EFFECTIVENESS OF MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY ALONG WITH CONVENTIONAL PHYSIOTHERAPY FOR IMPROVEMENT OF UPPER EXTREMITY FUNCTION FOR HEMIPLEGIC PATIENTS WITH STROKE

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

Effectiveness of modified constraint induced movement therapy along with conventional physiotherapy for improvement of upper extremity function for hemiplegic patients with stroke

Submitted by **Md. Shohag Rana**, for the partial fulfilment of the requirement for the degree of Bachelor of Science in Physiotherapy.

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Declaration

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 & Head of Physiotherapy Department, BHPI.

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Acronyms

BHPI	Bangladesh Health Professions Institute
CIMT	Constraint-Induced Movement Therapy
CRP	Centre for the Rehabilitation of the Paralysed
IRB	Institutional Review Board
LE	Lower Extremity
Lt	Left
MAL	Motor Activity Log
MCIMT	Modified Constraint-Induced Movement Therapy
PT	Physiotherapy
RCT	Randomized Control Trail
ROM	Range of Movement
Rt	Right
UE	Upper Extremity
LE	Lower Extremity
TMS	Transcranial Magnetic Stimulation
WHO	World Health Organization

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List of figures & tables

Abstract

Purpose: The purpose of the study was to find out the effectiveness of Modified Constraint Induced Movement Therapy with conventional physiotherapy compare to only conventional physiotherapy for hemiplegic stroke patients. **Objectives:** To compare between the activities of daily living before and after conventional physiotherapy with modified constraint induced movement therapy and conventional physiotherapy alone in patients with hemiplegic. **Methodology:** 10 patients with hemiplegic type of stroke were selected and randomly assigned, 5 patients to the modified constraint induced movement therapy with conventional physiotherapy group and 5 patients to the only conventional physiotherapy group for this randomize control trial study. The study was conducted at neurology department of CRP, Savar. Motor Activity Log (MAL) was used to measure activities of daily living before and after the application of treatment. Data was analysed by using Mann Whitney U test and Statistical Package for the Social Sciences (SPSS) 20 was used to decorate data. **Results:** After observing pre-test and post-test score the significant improvement was found. The study found that the both control group and experimental group showed significant improvement in motor function in Motor activity but the experimental group statistically showed more improvement than the control group. **Conclusion:** This experimental study showed that modified constraint induced movement therapy with conventional physiotherapy is more effective than conventional physiotherapy alone for stroke patients with hemiplegia.

Key words: Stroke, Hemiplegia, Conventional physiotherapy, Modified constraint induced movement therapy.

CHAPTER-I INTRODUCTION

1.1 Background

Constraint-induced movement therapy (CIMT) and modified CIMT (MCIMT) are new strategy that is focused on improving upper extremity motor function, activity and social participation in people with stroke. The CIMT intervention is based on three main elements repetitive, task oriented training; adherence enhancing behavioral strategies; and restraining use of the less affected upper extremity (Nijland et al., 2012). This technique have been advocated as means to improve movement of the UE and functional use of the affected limb among patients post stroke. CIMT and mCIMT involve restraint of the unaffected limb for an extended period and repeated task-specific training of the affected limb. Numerous studies in stroke patients have shown that CIMT/mCIMT can enhance performance of the affected UE during unilateral and bimanual functional tasks (e.g., flipping a light switch, putting on socks) assessed for example, using the Motor Activity Log (MAL) (Wu et al., 2012). Bonifer et al. (2015) reported that CIMT primarily led to improvements in bimanual task performance despite that training was primarily unilateral. Constraint-induced movement therapy (CI therapy) has been found in multiple randomized controlled trials to be effective for rehabilitating upper-extremity function in chronic and sub-acute stroke in adults and cerebral palsy in children from 1 year through adolescence. Case series support the efficacy of CI therapy for rehabilitating upper-extremity function in traumatic brain injury and multiple sclerosis, and lower-extremity function in chronic stroke, traumatic brain injury, and multiple sclerosis. The magnitude of the treatment effect that has been reported, however, has been markedly variable. The upper-extremity CI therapy protocol, as practiced in this laboratory, consists of 4 basic component (1) intensive training of the more affected arm for multiple days; (2) training by shaping (see Interventions section); (3) the transfer package (TP), a set of behavioral techniques to facilitate transfer of therapeutic gains from the treatment setting to daily life; and (4) prolonged motor restriction of the less affected arm (Taub et al., 2013).

Recovery from stroke with effective rehabilitation interventions is an elusive goal. Although intensive rehabilitation therapies such as constraint-induced movement therapy

(CIMT) has not been deployed in routine clinical practice. Slow uptake of CIMT in routine clinical practice has been attributed to its large demand on professional resources and patient compliance, as well as the costs associated with delivering high doses of therapy in a relatively short time. To remediate these limitations, modified versions of CIMT that are less intensive, lower cost, and easier to deliver. Recent work attempted to advance the understanding of modified forms of CIMT by applying this therapy in the home setting. Home CIMT includes the basic elements of CIMT including repetitive training, transfer of activities, and constraint of the non-paretic hand.

The protocol is designed to attempted use of the paretic limb is met with failure and negative reinforcement as the patient had to use the unaffected upper extremity only. The reversal of this learned nonuse and increased paretic limb use in everyday activities increased the level of performance (Tan et al., 2012). CIMT treatment may be an appropriate method to improve sensorimotor recovery after stroke. Most rehabilitation treatments for hemiplegic patients focus on compensatory strategies to promote independence in ADL by any means rather than restoration of UE function. It is suggested that CIMT may be used to overcome learned nonuse and induce cortical reorganization. The theoretical framework for unilateral training was derived from Edward Taub's basic research with monkeys and is based on the behavioral theory of "learned non-use" of the affected limb.

1.2 Rational

Stroke is the leading cause of disability worldwide. Only medical management is not enough for treatment of stroke. For proper treatment, rehabilitation of stroke is needed along with medical treatment by a multidisciplinary team. In developing country like Bangladesh stroke causing death of the victims as there is lack of health care delivery system including rehabilitation is not available. Physiotherapy is a specialized profession which focuses to re-educate normal movement helping the patients to regain the maximum level of independence in their lives as the patients with stroke have experience functional impairment. But many people are not aware about effectiveness of physiotherapy treatment. For this reason, stroke patients are dependent partially or fully on others to perform his activities of daily living properly specially in affected side. The individual functional status varies from patient to patient according to affected side and also depends on individual's functional uses of upper limbs are different. It is very important to find out the how much the patient is recovering functionally of affected upper limb while a physiotherapy management team focuses towards the improvement or the recovery of the functional status of stroke patient, otherwise the outcome of physiotherapy would not be significant. The main aim of physiotherapy treatment is to improve the function especially upper limb. Because by upper limb, all important functional tasks of are performed. Effectiveness of physiotherapy practice is essential to promote functional outcome of stroke patient. Only a few physiotherapist know about the efficacy of constraint induced movement therapy but in many developed countries physiotherapists are applying this treatment. This study also helps to play more attention to perform affected upper limb activity by physiotherapists and to provide important platform for physiotherapists. On the other hand this study would be helpful for professions and professionals of physiotherapy & with this connection to other professionals will have a chance to gather their knowledge from this. It is expected that after this research neuro-physiotherapists will use this treatment.

1.3 Aims

The aim of this study is to evaluate effectiveness of modified constraint induced movement therapy for hemiplegic patients with stroke.

1.4 Objectives

1.4.1 General objective

To estimate the effectiveness of Modified Constraint-Induced Movement Therapy for improvement of upper limb function in hemiplegic patients with stroke.

1.4.2 Specific objectives

i. To find out demographic information about the participants

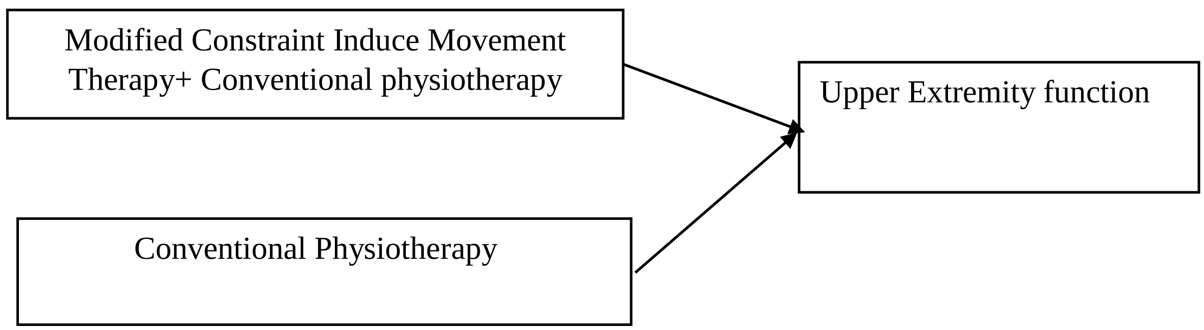
ii. To measure the effect of upper limb function after 2 week intervention by amount scale in Motor Activity Log after introducing MCIT therapy

iii. To measure the effect of upper limb function after 2 week intervention by how well scalee in Motor Activity Log after introducing MCIT therapy

iv. To compare the improvement of affected upper arm function of stroke patients after introducing Modified constraint induced therapy (MCIT)

1.5 Conceptual framework

Independent variable **Dependent variable**



1.6 Hypothesis

Modified constraint induced movement therapy along with conventional physiotherapy is more effective than only conventional physiotherapy on improving of upper extremity function for hemiplegic patients with stroke.

1.7 Null hypothesis

Modified constraint induced movement therapy along with conventional physiotherapy is no more effective than only conventional physiotherapy on of upper extremity function for hemiplegic patients with stroke.

1.8 Operational definition

Stroke: A neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours.

Hemiplegia: Hemiparesis is unilateral paralysis of the entire left or right side of the body (hemi means "half"). Hemiplegia is, in its most severe form, complete paralysis of half of the body.

Constraint-induced movement therapy (CI or CIMT): Constraint-induced movement therapy is a form of rehabilitation therapy that improves upper extremity function in stroke and other central nervous system damage victims by increasing the use of their affected upper by a combination of restraint of the unaffected limb and intensive use of the affected limb.

Motor activity log (MAL): The MAL is a scripted, structured interview to measure real-world upper extremity function. It was developed to measure the effects of constraint-induced movement therapy on the more impaired arm following stroke.

Transcranial magnetic stimulation (TMS): Transcranial magnetic stimulation (TMS) is a noninvasive procedure that uses magnetic fields to stimulate nerve cells in the brain to improve symptoms of depression.

Functional magnetic resonance imaging or functional MRI (fMRI): It is a functional neuroimaging procedure using MRI technology that measures brain activity by detecting changes associated with blood flow. This technique relies on the fact that cerebral blood flow and neuronal activation are coupled.

