard of care in stroke rehabilitation (Goljar et al., 2010).

Balance ability is an important factor for independent walking in stroke patients (Lee et al., 2014). Numerous interventions have been devised to improve balance, such as unstable surface training (UST), balance training, and virtual reality programs (Kawanabe et al., 2007). Unstable surface training (UST) has been proven to improve the strength, proprioception, and balance ability of the lower extremity (Verhagen et al., 2005).

Restoration of normal movements of the trunk, pelvis, and lower extremity, and improved weight bearing on the affected side while walking, are some of the most important goals of stroke rehabilitation (Roth & Harvey, 2000).

A large amount of gait training for rehabilitation of acute and sub-acute phase of stroke has suggested that there is potential for improvement, but the research of gait rehabilitation during the chronic phase of stroke is inconclusive (Peurala, 2005).

Balance training exercises along with conventional therapeutic interventions are required for improving patients sensory-motor ability and postural stability (static and dynamic), thus preventing falls and promoting safe ambulation (Smania et al., 2011).

It has been reported that only a small proportion can walk with sufficient ability to function effectively within the community and many people returning home after stroke rehabilitation walk at average speeds that are insufficient to cross the street safely or even to walk safely in the community (Yang et al., 2007). It is important to identify treatment approaches that maximize community ambulation and understanding the impairments that primarily determine walking ability of individuals with stroke will help with the development of effective gait training strategies (Hsu et al., 2003). The common impairments, muscle strength, motor control, and balance appear to have the strongest relation with walking (Kim et al., 2003).

Conventional gait training has focused on part-practice of components of gait in preparation for walking. It includes Symmetrical weight bearing training, weight shifting, stepping training, heel strike, single leg standing, push off / Calf rise (Balaban et al., 2014).

Followed by Traditional approaches to stroke recovery have a focus on neurofacilitation or neurodevelopmental techniques (NDT), Bobath techniques (Eng et al., 2007).

Exercise therapy, in the form of task-oriented exercise programs, are now recognized as a new strategy to improve the functional status of chronic stroke patients following several weeks of functional training have shown significant improvements in functional mobility, walking speed and endurance and in clinical measures of balance (Dean et al., 2000). Gait deficit could be classified on the basis of walking speed (Titianova et al., 2003).

Balancing on unstable surfaces will lead to heightened proprioception when the foot is on solid surfaces during normal activities (Schilling et al., 2009).

Balaban et al. (2014) suggested that unstable surface (foam) is useful for improving balance stability and also useful in balance training to prevent falls after stroke.

Bang et al. (2014) reported that Unstable Surface Training (UST) with treadmill training is a useful intervention for improving dynamic balance and walking endurance.

1.2 Rationale

- Most of the studies that have been conducted about the effects of Unstable surface Training (UST) on balance ability but a little is known about the effects of UST on lower extremity function, especially walking performance for independent living in chronic stroke patients. Therefore, the purpose of this study is to investigate that UST influences walking ability along with conventional therapy in chronic stroke patients.
- Unstable Surface Training (UST) in particular has been proven to improve the strength, proprioception, balance ability and weight bearing ratio of the affected lower extremity of stroke patients, so we hypothesize that Unstable Surface Training (UST) with conventional therapy group will show greater improvements in 10-meter walk test compared with a control group performing conventional therapy alone.
- Unstable surface training (UST) can be an effective approach to ensure continuous training after discharge. The UST protocol has a clinical advantage because it is simple and easy. In addition, UST is cost-effective because of the enhanced efficiency achieved by its use in combination with traditional methods.
- In this area there are a few researches published but no research directly compared the two different treatment procedures nor has seen the effect of Unstable Surface training (UST) along with conventional therapy on walking ability in stroke patients.
- The results of the study may help to guide physiotherapists to give evidence based treatment in patient with chronic stroke patients, which will be beneficial for both the patient with chronic stroke and for developing the field of physiotherapy profession.

1.3 Aim of the study

The aim of this study is to determine the effect of Unstable Surface Training (UST) along with conventional therapy on walking ability in chronic stroke patients.

1.4 Objectives of the study

General objectives

To evaluate the effect of Unstable Surface training (UST) on walking ability in chronic stroke patients.

Specific objectives

- To identify the effect of Unstable Surface Training (UST) on walking ability in chronic stroke patients.
- To identify the relationship of age, sex of the participants, types of stroke and side of involvement on walking ability in chronic stroke patients.

1.5 Hypothesis

Unstable surface training along with conventional therapy is effective on walking ability in chronic stroke patients.

(Ha>Ho).

1.6 Null hypothesis

Unstable surface training along with conventional therapy is not effective on walking ability in chronic stroke patients.

(Ho≠Ha).

1.7 List of Variables

1.7.1 Dependent variable

- Walking ability of stroke patient

1.7.2 Independent variables

- Unstable surface training
- Conventional therapy
- Age
- Sex
- Types of stroke
- Side of involvement

1.8 Operational Definition

Stroke, Unstable surface training, Conventional therapy

1.8.1 Stroke

The World Health Organization (WHO) definition of stroke is: “rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin” (Hossain et al., 2011).

1.8.2 Unstable surface training

Some systemic programmed exercises performed by unstable surface such as foam surface is called Unstable Surface Training (UST) (Destifano et al., 2009).

1.8.3 Conventional therapy

Conventional physiotherapy is a group of selected treatment techniques set by a physiotherapist on the basis of evidence that are widely used around the world for the treatment of specific disease (Kishner & Colby, 2007).

CHAPTER-II LITERATURE REVIEW

Stroke is the most common clinical manifestation of diseases of the cerebral blood vessels and it is a syndrome characterized by the acute onset of a neurologic deficit that persists for at least 24 hours, which reflects focal involvement of the central nervous system, and is due to a disturbance of the cerebral circulation (Ali et al., 2013).

Depending on its location, stroke can cause many permanent disorders, such like paralysis on one side of the body and loss of speech. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature (Longo et al., 2012). Ali et al. (2013) mentioned in their article, Stroke kills 15%–35% of its victims and causes serious disability in more adults who survive than any other medical disease and most strokes are ischemic, but approximately 15% of strokes are caused by subarachnoid or intra-cerebral haemorrhage.

After a stroke, the ability to control balance in the sitting and standing positions is a fundamental skill of motor deportment for reaching autonomy in everyday activities and the postural performance of patients soon following a stroke has been found to be closely correlated with long-term functional improvement (Ali et al., 2013). Initial walking function is impaired in two-thirds of the stroke population and this impairment is the greatest contributor to post stroke functional disability (Teixeira-Salmela et al., 2001).

Ali et al. (2013) mentioned in their study, gait disorders are systematically identified as a greatest risk factor for falls and injury.

Eng et al. (2007) stated that improved walking ability is one of the most often stated goals by people with stroke undergoing rehabilitation and with those individuals living with stroke in the community. They also suggested that impairments resulting from stroke, such as muscle weakness, incoordination, poor endurance, pain, spasticity and poor balance lead to persistent difficulties with walking.

Gait recovery is a major objective in the rehabilitation of patients who experience stroke. A wide range of walking ability is present after stroke that is dependent upon the severity of sensorimotor impairment. After stroke, 50% of patients initially are unable to walk, 12% can walk with assistance, and 37% can walk independently. At the end of 11 weeks of stroke rehabilitation, 18% of patients still are unable to walk, 11% can walk with assistance, and 50% can walk independently (Balaban et al., 2014).

The primary goals of rehabilitation of people with stroke include being managed to perform daily activities and to walk independently and rehabilitation programs for post stroke patients mainly focus on gait training, at least for sub-acute patients (Jette et al., 2005).

The incidence of falls is higher in community-dwelling stroke individuals than in the general healthy elderly population (Weerdesteyn et al., 2008). The majority of falls occur during walking which suggests that dynamic balance control during gait is an important issue (Forster et al., 2009).

Jaffe et al. (2004) stated that 60% of the stroke survivors recover independent walking after 3 months, several have continuing problem with mobility due to impaired balance, motor weakness and decreased walking velocities.

Viosca et al. (2005) showed that post-stroke walking recovery was observed throughout the first year after a stroke.

Walking ability is an important element for independent post stroke patients (Bang et al., 2014).

Walking has been identified as one of the most important components of Activities and Participation in the International Classification of Functioning, Disability and Health, ICF, Core Set for Stroke (Geyh et al., 2004).

The recovery of walking ability is a rehabilitation goal for most stroke patients (Borel et al., 2011).

Van de Port et al. (2008) suggested that although gait speed is an important determinant of community ambulation, the ability to walk in the community is determined by several underlying factors such as endurance, balance, and motor function.

Self-paced gait speed is the most common outcome measure for gait training strategies and reflects the ability to transport the body from one place to another in a time (Eng el al., 2007).

Perry et al. (1995) suggested that individuals with stroke who can walk at a self-paced speed of 25m/min (~0.4 m/s) are more likely to be able to walk in the community.

The muscle strength of the lower limbs was an important factor in maintaining walking ability in the stroke survivors (Maeda et al., 2000).

Van de Port et al. (2008) suggested that enhancing walking endurance by improving physical condition seems to be less specific, because progressive bicycling programs resulted in significant gains in walking endurance.

Walking ability improvement is one of the highest priorities for people living with a stroke. Gait retraining through different types of exercise is the most common approach to improving walking ability. Intensive mobility training which incorporates functional strengthening, balance and aerobic exercises and practice on a variety of walking tasks improves gait ability both in sub-acute and chronic stroke patients (Eng et al., 2007).

Graded strength training can improve the ability to generate force, but does not transfer to improvements in walking in both sub-acute and chronic inpatient of stroke (Eng, 2004).

Lower-limb strengthening alone failed to show significant effects on gait speed and walking distance (Van de Port et al., 2008).

In the study, Peurala et al. (2005) all patients over 6 months post stroke, improved their motor performance during the 3-week gait-oriented rehabilitation. They also said that the gait speed, dynamic balance, and motor task performance improved irrespectively.

Michael et al. (2005) found that stroke survivors had the low levels of ambulatory activity predicted by balance deficit severity and patients with the poorest balance will have the lowest ambulatory activity levels. They also suggested that balance-related interventions will improve cardiovascular fitness and ambulatory fitness of chronic stroke patients.

Reaching exercises performed while seated were reported to improve sitting balance, peak vertical force on the paretic foot, and gait speed in chronic hemiplegic patients (Dean et al., 2007).

Yang et al. (2007) showed that the dual-task–based exercise program is feasible and beneficial for improving walking ability in subjects with chronic stroke.

Intensive gait training produced a significant improvement in life role participation in the chronic phase after stroke (Pundik et al., 2012).

Unstable Surfaces such as foam surfaces, wobble boards, stability balls, etc. have become popular as a training aid for increasing balance capabilities. Such unstable surfaces reduce or effectively remove the person's foot contact with the solid ground (Cressey et al., 2007).

Balancing exercise on an unstable surface is more effective than on a stable surface for improving balance ability of stroke patients (Bang et al., 2014).

The neuromuscular training program resulted in significant improvements in static balance ability on an unstable surface (Distefano et al., 2009).

Eils & Rosenbaum (2001) suggested that exercising on an unstable surface is effective in improving body position awareness.

Park et al. (2013) found that the sit-to-stand training on an unstable surface was more effective than on a stable surface.

Jaeho et al. (2012) suggested that unstable surface (foam) is useful for improving balance stability and also useful in balance training to prevent falls after stroke.

Kawnabe et al. (2007) suggested that balancing exercises on an unstable surface sensitize the muscle spindle through gamma motor neurons, thereby improving motor output which influences the stability of joints.

