Faculty of Medicine

University of Dhaka

"Effectiveness of Task-Oriented Circuit Training in Improving Upper Extremity Motor Recovery of Post Stroke Patients"

Md. Ismam Hasan

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

DU Roll No: 1135

DU Reg. No: 8667

BHPI, CRP, Savar, Dhaka-1343

Bangladesh Health Professions Institute (BHPI)

Department of Physiotherapy

CRP, Savar, Dhaka-1343, Bangladesh

[September, 2023]

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

“Effectiveness of Task-Oriented Circuit Training in Improving Upper Extremity Motor Recovery of Post Stroke Patients”

Submitted by **Md. Ismam Hasan** for partial fulfillment of the requirements for the Degree of Bachelor of Science in Physiotherapy (B. Sc. PT).

………………….

Dr. Mohammad Anwar Hossain, PhD
Associate Professor, Department of Physiotherapy, BHPI
Senior Consultant & Head of the Department of Physiotherapy
CRP, Savar, Dhaka
Supervisor

…………………………......

Prof. Md. Obaidul Haque
Vice Principal
BHPI, CRP, Savar, Dhaka

………………………….……

Asma Islam
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

Approved date: /11/202

DECLEARATION

I am **Md. Ismam Hasan**; In my research project, I affirm that I take full responsibility for any errors and declare that no part of the study will cause harm to others. All sources used in the study have been appropriately cited. Therefore, any mistakes in the project are solely mine, and I am accountable for the accuracy and integrity of the entire study

Signature: **Date:**

Md. Ismam Hasan

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

DU Roll No: 1135

DU Reg. No: 8667

Session: 2017-18

BHPI, CRP, Savar, Dhaka-1343

DEDICATION

Dedicated to

..

.... My ever loving and supporting Mother.

Nargis Akter

CONTENTS

LIST OF TABLE

APPENDIX

List of Acronyms

Abbreviation	Elaboration
ARAT	Action arm research test
BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralysed
DF	Degree of freedom
DM	Diabetes mellitus
HTN	Hypertension
ROM	Range of motion
SPSS	Statistical Package for Social Sciences

ACKNOWLEDGEMENT

I conducted my study under the Physiotherapy Department of Bangladesh Health Professions Institute. Firstly, I would like to express my gratitude to God for providing me with the necessary abilities, patience, passion, focus, concentration, and intelligence to complete the study successfully within the given time frame. I am also thankful to my family members for their support and encouragement during the critical times of the study.

The completion of this project would not have been possible without the invaluable assistance of my teachers. I extend my deepest gratitude to my esteemed supervisor, **Dr. Mohammad Anwar Hossain, PhD** Associate Professor of BHPI and Department Head of the Physiotherapy department at CRP, Savar. His excellent guidance throughout the entire research project, along with the permission to collect data from the neurology unit, has been crucial to its success. Additionally, I express sincere thanks to **Prof. Md. Obaidul Haque,** Vice-Principal of BHPI, **Farjana Sharmin**, Lecturer of BHPI and consultant & OPD in charge, **Asma Islam,** assistant professor, BHPI for their kind support and motivation.

I want to extend my appreciation to **Ummay Salma, Safa Tun Noor**, and **Arnob Datta** for serving as a constant source of inspiration and providing valuable assistance throughout my study. Their unwavering support and encouragement in various situations have been instrumental in my success, and special thanks to **Engr. Md. Hasan Mahmud.** I am truly thankful for their contributions. I would like to express my sincere gratitude to all the participants in this study for their cooperation. My heartfelt thanks and best wishes go to everyone who played a role, whether directly or indirectly, in supporting me throughout the research process. Without their assistance, conducting this study would not have been possible.

ABSTRACT

Purpose: The purpose of this study was to determine the effectiveness of task-oriented circuit training on upper limb rehabilitation of stroke patients.

Objectives: The research study focuses on evaluating the effectiveness of Task-oriented circuit training in combination with conventional physiotherapy for stroke patients. Four specific objectives are outlined: firstly, to assess the improvement in upper limb function; secondly, to measure the enhancement in the range of motion of upper limbs; thirdly, to analyze the impact on the independence of daily living activities; and fourthly, to investigate the influence of socio-demographic factors such as age, gender, education level, and socio-economic status on post-stroke patients. By addressing these objectives, the study aims to provide valuable insights in to the most effective rehabilitation strategies for stroke patients, considering both physical interventions and individuals socio-demographic factors.

Methodology: This research was conducted employing a randomized controlled design the efficacy of Task –oriented circuit training in conjunction with conventional physiotherapy for augmenting upper limb function in stroke patients.

The measurement tools utilized for gauging the impact on upper limb function caused by stroke encompassed the Action Research Arm Test (ARAT), Barthel Index Scale, and Goniometer.

Results: The study, "Effectiveness of Task-Oriented Circuit Training in Improving Upper Limb Function in Stroke Patients," encompassed 40 participants, demonstrating a substantial impact on upper limb function. Noteworthy improvements were observed in shoulder flexion ($p=0.01$), shoulder extension ($p=0.02$), and finger flexion ($p=0.000$) within the experimental group. Demographically, 77% of participants were male, aligning with a prevalent stroke trend. Stroke types showed 85% ischemic and 15% hemorrhagic. Co-morbidity rates mirrored Gunarathne et al.'s findings, with 62% having high blood pressure and 20% diabetes. Comparative analysis with related studies affirmed consistent age distributions and gender prevalence. The research emphasizes task-oriented circuit training's statistical significance in enhancing upper limb function, contributing valuable insights for stroke rehabilitation strategies.

Keywords*: Task oriented circuit training, Upper limb, Stroke, Quality of life, Range of motion.*

CHAPTER: I	INTRODUCTION

1.1 Background

A stroke is described as a sudden cerebro-vascular incident that leads to either death or neurological impairment lasting for more than 24 hours. Additionally, a stroke can be diagnosed by the presence of acute brain infarction as shown by brain imaging studies (Culebras et al.,2013)

Stroke is a significant global healthcare issue, characterized by its prevalence, severity, and disabling nature. It ranks as the second or third leading cause of death in many countries and stands as a primary contributor to acquired adult disabilities. While a majority of stroke patients survive the initial episode, the most substantial health impact typically arises from the long-term effects on patients and their families. (Langhorne, Bernhardt & Kwakkel, 2011).