EXPLICIT Stroke: Explicit-stroke stands for Explaining Plasticity after stroke. It is a collaboration investigating Brain Plasticity in relation to functional recovery of the upper limb after stroke

CHAPTER-II LITARATURE REVIEW

Most stroke patients suffering from hemiparesis have marked limitations in upper-limb function. Stroke patients with arm paresis chiefly use their less paretic upper limb to perform activities of daily living (ADL) (Stefano et al., 2014). However, this prevents further recovery of the upper –limb function. To improve upper limb functions, it is best to use the paretic side more by restraining the less paretic side with a restive device (Brunner et al., 2012).

Functional recovery of upper-extremity function is more difficult than recovery of lower-extremity function, mainly because the patient with stroke and unilateral upper extremity dysfunction may progressively avoid using the more affected arm in favor of the non-paretic upper extremity. Therefore, functional recovery is affected and a learned nonuse phenomenon is formed. To solve this problem, Taub and his colleagues proposed constraint-induced movement therapy (CIMT) in 1993, and it is suggested that CIMT may be used to overcome learned nonuse and induce cortical reorganization. The theoretical framework for unilateral training was derived from Edward Taub's basic research with monkeys and is based on the behavioral theory of "learned non-use" of the affected limb. This learning phenomenon refers to a conditioned suppression of movement. From this conditioning point of view it should be possible to reverse the phenomenon or even to prevent it from happening. Positive results in this regard motivated the introduction of this particular conceptual framework and associated techniques in stroke rehabilitation in humans (Delden et al., 2012).

CIMT is one of the most developed training approaches for motor restoration and is based on a theory of brain plasticity and cortical functional reorganization. Constraint and massed and repeated practice may correct the learned nonuse and then improve functional performance of the more affected upper extremity. CIMT involves massed and intensive practice with the more affected upper extremity and includes 2 components: use of the unaffected upper extremity is restrained during 90% of waking hours, and at the same time, the more affected upper extremity receives repeated and intensive training for 6 hours or more a day. By this means, the use of the more affected arm may be increased, and learned nonuse may be overcome (Shi et al., 2011).

Early after stroke, approximately two-thirds of all patients experience impaired arm function, and only 50% of cognitively intact and medically stable patients obtain satisfactory dexterity in the course of the first three months. Regaining arm function is essential for independency in activities of daily living and contributes to health-related quality of life (Brunner et al., 2012).

Constraint-induced movement therapy (CIMT) is a neuro-rehabilitation approach developed to improve the use of the more affected upper limb after stroke. It is a physical rehabilitation technique that has attracted considerable attention as a means of treating the more-affected upper extremity and overcome learned non-use phenomenon following stroke. CIMT involves the restraint of the less-affected upper extremity over an extended period, in combination with intensive task-related training of the more-affected limb. The original therapy involves inducing the use of the more affected limb by constraining the less affected limb for up to most of waking hours over a two-week period, including two weekends. During this period, repetitive training of the more affected limb using shaping principles is applied for six-hours on each weekday (Nijland et al., 2011). Typical CIMT intervention requires supervised training of the more involved limb for 6–7 h per day over 10 days, with concurrent restraint of the less-involved limb for 90% of the stroke patients' waking hours over the same 2-week period (Wang et al., 2011). In the past two decades, many studies have shown the efficacy of CIMT in treating patients with stroke in both chronic and sub-acute stages. The key element in CIMT therapy is mass practice. Other elements include placing the unaffected arm in restraint, "shaping" (a type of training through which a desired motor objective is approached in small steps of increasing difficulty), and focusing on stimulating the functions that remain, rather than on underlying impairments (Sirtori et al., 2010).

CIMT includes massed practice (i.e., intense, concentrated, repetitive exercises with increasing speed or difficulty following improvements of performance) and the use of the paretic upper limb (Bang et al., 2015).

Although efficacious, CIMT may be difficult to implement, and stroke patients may not wish to participate in the long term restraint of a limb. To minimize this problem, many researchers Brunner et al., (2012) suggested the modified constrained-induced movement therapy (MCIMT), which restrains the less affected side for about 5 hours a day and trains the more affected side for 1-2 hours with intensive and repetitive exercise. Stroke patients also have a compensatory strategy for ADLs. In particular, the trunk compensatory strategy may reflect a habitual response of the central nervous system that was learned during a time in the recovery process when there the task more efficiently. To improve upper-limb function, a decrease in the trunk compensatory strategy is necessary. Recent studies in stroke patients reported that trunk restraint (TR) can promote improvement than an unrestraint trunk in upper-limb functions (Brunner et al., 2012). Reducing the compensatory mechanism by restraining the unnecessary movement may be helpful in relearning the upper-limb movement. However, most of the studies that have been conducted to date have only evaluated the effects of MCIMT on upper-extremity function. Therefore, the study found MCIMT more effective when combined with trunk restraint (MCIMT + TR) in chronic stroke patients' more affected upper-limb function and ADL by using a double-blinded, randomized controlled pilot trial (Bang et al., 2015).

It is accepted that 85% of strokes are due to cerebral infarction, 10% due to primary hemorrhage and 5% due to subarachnoid hemorrhage. The risk of recurrent stroke is 26% within 5 years of a first stroke and 39% by 10 years (Mohan et al., 2011). It is estimated that 75% of strokes occur in elderly patients (Rosamond et al., 2010). In recent studie mortality rates decreased significantly in both high income (37%, 31-41) and low-income and middle income countries (20%, 15-30) (Feigin et al. 2013). Incidence rates in the UK vary depending on the country or region being researched. It can range from 115 per 100,000 population to 150 per 100,000 population depending on the study (Roger et al., 2012). It is estimated that 700,000 people in the United States will experience a stroke each year and that there are over 5 million Americans living with a stroke (Kleinsmith et al., 2011). More than 50% of those 65 years and older who survive a stroke report persistent impairment of upper extremity (UE) movement. They have been encouraged to use their unaffected UE to perform tasks and progressively avoid use of the affected UE during task performance. This behavior may result in learned non-use phenomenon hindering a person's recovery of movement and function in the affected limb. One approach that has shown great promise for enhancing UE motor performance and functional use of the affected UE among patients with stroke is constraint-induced movement therapy (CIMT). The specific techniques of CIMT involve restraining the use of the unaffected UE (6-20h/d for 2-3week) and intense motor training (eg, 6h/d on 10-15 consecutive weekdays) through the use of shaping movements of the affected limb (Taub, 2013). The shaping procedure involves individualized task selection, graduated task difficulty, verbal feedback, prompting, and physically assisting with movements and modeling.CIMT has been widely used in patients with chronic, sub-acute and acute stroke with motor impairment of the unilateral upper extremity. In a recent systematic review, the available evidence about the effects of CIMT demonstrated that compared with other traditional rehabilitative techniques, CIMT could improve functional performance and increase the usage of the more affected upper extremity. However, an increased amount of practice task and longer restraint time may be dangerous for patients during the treatment period. In addition, patients may have difficulty with full compliance for this prolonged practice session; thus, the clinical feasibility of CIMT has been questioned. It has been confirmed that only 32% of patients comply with the CIMT restriction schedule. According to the points mentioned, Page and colleagues designed a modified CIMT that shortens both the intensive training session of the paretic upper extremity (30min/d–2h/d) and the restraint time of the non-paretic upper extremity (6h/d) (Shi et al., 2011).

However, the mature brain's ability to reorganize motor representation in response to novel external and/or internal demands may help diminish impairment after stroke. This plasticity is thought of as an enduring morphological and functional change in neuronal properties, which can occur via modification of synaptic strength, axonal sprouting, and altered synaptic activation. Related research has focused on translating this knowledge to novel rehabilitative approaches that optimize functional recovery after stroke. For example, a series of studies has provided evidence that constraint-induced movement therapy (CIMT) improves motor recovery after stroke. Several small-scale studies applying CIMT in the early phase after stroke have reported superior results compared with standard rehabilitative methods. A large multi-center trial enrolling 222 subjects who had predominantly ischemic strokes within the previous 3 to 9 months (i.e., the Extremity

Constraint Induced Therapy Evaluation [EXCITE] trial) has shown statistically significant and clinically relevant improvements in the motor ability and use of the paretic arm compared with participants receiving usual and customary care. Subjects receiving CIMT within 3 to 9 months post-stroke had greater improvement in motor function compared to subjects receiving identical intervention later than 12 months post-stroke. However, there was no statistical difference in motor function between the 2 groups after 24 months (Wolf et al., 2010). Also some research demonstrate that motor cortical activation and motor recovery after stroke are dynamic processes that depend on the time elapsed from the stroke, motor functional level, site, and size of the lesion. Previous studies applying CIMT in the late phase of stroke recovery have demonstrated expansion of motor maps as measured by transcranial magnetic stimulation (TMS) and also increase in motor map size with early phase CIMT compared to the care (Sawaki et al., 2014).

Studies comparing constraint-induced movement therapy or modified constraint-induced movement therapy with dose-matched control interventions show ambiguous results, especially concerning patients in the acute or sub-acute phase post stroke. In some studies more improvement was found in patients receiving constraint-induced movement therapy or modified constraint-induced movement therapy compared to dose-matched training, while the superiority of these approaches was not corroborated in other studies with patients in the acute or sub-acute phase post stroke. In a recent review it was suggested that a shorter training time per day may be more beneficial for patients in the acute phase, since detrimental effects for higher intensity constraint-induced movement therapy were found when applied very early after stroke (Nijland et al., 2011).

In contrast to the unilateral focus on the affected arm in constraint-induced movement therapy, different bilateral approaches have been developed. The coordinated use of both hands is requested for most manual daily life activities, therefore the training of inter limb coordination is considered important to prepare the patients for a natural use of both hands. It has been proposed that bilateral arm training contributes to a normalization of inhibitory influences of the opposite side hemisphere on the same side and stimulates recovery by activating similar networks in both hemispheres (Coupar et al., 2010). The basis of including constraint-induced movement therapy (CIMT) is aimed at recovery of upper limb function during the first weeks after stroke onset. The early start of MCIMT is mainly based on the suggestion of a limited time window of heightened homeostatic plasticity during the first 3 to 4 weeks post stroke. Neuroplasticity may be augmented by exercise therapy may lead to enhanced recovery. Recovery is a complex process that probably occurs through a combination of spontaneous and learning dependent processes, including restitution, substitution and using compensation strategies with the non-paretic limb (Langhorne et al., 2011).

Kinematic analysis can be used to provide objective, quantitative, fine-grained measures of arm motor impairment after stroke, with the ability to detect differences in movement patterns, which is crucial for a mechanistic understanding of this increasingly popular therapy. The few studies that have assessed kinematics before and after CIMT have shown reduced reaction time, reduced movement duration, increased smoothness, reduced path length and reduced trajectory variability (Kitago et al., 2012).