Unstable surface training increased the weight bearing ratio by more in the affected lower limb in stroke patients (Bang et al., 2014).

Training on an unstable surface constantly induces reactive postural control in the trunk muscles for balance, making muscle activity and trunk control improvement more effective compared to training on a stable surface (Karthikbabu et al., 2011)

Onigbinde et al. (2009) obtained that enhancement of static and dynamic balance ability resulted from training on unstable support surfaces.

Brincks & Nielsen (2012) reported that intervention studies have associated improvements in specific gait biomechanics with improvements in walking speed after stroke.

Training on an unstable surface was reported to be very effective in increasing proprioceptive inputs to the neuromuscular system (Gruber and Gollhofer 2004).

Karthikbabu et al. (2011) reported improved trunk control and dynamic balance after training stroke patients on an unstable surface for trunk control.

Shumway & Wollacott (2007) suggested that an unstable surface increases the external swing which more effectively encourages postural alignment by forcing faster modifications of the sensory system and motor system and also it assists in the postural strategy of self- postural control.

Reaching exercises performed while seated were reported to improve sitting balance, peak vertical force on the paretic foot, and gait speed in chronic hemiplegic patients (Dean et al., 2007).

Jaeho et al. (2012) revealed that stroke patients and age-matched older adults showed significantly higher postural control under the unstable (foam) surface conditions compared with the solid surface conditions.

Trunk control training on an unstable surface was reported to be very effective in increasing proprioceptive inputs to the neuromuscular system (Gruber & Gollhofer, 2004).

Eils & Rosenbaum (2001) suggested that exercising on an unstable surface is effective in improving body position awareness.

3.1 Study design

The study was conducted by using Randomized Control Trail (RCT). 12 patients conveniently selected from the outdoor patients with stroke and then 6 patients with stroke were randomly assigned to Unstable Surface Training with conventional physiotherapy group and 6 patients to the only conventional physiotherapy group for this randomize control trial study. It was a single blinded study which has been conducted at Neurology and stroke rehabilitation unit of CRP, Savar.

A pre-test (before intervention) and post-test (after intervention) was administered with each subject of both groups to compare the walking ability before and after the treatment.

The study is designed using an experimental design quantitative research. According to Depoy & Gitlin (2013) the design could be shown by:

Experimental Group	:	R	O_1	X	O_2
Control Group	:	R	O_1		O_2

Flow-chart of the phases of Randomized Controlled Trial

Assessed for eligibility

↓

Outdoor patients with Stroke

↓

Conveniently selected 12 patients with Stroke

↓

Randomly selected to Experimental or Control Group (n = 12)

↓

Experimental Group (n_1 = 6)

↓

Unstable Surface Training along with Conventional physiotherapy

↓

Follow Up (after 8 sessions)

↓

Outcome analysed

Control Group (n_2 = 6)

↓

Conventional physiotherapy

↓

Follow up (after 8 sessions)

↓

Outcome analysed

A flowchart for a randomized controlled trial of a treatment program including conventional physiotherapy with Unstable Surface Training for chronic stroke patients.

3.2 Study area

Outdoor Neurology and Stroke Rehabilitation Unit, Department of Physiotherapy, CRP, Savar, Dhaka-1343.

3.3 Study Population

A population refers to the entire group of people that meet the criteria set by the researcher. The populations of this study were the chronic stroke patients being treated at CRP.

3.4 Sample selection

A population refers to the entire group of people or items that meet the criteria set by the researcher. The populations of this study were the stroke Patients. Subjects, who met the inclusion criteria, were taken as sample in this study. Twelve patients with stroke were selected by convenience sampling from outdoor Neurology and Stroke rehabilitation unit, Department of Physiotherapy, CRP, Savar and then 6 patients with stroke were randomly assigned to unstable surface training with conventional physiotherapy group and 6 patients to the only conventional physiotherapy group for this randomize control trial study. The study was a single blinded study. When the samples were collected, the researcher randomly assigned the participants into experimental and control group, because it improves internal validity of experimental research. The samples were given numerical number C1, C2, C3, C4, C5 & C6 for the control and E1, E2, E3, E4, E5 & E6 for experimental group. Total 12 samples included in this study, among them 6 patients were selected for the experimental group (received unstable surface training with conventional physiotherapy) and rest 6 patients were selected for control group (conventional physiotherapy only).

3.5 Inclusion criteria

- History and clinical presentation (Hemiparesis) of stroke (first haemorrhage or infraction).
- More than 6 month post stroke.
- Age 25-70 years.
- Both right and left sided hemiplegic patient are included.
- Both ischaemic and haemorrhagic stroke are integrated.
- Can walk 10 meter independently.
- Not receiving any interventions related to gait concurrently from other institutions.
- Sufficient cognition to participate in the training.

3.6 Exclusion criteria

- Any comorbidity or disability other than stroke that precluded gait training.
- Subjects who are not agree to complete at least eight session of physiotherapy treatment.
- Uncooperative patient.
- Medically unstable patient.
- The participant who participated another study at the time of this study.

3.7 Method of data collection

3.7.1 Data Collection Tool

- Data collection form
- Consent Form
- Structured questionnaire. (Both open ended and close ended questionnaire)
- Stop Watch, meter scale
- Pen, Papers, Pencil

3.7.2 Questionnaire

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines structured questionnaire (Both open ended and close ended questionnaire) are used for data collection.

3.8 Measurement tool

3.8.1 10m walk test

10m walk test is for the measurement of gait speed performed by the patients (Van de Port et al., 2004). The walkway was 14m long, including a 2-m section for acceleration and a 2-m section for deceleration, and it has been used in other studies. The participants were asked to walk in a comfortable pace and as safely as they could. Gait speed was measured with a stop watch. The participants were asked to walk 2 times, and the average round-trip time was recorded (Bang et al., 2014).

3.9 Data collection procedure

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at department, the patients were assessed by graduated physiotherapists who were qualified. Eight sessions of treatment was provided for every subject. Twelve subjects were chosen for data collection according to the inclusion criteria. The researcher randomly assigned all participants into two groups and coded C1, C2, C3, C4, C5 & C6 for control group and E1, E2, E3, E4, E5 & E6 for experimental group for maintaining internal validity. Experimental group received conventional physiotherapy with unstable surface training and control group received only conventional physiotherapy. Data was gathered through a pre-test and post-test intervention and the data was collected by using a written questionnaire form which was formatted by the researcher. Pre-test was performed before beginning the treatment and the walking ability were noted with 10 m walk test questionnaire form. The same procedure was performed to take post-test at the end of 8 sessions of treatment. The researcher collected the data both in experimental and control group in front of four graduate qualified physiotherapists in order to reduce the biasness. At the end of the study, specific test was performed for statistical analysis.

3.10 Treatment regimen

Treatment was given by graduated clinical physiotherapists who were expertized.

For control group

There were 6 participants in control group. The participants were received 8 sessions of conventional physiotherapy in 4 weeks. They received 45 minutes of conventional physiotherapy in every session by graduated clinical physiotherapist according to their assessment.

Conventional treatments for both groups

- Balance training on stable surface and tilting board
- Strengthening exercise
- Stretching exercise
- Conventional gait training-

  -Symmetrical Weight bearing training

  -Weight shifting

  -Stepping training

  -Heel strike

  -Single leg standing

  -Push off
- Walking over obstacles
- Up and down slopes
- Cycling
- Treadmill Training

For experimental group

The participants of the experimental group performed Unstable Surface Training (UST) using the method of Bang et al. (2014). The participants of the experimental group used foam surface (Comfort 3/D, 18"×22"×3") which is covered by rexin as an unstable surface.

There were 6 participants in experimental group. Unstable Surface Training (UST) and conventional physiotherapies both were given by graduated clinical physiotherapist. The participants were received 8 sessions of Unstable Surface Training (UST) in addition with conventional physiotherapy in 4 weeks.45 minutes of treatment in a session.

UST (Unstable surface training)

Category	Components	Setting
Exercise	Forward reaching in a sitting position on the foam surface.	10 reps
	Maintaining a standing position on the foam surface.	40 seconds
	Squatting exercise on the foam surface.	10 reps
	Marching in place on the foam surface.	40 seconds
	Lifting the heels of a foot on the foam surface.	40 seconds
	Forward reaching in a standing position on the foam surface.	10 reps

Forward reaching in a sitting position on the foam surface | Maintaining a standing position on the foam surface | Forward reaching in a standing position on the foam surface

Squatting exercise on the foam surface | Marching in place on the foam surface | Lifting the heels of a foot on the foam surface

Figure–1: Unstable Surface Training on Foam

3.11 Ethical Consideration

At first Research proposal was submitted for approval to the administrative bodies of ethical committee of CRP. Again before beginning the data collection, researcher obtained the permission from the concerned authorities ensuring the safety of the participants. In order to eliminate ethical claims, the participants were set free to receive treatment for other purposes as usual. Each participant was informed about the study before beginning and given written consent. Bangladesh Medical Research Council (BMRC) guideline and World Health Organization (WHO) Research guideline was followed by the researcher.

3.12 Informed Consent

The researcher got signature in the consent form to participate in the study from each subject. The participants were informed that they were completely free to decline answering any question during the study and were free to withdraw their consent. Withdrawal of participation from the study would not affect their treatment in the physiotherapy department and they would still get the same facilities. Every subject had the opportunity to discuss their problem with the administration of CRP.

3.13 Data analysis

The collected data has presented in ways that other research workers can understand.

The researcher had to make sense of the results. As the result came from an experiment in this research, data analysis was done with statistical analysis. All the collected data were analysed using Microsoft word excel 2010. Descriptive and analytical statistics have been used to present for the data analysis. Though the data were interval/ratio, the researcher used unrelated t-test for analysis of data (Hicks, 2009). The unrelated t-tests were used to compare differences between group means. Data are presented as the mean and standard deviation (SD) in the analysis. A p value is called level of significance for an experiment and p value of <0.05 was accepted as significant.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum X_1^2 - \frac{(\sum X_1)^2}{n_1}\right) + \left(\sum X_2^2 - \frac{(\sum X_2)^2}{n_2}\right)}{(n_1 - 1) + (n_2 - 1)}} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where,

$\bar{x}_1$ = mean of scores from treatment group.

$\bar{x}_2$ = mean of scores from control group.

$(x_1)2$ = the square of the each individual score from treatment group totaled.

$(x_2)2$ =the square of the each individual score from control group totaled.

$(\sum x_1)2$ = the total of the individual score from treatment group squared.

$(\sum x_2)2$ = the total of the individual score from control group squared.

n_1 = number of subjects from treatment group.

n_2 = number of subjects from control group.

3.14 Significant level

In order to find out the significance of the study, the researcher calculated the "p" value. The p values refer the probability of the results for experimental study. The word probability refers to the accuracy of the findings. A p value is called level of significance for an experiment and a p value of <0.05 was accepted as significant result for health service research. If the p value is equal or smaller than the significant levels, the results are said to be significant (Hicks, 2009).

Calculating the degree of freedom from the formula:

Degrees of freedom (df) = $(n_1 -1) + (n_2-1) = (6-1) + (6-1) = 10$

df	.20	.10	.05	.02	.01	.001
10	1.372	1.812	2.228	2.764	3.169	4.587

Table-1: Level of significance for two tailed hypothesis

CHAPTER-IV	RESULTS

Twelve patients with chronic stroke were selected in this study. 6 patients in the Unstable surface training with conventional physiotherapy group and 6 patients in the only conventional physiotherapy group for this randomize control trial study. The walking ability of all subjects of both experimental and control group were measured by 10 metre walk test before and after completing treatment.