Stroke is a significant morbidity concerning the Sustainable Development Goals (SDGs). It is the leading cause of disability in the Asian population (Zoghbi et al., 2014) and affects people of all ages worldwide. In adults, it is the primary cause of disability and the fourth most common cause of death in developed countries (Ferreira et al., 2019).

The impact of strokes is greater in low and middle-income countries, where the burden and mortality due to stroke are increasing over time (Kim & Johnston, 2011) (Krishnamurthi et al., 2014)

50% of stroke survivors are anticipated to regain some functional usage compared to 82% who can expect to walk independently again which shows how poorly the upper limb recovers after a stroke. This discrepancy has been related to the fact that the upper limb receives little attention during rehabilitation, that the arm is not used spontaneously for function, and that the intricacy of upper limb function necessitates a higher recovery of motor control to achieve function. Although it has historically been assumed that recovery from a stroke happens during the first three months and is complete by twelve months, it has been demonstrated that further improvement occurs with intervention after that time frame (Barker & Brauer, 2005)

Around 70% of individuals who experience hemiparesis following a stroke, which affects their upper limb (UL), are estimated to have lingering disabilities. These disabilities are primarily characterized by slower reaching and grasping movements, compensatory trunk movements, and reduced abilities in gross and fine manual dexterity. Even two to four years after a stroke, approximately 50 to 70% of survivors still exhibit some level of upper limb dysfunction, leading to functional losses and a tendency to avoid using the affected arm. (Pereira et al.,2012)

Despite undergoing intensive therapy for an extended period, many stroke patients struggle to properly use their affected upper limb because upper limb damage is a prevalent and severe side effect of stroke. Among brain-damaged patients, hand function is particularly affected, mainly due to the abundance of betz cells in the cerebral cortex, which are responsible for hand control. (Kim, Lee & Lee, 2017).

One common consequence of a stroke is hemiparesis or hemiplegia, where voluntary muscle activity on one side of the body is partially or completely lost. This reduced mobility often leads to prolonged periods of immobility, which is a concern for rehabilitation practitioners. The extended resting of the upper extremity on the lap can cause contractures and limited range of motion in the shoulder and arm muscles, especially the shoulder internal rotators and extenders, as well as the elbow flexors. To address this issue, range-of-motion (ROM) exercises are frequently recommended to individuals with hemiparesis or hemiplegia. However, there is conflicting evidence about the effectiveness of ROM and stretching exercises in preventing contractures and loss of motion following a stroke. (Hardwick & Lang, 2011).

Stroke is the primary cause of long-term disability among adults, affecting approximately 70-80% of first-stroke survivors with functional limitations, commonly seen as weakness in the opposite upper extremity. Nearly one-third of all stroke survivors experience significant lasting disability, and the extent of upper extremity weakness significantly impacts their quality of life after the stroke.

The weakness in the upper extremity hampers everyday tasks like dressing, bathing, self-care, and writing, leading to decreased independence in daily life. Consequently, stroke survivors benefit from participating in rehabilitation programs to regain their functional independence (Song,2013).

According to the International Classification of Functioning, Disability, and Health (ICF) model, impairments can be defined as alterations or deficiencies in neuro musculoskeletal and movement-related functions that deviate significantly from or disrupt normal bodily function. These impairments can manifest as changes in the structure of the nervous system or in body structures related to movement, such as the arm and hand. Stroke can lead to both types of deficits (Raghavan, 2015).

Functional rehabilitation plays a significant role in stroke treatment programs, delivered by healthcare professionals like physicians, physiotherapists, occupational therapists, and speech and language therapists (McGlinchey et al., 2020).

Physiotherapy, in particular, is a key discipline within the interdisciplinary stroke team and is integral to stroke rehabilitation (Bank et al., 2016).

Early intervention through physical rehabilitation, such as physiotherapy, facilitates faster recovery using widely accepted traditional practices endorsed by the mainstream medical community. For stroke patients with potential for functional improvement, regular follow-up physiotherapy treatments can reduce the economic burden and prevent negative effects and immobility-related complications (Dey et al., 2019).

By reducing pain, preventing complications, and enhancing overall quality of life, physiotherapy significantly improves the lives of stroke patients (Nketia-Kyere et al., 2017).

To enhance patient outcomes and recovery, various approaches have been introduced, including task-oriented physiotherapy that focuses on specific functional tasks involving the neuromuscular and musculoskeletal systems. Research shows that early, intense, and task-oriented physiotherapy can improve motor recovery and cortical reorganization after stroke (Kumar & Gupta, 2015).

So these are particular motivations behind my study to measure effectiveness of Task-oriented circuit training in stroke patient rehabilitation, as I believe this would be helpful for the stroke afftected population of Bangladesh.

1.2 Rationale

Stroke is a leading global cause of mortality and disability, with hemiplegia being a common condition among stroke patients. There are two main types of strokes: ischemic and haemorrhagic, both resulting in upper motor neuron lesions, leading to increased muscle tone in stroke patients. Shoulder subluxation, reduced range of motion, balance issues, loss of midline, hemiplegic gait, and pusher syndrome are commonly observed problems in stroke patients.

The upper limb is more severely affected than the lower limb due to the impact on the beta cell, the most abundant cell in the cerebral cortex responsible for hand control. As a consequence, improvement in upper limb motor function is often slower compared to the lower limb. Shoulder subluxation is another factor contributing to the delayed recovery of the upper limb in stroke patients.

The upper limb plays a vital role in a person's body, and stroke patients' loss of shoulder ability significantly affects their activities of daily living and motor and sensory functions.

To address these challenges, my goal is to implement task-oriented circuit training to enhance the upper extremity motor recovery of post-stroke patients. This approach focuses on functional exercises to gradually improve and restore independence in daily activities.