TMS can be used extensively in humans to evaluate brain reorganization associated with simple motor training or central lesions. Because the effect of time after stroke (chronicity) on this type of plastic change has not been thoroughly investigated, we tested the hypothesis that participants early after stroke (3 to 9 months post-stroke) receiving 2 weeks of CIMT would show an increased TMS motor map volume in the ipsilesional primary motor cortex compared with participants receiving the identical intervention late after stroke (more than 12 months post-stroke) and further hypothesis was done that it increase persists at the 4-month follow-up. It is expected that the degree of map expansion would be positively correlated with improvement in upper extremity motor function (Sawaki et al., 2014).

The therapy also aimed at recovery in terms of neurological repair, by applying an impairment-focused intervention, while preventing the development of compensatory movement strategies. This approach is specified as the approach in the EXPLICIT-stroke MCIMT protocol, referring to the hierarchical levels of the International Classification of Functioning, Disability and Health (ICF). The decision to focus on restoring impairments during the first weeks after stroke in order to regain activities is in line with the review by Langhorne et al. (2011), which discussed the pattern of recovery after stroke, combined with the timing of intervention strategies. Different patterns of reorganization have been described during the acute and sub-acute phases of stroke in functional MRI and positron emission tomography studies. These include wide extension of activation, shifts from primary to secondary motor areas, and recruitment of motor areas of the unaffected hemisphere whereas using specific rehabilitation approaches in patients with chronic stroke, most studies have emphasized activation changes within the primary sensorimotor cortex (SMC) and premotor regions, with improvements that vary partly in relation to damage of the corticospinal tract. Fewer studies have focused on the selective role of the somatosensory cortex (S1) in motor recovery, but correlation analysis of the observed activation shift toward S1 in relation to increases in hand function have not been unsuccessful. It was suggested that the posterior shift of activation toward S1 has no clinical relevance. To date, only 1 study correlated activation change patterns within the secondary somatosensory cortex and ipsilesional premotor cortex with improved hand. In a few studies where fMRI was analysis to study brain reorganization after CIT in patients with stroke, and none of them has included a control group for comparison. Gains in motor function of the affected hand were accompanied by increased activation in the perilesional areas and bilateral association motor cortices. The activation pattern showed a trend toward a reduced laterality index (LI) and a shift in activation toward the contralesional hemisphere. Activation in the affected primary motor cortex (M1), premotor cortex (PMC), and supplementary motor area (SMA) can occur after CIT, whereas increased activation in the unaffected SMA can be also observed for the some patients. Cortical reorganization was positively related to the degree of increase in the use and capability of the affected arm, but the hemispheric fMRI changes remain inconsistent. The results of these fMRI studies varied in patterns of cortical reorganization after CIT. Only a few individual patients tested in some studies partly because of the complicated and expensive measurement technique (Lin et al., 2010).

There has been mounting evidence for the efficacy of forced-use and constraint-induced movement therapy (CIMT) protocols to address the suboptimal recovery of upper-extremity function after stroke which was designed to lift “learned nonuse,” incurred early after the stroke when attempted use of the paretic limb is met with failure and negative reinforcement. The reversal of this learned nonuse and increased paretic limb use in everyday activities has been shown to result from a 2-week protocol of training in the laboratory for 6 h/d, 5 d/wk combined with restraint of the nonparetic limb during 90% of waking hours (Tan et al., 2012).

In a cluster-randomised controlled trial, a total of selected 71 therapy practices in northern Germany that treat adult patients with upper limb dysfunction after stroke. Practices were stratified by region and randomly allocated by an external biometrician (1:1, block size of four) using a computer-generated sequence. 37 practices were randomly assigned to provide 4 weeks of home CIMT and 34 practices to provide 4 weeks of standard therapy. Eligible patients had mild to moderate impairment of arm function at least 6 months after stroke and a friend or family member willing to participate as a non-professional coach. Patients of both groups received 5 h of professional therapist contact in 4 weeks. In the home CIMT group, therapists used the contact time to instruct and supervise patients and coaches in home CIMT. Patients in the standard therapy group received conventional physical or occupational therapy, but additional home training was not obligatory. All assessments were done by masked outcome assessors at baseline, after 4 weeks of intervention, and at 6 month follow-up. The primary outcomes were quality of movement, assessed by the Motor Activity Log (MAL-QOM, assessor-assisted self-reported), and performance time, assessed by the Wolf Motor Function Test (WMFT-PT, assessor-reported). Primary outcomes were tested hierarchically after 4 weeks of intervention and analysed by intention to treat, using mixed linear models. Between July 11, 2011, and June 4, 2013, 85 of 156 enrolled patients were assigned home CIMT and 71 patients were assigned standard therapy. 82 (96%) patients in the home CIMT group and 71 (100%) patients in the standard therapy group completed treatment and were assessed at 4 weeks.

Patients in both groups improved in quality of movement (MAL-QOM; change from baseline 0·56, 95% CI 0·41–0·71, p<0·0001 for home CIMT *vs* 0·31, 0·15–0·46, p=0·0003 for standard therapy). Patients in the home CIMT group improved more than patients in the standard therapy group (between-group difference 0·26, 95% CI 0·05–0·46; p=0·0156). Both groups also improved in motor function performance time (WMFT-PT; change from baseline −25·60%, 95% CI −36·75 to −12·49, p=0·0006 for home CIMT *vs* −27·52%, −38·94 to −13·94, p=0·0004 for standard therapy), but the extent of improvement did not differ between groups (2·65%, −17·94 to 28·40; p=0·8152). Nine adverse events (of which six were serious) were reported in the home CIMT group and ten (of which seven were serious) in the standard therapy group; however, none was deemed related to the study intervention. Home-based CIMT can enhance the perceived use of the stroke-affected arm in daily activities more effectively than conventional therapy, but was not superior with respect to motor function. Further research is needed to confirm whether home CIMT leads to clinically significant improvements and if so to identify patients that are most likely to benefit (Barzel et al., 2015).

A conducted study using a prospective consecutive quasi-experimental study design with twenty patients with spastic hemiplegia (aged 22–67 years) who were tested before and after 2-week modified CIMT in an outpatient rehabilitation clinic and at 6 months. The non-affected arm was put in a restricting position belt for 90% of the patient's waking hours, 7 days per week. The Modified Ashworth Scale (MAS), active range of motion (AROM), grip strength, Motor Activity Log (MAL), Sollerman hand function test, and Box and Block Test (BBT) were used as outcome measures. By that research reductions ($p < 0.05$–0.001) in spasticity (MAS) were seen both after the 2-week training period and at 6-month follow-up. Improvements were also seen in AROM (median change of elbow extension 5°, dorsiflexion of hand 10°), grip strength (20 Newton), and functional use after the 2-week training period (MAL: 1 point; Sollerman test: 8 points; BBT: 4 blocks). The improvements persisted at 6-month follow-up, except for scores on the Sollerman hand function test, which improved further. The study suggests that modified CIMT in an outpatient clinic may reduce spasticity and increase functional use of the affected arm in spastic chronic hemiplegia, with improvements persisting at 6 months (Siebers et al., 2010).

A randomized control trial by published in twenty-one stroke patients were randomly assigned to the CIMT group or control group. Thirteen patients in the CIMT group wore MORO confining the thumb and index finger for at least 5 hours of each day, 7 days a week for 8 weeks. The affected upper extremity function was evaluated using the manual function test (MFT), Purdue Pegboard (PP) score, and motor activity log (MAL) at pre and post-CIMT. Four of the 13 patients in the CIMT group dropped out due to motivational problems, and 9 patients remained in the CIMT group at the end of the study. The patients in the CIMT group showed a mean improvement of 195.8% on MAL. He also stated that a modified restriction schedule based on Page's protocol with 10-week regiment the motor learning researchers have noted that a number of alternative practice schedules can elicit similar outcomes. The modified restriction schedule that was developed stating that the restraint be worn for at least 5 hours of each day, 7 days a week for 8 weeks (Kim et al., 2010).

A randomized controlled trial where 30 stroke patients received 2 hours of mCIMT or traditional rehabilitation (TR) for 3 weeks. Motor control of the upper extremity was evaluated using kinematic analysis in unilateral and bilateral tasks. Kinematic variables included spatial and temporal movement efficiency and type of movement control (preplanned control, representing well-learned movement, or feedback-guided control). Functional outcomes were evaluated using the Motor Activity Log (MAL) and the Functional Independence Measure (FIM). Patients receiving mCIMT showed more temporally (P = .013) and spatially (P = .011) efficient movement and more preplanned movement control (P = .009) during the bimanual task, and greater gains in FIM (P = .004) and MAL scores (amount of use: P < .0001, and quality of movement: P = .012) than patients in the TR group. Patients receiving MCIMT produced more ballistic/preplanned reaching movement than did patients receiving TR (P = .023) during the unilateral task; but there were no group differences in temporal or spatial efficiency in unilateral task performance. Relative to TR, MCIMT produced a greater improvement in functional performance and motor control. Improvement of motor control after MCIMT was based on improved spatial and temporal efficiency, apparently more salient during bimanual rather than unilateral task performance. This suggests that bilateral task performance should potentially be emphasized in kinematic study of changes in motor control after MCIMT (Wu et al., 2011).

Meta-analysis of thirteen RCTs involving 278 patients (modified CIMT/TR=143/135) showed that patients receiving modified CIMT showed higher scores for the Fugl Meyer Assessment (mean difference [MD]=7.8; 95% confidence interval [CI], 4.21-11.38), the Action Research Arm Test (MD=14.15; 95% CI, 10.71-17.59), the FIM (MD=7.00; 95%

CI, .75-13.26), and the Motor Activity Log: Amount of Use (MD=.78; 95% CI, .37-1.19) and Quality of Use (MD=.84; 95% CI, .42-1.25) than patients in the TR group. In kinematic variables, patients receiving modified CIMT had a shorter reaction time and a higher percentage of movement time where peak velocity occurred than patients receiving TR (P<.05), while meta-analysis showed that there was no significant difference in normalized movement time (P=.99), normalized total displacement (P=.44), and normalized movement unit (P=.68). This systematic review provided fairly strong evidence that modified CIMT could reduce the level of disability, improve the ability to use the paretic upper extremity, and enhance spontaneity during movement time, but evidence is still limited about the effectiveness of modified CIMT in kinematic analysis (Shi et al., 2011).

In another randomized control trial eighteen participants with hemiparesis were randomly assigned to Constraint Induced Movement therapy along with Trunk Restrain (TR) or mCIMT. Each group underwent 20 (4 h/d) intervention session (5 d/wk for 4 weeks). Patients were assessed with the action research arm test (ARAT), the Fugl-Meyer assessment upper extremity (FMA-UE), the modified Barthel index (MBI), and the motor activity log (MAL-AOU and MAL-QOM). The mCIMT combined with trunk restraint group exhibited greater changes in the ARAT, FMA, MBI, and MAL (MAL-AOU and MAL-QOM) compared with the mCIMT group. Statistical analyses showed significantly different in ARAT ($Z = –2.17$, $P = 0.03$), FMA-UE ($Z = –2.49$, $P = 0.01$), MBI ($Z = –2.44$, $P = 0.02$), MAL-AOU($Z = –2.17$, $P = 0.03$), and MAL-QOM ($Z = –2.17$, $P = 0.03$) between groups. These finding suggest that MCIMT combined with trunk restraint is more helpful to improve upper-extremity function than MCIMT only in patient with chronic stroke. (Bang et al., 2015).