Mean age of the participants

Experimental Group		Control Group	
Subjects	Age (Year)	Subjects	Age (Year)
E1	26	C1	55
E2	45	C2	67
E3	42	C3	68
E4	46	C4	55
E5	65	C5	50
E6	45	C6	55
Mean Age	**49 years**	**Mean Age**	**58 years**

Table-2: Mean age of the participants of experimental and control group.

Age range among the participants

Among the participants the age distribution of them were 25- 34 years aged were 8%, 35 -44 years aged were 8%, 45-54 years were 34%, 55 – 64 years aged were 25% and 65-74 years aged were 25%.

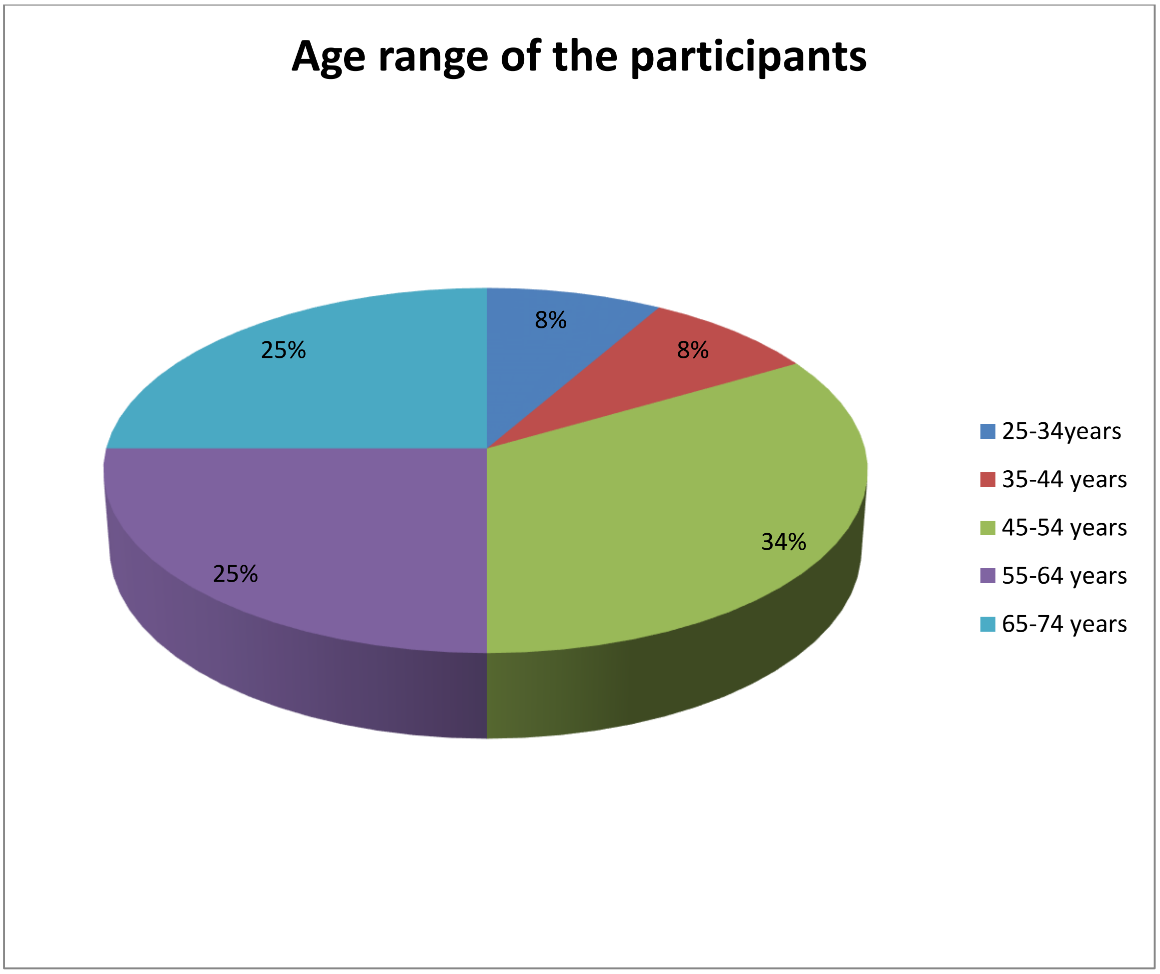

Figure-2: Average age range of the participants

Sex of the participants

12 chronic stroke patients were included as sample of the study, among them almost 66% (n=8) were male and about 34% (n=4) were female.

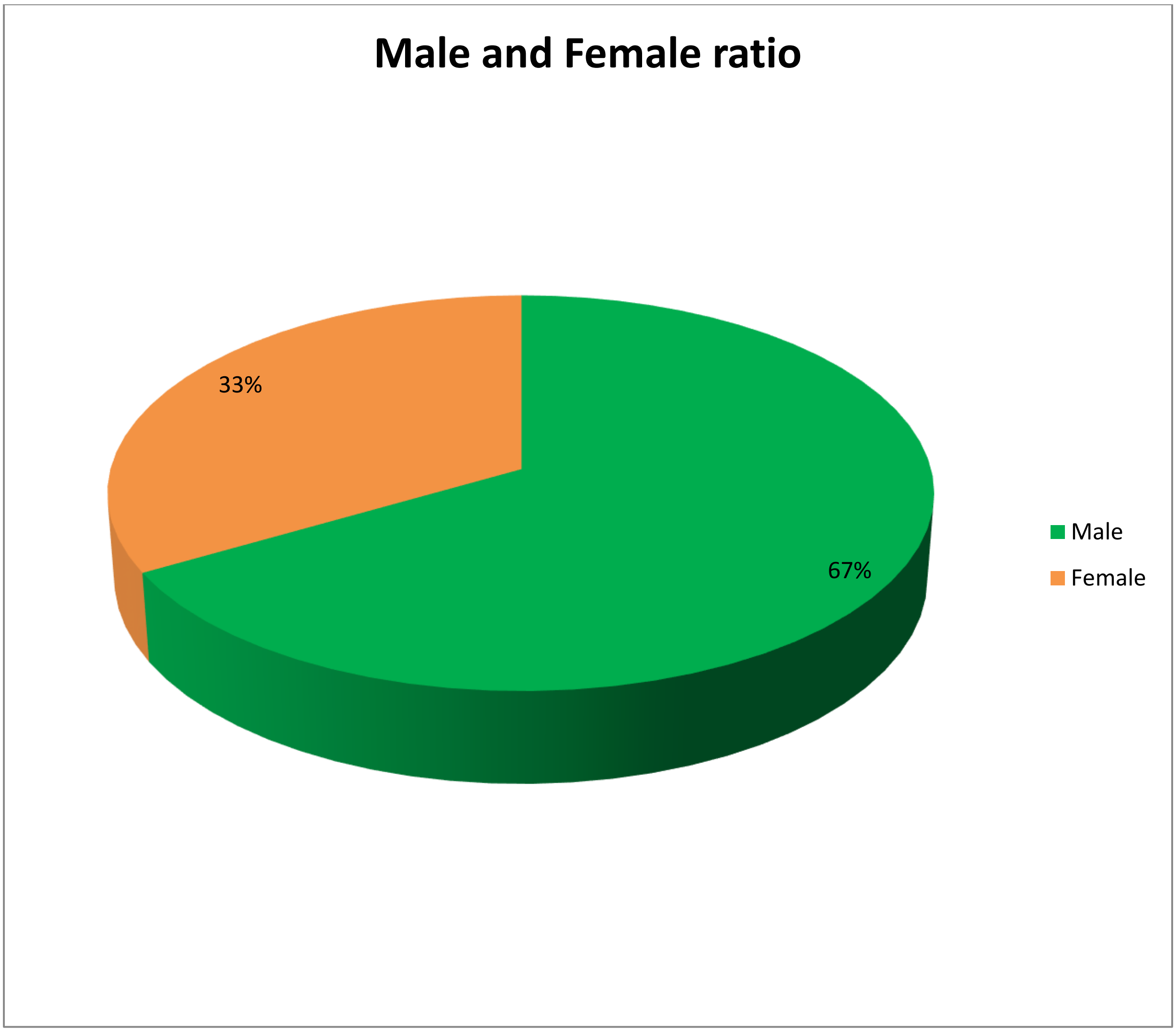

Figure-3: Involvement of the sex

Mean weight of the participants

12 chronic stroke patients were included as sample of the study

Mean age of the participants

Experimental Group		**Control Group**	
Subjects	**Weight (Kg)**	**Subjects**	**Weight (Kg)**
E1	69	C1	72
E2	62	C2	74
E3	65	C3	68
E4	70	C4	56
E5	68	C5	60
E6	75	C6	72
Mean Weight	**68.16 Kg**	**Mean Weight**	**67 Kg**

Table-3: Mean weight of the participants of experimental and control group

From the above table we found that the mean weight of the experimental group was 68.16 kg and mean weight of the control group was 67 kg. So, there was no significant difference between two groups.

Occupation

The study was conducted on 12 participants of chronic stroke patients. Among them (n=4) were businessmen, (n=3) were service holder, (n=3) were house wife, teacher (n=1) and other (n=1) persons.

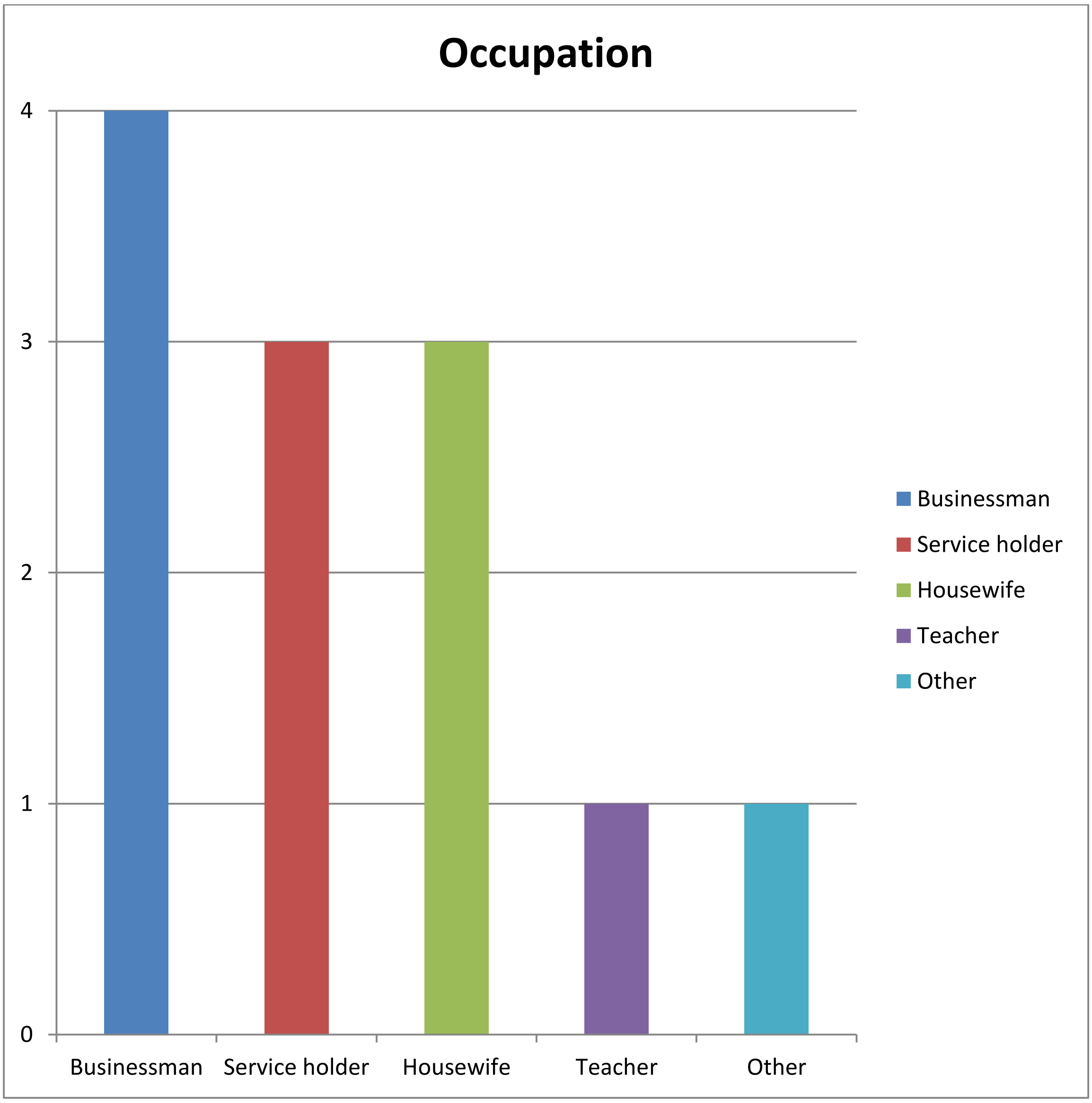

Figure-4: Percentage of occupation of the participants

Side of involvement

12 chronic stroke patients participated in this study. Among them 50% (n=6) patients were in experimental and 50% (n=6) patients were in control group. In experimental group 42% (n=5) were in right side and 8% (n= 1) patient was in left sided paretic and in control group 42% (n= 5) patients were in right and 8% (n=1) was in left sided paretic.