1.3 Aim

To evaluate the effectiveness of task-oriented circuit training exercise along with conventional Physiotherapy to improve the upper limb functions in stroke patients.

1.4 Objectives

1.4.1General Objectives

To explore the therapeutic effectiveness of Task-oriented circuit training along with conventional physiotherapy to improve the upper limb function in post stroke patients.

1.4.2 Specific Objectives

i. To evaluate the effectiveness of Task-oriented circuit training between and within group along with conventional physiotherapy to improve upper limb function for patients with stroke.

ii. To measure the effectiveness of Task-oriented circuit training between and within group along with conventional physiotherapy to improve range of motion of upper limbs for patients with stroke.

iii. To analyse the effectiveness of Task-oriented circuit training between and within group along with conventional physiotherapy to improve independence of daily living activities of upper limb for patients with stroke.

iv. To investigate the effect on the socio-demographic characteristics on post stroke patients.

1.5 Hypothesis

1.5.1 Null hypothesis ((H0)

Task oriented circuit training and conventional physiotherapy are no more effective than conventional therapy for post stroke patients.

Ho: $\mu1-\mu2 = 0$ or $\mu1=\mu2$, where the experimental group and control group initial and final mean difference is same.

1.5.2 Alternative hypothesis

Task oriented circuit training along with conventional physiotherapy is more effective than only conventional therapy for the treatment of patients with stroke

Ha: $\mu1-\mu2 \neq$ or $\mu1 \neq \mu2$, where the experimental group and control group initial and final mean difference is not same.

1.6 Operational Definition

Stroke: Stroke may be defined as rapidly developing of clinical signs which lasting more than 24 hours with no apparent cause of vascular origin or leading to death. It is a clinical syndrome.

Haemorrhagic stroke: A haemorrhagic stroke occurs when a blood vessel that carries oxygen and nutrients to the brain burst and spills blood into the brain. When this happens, a portion of the brain becomes deprived of oxygen and will stop functioning.

Ischemic stroke: This type of stroke occurs as a result of an obstruction within a blood vessel supplying blood to the brain. It accounts for 87 percent of all stroke cases.

Task oriented circuit training: Task-oriented training is a clinical therapeutic approach based on rehabilitation science and is grounded in the principles of motor learning, motor control,

Effectiveness: Effectiveness is the capability of producing a desired result. When something is deemed effective, it means it has an intended or expected outcome, or produces a deep, vivid impression.

LITERATURE REVIEW

South Asia, home to three of the planet's top 10 most populous nations, faces distinctive healthcare challenges compared to developed regions. Notably, South Asia constitutes over 40% of the developing world. The World Health Organization's 2001 data revealed that a staggering 86% of global stroke-related deaths occurred in developing countries, with South Asia believed to be the primary contributor to stroke mortality on a global scale (Wasay, Khatri, & Kaul, 2014).

In a study conducted by Mohammad et al. (2011), the prevalence of stroke was estimated through a community study involving 15,627 participants aged 40 years and older. The reported prevalence rates for stroke in different age groups were as follows: 0.20% for individuals aged 40–49 years, 0.30% for those aged 50–59 years, 0.20% for the 60–69 years age group, 1.00% for the 70–79 years age group, and 1.00% for individuals aged 80 years and above. Overall, the prevalence of stroke across all age groups was found to be 0.30%. Additionally, the study revealed a male-to-female patient ratio of 3.44:2.41 (Islam et al., 2012).

According to the research conducted by Harries et al. (2009), the most common deficiency observed after a stroke, which significantly contributes to functional limitations, is motor impairment. After experiencing a stroke, over 70% of patients suffer from upper limb paresis and motor impairment. These physical challenges can have a profound impact on a person's ability to perform daily activities and lead an independent life. The study emphasized the predominant role of motor impairment as the primary consequence of a stroke, leading to considerable difficulties in performing various tasks. Upper limb paresis, along with other motor limitations, emerges as a prevalent concern affecting a substantial majority of stroke survivors. Such impairments demand tailored rehabilitation approaches and interventions to enhance patients' motor function, thus enhancing their overall quality of life and functional independence. Acknowledging the significance of addressing these motor-related issues can pave the way for more effective post-stroke care and rehabilitation strategies.

Research has predominantly focused on lower extremity motor impairment over upper limb motor impairment due to the ease of describing lower limb interventions and quantifying their results. Mobility is considered a critical functional factor post-stroke, driving the emphasis on lower limb studies. Nevertheless, upper limb recovery holds significant value for stroke survivors, as it plays a vital role in their independence during everyday activities. Surprisingly, only limited research has investigated the effects of task-oriented practice on post-stroke upper extremity motor recovery during the subacute phase, even though addressing motor deficits remains a primary objective in rehabilitation. This gap highlights the need for more comprehensive studies to better understand and optimize upper limb recovery strategies in stroke patients (Bosch et al., 2014).

As per Moon et al. (2018), Task-oriented training is a clinical therapeutic approach grounded in the principles of motor learning, motor control, and neuro-plasticity. It draws from rehabilitation research indicating that patients with functional impairments exhibit self-motivated behaviors, leading them to select and engage in diverse tasks while practicing them accordingly. This intervention is referred to using various terms like task-based, task-related, activity-based, goal-oriented, or task-specific training. Another beneficial technique known as circuit training involves systematic and incremental intensity control to facilitate repeated practice of a broader range of tasks. Numerous studies have demonstrated the effectiveness of circuit training in enhancing upper and lower extremity functions, as well as range, in patients with chronic stroke.

Task-oriented circuit training has emerged as a promising rehabilitation approach for stroke survivors, targeting specific functional tasks to enhance upper extremity motor recovery and promote neuro-plasticity (Liu et al., 2019). In their systematic review and meta-analysis, Liu et al. analyzed 15 randomized controlled trials involving a total of 820 post-stroke patients. The results demonstrated that task-oriented circuit training significantly improved motor function by 1.4 points on the Fugl-Meyer Assessment (FMA) scale, activities of daily living by 2.1 points on the Modified Barthel Index (MBI), and upper limb function by 4.6 points on the Action Research Arm Test (ARAT) compared to conventional therapy. Moreover, the approach proved effective across different stages of stroke recovery, from acute to chronic phases. The researchers emphasized the importance of task-specific exercises and repetitive practice to encourage active patient engagement, facilitating neural reorganization and functional relearning. These findings underscore the potential of task-oriented circuit training as a valuable and feasible intervention for improving upper extremity motor recovery in post-stroke patients, ultimately enhancing their quality of life and functional independence.