In another research twelve new chronic stroke patients were treated with CIMT and integrity of PT was measured with transcranial magnetic stimulation. Before therapy, after therapy, and after 6 months, changes in motor function were correlated with differential and percent fMRI signal changes. All patients improved after two weeks of therapy, but only those with intact PT maintained improvement after 6 months. When PT was intact, improvement correlated with first a decrease of activation in SMC and after 6 months with an increase. When PT was affected, improvement consistently correlated with an increase in a lateral extension of SMC. Percent changes of activation were surrounded by differential changes. An intact PT might be advantageous for lasting improvement after CIMT and sub-regions in SMC seem to behave differently during recovery (Rijntjes et al., 2011).

In another study thirty patients in the sub-acute phase post stroke (2–16 weeks) were randomized to modified constraint-induced movement therapy with an emphasis on unimanual tasks, or bimanual task related training, emphasizing bimanual tasks. All trained with a therapist 4 hours a week for four weeks, followed by a 2–3 hours daily self-training program. Patients in the modified constraint induced movement therapy group were supposed to wear a restraining mitt on the unaffected hand for 4 hours a day for four weeks. To measure effectiveness blinded assessments at pre and post treatment and after three months with Action Research Arm Test as a primary outcome measure, Nine-Hole Peg Test and Motor Activity Log was used. Power calculations suggested an inclusion of 60 patients, but due to recruitment difficulties the trial was stopped after an interim analysis at 30 patients. There was no difference in change ($P > 0.05$) between the groups on any of the measures, neither at post treatment nor at follow-up assessments. From pre-intervention to follow-up assessment the modified constraint-induced movement therapy group obtained a mean change score of 17.77 (14.66) on Action Research Arm Test, the bimanual group 15.47 (13.59). So it was found that bimanual training was as effective as modified constraint-induced movement therapy in improving arm motor function. Wearing a mitt seems unnecessary (Brunner et al., 2012).

Most studies of CIMT have used self-reported questionnaires or functional scales that are unable to distinguish between improvements resulting from motor recovery and those attributable to compensation. The primary outcome measures in the largest randomized controlled trial of CIMT to date were a patient questionnaire (Motor Activity Log) and a functional arm test (Wolf Motor Function Test) involving timed and strength tasks. A few studies have also investigated the effect of CIMT on tests of arm impairment in chronic stroke patients, most commonly using the Upper- Extremity Fugl-Meyer Assessment (FM-UE), with variable results. Mean changes in FM-UE scores in these studies ranged from 3 to 19, with the larger changes occurring with lower-intensity, longer-duration treatment protocols and the limitations of the FM-UE as an impairment assessment tool include a ceiling effect in patients with mild deficits and its 3-graded scale, which may limit its responsiveness to change (Kitago et al., 2012). Massie et al., (2009) found that patients used more shoulder abduction to reach after CIMT, which suggests that some of the functional improvements seen with CIMT may be a result of compensatory strategies rather than reacquisition of normal motor control. These prior kinematic studies characterized unrestrained 3-dimensional movements and so did not test patients' abilities to perform tasks under conditions that do not allow the use of compensatory strategies. Indeed, patients may continue to use compensatory habits despite a degree of neural recovery that would actually allow for a more normal movement pattern if they were to attempt it. CIMT is also considered a subgroup of a larger category of interventions termed task-oriented training (TOT), which has emerged as the dominant approach for the restoration of motor function after stroke. Though individual protocols vary, TOT interventions are designed to enhance functional, goal-directed behavior through the application of principles derived from behavioral neuroscience, motor control, and motor learning. An important guiding principle for TOT is that motor learning is an integral mechanism for motor recovery (Tan et al., 2012).

Enhancing recovery from stroke with effective rehabilitation interventions remains an elusive goal. Although intensive rehabilitation therapies such as constraint-induced movement therapy (CIMT) has not been deployed in routine clinical practice. Slow uptake of CIMT in routine clinical practice has been attributed to its large demand on professional resources and patient compliance, as well as the costs associated with delivering high doses of therapy in a relatively short time. To remediate these limitations, modified versions of CIMT that are less intensive, lower cost, and easier to deliver. Recent work attempted to advance the understanding of modified forms of CIMT by applying this therapy in the home setting. Home CIMT includes the basic elements of CIMT including repetitive training, transfer of activities, and constraint of the non-paretic hand. However, Home CIMT attempts to accomplish each of these goals within the individual's home setting under the supervision of a nonprofessional coach. Although study participants were involved in overall goal overall goal setting for their therapeutic program, they only interacted with professional rehabilitation practitioners (Occupational or Physical

Therapists) in 5 visits: 2 initial home visits to set up the program in the first week of a 4-week program and 3 additional sessions to adjust the program during the next 3 weeks. The overall goal was 40 hours of task practice with the paretic arm for a 20-day period (Boyd & Walker, 2016). By applying Constraint-induced movement therapy (CIMT) to train the impaired hand fMRI had shown (functional MRI) activation changes from baseline to post-CIMT, a correlation analysis performed with changes of the Wolf Motor Function Test (WMFT) as a test for the hand function. A close relationship found between increases in hand function and peak changes in activation within the ipsilesional S1. With a better outcome, greater increases in activation within the S1 were evident ($P < .03$; $r = 0.73$) (Laible et al., 2012).Recent advances in stroke rehabilitation research, including constraint-induced movement therapy (CIMT), have the potential to change traditional therapeutic approaches in clinical practice. However, communicating best practices and implementing change remain significant challenges for both researchers and practicing clinicians to overcome (Reiss et al., 2012). A two-group randomized controlled trial with pretreatment and post-treatment measures was conducted where thirteen patients with stroke were randomly assigned to the distributed form of constraint-induced therapy (n = 5) or the control intervention group (n = 8). Outcome measures included the Fugl-Meyer Assessment, the Motor Activity Log, and functional magnetic resonance imaging examination. The number of activation voxels and laterality index were determined from the functional magnetic resonance imaging data for the study of brain reorganization. The distributed form of constraint-induced therapy group exhibited significantly greater improvements in the Fugl-Meyer Assessment and Motor Activity Log than the control intervention group. The functional magnetic resonance imaging data showed that distributed form of constraint induced therapy significantly increased activation in the contralesional hemisphere during movement of the affected and unaffected hand. The control intervention group showed a decrease in primary sensorimotor cortex activation of the ipsilesional hemisphere during movement of the affected hand. The preliminary findings indicate that brain adaptation may be modulated by specific rehabilitation practices, although generalization of the functional magnetic resonance imaging findings is limited by sample size. Further research is needed to identify the specific neural correlates of the behavioral gains achieved after rehabilitation therapies (Lin et al., 2010).

CHAPTER-III METHODLOGY

3.1 Study Design

The study was conducted by using a quantitative randomized control trial design with two different subject groups. The study was randomized control trial between different subject designs. Both groups received a common treatment regimen except one intervention. Only the experimental group received modified constraint induced movement therapy along with conventional physiotherapy while in control group only conventional physiotherapy treatment program was given.

A pretest (before intervention) and post test (after intervention) was administered with each subject of both groups to compare the effects before and after the treatment. The design could be shown by-

r o x o (experimental group)

r o - o (control group)

Flowchart of the phases of randomized controlled trial:-

Hemiplegic stroke patients assessed for eligibility

Randomly selected 10 samples that meets the inclusion criteria

Randomized to Trial or Control Group (n=10)

Experimental Group (n_1=5)

Control Group (n_2=5)

Received constraint induced movement therapy

With Conventional Physiotherapy

Only receives Conventional therapy

Outcome analyzed

CONSORT: A flowchart for a randomized controlled trial of a treatment program including conventional physiotherapy with constraint induced movement therapy for patient with hemiplegic stroke.

3.2 Study area

Physiotherapy neurology outdoor department of Centre for the Rehabilitation of the Paralyzed (Savar), Dhaka-1343.

3.3 Study Population

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 hemiplegic stroke patients.

3.4 Sample selection

Subjects, who met the inclusion criteria, was taken as sample in this study. Ten patients with hemiplegic stroke was selected from outdoor neurology physiotherapy department of CRP (Savar). From the outdoor patients with stoke, 10 patients randomly selected from outdoor neurology unit, CRP and then 5 patients with stroke were randomly assigned to modified constraint induced movement therapy with conventional physiotherapy group and 5 patients to the only conventional physiotherapy group for this randomize control trial study. When the samples was 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 etc for the control and E1, E2, E3 etc for experimental group. Total 10 samples included in this study, among them 5 patients were selected for the experimental group (received constraint induced movement therapy with conventional physiotherapy) and rest 5 patients was selected for control group (conventional physiotherapy only).

3.5 Inclusion criteria

1. Reduced ability to use the hemi-paretic arm (Siebers et al., 2010).
2. Six months or more since stroke (patient had completed primary medical treatment and was currently receiving physiotherapy) (Siebers et al., 2010).
3. Ability to actively extend the wrist at least 20° and to extend the metacarpophalangeal and the interphalangeal joints 10° (ROM will be measured from the resting position of the hand for each patient) (Siebers et al., 2010).
4. Ability to walk and balance safely, without using the non-affected hand, with or without gait aid (patients who used a wheelchair had to be able to operate the wheelchair with their feet) (Siebers et al., 2010).
5. Absence of any serious cognitive deficit or uncontrolled medical problem believed to negatively affect participation during the training period (this criterion was evaluated after consultation with the therapists and the doctor in charge) (Siebers et al., 2010).
6. Ability to understand the content of the training period and motivation to participate (Siebers et al., 2010).
7. Muscle tone is not more than 1 or 1+ in Modified Asworth scale.

3.6 Exclusion criteria

1. Medically unstable patient.
2. Patients with dysarthia
3. Patient with sub-luxed shoulder, shoulder pain, abnormal muscle tone, facial palsy and any deformity that affect normal alignment.
4. Have poor static sitting balance and dynamic sitting balance.
5. Patient with cognitive problem.
6. Patient with typically injured and psychologically unstable.

3.7 Pilot study

Pilot study is a preliminary run of the main study to highlight any problems which can then be corrected and it is important always to run some pilot study before beginning the experiment. So, the researcher performed a pilot study before beginning the main study and the aim of this pilot study was to define the list of conventional physiotherapy treatment is provided by neurology department of CRP for managing the case of hemiplegic stroke. Researcher took one week for pilot study and visited the CRP neurology department of physiotherapy and consulted with relevant qualified physiotherapist. The researcher formulated a list of evidence based physiotherapy interventions for stroke. After finishing the pilot study, researcher became able to find out the conventional physiotherapy interventions used for stroke, with the consent of five clinical physiotherapists. Stretching, balance exercise, co-ordination exercise, pelvic muscle strengthening, standing balance exercise, treadmill walking, cycling were the most commonly used interventions.