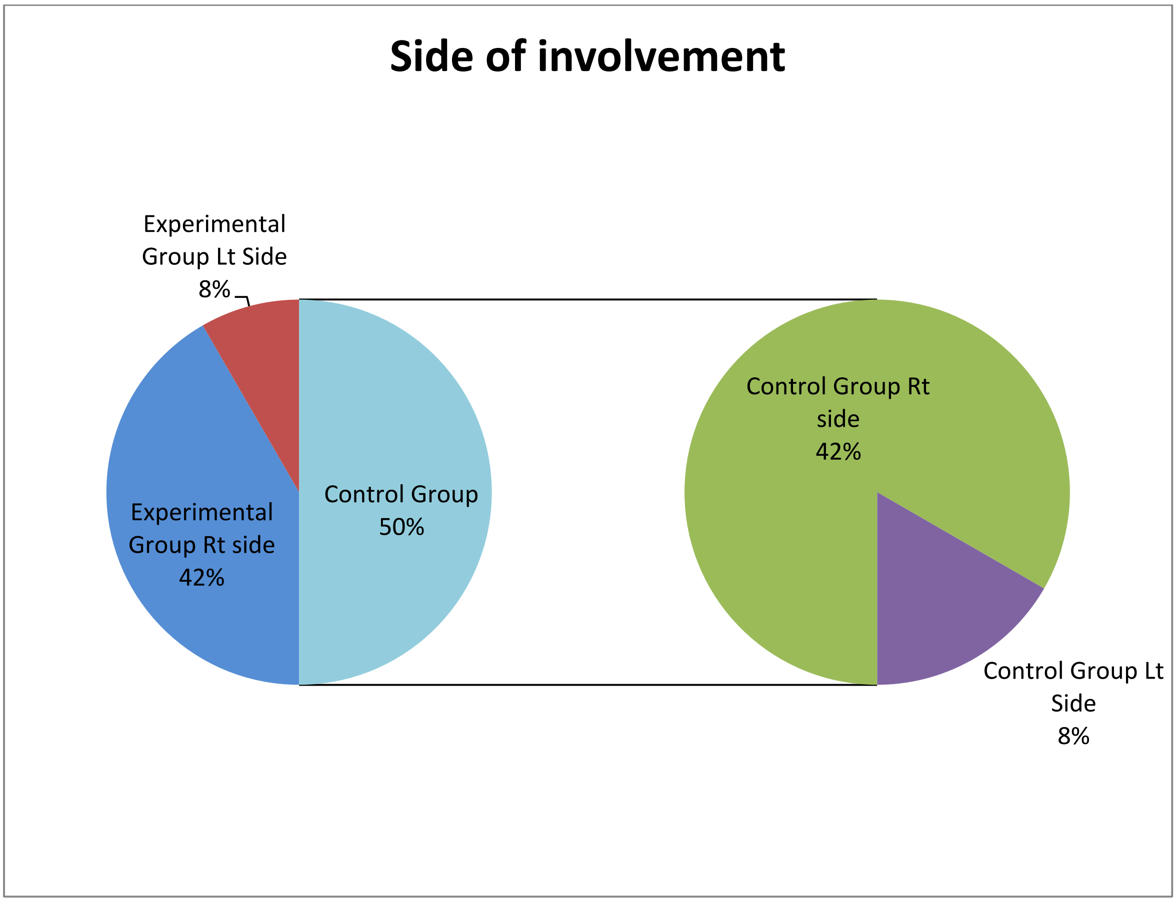

Figure-5: Percentage of the side of Involvement

Type of Stroke

The study was conducted on 12 participants of chronic stroke patients. Among them 54% (n=7) patients were in ischemic and 46% (n=5) patients were in haemorrhagic stroke. In experimental group 3 patients were in ischemic and 3 patients were in haemorrhagic stroke. In control group 4 patients were in ischemic and 2 patients were in haemorrhagic stroke.

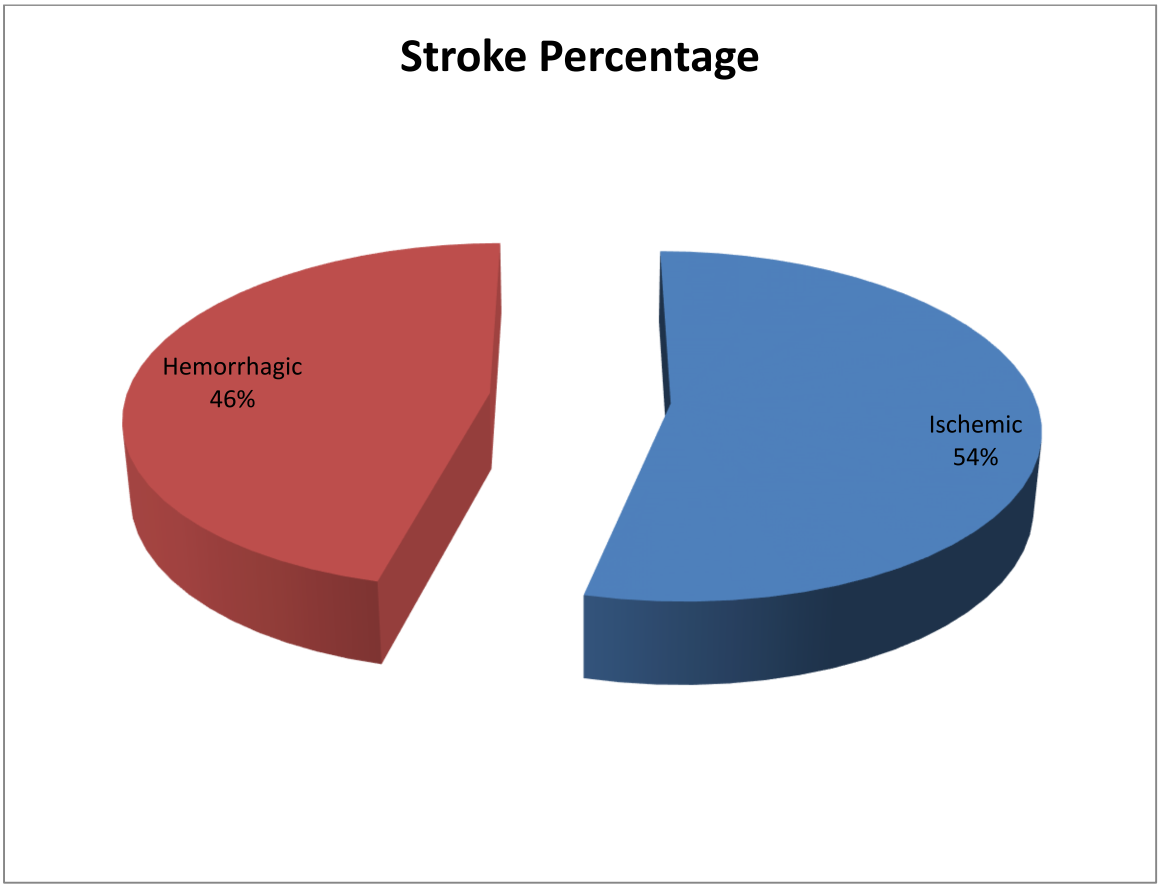

Figure-6: Percentage of the type of stroke among the participants

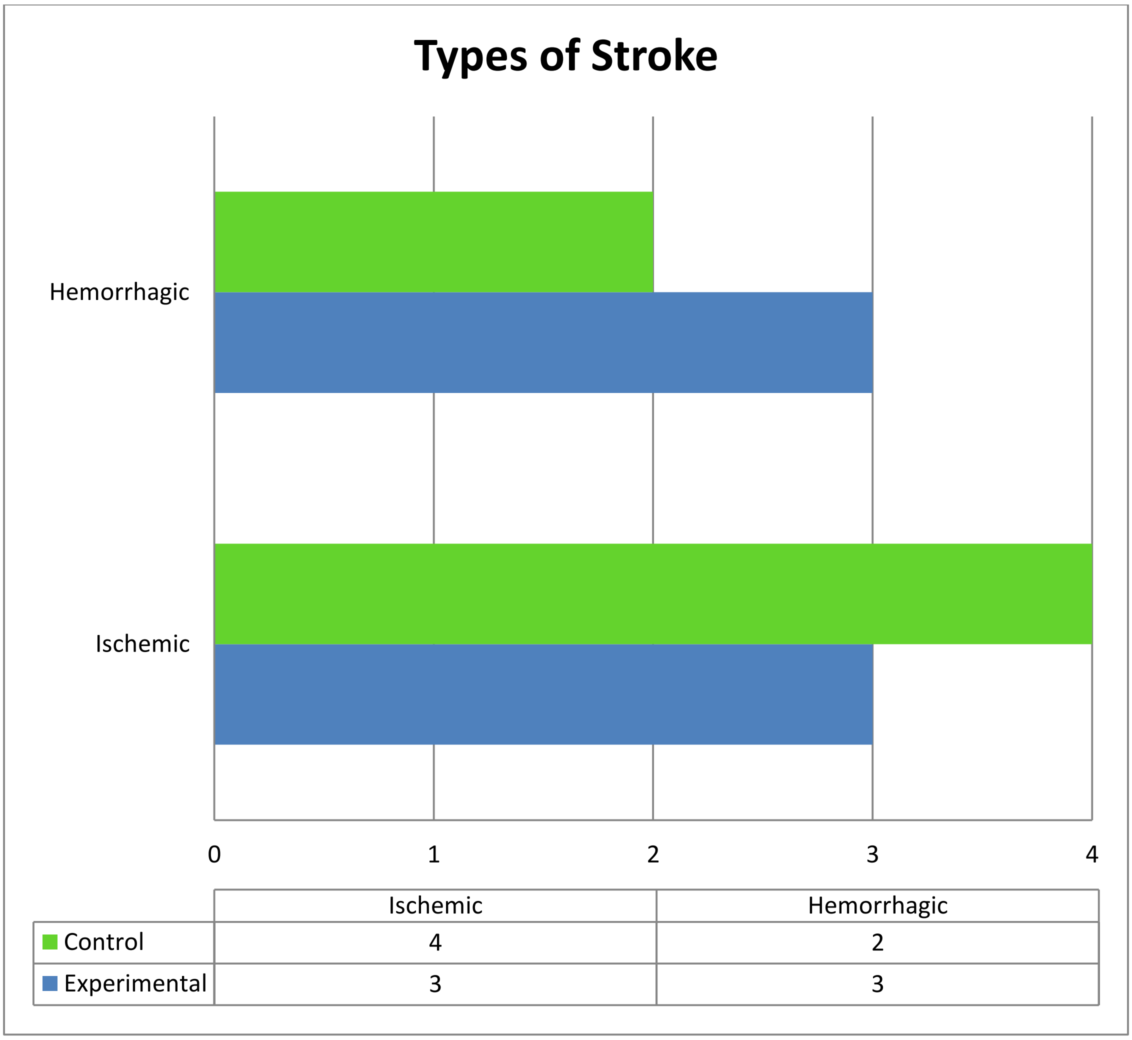

Figure-7: Types of stroke among the participants

Living area

12 chronic stroke patients were included as sample of the study, among them almost 67% (n=8) lived in rural and 33% (n=4) lived in urban.