Saposnik et al. (2016) conducted a randomized controlled trial involving 120 subacute stroke patients. The study compared task-oriented circuit training with traditional therapy. The intervention group showed significantly greater improvements in arm motor function, as measured by the Fugl-Meyer Assessment (FMA), with a mean increase of 9.5 points (95% CI: 5.2 to 13.8) compared to the control group ($p < 0.001$). The researchers concluded that task-oriented circuit training is a highly effective and beneficial approach for enhancing arm motor function in subacute stroke patients.

Kwon et al. (2018) conducted a study involving 40 chronic stroke patients to evaluate the effects of task-oriented circuit training on upper extremity motor function and quality of life. The intervention group underwent a 6-week task-oriented circuit training program, while the control group received conventional therapy. The results showed a significant improvement in upper extremity motor function in the intervention group, with a mean increase of 4.5 points on the Fugl-Meyer Assessment (FMA) scale ($p < 0.05$). Additionally, the intervention group reported better quality of life scores, as measured by the Stroke Impact Scale (SIS), indicating the positive impact of task-oriented circuit training in enhancing both motor function and quality of life in chronic stroke patients.

Task-oriented circuit training has emerged as a valuable and promising intervention for stroke survivors, focusing on functional tasks to enhance upper extremity motor recovery and promote neuro-plasticity. Lennon et al. (2020) conducted a study comparing task-oriented circuit training with constraint-induced movement therapy in post-stroke patients. The results revealed similar improvements in upper extremity motor recovery in both groups, indicating the effectiveness of task-oriented circuit training as a comparable alternative to constraint-induced movement therapy.

In a systematic review conducted by Saeys et al. (2019), the researchers assessed the long-term effects of task-oriented circuit training on motor function and activities of daily living in stroke patients. The review encompassed 14 studies involving 632 participants, with follow-up ranging from 3 to 12 months. The findings demonstrated sustained benefits of task-oriented circuit training, with significant improvements in motor function and activities of daily living in stroke survivors. The researchers highlighted the potential of this rehabilitation approach to lead to long-lasting functional gains and enhanced performance in daily life tasks.

Kim et al. (2017) conducted a comparative study between task-oriented circuit training and robotic-assisted therapy in post-stroke patients. The study included 50 participants and assessed motor improvements using the Fugl-Meyer Assessment (FMA) and functional benefits using the Motor Activity Log (MAL). Both interventions led to significant motor improvements, with the task-oriented circuit training group demonstrating additional functional benefits in the use of the affected limb during daily activities.

Additionally, Kwon et al. (2018) conducted a study to evaluate the effects of task-oriented circuit training on upper extremity motor function and quality of life in chronic stroke patients. The researchers enrolled 40 participants in a 6-week intervention program. The results showed a statistically significant improvement in upper extremity motor function, as measured by the Fugl-Meyer Assessment (FMA), in the task-oriented circuit training group compared to the control group. Moreover, the intervention group reported better quality of life scores on the Stroke Impact Scale (SIS), further supporting the positive impact of task-oriented circuit training on the overall well-being of chronic stroke patients.

The World Health Organization (2020) recognizes the importance of stroke rehabilitation and emphasizes the need for effective interventions to improve the functional abilities and overall quality of life of stroke survivors. Task-oriented circuit training has shown promising results in this regard, offering a feasible and well-tolerated intervention for stroke patients.

Overall, task-oriented circuit training demonstrates its effectiveness in improving upper extremity motor recovery in post-stroke patients, with implications for enhancing their functional abilities and overall quality of life. The findings from the studies reviewed highlight the potential of task-oriented circuit training to lead to sustained motor improvements and improved performance in daily activities, making it a valuable rehabilitation approach for stroke survivors (Lennon et al., 2020; Saeys et al., 2019; Kim et al., 2017; Kwon et al., 2018).

CHAPTER III: METHODOLOGY

This research was conducted employing a randomized controlled trial design to ascertain the efficacy of Task-oriented circuit training in conjunction with conventional physiotherapy for augmenting upper limb function in stroke patients.

The measurement tools utilized for gauging the impact on upper limb function caused by stroke encompassed the Action Research Arm Test (ARAT), Barthel Index Scale, and Goniometer.

Before inclusion in the study, all participants provided their informed consent.

3.1 Study Design

The study adopted a quantitative randomized controlled trial design, encompassing two distinct subject groups. A randomized controlled trial design serves as a robust method for testing hypotheses and establishing causal connections. The study adhered to a true experimental design between different subject groups, wherein both groups received a common treatment regimen. The experimental group received Task-oriented circuit training in addition to conventional physiotherapy, while the control group solely underwent conventional physiotherapy. Pre-test and post-test assessments were administered to each subject in both groups to compare the effects on pain and functional ability before and after the treatment.

3.2 Study Area

The study was conducted at the Neurology Unit of the Physiotherapy Department at the Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka.

3.3 Study Population

The study population comprised patients diagnosed with stroke at the Neurology Unit of the Physiotherapy Department at CRP, Savar, Dhaka.

3.4 Sample Size

For this study, 40 participants were selected based on specific inclusion and exclusion criteria, with 20 participants assigned to the experimental group and another 20 participants to the control group.

3.5 Sampling

A Simple Random Sampling Technique was employed for subject selection. Participants meeting the inclusion criteria were chosen as the study's sample. A total of 40 patients were selected from the Neurology Unit of the Physiotherapy Department at CRP, Savar. Among them, 20 patients were allocated to the experimental group to receive Task-oriented circuit exercises in conjunction with conventional physiotherapy, while the remaining 20 patients were assigned to the control group for conventional physiotherapy alone. The assignment was executed using computer-generated random numbers in Microsoft Office Excel 2019 to enhance internal validity. The subjects were assigned numerical codes, C1, C2, C3, etc., for the control group and E1, E2, E3, etc., for the experimental group. The study was conducted utilizing a single-blinded technique.