3.8 Treatment protocol:

The non-affected arm was put in an elbow bag restricting the use of the arm and keeping the side in position 6 hours, 7 days per week, for 2 weeks. The hand was hold in a comfortable position while permitting quick arm use in unsafe situations. Patients could use their non-affected hand when going to the toilet, bathing, and washing; in potentially unsafe situations; to prevent stiffening of the arm; and when it was impossible to perform a necessary task at home and there was no other person to help. Patients was demonstrated basic ADL from Motor Activity Log (MAL) that the patient should perform wearing elbow bag. The activities that was advised may vary from patient to patient depending on the functional level and after achieving short term goals the tasks would be made difficult according to participants' capabilities for example, speed of performance can be increased. Training tasks are selected separately for each participant depending on: 1) joint movement that shows the most deficit, 2) joint movement that could be improved the most, 3) participants priority tasks that is needed to be done by the participants themselves (Morris et al., 2006). During each physiotherapy session patient would wear elbow bag (except for the activities that needs the use of both arm) and after one hour of physiotherapy session patient would perform specific goal oriented hand activities under close supervision of a physiotherapist for another one hour. During this session patient would be facilitated while performing the activity by the physiotherapist through verbal command, demonstration or assistance if required.

As mentioned earlier, these task may vary from patient to patients and during each sessions new goal oriented tasks would be given. Both patient and caregiver would be educated about the tasks that patient would perform at home for 4 hours by the affected while wearing elbow bag on the unaffected side. From Saturday to Wednesday individualized training program was performed and during weekends when patient would not take physiotherapy treatment at department the duration would be the same (6 hours), but patient would perform activities of daily living for at home while wearing arm restriction (Siebers et al., 2010). Patients and caregivers would be advised to maintain a daily activity log or diary to write down the activities patients performs at home to make sure that patient was performing the tasks.

One typical session of supervised physiotherapy included followings:

Table 1: Supervised physiotherapy and duration

Co-ordination exercise (finger–nose)	10 minutes
Reaching activity (forward-sideways)	10 minutes
Reaching opposite side	5 minutes
Wiping table with cloth	10 minutes
Capping/Uncapping water bottle	10 minutes
Lifting small objects by finger	5 minutes
Picking up glass by hand and trying to drink	5 minutes
Pressing buttons on phone	5 minutes
	Total=60 minutes

3.9 Method of data collection

3.9.1 Data collection tools

A written questionnaire, pen, paper, MAL scale was used as data collection tools in this study.

3.9.2 Questionnaire

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines.

3.9.3 Data collection procedure

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at neurology department of Centre for rehabilitation of the Paralysed (CRP), ten patient was selected by convenience sampling according to the inclusion criteria. Written consent was taken from the patient in presence of qualified physiotherapist. The program modifications included intensive and varied exercise training toward the negative symptoms of spasticity exercises of strength, coordination, and speed. The exercises were arranged according to each patient's phase of motor learning. The Motor Activity Log (MAL) was assessed before and after the training period, but not every day. Data collection tool was written questionnaire, elbow bag, MAL scale. Data will be collected in two sections (i) before applying MCIMT, (ii) after applying MCIMT. At the end of the study, specific test was performed for statistical analysis.

3.10 Ethical consideration

Research proposal was submitted for approval to the administrative bodies of ethical committee. 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.The researcher obtained consent to participate from every subject. A signed informed consent form was received from each participant. The participants were informed that they have the right to meet with outdoor doctor if they think that the treatment is not enough to control the condition or if the condition become worsen. The participants were also informed that they were completely free to decline answering any question during the study and were free to withdraw their consent and terminate participation at any time. 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 senior authority or administration of CRP and have any questioned answer to their satisfaction.

3.12 Data analysis

In order to ensure that the research have some values, the meaning of collected data has to be presented in ways that other research workers can understand. In other words the researcher has to make sense of the results. As the result came from an experiment in this research, data analysis was done with statistical analysis. For the significance of the study, a statistical test was carried out. Statistical analysis refers to the well-defined organization and interpretations of the data by systemic and mathematical procure and rules. The U test was done for the analysis of MAL scale after treatment of both control and trail groups.

Mann-Whitney U test is a non-parametric test that is simply compares the result obtained from the each group to see if they differ significantly. This test can only be used with ordinal or interval/ ratio data.

The formula of Mann-Whitney U test:

$$U = n_1 n_2 + \frac{n_x(n_x + 1)}{2} - T_x$$

n_1= the number of the subjects in trail group

n_2= the number of the subject in control group.

T_x= the larger rank total.

n_x= the number of the subjects of the group with larger rank total.

CHAPTER-IV	**RESULTS**

Ten participants with hemiplegic stroke were taken for this study. Five patients with Modified Constraint Induced Movement therapy technique with conventional physiotherapy was randomly selected for treatment group (experimental group) and another five with conventional physiotherapy treatment group (control group). The all subjects of both experimental and control group scored their activity in Motor Activity Log before and after completing treatment.

Ten patients with hemiplegic stroke were taken for this study. Five patients with Constraint Induced Movement Therapy with conventional physiotherapy treatment group (experimental group) and another five with conventional physiotherapy treatment group (control group). The all subjects of both experimental and control group scored their activity according to Motor Activity Log before and after completing treatment.

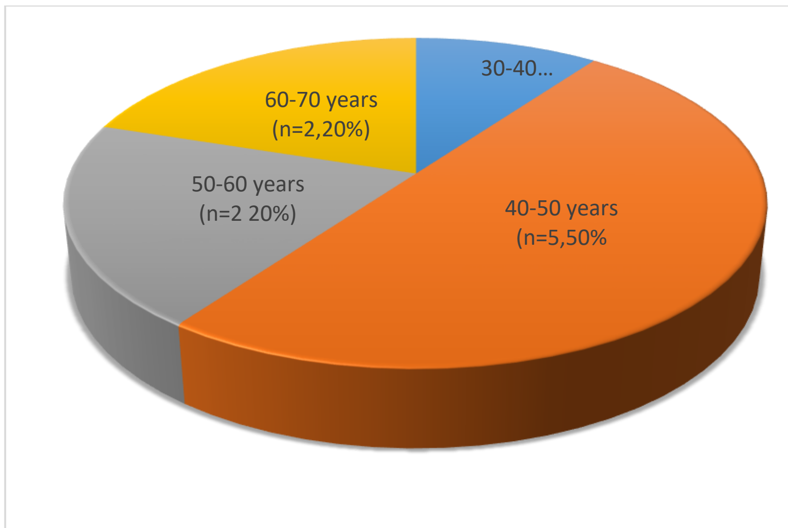
Table 2: Demography of the participants

Variable		n
Gender	Male	9
	Female	1
Affected side	Left	4
	Right	6
Time since hemiplegia	<1 year	2
	1-2 year	7
	>2 year	1

AGE

The study was conducted on 10 participants of hemiplegic stroke patients. Out of the participant the mean age of the participants was 51 years at trial group and 45 years at control group. The minimum age range is 30 years and maximum 66 years.

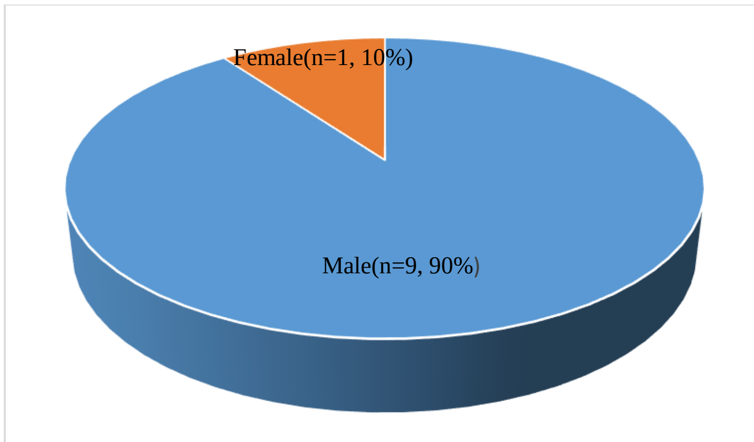
Figure 1: Age of the participants



Sex of the participants

Among 10 patients with hemiplegic stroke 90% (n=9) were male and 10% (n=1) were female.

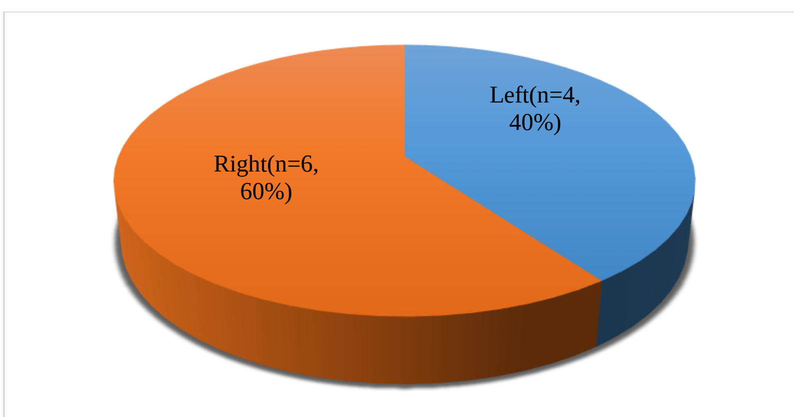
Figure 2: Gender Distribution



Affected side

Among 10 patients with hemiplegic stroke 60% n=6 were left and 40% (n=4) were right side affected

Figure 2: Affected side of the patients



MOTOR ACTIVITY LOG AMOUNT SCALE:

Statistical analysis of motor activity log amount scale are given below:

TURN SWITCH: MAL amount score after two weeks of intervention for experimental group and control group are shown in table 3

EXPERIMENTAL GROUP			CONTROL GROUP		
Subject	Post test score	Rank	Subject	Post test score	Rank
E1	3	9.5	C1	0	2
E2	1	5.5	C2	1	5.5
E3	3	9.5	C3	1	5.5
E4	1	5.5	C4	2	8
E5	0	2	C5	0	2
Total	8	32		4	23

Table 3: MAL amount score after two weeks of intervention for experimental group and control group

Here,

N_1= the number of the subjects in control group= 5

N_2= the number of the subject in experimental group= 5

T_x = the larger rank total =32

n_x= the number of the subjects in the condition with larger rank total. That is control group = 5

$$U = n_1 n_2 + \frac{n_x(n_x+1)}{2} - T_x$$

$=5\times5+\frac{5(5+1)}{2}$ - 32

=8

The U-value is 8. The critical value of U at $p < .05$ is 4. Therefore, the result is not significant at $p < .05$.The Z-Score is 0.83557. The p-value is .20045. The result is not significant at $p < .05$.