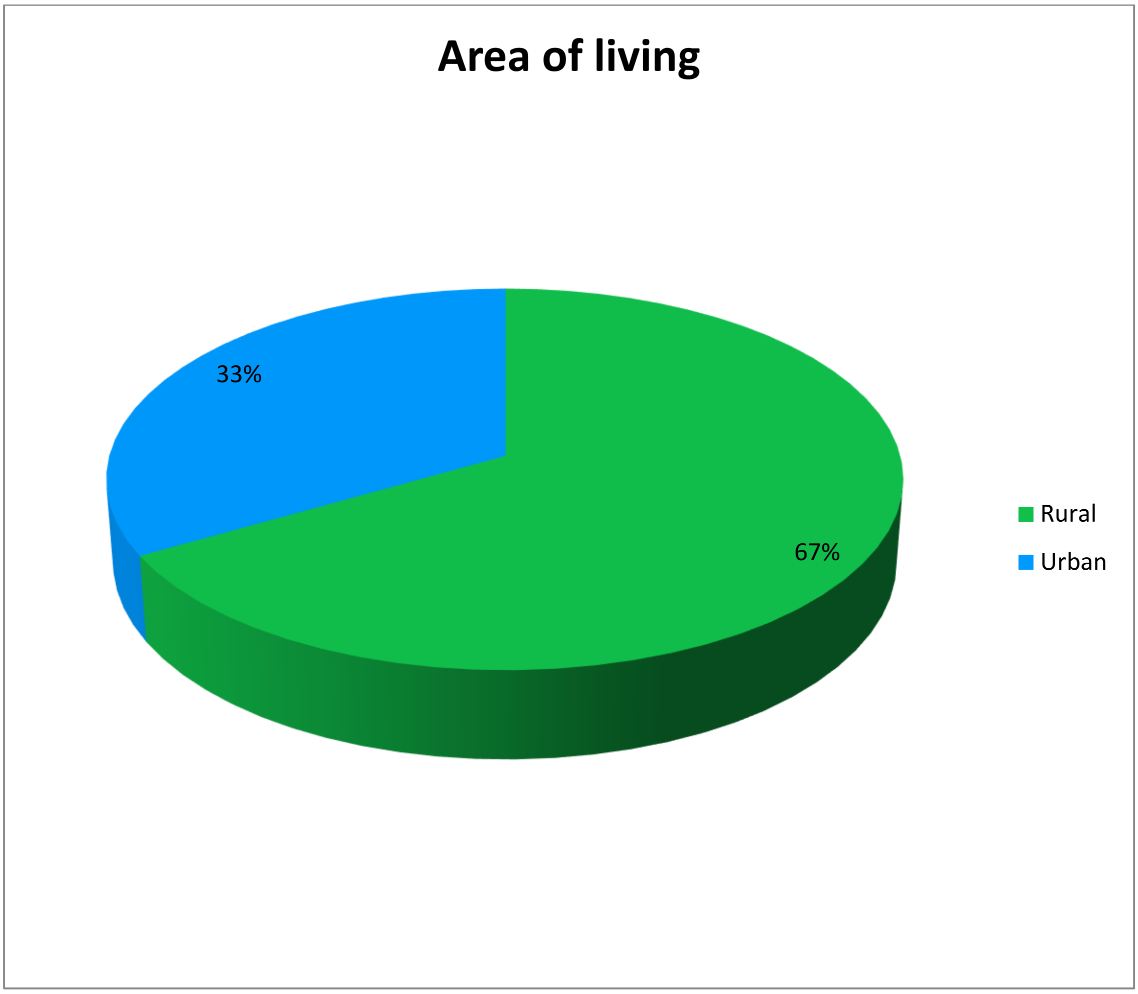

Figure-8: Living area of the participants

Educational level

Among the 12 participants 0% (n=0) participants were illiterate, 8.33% (n=1) participants primary passed, 50% (n=6) participants were S.S.C passed, 33.33% (n=4) participants completed H.S.C level, and only 8.33% (n=1) participant was graduate.

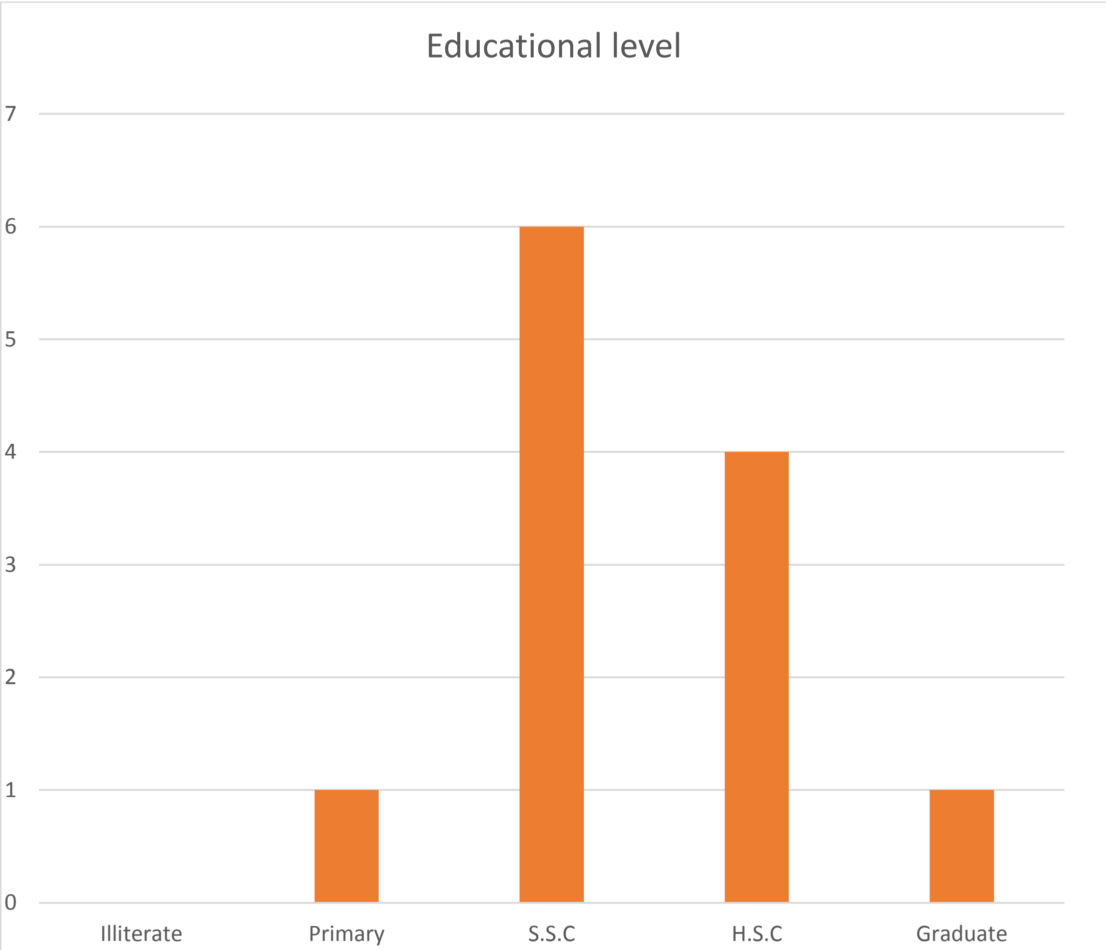

Figure-9: Percentage of educational level of the participants

Duration of incidence of stroke among the participants

12 chronic stroke patients were participated in this study. In control group (n=2) patients were 6 months post stroke, (n=1) were 7 months post stroke, (n=1) was 8 months, (n=2) were 9 months and in experimental group, (n=3) patients were 6 months post stroke, (n=2) were 7 months post stroke, (n=1) patient was 10 month post stroke.

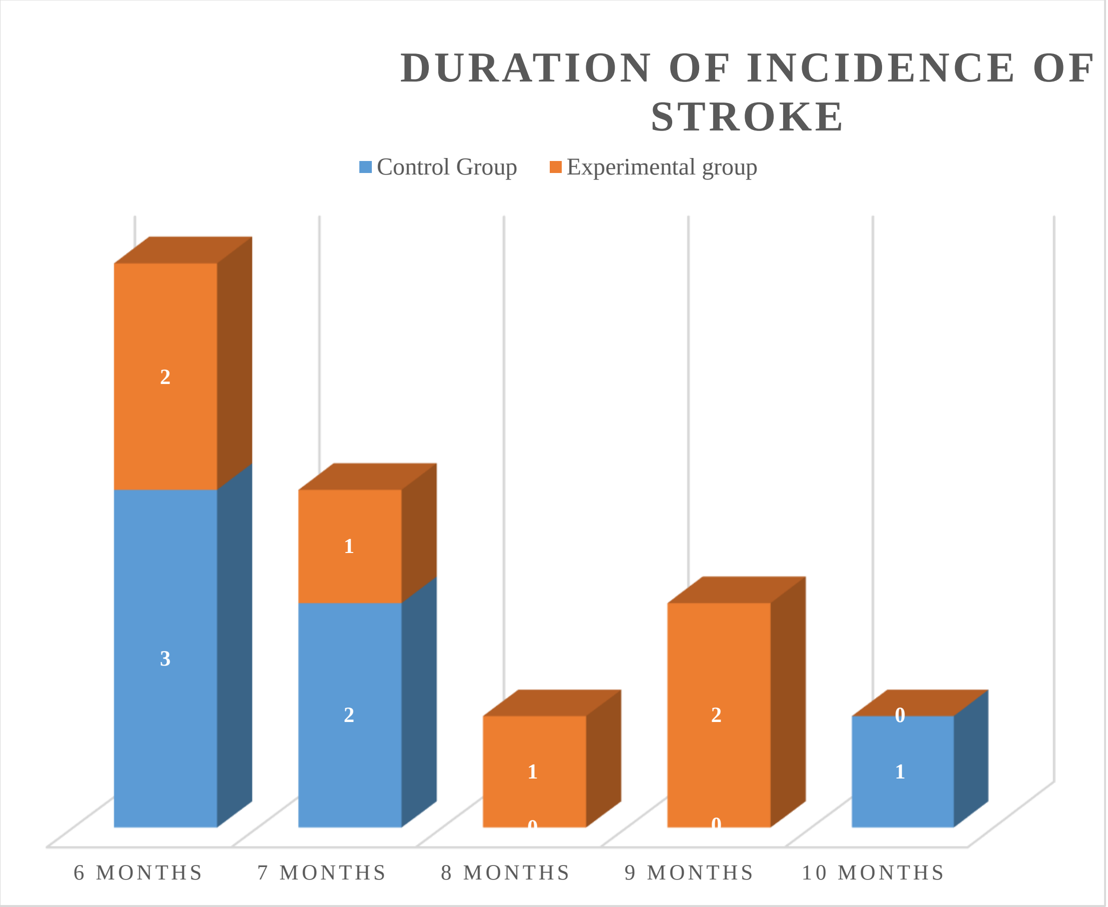

Figure-10: Duration of incidence of stroke among the participants

Physiotherapy treatment received by the participants before the study

Among 12 participants of chronic stroke patients, 83.33% (n=10) patients received >10 sessions, 8.33% (n=1) patient received 7-8 sessions and 8.33% (n=1) patient received physiotherapy treatment.