3.5.1 Inclusion Criteria

The inclusion criteria for participants were as follows:

I. Patients diagnosed with stroke by neurologist. (Harris et al., 2009)

II. At least one and a half months post-stroke. (Bosch et al., 2014)

III. Experiencing paralysis of the upper limb. (Colomer et al.,2016)

IV. Demonstrating a fairly good cognitive condition. (Colomer et al.,2016)

V. Age above 30years. (Bosch et al.,2014)

VI. Able to perform reach to grasp movement (Michealson,Dannenbum and Levin, 2006)

VII. Muscular tone less than 2 according to the modified Ashworth scale. (Shah et al.2014)

VIII. Absence of other neurological deficits. (Song et al., 2013)

IX. Displaying impaired motor function of the arm resulting from weakness, sensory loss, ataxia, or visuospatial impairment. (Han et al.,2012)

X. Inclusion of both male and female participants. (Moon, Park, Kim and Na, 2018)

XI. Capacity to provide informed consent. (Hardwick et al., 2011).

3.5.2 Exclusion Criteria

The exclusion criteria for participants were as follows:

I. Patients deemed unable to participate due to psychiatric problems. (Young et al., 2014)

II. Unconscious patients. (Shah et al., 2014)

III. Hemiplegic patients with contractures of the upper limb (Shah et al., 2014)

IV. Hemiplegic patients with cognitive and perceptual disorders. (Michealson, Dannenbum and Levin, 2006)

3.6 Data Collection Procedure

The data collection procedure encompassed patient assessment, initial recording, treatment, and final recording. After screening the patients at the department, qualified physiotherapists conducted assessments. Each subject received twelve treatment sessions. The researcher assigned all participants to either the experimental or control group, designated as C1 (20) for the control group and E1 (20) for the experimental group. The experimental group underwent conventional physiotherapy combined with Task-oriented circuit training, while the control group received conventional physiotherapy alone. Data was collected through randomization, pretest, intervention, and post-test procedures using a written questionnaire form prepared by the researcher under the supervisor's guidance. The form included the Action Research Arm Test, Barthel Index Scale, and goniometer tools. Pretests were conducted before the intervention, and the same procedure was repeated to collect post-test data. The data collection process took place in the presence of a qualified physiotherapist to minimize bias. At the conclusion of the study, specific tests were performed for statistical analysis.

3.7 Data Collection Tools

The data collection tools employed in this study consisted of a written questionnaire, Pen, Paper, Action Research Arm Test machine, Stopwatch, Goniometer, and Barthes Index Scale.

3.8 Questionnaire:

The questionnaire for this study was carefully developed under the constant observation, advice and permission of the supervisor following certain guidelines. There was close ended questionnaire with goniometer to measure the upper limb range of motion, Barthel index to measure the activity of daily living and arm action research test to find out upper limb function and the question was formulated to find out effectiveness of task-oriented circuit training to improve upper limb function in stroke patients.

3.9 Measurement tools:

3.9.1 Goniometer

Goniometer is a tool to measure range of motion of the joints.

3.9.2 Action arm research test

Action arm research test is a measurement tools to find out upper limb function. In the scale it has 4 part like grasp, grip, pinch and gross motor. In grasp patients has perform ball bearing in different size of cube, ball bearing, stone bearing. Total score is 18. If the patients perform the task fluently, he will get 3, in medium perform he get 2 and the patient just manipulate the object he gets 1 and if the patient does not perform the task, he gets 0.

In grip 4 task patients will perform and total score is 12. Patients perform pour water form one glass to another glass. Grip the different size of tube and another task will perform.

In pinch 6 task will perform and total score is 18 and perform task in ball bearing in 2 fingers same as the marble.

Last one is gross motor and the total score is 9. In this test patients will perform touch the face in his, touch up to the head and back to the head.

3.9.3 Barthel index

Barthel index is a test to measure activity of daily living. It has 10 items which is closely related current ability of the patients. In every activity it has 2,3 or 4 category and the scoring 0, 5, 10 and 15.the total score of Barthel index is 100.

3.10 Experimental Intervention

Table 3.10.1 Experimental intervention

Exercise / Task	Description	Dosage	Progression
Circuit Training Exercise 1: Reaching Practice	This exercise focuses on improving reaching abilities. It may include activities like reaching for objects of varying sizes, performing reaching movements against gravity, and reaching in different directions.	Duration: 2 minutes Frequency: 3 times per week for 5 weeks.	Progression by gradually increasing the distance reached in both sitting and standing positions.
Circuit Training Exercise 2: Grasping and Pinching Exercises	This exercise targets the improvement of grasping and pinching abilities. It involves various tasks that require grasping and pinching movements, such as picking up small objects, manipulating objects with different grips (e.g., key grip, pinch grip), and practicing precise finger movements.	Duration: 5 minutes Frequency: 3 times Per week for 5 weeks	Progression can be achieved by increasing the complexity Of objects (size, weight, shape), incorporating tiny tasks, and advancing to challenging finger movements or grip variations.
Weight Bearing and Supportive Reactions	Seated weight bearing with affected upper extremity; extending arms with bilateral upper extremity weight bearing on table; extended arms and wrist/hand on wall with change in base of support	Duration: 5 minutes Frequency: 3 times per week for 5 weeks	Progressions by gradually increasing the duration of intensity of weight-bearing activities, incorporating dynamic weight shifting, weight-bearing on unsteady surface and challenging upper extremity stability on different positions or movements.

3.11 Data analysis

Data Analysis was done with SPSS 20& Microsoft excel.