Variables in amount scale of MAL were statistically significance at the following level of significance

Table 4: Statistical significance of Motor Activity Log Amount Scale

SN	variable	U VALUE	P VALUE	Level of significance
1	Turn on/off switch	8	.20045	<.01
2	Open drawer	2.5	.02385	<.005
3	Remove an item from drawer	9.5	.52223	<.05
4	Pick up phone	2.5	.02385	<.005
5	Wipe table with cloth	2.5	.02385	<.005
6	Open fridge	2.5	.02385	<.005
7	Open door	10	.33724	<.05
8	TV remote operate	2.5	.02385	<.005
9	Wash hand	11.5	.46017	<.01
10	On/off Water knob	7.5	.17361	<.01
11	Dry hand	2.5	.02385	<.005
12	Put on socks	7	.14917	<.005
13	Put off socks	11.5	.46017	<.01
14	Put on shoe	6.5	.12507	<.005
15	Put off shoe	11.5	.46017	<.01
16	Get up from chair by using armrest	4.5	.05821	<.005
17	Pull away chair from table	9	.26435	<.05
18	Pull towards during sitting	12	.05323	<.01
19	Pick glass or bottle	3	.03852	<.005

20	Brush teeth	12	.50000	<.05
21	Use lotion	2.5	.02385	<.005
22	Use key	12	.50000	<.05
23	Write on paper	8	.83557	<.05
24	Carry object	2.5	.02385	<.005
25	Use spoon	11.5	.46017	<.01
26	Comb hair	2.5	.02385	<.005
27	Pick cup	6.5	.12507	<.01
28	Button shirt	9	.26435	<.05
29	Eat with hand	10.5	.37828	<.05

MOTOR ACTIVITY LOG HOW WELL SCALE:

Statistical analysis of motor activity log how well scale are given below:

TURN SWITCH: MAL how well score after two weeks of intervention for experimental group and control group are shown in table 5

EXPERIMENTAL GROUP			CONTROL GROUP		
Subject	Post test score	Rank	Subject	Post test score	Rank
E1	3	9.5	C1	2	6
E2	2	6	C2	1	2.5
E3	3	9.5	C3	1	2.5
E4	2	6	C4	2	6
E5	0	1	C5	2	6
Total	10	32	Total	8	23

Table 5: MAL how well score after two weeks of intervention for experimental group and control group

Here,

N_1= the number of the subjects in control group= 5

N_2= the number of the subject in experimental group= 5

T_x = the larger rank total =32

n_x= the number of the subjects in the condition with larger rank total. That is control group = 5

$$U = n_1 n_2 + \frac{n_x(n_x+1)}{2} - T_x$$

$$=5\times5+\frac{5(5+1)}{2} - 32$$

$$=8$$

The U-value is 8. The critical value of U at $p < .05$ is 4. Therefore, the result is not significant at $p < .05$. The Z-Score is 0.83557. The p-value is .20045. The result is not significant at $p < .05$.

Variables in the study statistically significance at the following level of significance

Table 6: Statistical significance of Motor Activity Log How Well Scale

SN	variable	U VALUE	P VALUE	Level of significance
1	Turn on/off switch	8	.20045	<.01
2	Open drawer	2.5	.02385	<.005
3	Remove an item from drawer	9.5	.52223	<.05
4	Pick up phone	2.5	.02385	<.005
5	Wipe table with cloth	2.5	.02385	<.005
6	Open fridge	2.5	.02385	<.005

7	Open door	10	.33724	<.05
8	TV remote operate	2.5	.02385	<.005
9	Wash hand	11.5	.46017	<.01
10	On/off Water knob	7.5	.17361	<.01
11	Dry hand	2.5	.02385	<.005
12	Put on socks	7	.14917	<.005
13	Put off socks	11.5	.46017	<.01
14	Put on shoe	6.5	.12507	<.005
15	Put off shoe	11.5	.46017	<.01
16	Get up from chair by using armrest	4.5	.05821	<.005
17	Pull away chair from table	9	.26435	<.05
18	Pull towards during sitting	12	.05323	<.01
19	Pick glass or bottle	3	.03852	<.005
20	Brush teeth	12	.50000	<.05
21	Use lotion	2.5	.02385	<.005
22	Use key	12	.50000	<.05
23	Write on paper	8	.83557	<.05
24	Carry object	2.5	.02385	<.005
25	Use spoon	11.5	.46017	<.01
26	Comb hair	2.5	.02385	<.005
27	Pick cup	6.5	.12507	<.01
28	Button shirt	9	.26435	<.05
29	Eat with hand	10.5	.37828	<.05

Mean difference in MAL score in Control group

The mean difference in MAL Amount scale of the control group was 3.2 and How Well scale was 2.

Table 7: Mean difference in MAL score in Control group

Subject	Amount score		How well score	
	Pretest	Posttest	Pretest	Posttest
C1	39	40	47	47
C2	49	52	52	57
C3	32	34	34	34
C4	17	24	19	24
C5	47	50	59	59
Total	184	200	211	216
Mean	36.8	40	42.2	44.2
Mean difference	3.2		2	

Mean difference in MAL score in Experimental group

The mean difference in MAL Amount scale of the control group was 8.2 and How Well scale was 5.4

Table 8: Mean difference in MAL score in Experimental group

Subject	Amount score		How well score	
	Pretest	Posttest	Pretest	Posttest
E1	64	71	67	73
E2	42	53	63	65
E3	52	61	58	66
E4	31	37	37	39
E5	27	35	33	42
Total	216	257	258	285
Mean	43.2	51.4	51.6	57
Mean difference	8.2		5.4	

Mean difference in MAL score in both groups

The pretest-posttest mean difference in MAL amount score in control group was 3.2 and experimental group was 8.2. The pretest-posttest mean difference in MAL how well score in control group was 2 and in experimental group was 5.4.

Table 9: Mean difference in MAL score in both groups

	Control group	Experimental group
Amount scale	3.2	8.2
How well scale	2	5.4

CHAPTER-V DISCUSSION

The purpose of this study was to evaluate the effectiveness of Modified Constraint Induced Movement Therapy (MCIT) with conventional physiotherapy compare to only conventional physiotherapy for hemiplegic stroke patients. In this experimental study 10 patients with hemiplegic stroke were randomly assigned to the experimental group and to the control group. Among these 10 patients, 5 patients were included in the experimental group who received Modified Constraint Induced Movement Therapy (MCIT) with conventional physiotherapy and the rest of the 5 patients were included in the control group, who received conventional physiotherapy only. In physiotherapy neurology outdoor department of CRP Savar each group attended for 2 hours of physiotherapy treatment but only experimental group received both conventional treatment and Modified Constraint Induced Movement Therapy (MCIT) for a total of six hours including the time of physiotherapy session and at home everyday within two weeks in the in order to demonstrate the improvement. The outcome was measured by using Motor Activity Log which included Amount score and How well score. The pretest-posttest mean difference in MAL amount score in control group was 3.2 and experimental group was 8.2. The pretest-posttest mean difference in MAL how well score in control group was 2 and in experimental group was 5.4. So the result suggested that experimental group receiving both conventional physiotherapy and modified constraint induced movement therapy showed more improvement than the control group receiving only conventional physiotherapy.

The mean difference in MAL amount score in control group was 3.2 and experimental group was 8.2. The mean difference in MAL how well score in control group was 2 and in experimental group was 5.4. So the result suggested that experimental group receiving both conventional physiotherapy and modified constraint induced movement therapy showed more improvement than the control group receiving only conventional physiotherapy.

A randomized control trial by Bang et al. (2015) where 12 hemiplegic patients went under intervention session for four hours per day, five days per week by MCIMT had better improvement in the treatment group than the control group in MAL score. The result represents similarities that experimental group has better improvement in function.

Siebers et al., (2010) conducted a study where 20 hemiplegic patients went under a clinical trial of 2 weeks of CIMT for 90% of waking hours each day and found increase functional use of the affected arm. The results indicates that patients of the experimental group have better improvement of functional activities according to MAL score.

Another study by Kim et al., (2010) MCIMT was used for patients 21 hemiplegic patients were randomly assigned in treatment group and control group where treatment group showed better result for improvement of affected upper extremity function on MAL. The result indicates that on MAL, the experimental group has better improvement.

The patients in the experimental group showed increase use of affected hand than the patients in the control group which can be explained by the compensatory strategy for ADLs. Patients might use the trunk compensatory strategy may reflect a habitual response of the central nervous system that was learned during a time in the recovery process when there was not sufficient motor control or strength to perform the task more efficiently (Brunner et al., 2012).

Result from a 2-week protocol of training for 6 h/d, 5 d/wk combined with restraint of the non-paretic limb during 90% of waking hours also showed significant amount of improvement due forced-use and constraint-induced movement therapy (CIMT) protocols to address the suboptimal recovery of upper-extremity function after stroke. The protocol that was designed to attempted use of the paretic limb is met with failure and negative reinforcement as the patient had to use the unaffected upper extremity only. The reversal of this learned nonuse and increased paretic limb use in everyday activities increased the level of performance (Tan et al., 2012). CIMT treatment may be an appropriate method to improve sensorimotor recovery after stroke. Most rehabilitation treatments for hemiplegic patients focus on compensatory strategies to promote independence in ADL by any means rather than restoration of UE function. Typically, patients are taught to use the unaffected UE and various assistive devices for ADL. In contrast, CIM treatment discourages the use of the unaffected UE and encourages the use of the hemiplegic arm. The goal of this treatment is to maximize or restore motor function. Before the present study, no studies had tested this treatment in the acute phase of stroke recovery during inpatient stroke rehabilitation.

Another study conducted for 16 stroke hemiplegic stroke patients where MCIMT was applied for approximately 2 hours/day, 3 days/week and over a period of 21-day. Patients who received constraint-induced therapy CIT showed more improvement than control group (customary care, ranging from no treatment after formal rehabilitation to pharmacologic or physiotherapeutic interventions). The Mann–Whitney test, demonstrated significant differences in AOU and QOM immediately after treatment and QOM in follow-up in favor of mCIMT in MAL scale (Otadi et al., 2016). Patients in the mCIMT group subjectively reported considerably larger improvements in the use and function of their affected UEs, as measured by the MAL, than those in the traditional rehabilitation group. These MAL scores in the mCIMT group suggested that the learned nonuse phenomenon observed in the patients can be overcome through a modified intensive training and mitt wear schedule emphasizing repeated functional use.