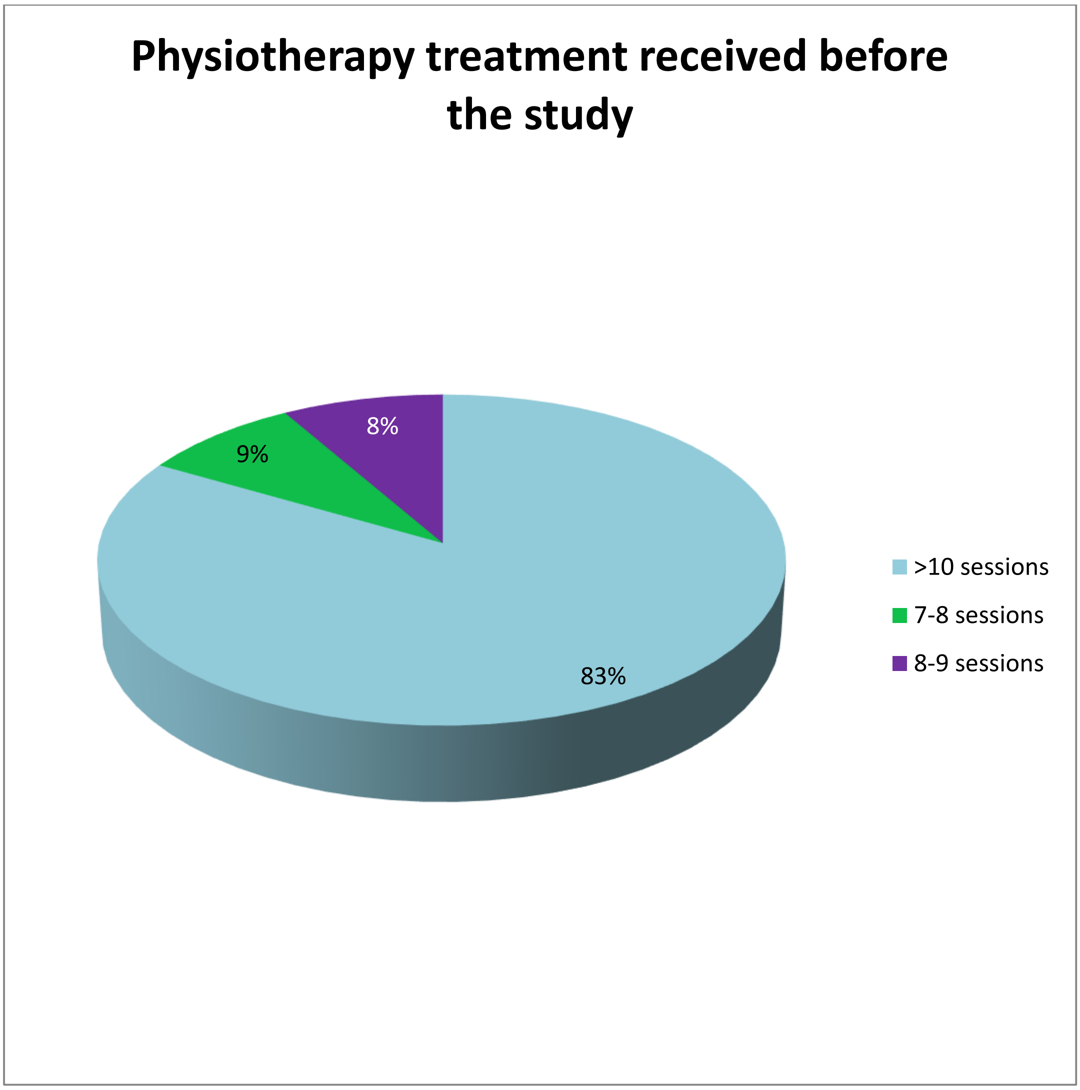

Figure-11: Percentage of the patients who received physiotherapy treatment before the study

Walking ability measurement

10-metre walk test

Control group	seconds	
	Pre-test	Post test
C1	64	54
C2	23	18
C3	47	41
C4	61	50
C5	25	20
C6	22	19
Mean	**40 seconds**	**34 seconds**

Table-4: Mean value of 10-MWT in seconds (control group)

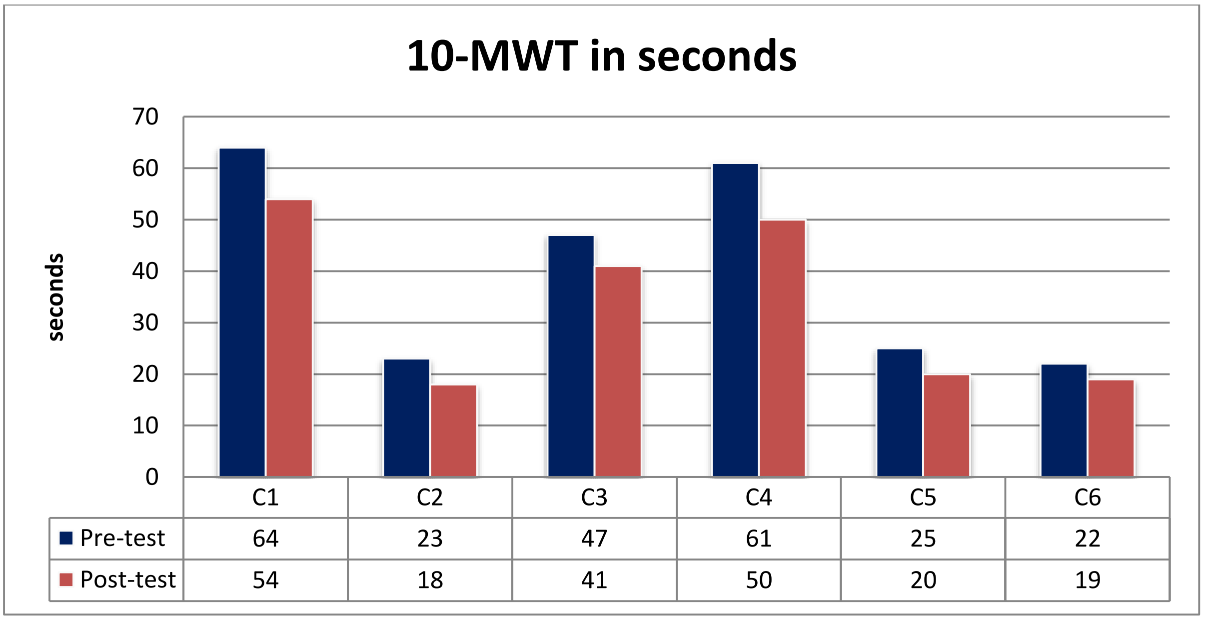

Figure-12: 10-MWT of the control group in seconds

Walking ability measurement

10-metre walk test

Experimental group	**seconds**	
	Pre-test	**Post test**
E1	26	15
E2	37	22
E3	56	27
E4	54	35
E5	27	17
E6	22	16
Mean	**37 sec**	**22 sec**

Table-5: Mean value of 10-MWT in seconds (experimental group)

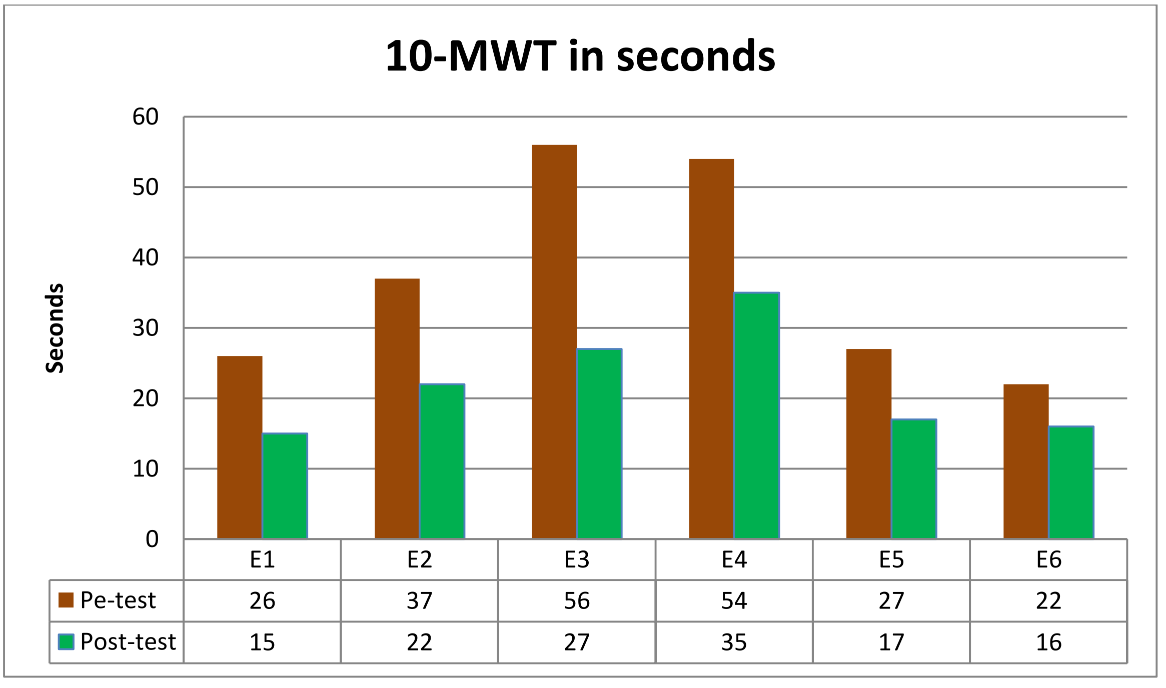

Figure-13: 10-MWT of the experimental group in seconds

10-metre walk test in m/s

Control group	m/s	
	Pre-test	Post test
C1	0.16	0.18
C2	0.44	0.58
C3	0.21	0.24
C4	0.16	0.2
C5	0.4	0.49
C6	0.47	0.55
Mean	**0.31 m/s**	**0.37 m/s**

Table-6: Mean value of 10-MWT in m/s (control group)