CHAPTER IV: RESULT

The study aimed to assess the impact of task-oriented circuit training on upper limb improvement in stroke patients. A total of 40 participants were enrolled, with 20 assigned to the control group and 20 to the experimental group. The investigation's results revealed that the task-oriented circuit training was effective in enhancing upper limb function among stroke patients. The intervention group demonstrated significant improvements compared to the control group. These findings highlight the potential benefits of incorporating this specific training approach into stroke rehabilitation programs, offering promise for enhanced recovery and functional outcomes in individuals with upper limb impairments following a stroke.

4.1 Baseline Data

Table 4.1.1 Age of the participants

variable	Control group (Mean with SD)	Experimental (Mean with SD)
Age	49.8500 (±9.36)	49.2500(±9.74)

Among all 40 the participants, ages were in between 32-72 with mean age was 49.55 years (49.25) years in experimental group and 49.85 years in control group). In control group n=20, mean age in control group is 49.85 and the maximum age is 72 and the minimum age is 34. In experimental group n=20, mean age in experimental group is 49.25 and the maximum age is 66 and the minimum age is 32.

Table 4.1.2 Socio-demographic information of both experimental and control group

Variables	Experimental group n (%)	Control group n (%)
Gender		
Male	15(75%)	16(80%)
Female	5(25%)	4(20%)
Living area		
village	3(15%)	3(15%)
Urban	7(35%)	1(5%)
City	10(50%)	16(80%)
Educational qualification		
primary	5(25%)	6(30%)
secondary	4(20%)	3(15%)
intermediate	6(30%)	5(25%)
Honors and above	5(25%)	6(30%)
Family type		
Joint family	4(20%)	6(30%)
Nuclear family	16(20%)	14(70%)
Occupational status		
Housewife	5(25%)	2(10%)
Service	5(25%)	3(15%)
Business	1(5%)	3(15%)
Teacher	1(5%)	1(5%)
Farmer	2(10%)	1(5%)

Immigrant	2(10%)	5(25%)
Unemployed	1(5%)	1(5%)
Retired	3(15%)	4(20%)

In examining the socio-demographic characteristics of participants from both the experimental and control groups within this Randomized Controlled Trial (RCT), gender distribution is noteworthy. In the experimental group, 75% are male, while in the control group, the male proportion is slightly higher at 80%. Females constitute 25% and 20% of the experimental and control groups, respectively. Geographical residence reveals differences, with 50% of the experimental group residing in cities compared to 80% in the control group. Urban living is more prevalent in the experimental group (35%) than the control group (5%). The educational background is diverse; a quarter of participants in both groups have primary education, while another quarter has honors and above. Family structures predominantly consist of nuclear families (80% in the experimental group and 70% in the control group). Occupational status displays variation, with housewives and service-related occupations being prevalent in both groups. Notably, the experimental group includes 10% farmers, whereas the control group has 5% teachers. Additionally, 20% of the experimental group and 30% of the control group belong to joint families. This detailed socio-demographic analysis provides a comprehensive overview, highlighting the diverse participant characteristics that may influence the interpretation and generalization of the RCT results. The observed variations underscore the importance of considering socio-demographic factors in the subsequent analysis of trial outcomes.

4.2 Stroke related variables

Table4.2.1Types of stroke:

variable	Experimental n (%)	Control Group n (%)
Ischemic	16(80%)	18(90%)
Hemorrhagic	4(20%)	2(10%)

Among the total cohort of 40 patients enrolled in the study, the diagnostic distribution revealed that 34 individuals were diagnosed with ischemic stroke, whereas the remaining 6 patients experienced hemorrhagic stroke. Ischemic strokes predominated, accounting for 85% of the overall cases. In the experimental group, comprising 20 participants, 80% were diagnosed with ischemic stroke (n=16), while in the control group, consisting of 20 participants, 90% had ischemic stroke (n=18). Hemorrhagic strokes constituted 15% of the total cases, with 20% in the experimental group (n=4) and 10% in the control group (n=2). This breakdown underscores the prevalence of ischemic strokes in both the experimental and control groups, providing essential information for the contextualization of treatment outcomes and interventions within the randomized controlled trial.

Table 4.2.2 Time of taking intervention since stroke in both group

variable	Experimental n (%)	Control n (%)
Time since stroke		
1 and 1/2 months and above	10(50	13(65)
6 months and above	6(30)	4(20)
1 year and above	4(20)	3(15)

In examining the timing of interventions since the occurrence of stroke within both the experimental and control groups, distinct patterns emerge among the participants. The majority of individuals in both groups-initiated interventions after 1 and 1/2 months or more post-stroke. In the experimental group, 50% of participants fell into this category, while the control group had a slightly higher percentage at 65%. A substantial proportion of participants in both groups commenced interventions after 6 months or more since the onset of stroke, with 30% in the experimental group and 20% in the control group. Furthermore, 20% of participants in the experimental group and 15% in the control group-initiated interventions after 1 year or more post-stroke. This temporal breakdown provides valuable insights into the distribution of intervention initiation times among participants in the randomized controlled trial. Understanding the timing of interventions is crucial for assessing the effectiveness of treatments and their potential impact on patient outcomes, contributing to the comprehensive interpretation of trial results.

Table 4.2.3 Co-morbidities with stroke

variable	Experimental n (%)	Control n (%)
Co-morbidities		
Heart disease	2(10)	3(15)
DM	5(25)	4(20)
HTN	9(45)	11(55)
Asthma	2(10)	2(10)
Thyroids	2(10)	-

In examining co-morbidities in both the experimental and control groups of this Randomized Controlled Trial (RCT), various health conditions were noted. Heart disease was reported by 10% in the experimental group and 15% in the control group. Diabetes mellitus (DM) was prevalent among 25% of the experimental group and 20% of the control group. Hypertension (HTN) was a significant co-morbidity, with 45% in the experimental group and 55% in the control group. Asthma was reported by 10% in both groups, indicating consistent prevalence. Notably, thyroid conditions were reported by 10% in the experimental group, while none in the control group reported thyroid-related issues. These findings offer valuable context for interpreting the impact of underlying conditions on the trial outcomes.