From the literatures used in this study suggest that the main mechanism of CIMT is development of neuroplasticity. The neuroplasticity seems to be developed as a result of repetitive movements by and long-term practice. Synaptic efficiency is increased as a plastic change, presumably involves an increase in, and permits reduction in the excitability of the neuronal connections. Probably CIMT is effective in producing these changes as the patient overcomes the "learned nonuse" and also because it increases the motivation in using of the extremity as CIMT therapy provides opportunities for positively reinforcing the use of the more affected extremity by training the more affected arm and constraining the less affected arm, and adverse consequences for its non-use. Expansion of the contralateral cortical area that controls movement of the more affected extremity occurs and it also cause the recruitment of new ipsilateral areas. This use-dependent cortical reorganization could serve as the neural basis of the permanent increase in the use of the more affected arm. The patients in the experimental group were also very motivated than the control group because the tasks became easier in each different session. These patients were able to pick glass and carry object showed improvements in fine motor control. The effect sizes between post-test and pre-test in the above-mentioned outcome measures were moderate to large in mCIMT.

Current study suggest that modified CIMT is a feasible alternative intervention for patients with upper-extremity dysfunction after stroke because the current study revealed that compared with only conventional physiotherapy, modified CIMT could improve the ability to use the paretic upper extremity, and increase the use of the paretic upper limb in daily living. However, evidence is still limited about the effectiveness of modified CIMT in our country as it is not familiar to all physiotherapists. More RCTs are necessary to confirm the efficacy of this treatment and overcome the limitation of the current trial. More valid outcome measures should be monitored during rehabilitation phase of stroke so that the aims of treatment might focus on improving the paralysed extremity function. Application of modified CIMT might bring a significant change of the health-related quality of life of patients with stroke.

So it can be said that modified constraint induced movement therapy (MCIMT) which includes massed practice (i.e., intense, concentrated, repetitive exercises with increasing speed or difficulty following improvements of performance) and the use of the paretic upper limb is found to be effective for performance improvement of the paretic upper limb (Bang et al., 2015).

The limitation of the study was its short duration and small sample size, The study was conducted with 10 patients of hemiplegic stroke, 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. Not all patients received 5 days of physiotherapy in a week, for these missing therapy days the treatment protocol was focused only on home exercise as supervised physiotherapy was not possible. 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. There was no available research done in this area in Bangladesh. So, there was no relevant information about application of constraint induced movement therapy in Bangladesh.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

The result of this experimental study have identified the effectiveness of conventional physiotherapy with MCIMT are better treatment than the conventional physiotherapy alone for improvement of upper extremity functions for hemiplegic stroke patients. Participants in the experimental group showed a greater benefit than those in the control group, which indicate that the conventional physiotherapy with modified constraint induced movement therapy can be an effective therapeutic approach for patient with hemiplegic stroke.

Constraint induced movement therapy which includes repeated practice of tasks by affected arm may correct the learned nonuse and then improve functional performance of the more affected upper extremity. So it may become helpful for patients with hemiplegic stroke to determine constraint induced movement therapy with conventional physiotherapy as intervention for improving upper extremity function.

From this research the researcher wishes to explore the effectiveness of Constraint Induced Movement therapy with conventional physiotherapy for hemiplegic stroke patient, which will be helpful to facilitate their rehabilitation and to enhance functional activities.

Recommendations

For future studies, the following recommendations may be made:

- A larger sample size may improve the statistical significance of some of the results.
- A longer time frame and long-term follow-up examination may prove valuable in showing the long-term effect of the treatment
- It is recommended that other outcome measurement tools should be used along with MAL scale to find out any other improvements that may occur due to treatment.
- It is also recommended that patient or carer should maintain a diary or log to make sure the patients is performing daily tasks at home.

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APPENDIX

সম্মতিপত্র

আসসালামুয়ালাইকুম, আমি সোহাগ রানা , ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধিভুক্ত বাংলাদেশ হেলথ প্রফেশনস্ ইন্সিটিটিউট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের চূড়ান্ত বর্ষের একজন শিক্ষার্থী। অধ্যায়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। নিম্নোক্ত তথ্যাদি পাঠ করার পর অংশগ্রহণকারীদের গবেষণায় অংশগ্রহনের জন্য অনুরোধ করা হলো।

আমার গবেষণার বিষয় হল **"হেমিপ্লেজিক স্ট্রোক সম্বলিত রোগীদের প্রচলিত ফিজিওথেরাপির সাথে মোডিফাইড কনস্ট্রেইন্ট ইনডিউস থেরাপি এর কার্যকারিতা"**এই পরীক্ষামূলক গবেষণার মাধ্যমে আমি একটি অনুমান পরীক্ষা করব যে, হেমিপ্লেজিক রোগীদের ক্ষেত্রে শুধুমাত্র প্রচলিত ফিজিওথেরাপি অপেক্ষা প্রচলিত ফিজিওথেরাপির সাথে কনস্ট্রেইন্ট ইনডিউস থেরাপি বেশি কার্যকরী। আমার গবেষণার উদ্দেশ্য হলো থেরাপি দেবার পূর্বে ও পরে হাতের কাজ করার ক্ষমতা পরিমাপ করা হবে। আমি যদি আমার গবেষণাটি সার্থক ভাবে সম্পূর্ণ করতে পারি তবে যেসব রোগী হেমিপ্লেজিক স্ট্রোক রোগে ভুগছেন তারা উপকৃত হবেন এবং এটি হবে একটি পরীক্ষামূলক প্রমাণ। গবেষণাটি সম্পাদনের জন্য, আমার তথ্য সংগ্রহ করা প্রয়োজন হবে। গবেষণার ক্ষেত্র বিবেচনা করে আপনার মাঝে আমার গবেষণায় অংশগ্রহণ করার জন্য প্রয়োজনীয় বৈশিষ্ট্য লক্ষ্য করা গেছে। এজন্য, আপনি আমার গবেষণার একজন সম্মানিত অংশগ্রহণকারী হতে পারেন এবং আমি আপনাকে আমার গবেষণায় অংশগ্রহন করতে অনুরোধ জানাচ্ছি।

আমি প্রতিজ্ঞা করছি যে,এই গবেষণা আপনার জন্য ঝুঁকিপূর্ণ হবে না অথবা আপনার কোন ক্ষতি করবে না। গবেষণা চলাকলীন সময়ে কোন রকম দ্বিধা বা ঝুঁকি ছাড়াই যেকোন সময়ে আপনি এটাকে বাদ দিতে পারবেন। এই গবেষণার প্রাপ্ত তথ্য সম্পূর্ণভাবে গোপনীয় থাকবে এবং অংশগ্রহণকারীর ব্যক্তিগত তথ্য অন্য কোথাও প্রকাশ করা হবে না।

যদি আপনার গবেষণা সম্পর্কে কোনো জিজ্ঞসা থাকে তবে আপনি অনুগ্রহপূবক যোগাযোগ করতে পারেন সোহাগ রানা গবেষক, ফিজিওথেরাপি বিভাগ, বিএইচপিআই অথবা এহসানুর রাহমান, সহকারী অধ্যাপক, ফিজিওথেরাপি বিভাগ, বিএইচপিআই, সিআরপি, সাভার, ঢাকা-১৩৪৩ এর সাথে।

শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি কি শুরু করতে পারি ?

☐ হ্যাঁ ☐ না

অংশগ্রহণকারীর স্বাক্ষরও তারিখ ....

তথ্য সংগ্রহকারীরস্বাক্ষর ও তারিখ...

সাক্ষীর স্বাক্ষরও তারিখ ....

Consent Form

Assalamualaikum, I am Shohag Rana, Final Year of B.Sc. in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under the Faculty of Medicine, University of Dhaka. To obtain my Graduation degree, I have to conduct a research project and it is a part of my study. You are requested to participate in the study after a brief of the following.

My research title is “Effectiveness of Modified Constraint-Induced Movement Therapy along with conventional physiotherapy for the improvement of upper extremity function for the hemiplegic patients with stroke”. Through this study I will find the effectiveness of Modified Constraint-Induced Movement Therapy in upper limb function along with other physiotherapy for the treatment of patient with hemiplegic type of stroke. If I can complete this study successfully, patients may get benefits who are suffering from hemiplegic type of stroke .To fulfil my research project, I need to collect data. So, you are requested to participate in this research. I want to meet you a couple of sessions, during your regular therapy schedule. Given that exercises would be pain free and safe for you.

I would like to inform you that this is a purely academic study and will not be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the experiment. You also have the rights to answer a particular question that you don’t like.

If you have any query about the study or right as a participant, you may contact with researcher Shohag Rana, Dept. of Physiotherapy or Ehsanur Rahman, Assistant professor, Dept. of Physiotherapy, BHPI, CPR, Savar, Dhaka-1343.

Do you have any questions before I start?

So, may I have your consent to proceed with the interview? i. Yes ii. No

Signature of Participent and Date……………………………..

Signature of the Data collector and Date……………………..

Signature of the witness……………………………………….

<u>প্রশ্নাবলী (বাংলা)</u>

<u>পর্ব-ক:ব্যক্তিগত তথ্যাবলী</u>

এই প্রশ্নপত্রটি গড়ে তলা হয়েছে হেমিপ্লেজিক স্ট্রোক সম্বলিত রোগীদের জন্য৷ ব্যক্তিগত তথ্যাবলী অংশটি রোগী কিন্তু বিশেষ বিবেচনায় ফিজিওথেরাপিস্ট কালো নীল/ কালি বলপেন দ্বারা পূরণ করবেন৷ সঠিক জবাবটির বাম পার্শে টিক) √ (দিন

রোগীর কোড নং: তারিখ :

১।রোগীর নামঃ রোগের নামঃ

২। বয়স

৩। লিঙ্গ i. পুরুয ii. নারী

৪। ঠিকানা

গ্রাম

পোস্ট অফিস থানা :

জেলা

মোবাইল নম্বর:

৫. স্ট্রোক এ আক্রান্ত হওয়ার সময়কাল

৬. আক্রান্ত পাশ i. ডান ii. বাম

৭. আপনি কি হাসপাতালে প্রতিদিন দুই ঘন্টা করে ফিজিওথেরাপি চিকিৎসা পান?

i. হ্যাঁ
ii. না

৮. আপনি কি বাসায় প্রতিদিন ৪ ঘন্টা করে কনস্ট্রেইন্ট ইনডিউস থেরাপি গ্রহন করেন?

i. হ্যাঁ
ii. না

এম. এ. এল **তারিখ**

সিরিয়াল নং	নির্দেশনা	**পুনরাবৃত্তির স্কেল কেমন?**	**‘ভাল’ এর স্কেল কেমন?**	মন্তব্য
১	বাতির সুইচ চালু করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২	ড্রয়ার খোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৩	ড্রয়ার থেকে কাপড় সরানো	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৪	ফোন ধরা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৫	টেবিল কাপড় দিয়ে মোছা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৬	গাড়ি থেকে বের হওয়া	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৭	ফ্রিজ খোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৮	দরজার হাতল ঘুরিয়ে দরজা খোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৯	টিভি রিমোট ব্যবহার করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১০	নিজের হাত ধোওয়া	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১১	পানির কল বন্ধ করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১২	হাত মোছা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৩	মোজা পরিধান করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৪	মোজা খুলে ফেলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৫	জুতা পরিধান করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৬	জুতা খুলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৭	চেয়াররে হাতল ধরে দাঁড়ানো	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	