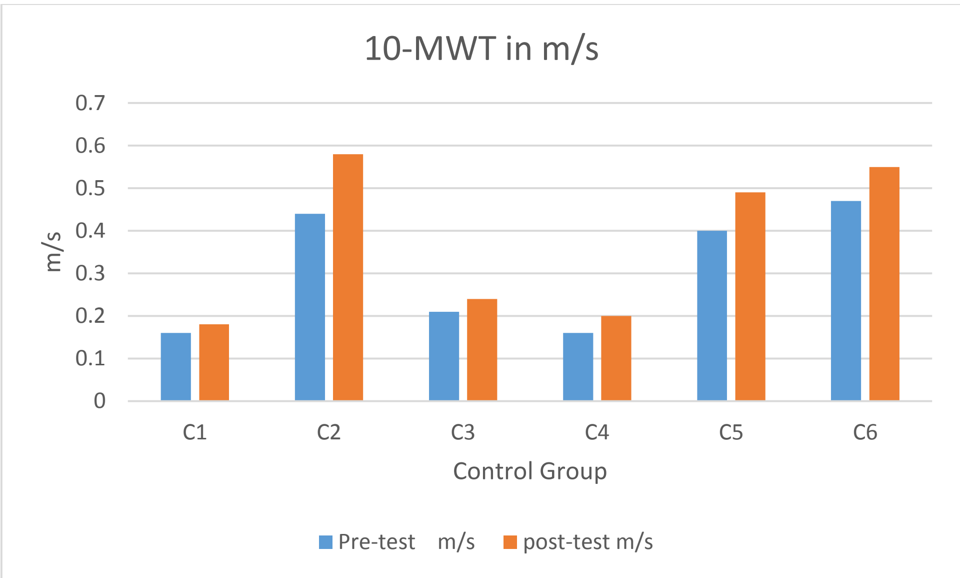

Figure-14: 10-MWT in m/s (control group)

10-metre walk test in m/s

Experimental group	m/s	
	Pre-test	**Post test**
E1	0.39	0.69
E2	0.27	0.44
E3	0.18	0.38
E4	0.18	0.29
E5	0.37	0.61
E6	0.44	0.65
Mean	**0.31 m/s**	**0.53 m/s**

Table-7: Mean value of 10-MWT in m/s (experimental group)

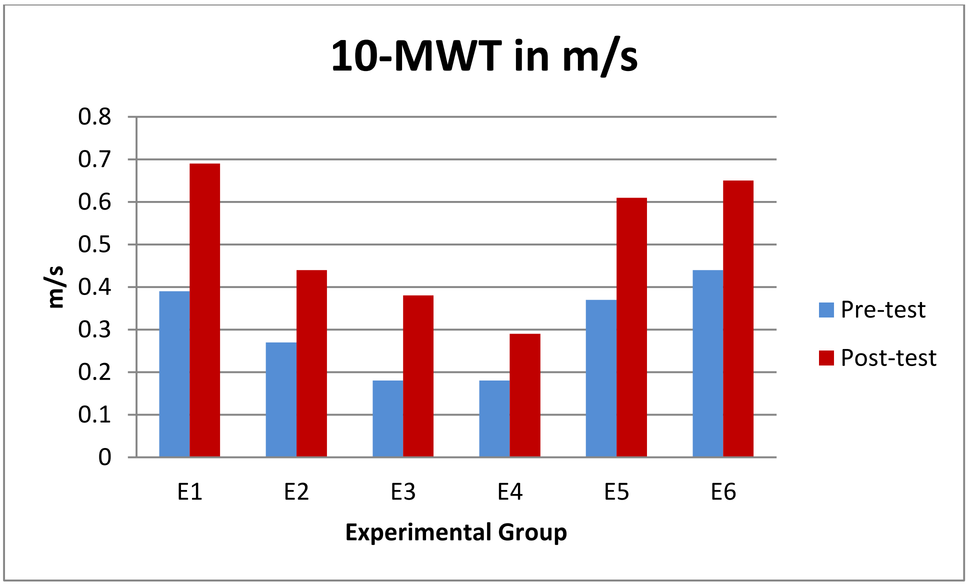

Figure-15: 10-MWT in m/s (experimental group)

Mean difference of 10-MWT in the Control and Experimental Group

Control Group	10 MWT in sec		10 MWT in m/s	
	Pre-test	Post-test	Pre-test	Post-test
Mean	40	34	0.31	0.37
Mean Difference	**6 sec**		**0.06 m/s**	

Table-8: Mean difference of 10-MWT in sec and m/s (control group)

Experimental Group	10 MWT in sec		10 MWT in m/s	
	Pre-test	Post-test	Pre-test	Post-test
Mean	37	22	0.31	0.53
Mean Difference	**15 sec**		**0.22 m/s**	

Table-9: Mean difference of 10-MWT in sec and m/s (Experimental group)

Analysis of t value:

Subject	x_1	X_1^2	Subject	x_2	X_2^2
E1	0.69	0.48	C1	0.18	0.03
E2	0.44	0.19	C2	0.58	0.34
E3	0.38	0.14	C3	0.24	0.06
E4	0.29	0.08	C4	0.2	0.04
E5	0.61	0.37	C5	0.49	0.24
E6	0.65	0.42	C6	0.55	0.30
	$\sum x_1$ = 3.06	$\sum X_1^2$ = 1.68		$\sum x_2$ = 2.24	$\sum X_2^2$ = 1.01

$(\sum x_1)^2$ = 9.36

n_1 = 6

$\bar{x}_1 = \frac{3.06}{6}$ = 0.51

$(\sum x_2)^2$ =5.02

n_2 = 6

$\bar{x}_2 = \frac{2.24}{6}$ = 0.37

Calculating the degree of freedom from the formula:

df = (n_1- 1) + (n_2 - 1) = (6 - 1) + (6 - 1) = 10

Now according to *t* formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum X_1^2 - \frac{(\sum X_1)^2}{n_1}\right) + \left(\sum X_2^2 - \frac{(\sum X_2)^2}{n_2}\right)}{(n_1 - 1) + (n_2 - 1)}} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{0.51 - 0.37}{\sqrt{\frac{\left(1.68 - \frac{9.36}{6}\right) + \left(1.01 - \frac{5.02}{6}\right)}{10}} \times \sqrt{\left(\frac{1}{6} + \frac{1}{6}\right)}}$$

$$t = \frac{0.14}{\sqrt{\frac{1.68 - 1.56 + 1.01 - 0.84}{10}} \times \sqrt{0.34}}$$

$$t = \frac{0.14}{\sqrt{0.029} \times \sqrt{0.34}}$$

$$t = \frac{0.14}{0.10}$$

$$t = 1.40$$

CHAPTER-V DISCUSSION

In chronic stroke patients, improvement of walking ability has been considered an important element for promoting social interaction and for improving quality of life through participation in social as well as daily activities (Lord et al., 2006). This study was conducted to evaluate the effects of Unstable Surface Training (UST) in improving walking ability.

In this experimental study 12 patients with chronic stroke were randomly assigned to the experimental and control group. Among them 6 patients were included in the experimental group who received Unstable Surface Training with conventional physiotherapy and the rest of the 6 patients were included in the control group, who received conventional physiotherapy only. Each group received 8 sessions of physiotherapy treatment within 4 weeks from the outdoor Neurology and stroke rehabilitation unit of CRP, Savar for the improvement. The functional outcome was measured by 10-MWT. Many walking tests are available to assess walking ability in stroke survivors. Walking speed, walking distance and functional mobility measurement is more valid test for measuring walking ability. Gait speed was measured by 10-m walk test (10-MWT).

In this study it was found that among participants the age distribution of them were 25- 34 years aged were 8%, 35 -44 years aged were 8%, 45-54 years were 34%, 55 – 64 years aged were 25% and 65-74 years aged were 25%. The mean age for experimental group was 45 years and control group was 58 years. Age is a factor that provokes the test result.

It was also found that the patients who participated in this study almost 67 % of them were male and 33% of them were female. In this study it was found that the mean weight of the experimental group was 68.16 kilograms and the mean weight of the control group was 67 kilograms. So, weight is not a factor that affects the result. Among the participants 54% patients were in ischemic and 46% (n=5) patients were in haemorrhagic stroke.

The researcher found significant improvement of walking ability of chronic stroke patients. In Experimental group, Mean difference of improving walking ability was 0.53 m/s which was1.4 times more than Mean difference in control group. Bang et al. (2014) suggested that UST is an effective method for improvement of walking ability in chronic stroke patients. In their study, they found significant differences in the TUG and 6-MWT but could not found statistically significant difference in 10-MWT. In this study, a small but not statistically significant improvement has been found. Researcher found t=1.40, p is greater than 0.05 at two tail hypothesis and therefore the result was not statistically significant.

5.1 Limitations

The study was conducted with 12 chronic stroke patients, which was a very small number of samples in both groups and was not sufficient enough for the study to generalize the wider population of this condition. In this study, the researcher could not maintain external validity but maintained internal validity during data collection due to time limitation. It was limited by the fact daily activities of the subject were not monitored which could have influenced. Researcher only explored the effect of UST after 8 sessions, so the long term effect of treatment was not explored in this study. In this study, interventions were given by 4 clinical physiotherapists. So, the inter-rater reliability was not maintained due to lack of time and patient’s availability. The research was carried out in CRP, Savar such a small environment, so it was difficult to keep confidential the aims of the study for blinding procedure. Therefore, single blinding method was used in this study.

CHAPTER-VI CONCLUSION AND RECOMENDATION

6.1 Conclusion

The results of this experimental study indicate that UST (Unstable Surface Training) improved walking ability and suggest the applicability of UST for clinical rehabilitation. In this study the researcher found that the Unstable Surface Training along with conventional therapy is more effective treatment for improving walking ability of stroke patients. Improvement of walking ability in chronic stroke patients increases the opportunities for independent living and social activities. In this study, the researcher suggested that UST can be an effective approach to ensure continuous training after discharge. The UST protocol has a clinical advantage because it is simple and easy. In addition, UST is cost-effective because of the enhanced efficiency achieved by its use in combination with traditional methods. Therefore, the results must be interpreted with the type of foam surface.

6.2 Recommendations

The aim of the study was to find out the effect of Unstable Surface Training among the chronic stroke patients in improving walking ability. However, the study had some limitations. Some steps were identified that might be taken for the better accomplishment for further study. The main recommendations would be as follow:

- Researcher used only 12 participants as the sample of this study, in future the sample size would be more.
- Future studies should examine the time course of changes in walking ability during unstable surface training in larger groups of persons with chronic stroke and should include follow-up testing.
- Researcher used only a measurement tools for walking ability that was not sufficient, further study will be needed with more measurement tools.
- Double blinding procedure should be maintained.
- Interventions should be given by one physiotherapist.
- A specific protocol should be included that in which stage patient will be able to start this exercises in the home.

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APPENDIX-I

Verbal Consent Form

Title: Effect of Unstable Surface Training along with Conventional therapy on Walking Ability in chronic Stroke Patients

Assalamualaikum\ Namashker,

I am Md. Hasanuzzaman, the 4th year B.Sc. (Hon's) in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under Medicine faculty of University of Dhaka. To obtain my Bachelor degree, I shall have to conduct a research and it is a part of my study. The participants are requested to participate in the study after reading the following. My research title is "**Effect of Unstable Surface Training along with Conventional therapy on Walking Ability in chronic Stroke Patients**". Through this study I will find the effect of unstable surface training along with conventional therapy on walking ability of stroke patients. If I can complete the study successfully, the patients may get the benefits of improve neurology outdoor physiotherapy service. To implement my research project, I need to collect data from the musculoskeletal patients. Therefore, you could be one of my valuable subjects for my study.

I am committed that the study will not pose any harm or risk to you. You have the absolute right to withdraw or discontinue at any time without any hesitation or risk. I will keep all the information confidential which I obtained from you and personal identification of the participant would not be published anywhere. If you have any query about the study, you may contact with the researcher Md. Hasanuzzaman or supervisor Muhammad Millat Hossain, Lecturer in physiotherapy department, BHPI, CRP, Savar, Dhaka-1343. Do you have any questions before I start?

So, may I have your consent to proceed with the interview?

☐ = Yes ☐ = No

Signature of the participant & Date……………………………

Signature of the researcher & Date……………………………..