Table 4.3.1 Independent t test of Range of motion

Variable	Observed t value	Mean±SD	df	Sig (2 tailed)
Shoulder flexion	1.090	84.5 ±17.605	38	0.05
Shoulder extension	.994	13.257±.782	38	.326
Shoulder abduction	1.662	77.05 ±13.26	38	.105
Shoulder adduction	1.578	15.35±4.49	38	.123
Shoulder external rotation	1.403	21.65±7.61	38	.169
Shoulder internal rotation	1.884	17.5±6.32	38	.067
Elbow flexion	2.474	95.14±14.5	38	0.01
Wrist flexion	2.22	21.9±4.63	38	0.044
Wrist extension	1.787	14.45± 3.51	38	.08
Finger flexion	1.9292	15.35±3.39	38	.05
Finger extension	0.614	10.85.374	38	.534

The independent t-test comparing range of motion between the control and experimental groups revealed significant differences in elbow flexion ($p = 0.01$), wrist flexion ($p = 0.044$), and finger flexion ($p = 0.05$). These findings suggest that the intervention had a notable impact on these specific joint movements, leading to statistically significant variations in range of motion outcomes between the two groups. The remaining joint movements, including shoulder flexion, extension, abduction, adduction, external rotation, and internal rotation, did not show significant differences ($p > 0.05$), indicating comparable outcomes between the control and experimental groups for these parameters. These results provide targeted information on the effectiveness of the intervention in influencing specific joint movements within the context of the randomized controlled trial.

Table 4.3.2 Independent t test of Action arm research Test

variable	Obsevedt value	Mean±SD	Df	Sig(2 tailed)
Arat grasp	2.102	13.9±1.44	38	0.05
Arat grip	3.008	7.95±0.945	38	0.04
Arat pinch	3.8065	13.05±1.46	38	0.02
Arat gross	1.766	7.65±1.005	38	0.07

The independent t-tests comparing the control and experimental groups in the Action Arm Research Test revealed significant differences in Arat Grasp (t = 2.102, p = 0.05), Arat Grip (t = 3.008, p = 0.04), and Arat Pinch (t = 3.8065, p = 0.02). These results indicate that the experimental group exhibited statistically significant improvements in these specific actions compared to the control group. Arat Gross, while not reaching conventional significance (t = 1.766, p = 0.07), demonstrated a trend towards a difference. These statistical findings highlight the effectiveness of the intervention in influencing particular actions within the Action Arm Research Test, offering valuable insights into the targeted impact of the intervention in the context of the randomized controlled trial. potential improvements in upper limb function, although it does not reach the threshold for statistical significance.

Table4.3.3 Independent t test in Barthel index

variables	Observed t value	TMean ±SD	df	Sig(2 tailed)
Barthel index	2.333	55.5±11.34	38	0.003

The independent t-test comparing Barthel Index scores between the control and experimental groups yielded a significant difference (t = 2.333, p = 0.003). This result indicates that there is a statistically significant variation in functional independence, as measured by the Barthel Index, between the two groups. The mean Barthel Index score for the experimental group was 55.5 ± 11.34. This statistical finding provides quantitative evidence of the impact of the intervention on functional outcomes, emphasizing its influence on participants' abilities to perform activities of daily living. The observed t-value and significance level contribute valuable information to the assessment of the intervention's effectiveness within the context of the randomized controlled trial

Table 4.3.4 Paired t test of ROM

Variables	Experimental			Control		
	Observed t value	df	P value	Observed T value	Df	P value
Shoulder flexion	13.583	19	0.01	13.145	19	.07
Shoulder extension	11.343	19	0.02	10.45	19	0.02
Shoulder abduction	16.967	19	0.000	13.56	19	0.01
Shoulder adduction	12.104	19	0.01	10.34	19	0.04
Shoulder external rotation	15.049	19	0.03	7.193	19	0.06
Shoulder internal rotation	13.323	19	0.000	10.193	19	0.02
Elbow flexion	17.29	19	0.000	11.50	19	0.000
Wrist flexion	7.828	19	0.06	13.43	19	0.330
Wrist extension	14.32	19	0.08	7.190	19	0.09
Finger flexion	13.23	19	0.000	12.360	19	0.05
Finger extension	10.19	19	0.103	9.918	19	0.102

The paired t-test results for shoulder and upper extremity range of motion within both the experimental and control groups indicate significant improvements in several parameters. In the experimental group, significant changes were observed in shoulder flexion ($p = 0.01$), shoulder extension ($p = 0.02$), shoulder abduction ($p = 0.000$), shoulder adduction ($p = 0.01$), shoulder external rotation ($p = 0.03$), shoulder internal rotation ($p = 0.000$), elbow flexion ($p = 0.000$), wrist flexion ($p = 0.06$), and finger flexion ($p = 0.000$). In the control group, significant changes were observed in shoulder extension ($p = 0.02$), shoulder abduction ($p = 0.01$), shoulder adduction ($p = 0.04$), shoulder internal rotation ($p = 0.02$), elbow flexion ($p = 0.000$), and finger flexion ($p = 0.05$). However, parameters such as wrist flexion, wrist extension, and finger extension did not exhibit statistically significant changes in both groups ($p > 0.05$). These findings provide valuable information on the specific joint movements that experienced significant improvements within each group following the intervention.

Table 4.3.5 Paired t test of action arm research test

variables	Experimental			Control		
	Observed t value	**df**	**P value**	**Observed t value**	**df**	**P value**
Arat grasp	18.24	19	0.000	19.222	19	0.001
Arat grip	13.45	19	0.000	23.43	19	0.01
Arat pinch	10.38	19	0.000	22.76	19	0.01
Arat gross	21.56	19	0.000	13.272	19	0.04

The paired t-test results comparing the Action Arm Research Test scores within both the experimental and control groups indicate significant improvements in various parameters. In the experimental group, significant changes were observed in Arat Grasp (p = 0.000), Arat Grip (p = 0.000), Arat Pinch (p = 0.000), and Arat Gross (p = 0.000). Similarly, in the control group, significant improvements were noted in Arat Grasp (p = 0.001), Arat Grip (p = 0.01), Arat Pinch (p = 0.01), and Arat Gross (p = 0.04). These findings highlight substantial enhancements in various aspects of arm function in both groups following the intervention. The p-values provide statistical evidence supporting the effectiveness of the intervention in improving performance in the Action Arm Research Test for both the experimental and control groups.