১৮	চেয়ার টেবিল থেকে টেনে সরিয়ে বসা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
১৯	চেয়ার নিজের দিকে টেনে বসা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২০	গ্লাস থেকে পানি খাওয়া দাঁত মাজা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২১	দাঁত মাজা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২২	মুখে ক্রিম ব্যাবহার করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৩	চাবি দিয়ে তালা খোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৪	কাগজে কলম দিয়ে লেখা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৫	হাত দিয়ে ওজন বহন করা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৬	চামচ দিয়ে কিছু খাওয়া	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৭	চুল আঁচড়ানো	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৮	কাপের হাতল ধরে কাপ তোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
২৯	শর্টের বোতাম খোলা	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	
৩০	হাত দিয়ে খাবার খাওয়া	০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫	

<u>পুনরাবৃত্তির স্কেল কেমন?</u>

০ – ব্যবহার হয় নি -আপনি কাজ করার জন্য দুর্বল বাহু ব্যবহার করেননি।

১ – খুবই কম – আপনি কাজটি করার জন্য মাঝে মাঝে দুর্বল বাহু ব্যবহার করে,কিন্তু খুব কম।

২ - কম – আপনি খুব কম সময়ে দুর্বল বাহু ব্যবহার করে, কিন্তু বেশির ভাগ সময় শক্তিশালী বাহু দিয়ে কাজটি করেন।

৩ – কখনো কখনো–আপনার দুর্বল বাহু ব্যবহৃত হল্নারতার পরিমাণ শক্তিশালী বাহুর অর্ধেক।

৪ -- প্রায়ই –আপনার দুর্বল বাহুটি ব্যবহৃত হত নিয়মিত, কিন্তু সবল বাহুর তিন-চতুর্থাংশ।

৫ - স্বাভাবিক – আপনার দুর্বল বাহুটি সবল বাহুর মতই ব্যবহৃত হয়েছে।

<u>‘ভাল’ এর স্কেল কেমন?</u>

০ – ব্যবহার হয় নি –কাজের জন্য দুর্বল বাহুটি মোটেও ব্যবহার করে নি।

১ – খুব কম –বাহুতে কাজ করার সামর্থ্য কম। হয়ত কাজের সময় নড়েছে কিন্তু কাজে কোন অবদান নেই।

২ - খারাপ –কাজটি করাতে দুর্বল বাহুর সামান্য অবদান ছিল। তা সক্রিয়ভাবে কাজটি করতে আসে, কিন্তু শক্তিশালী বাহু বা দেখাশুনা কারী বেশি অংশ করে দেয়।

৩ - মোটামোটি- দুর্বল বাহুটি সবসময় কাজে ব্যবহৃত হত, কিন্তু কাজটি ধীরে বা খুব জটিলতার সাথে সম্পন্ন হত।

৪ – প্রায় স্বাভাবিক – স্বাধীণভাবে বাহুটি কাজ করতে পারে, কিন্তু সমস্যা বা জটিলতা দেখা দেয়।

৫ – স্বাভাবিক –দুর্বল বাহুটি স্বাভাবিকভাবেই কাজটি করে।

Questionnaire (English)

SECTION-1: Subjective Information

This questionnaire is developed to measure the effectivenessof Modified Constraint-Induced Movement Therapy on upper extremity function in hemiplegic patients with strokeand this section will be filled by tick (V) mark in the left of point by patients but in special consideration physiotherapist using a black or blue pen.

Code No:

Date:

1. Patients name:

2. Age:

3. Sex:

i. Male

ii. Female

4. Address:

Village:	Post office:
Police station:	District:
Mobile number:	E-mail:

5. Year of Stroke episode:

6. Affected side

i. Right ii. Left

7. Did you take two hour session physiotherapy for every day?

i. Yes ii. No

8. Do you perform Constraint Induced Movement Therapy for 4 hours everyday?

i.Yes ii. No

MAL SCORE: **DATE**

Number	Instruction	Amount score	How well score	Comment
1	Turn on a light with a light switch	5 4 3 2 1 0	5 4 3 2 1 0	
2	Open drawer	5 4 3 2 1 0	5 4 3 2 1 0	
3	Remove an item of clothing from a drawer	5 4 3 2 1 0	5 4 3 2 1 0	
4	Pick up phone	5 4 3 2 1 0	5 4 3 2 1 0	
5	Wipe off a table with cloth	5 4 3 2 1 0	5 4 3 2 1 0	
6	Get out of a car	5 4 3 2 1 0	5 4 3 2 1 0	
7	Open refrigerator	5 4 3 2 1 0	5 4 3 2 1 0	
8	Open a door by turning a door knob/ Handle	5 4 3 2 1 0	5 4 3 2 1 0	
9	Use a TV remote control	5 4 3 2 1 0	5 4 3 2 1 0	
10	Wash your hands	5 4 3 2 1 0	5 4 3 2 1 0	
11	Turning water on/off with knob/lever on faucet	5 4 3 2 1 0	5 4 3 2 1 0	
12	Wipe your hand	5 4 3 2 1 0	5 4 3 2 1 0	
13	Put on your socks	5 4 3 2 1 0	5 4 3 2 1 0	
14	Take off your socks	5 4 3 2 1 0	5 4 3 2 1 0	
15	Put on your shoes	5 4 3 2 1 0	5 4 3 2 1 0	
16	Take off your shoes	5 4 3 2 1 0	5 4 3 2 1 0	
17	Get up from a chair with armrests	5 4 3 2 1 0	5 4 3 2 1 0	

18	Pull chair away from table before sitting down	5 4 3 2 1 0	5 4 3 2 1 0	
19	Pull chair toward table after sitting down	5 4 3 2 1 0	5 4 3 2 1 0	
20	Pick up a glass, bottle, drinking cup	5 4 3 2 1 0	5 4 3 2 1 0	
21	Brush your teeth	5 4 3 2 1 0	5 4 3 2 1 0	
22	Put on cream or lotion, or shaving cream on face	5 4 3 2 1 0	5 4 3 2 1 0	
23	Use a key to unlock a lock	5 4 3 2 1 0	5 4 3 2 1 0	
24	Write on paper	5 4 3 2 1 0	5 4 3 2 1 0	
25	Carry an object in your hand	5 4 3 2 1 0	5 4 3 2 1 0	
26	Use a fork or spoon for eating	5 4 3 2 1 0	5 4 3 2 1 0	
27	Comb your hair	5 4 3 2 1 0	5 4 3 2 1 0	
28	Pick up a cup by a handle	5 4 3 2 1 0	5 4 3 2 1 0	
29	Button a shirt	5 4 3 2 1 0	5 4 3 2 1 0	
30	Eat with hands (finger foods)	5 4 3 2 1 0	5 4 3 2 1 0	

Amount Scale (AS)

0 - Did not use my weaker arm (**not used**).

1 - Occasionally used my weaker arm, but only very rarely **(very rarely).**

2 - Sometimes used my weaker arm but did the activity **most of the time** with my stronger arm**(rarely).**

3 - Used my weaker arm about half as much as before the stroke **(half pre-stroke).**

4 - Used my weaker arm almost as much as before the stroke **(3/4 pre-stroke).**

5 - Used my weaker arm as often as before the stroke **(same as pre-stroke).**

How Well Scale (HW)

0 - The weaker arm was not used at all for that activity **(never).**

1 - The weaker arm was moved during that activity but was not helpful **(very poor).**

2 - The weaker arm was of some use during that activity but needed some help from the stronger arm or moved very slowly or with difficulty **(poor).**

3 - The weaker arm was used for the purpose indicated but movements were slow or were made with only some effort **(fair).**

4 - The movements made by the weaker arm were almost normal, but were not quite as fast or accurate as normal **(almost normal).**

5 - The ability to use the weaker arm for that activity was as good as before the stroke **(normal).**

Modified Ashworth Scale Testing Form

Name:____ Date:___________

Muscle Tested	Score
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0 No increase in tone No increase in muscle tone

1 (Slight increase in tone giving a catch when the limb
was moved in flexion or extension
Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the
end of the range of motion when the affected part(s) is moved in flexion or extension

1+ Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout
the reminder (less than half) of the ROM (range of movement)

2 More marked increase in tone but limb easily flexed More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved

3 Considerable increase in tone - passive movement
difficult Considerable increase in muscle tone passive, movement difficult

4 Limb rigid in flexion or extension Affected part(s) rigid in flexion or extension

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনষ্টিটিউট (বিএইচপিআই)

BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)

(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/04/17/85

Date: 05/04/2017

To
Md. Shohag Rana
4th year Bachelor of Science in Physiotherapy (B.Sc PT)
Department of Physiotherapy
Session: 2011-2012, DU Reg. No.: 1707
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – "Effectiveness of Modified Constraint Induced Movement Therapy Along With Conventional Physiotherapy for Improvement of Upper Extremity Function for Hemiplegic Patients With Stroke".

Dear Md. Shohag Rana,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on February 17, 2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.

Since the study involves answering a "Motor Activity Log" questionnaire that takes 20 to 30 minutes and have no likelihood of any harm to the participants and have possibility of benefit patients in their pain management and rehabilitation, the members of the Ethics committee has approved the study to be conducted in the presented form at the meeting held at 08:30 AM on February 25, 2016 at BHPI.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Millathossain

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343. Tel: 02-7745464-5, 7741404 , Fax: 02-7745069,
Email: contact@crp-bangladesh.org, www.crp-bangladesh.org

Permission Letter

August 25, 2016

Head of Physiotherapy Department,

Center for Rehabilitation of the Paralyzed,

Savar, Dhaka-1343.

Subject: Prayer for permission to collect data from Neurology department to conduct a research project.

Sir,

I respectfully state that I am Shohag Rana, a student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). In 4th year course curriculum I have to do a research project. I have chosen a research title that is "Effectiveness of Modified Constraint Induced Movement Therapy Along With Conventional Physiotherapy For Improvement Of Upper Extremity Function For Hemiplegic Patients With Stroke" under my honorable supervisor Ehsanur Rahman, Associate Professor, Bangladesh Health Professions Institute (BHPI). Now, I have to collect data from the department of Neurology for which I want your kind approval. I 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 permission for data collection from the Neurology department and oblige thereby.

Yours faithfully

Shohag Rana

Shohag Rana

Roll:05

Session: 2011-2012

4th year B.Sc. in Physiotherapy

BHPI, CRP-Chapain

Savar, Dhaka-1343

Forwarded to
Head of Dept, PT
E. Rahman
25.08.16

Forwarded
27/08/16
Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Approved
27/08/16
Mohammad Anwar Hossain
Associate Professor &
Head of Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343