Signature of the witness & Date………………………………..

মৌখিক সম্মতিপত্র

শিরোনামঃ প্রচলিত থেরাপির সাথে বরাবর পরিবর্তনশীল তল(ফোম) এর উপর প্রশিক্ষণ দীর্ঘস্থায়ী স্ট্রোক রোগীদের হাঁটার ক্ষমতার উপর প্রভাব।

আসসালামু আলাইকুম \ নমস্কার,

আমি মোঃ হাসানুজ্জামান, ৪র্থ বর্ষ ঢাকা বিশ্ববিদ্যালয়ের মেডিসিন অনুষদ অধীনে বাংলাদেশ হেল্থ প্রফেশন ইনস্টিটিউট (বিএইচপিআই) এর বিএসসি ফিজিওথেরাপি বিভাগ এর ছাত্র। আমার ব্যাচেলর ডিগ্রী অর্জনের জন্য একটি গবেষণা করতে হবে এবং এটা আমার অধ্যয়নের একটি অংশ। অংশগ্রহণকারীদের নিম্নলিখিত পড়ার পর গবেষণায় অংশগ্রহণের জন্য অনুরোধ করা হয়। আমার গবেষণা শিরোনাম " প্রচলিত থেরাপির সাথে বরাবর পরিবর্তনশীল তল(ফোম) এর উপর প্রশিক্ষণ দীর্ঘস্থায়ী স্ট্রোক রোগীদের হাঁটার ক্ষমতার উপর প্রভাব "। এই গবেষণার মাধ্যমে আমি স্ট্রোক রোগীদের হাঁটার ক্ষমতার উপর প্রচলিত থেরাপির সঙ্গে বরাবর পরিবর্তনশীল তল(ফোম) এর উপর প্রশিক্ষণের কার্যকারিতা খুঁজে বের করার চেষ্টা করবো । আমার গবেষণা সঠিকভাবে শেষ করতে পারলে নিউরলজি বহির্বিভাগ ফিজিওথেরাপি সেবার মাধ্যমে রোগী উপকৃত হবেন। আমার গবেষণা প্রকল্প বাস্তবায়ন করার জন্য, রোগীদের কাছ থেকে তথ্য সংগ্রহ করা প্রয়োজন । অতএব, আপনি আমার অধ্যয়নের জন্য সম্মানিত অংশগ্রহণকারী হতে পারেন।

আমি প্রতিশ্রুতিবদ্ধ যে,আমার গবেষণায় আপনার কোন ক্ষতি বা গুরুতর বিপদ হবে না।আপনার যে কোনো দ্বিধা বা ঝুঁকি ছাড়াই যে কোন সময় নিজেকে এ গবেষণা থেকে প্রত্যাহারের অধিকার আছে। আমি প্রতিশ্রুতিবদ্ধ যে আপনার সকল ব্যক্তিগত সনাক্তকরণ কোথাও প্রকাশ করা হবে না, প্রাপ্ত তথ্য গোপনীয় রাখা হবে। যদি গবেষণা সম্পর্কে আপনার কোনো জিজ্ঞসা থাকে তবে আপনি অনুগ্রহপূবক গবেষক মোঃ হাসানুজ্জামান অথবা নির্দেশক মুহাম্মাদ মিল্লাত হুসাইন, প্রভাষক, ফিজিওথেরাপি বিভাগ, বিএইচপিআই, সিআরপি, সাভার, ঢাকা-১৩৪৩ এ যোগাযোগ করতে পারেন। শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি কি শুরু করতে পারি ?

☐ = হ্যাঁ ☐ = না

অংশগ্রহণকারীর স্বাক্ষর ও তারিখ ....

গবেষকের স্বাক্ষর ও তারিখ ....

সাক্ষীর স্বাক্ষর ও তারিখ ....

APPENDIX-II

Questionnaire

Title: Effect of Unstable Surface Training along with Conventional therapy on Walking Ability in chronic Stroke Patients

Questionnaire (English)

Section-1: Subjective Information

This questionnaire is developed to assessment of walking ability of chronic stroke patients and this section will be filled by physiotherapist using a black coloured ball pen.

Code:

Patient's ID: Date of test:

1. Socio-demographic information:

1.1 Patient's name:

1.2 Address:

Village/House no- Thana-

Post office- District-

Mobile:

1.3 Age: .... years

1.4 Sex: (Tick □ which is appropriate)

□= Male □= Female

1.5 What is your marital status? (Tick □ which is appropriate)

□= Married □= Unmarried

□= Widow □= Divorced

1.6 Weight: .... Kg

1.7 Paretic side: (Tick which is appropriate)

= Right = Left

1.8 Occupation:

1.9 Diagnosis:

1.10 Type of stroke: (Tick which is appropriate)

= Ischemic = Haemorrhagic

1.11 Duration of incidence of stroke: ....months

1.12 Do you have any carer? (Tick which is appropriate)

 = Yes = No

1.13 Living area: (Tick which is appropriate)

 = Rural = Urban = Hill tracks

1.14 What is your educational level? (Tick which is appropriate)

= Illiterate = Primary = S.S.C

= H.S.C = Graduate = Masters and above

1.15 How long you have received physiotherapy treatment? (Tick which is appropriate)

 = 1-2 session = 3-4 session = 5-6 session = 7-8 session

= 8-9 session = > 10 session

Section-2 (Measurement of walking ability)

This questionnaire is designed for assessment of walking ability of chronic stroke patients. Many measures can be used to assess the walking progress of stroke patients, but the measurement of gait speed is particularly useful .To measure the walking ability 10-meter walk test will be used. The most commonly used gait speed test is 10-meter timed walk (10MTW). This section of questionnaire will be filled by the physiotherapist using a black colored ball pen.

10- Meter walk test

Tilson et al.(2010). describe the 10-Meter walk test procedure in the following method.

Procedure:

Description: The 10-Meter Walk Test is a measure of gait speed.

Equipment: Digital stopwatch, masking tape, measuring tape, quiet hallway or open space at least 14 m long

Note: The participant should be wearing flat shoes or shoes with a heel less than 1⁄2 inch.

1. A measured course indoors is established with a length of 14 m. Lines are drawn with tape at 0, 2, 12, and 14 m.

2. With the participant seated, measure the participant's resting heart rate and blood pressure. Do not start the test if the participant's blood pressure is 180/100 mm Hg or his or her heart rate is greater than 100 bpm or 80% of predicted maximum heart rate (estimated as 220- age).

3. Give the participant the following information: "You are going to walk a distance of about 40 feet. We will repeat this distance 2 times. Both times will be completed at your comfortable pace. Do you have any questions?"

4. Have the participant proceed to the start line (0 m). Before the first trial, tell the participant, "You are going to walk at a comfortable pace to the chair. (Use appropriate descriptor of chair/location as needed but do not refer to the tape on

the floor.) Continue walking until I saw ‘STOP.’ The start command will be ‘Ready and go.’”

5. When you and the participant are ready, say, “Ready and Go.’” If the participant starts too early, have him or her start again.

6. Start the stopwatch when the participant’s first foot crosses the plane of the 2-m line, and stops the stopwatch when the participant’s first foot crosses the plane of the 12-m line. Have the participant continue walking until he or she reaches the chair after the 14-m line.

7. Record the time (in seconds to the hundredths) it took for the participant to walk the 10-m distance between the 2-m line and the 12-m line.

8. Have the participant rest, if needed, in the chair at the 14-m line.

9. The participant is going to repeat the exact same procedure as described above at a “comfortable pace,” except he or she will be walking from the 14-m line to the 0-m line. Start the stopwatch at the 12-m line, and stop the stopwatch at the 2-m line.

10. Record the time (in seconds to the hundredths) for the second trial at a “comfortable pace.” The participant can rest, if needed, in the chair at the 0-m line.

11. Take the average measurement of 1st and 2nd measurement of walking.

12. Immediately take the participant’s pulse and blood pressure when he or she is sitting in the chair.

10 meter walk test

Code:

Patient's ID: Date of test:

2.1 Patient's name:

2.2 Age: .... years

2.3 Sex: (Tick □ which is appropriate)

□ = Male □ = Female

2.4 Blood pressure:

2.5 Heart rate:

2.6 Measurement of 10-meter walk test:

10-meter walk test (m/s)	Pre-test	Post-test
1st time walk measurement		
2nd time walk measurement		
Average measurement		

Date: ……………..

Signature of Examiner……………………..

APPENDIX-III: Calculating the t-test

Analysis of t value:

Subject	x_1	X_1^2	Subject	x_2	X_2^2
E1	0.69	0.48	C1	0.18	0.03
E2	0.44	0.19	C2	0.58	0.34
E3	0.38	0.14	C3	0.24	0.06
E4	0.29	0.08	C4	0.2	0.04
E5	0.61	0.37	C5	0.49	0.24
E6	0.65	0.42	C6	0.55	0.30
	$\sum x_1$ = 3.06	$\sum X_1^2$ = 1.68		$\sum x_2$ = 2.24	$\sum X_2^2$ = 1.01

$(\sum x_1)^2$ = 9.36 $(\sum x_2)^2$ =5.02

n_1 = 6 n_2 = 6

$\bar{x}_1 = \frac{3.06}{6}$ = 0.51 $\bar{x}_2 = \frac{2.24}{6}$ = 0.37

Calculating the degree of freedom from the formula:

df = (n_1- 1) + (n_2 - 1) = (6 - 1) + (6 - 1) = 10

Now according to *t* formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum X_1^2 - \frac{(\sum X_1)^2}{n_1}\right) + \left(\sum X_2^2 - \frac{(\sum X_2)^2}{n_2}\right)}{(n_1 - 1) + (n_2 - 1)}} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{0.51 - 0.37}{\sqrt{\frac{\left(1.68 - \frac{9.36}{6}\right) + \left(1.01 - \frac{5.02}{6}\right)}{10}} \times \sqrt{\left(\frac{1}{6} + \frac{1}{6}\right)}}$$

$$t = \frac{0.14}{\sqrt{\frac{1.68 - 1.56 + \ 1.01 - 0.84}{10}} \times \sqrt{0.34}}$$

$$t = \frac{0.14}{\sqrt{0.029} \times \sqrt{0.34}}$$

$$t = \frac{0.14}{0.10}$$

$$t = 1.40$$

11th March, 2015

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralyzed (CRP)

CRP-Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI

Approved please contact with Ms Farjana Sharmin Rumana as a counter part of data collection process.

14/3/15

Mohammad ... Hossain
Associate Professor &
Head of Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343

Subject: Seeking permission for data collection to conduct my research project.

Sir,

With due respect and humble submission to state that I am Md. Hasanuzzaman, student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). The Ethical Committee has approved my research title on "Effect of Unstable Surface Training along with conventional therapy on Walking Ability in chronic Stroke patients" under the supervision of Muhammad Millat Hossain, Lecturer in Physiotherapy department, BHPI. Conducting this research project is partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. I want to collect research data for my research project at Neurology and Stroke rehabilitation unit, CRP, Savar. So, I need permission for data collection from Neurology and Stroke rehabilitation unit. I would like to assure that anything of my study will not be harmful for the participants.

I, therefore, pray and hope that you would be kind enough to grant my application and give me the permission for data collection and oblige thereby.

11/03/15

Rumana
14/03/15

Forwarded for Approval
11/03/15

Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Yours faithfully

Hasanuzzaman
11-03-15

....

Md. Hasanuzzaman
4th year B.Sc. in Physiotherapy
Session: 2009-2010
Bangladesh Health Professions Institute (BHPI)
(An academic Institution of CRP)
CRP-Chapain, Savar, Dhaka- 1343.