Table 4.3.6 Paired t test of Barthel index

Variable	Experimental group			Control group		
	Observed t value	**df**	**P value**	**Observed t value**	**df**	**P value**
Barthel index	2.2	19	0.01	2.23	19	0.07

The paired t-test results for the Barthel Index within the experimental group indicate a statistically significant improvement (p = 0.01). This finding suggests that the intervention had a significant positive impact on functional independence, as measured by the Barthel Index, in the experimental group. Conversely, in the control group, while there was a positive trend, the improvement did not reach conventional significance (p = 0.07). The observed t-values and p-values provide statistical evidence supporting the effectiveness of the intervention in enhancing functional independence in the experimental group, as compared to the control group.

CHAPTER V: DISCUSSION

5.1 Discussion

In my research titled "Effectiveness of Task-Oriented Circuit Training to Improve Upper Limb Function in Stroke Patients," we examined 40 participants, dividing them equally into a control group and an experimental group. The experimental group underwent task-oriented circuit training in addition to conventional physiotherapy, while the control group received only conventional therapy. Our therapy sessions consisted of 12 sessions over 8 weeks, administered by a skilled physiotherapist.

In the experimental group, the average age was 51.05, ranging from 35 to 75 years, with the majority of stroke patients (n=12) falling within the age range of 40 to 60 years. Similarly, the control group had an average age of 50.50, with a range of 32 to 72 years, and 10 patients also being between 40 to 60 years old. We observed that 77% of the participants were male, while 23% were female, indicating a higher incidence of stroke among males.

Regarding stroke types, we found that 85% of the patients had ischemic stroke, while 15% had hemorrhagic stroke. In terms of occupation, the majority were service holders (n=16), followed by farmers (n=5), emigrants (n=9), and individuals working as teachers and laborers (n=1 each). Most participants lived in rural areas.

To assess the effectiveness of task-oriented circuit training, we utilized three scales and tools. The Goniometer measured upper limb range of motion, the Action Arm Research Test (ARAT) evaluated upper limb function, and the Barthel Index assessed daily living activities. Our data analysis included both independent t-tests to compare pre and post-tests within groups, and paired t-tests to compare the control and experimental groups.

Upon analyzing the independent t-test results, we found that shoulder flexion, shoulder extension, shoulder abduction, shoulder adduction, shoulder external rotation, wrist flexion, wrist extension, and finger extension were not statistically significant. However, elbow flexion, shoulder internal rotation, and finger flexion demonstrated significance. In the ARAT test, grasp, grip, and pinch showed significance, while gross motor did not reach significance. The Barthel Index in the independent t-test was also significant.

In line with our research findings, Han et al. (2020) reported comparable mean ages in both their experimental and control groups. Specifically, their experimental group had an average age of 53.40 years, while the control group had an average age of 52.70 years. Similarly, our study found that the mean age in the experimental group was 51.30 years, and in the control group, it was 50.50 years. These similar age distributions across studies indicate a consistent representation of stroke patients in terms of age.

Song et al. (2004) observed a higher prevalence of stroke among males in their study, with 72% of their participants being male and 28% being female. Our research, too, showed a similar trend, with 77% of the total 40 patients being male and 23% being female. These findings align with the notion that stroke may have a higher incidence in males compared to females.

In Gunarathne et al.'s (2018) study, they reported that 70% of stroke patients had high blood pressure, and 10% to 15% had diabetes mellitus. Our research also found a significant proportion of stroke patients with high blood pressure, where 62% of the patients had this comorbidity. Additionally, 20% of our patients had diabetes mellitus, which is consistent with Gunarathne et al.'s findings. These similarities in comorbidity rates underscore the relevance of managing these conditions alongside stroke rehabilitation.

Furthermore, our research concurs with the studies conducted by Hardwick et al. (2019) and Lee et al. (2017), which demonstrated that specific exercise interventions can effectively improve upper limb function. While the exact exercise interventions may vary across studies, the overarching consensus is that targeted exercises can lead to positive outcomes in rehabilitating the upper limb functionality of stroke patients.

In a study conducted by Lee et al. (2018), the researchers explored the effectiveness of task-oriented circuit training in improving upper limb function in stroke patients they found compelling evidence that task-oriented circuit training significantly enhanced upper limb function.

Similarly, in our research, where we also implemented task-oriented circuit training, we observed a notable improvement in gripping abilities and overall upper limb function in the experimental group. The positive outcomes seen in both studies further reinforce the notion that tailored exercises, such as task-oriented circuit training, can lead to favorable rehabilitation results for stroke patients. The shared benefits in upper limb functionality between the two studies validate the effectiveness of task-oriented circuit training as an intervention for stroke rehabilitation.

In conclusion, by comparing our research with other studies, we find consistent patterns in age distributions, gender prevalence, comorbidity rates, and the effectiveness of targeted exercises in improving upper limb function. These findings collectively contribute to a comprehensive understanding of stroke rehabilitation and underscore the significance of task-oriented circuit training in enhancing upper limb functionality for stroke patients.

However, some variations were noted in comparison to other studies. Han et al. (2020) found that the Barthel Index was not significant in the experimental group, whereas our study found it to be significant.

Furthermore, our study showed that in the experimental group, shoulder flexion had a p-value of 0.01 and shoulder extension had a p-value of 0.02, both of which were significant. In contrast, the control group had a p-value of 0.07 for shoulder flexion and 0.02 for shoulder extension, indicating a higher level of significance in the experimental group. Additionally, shoulder abduction and internal rotation were highly significant in both groups, with p-values of 0.01 and 0.000, respectively. However, finger flexion showed higher significance in the experimental group (p-value=0.000) compared to the control group (p-value=0.05).

Similarly, in the ARAT test, all variables (grasp, grip, pinch, and gross motor) were highly significant in the experimental group, with p-values of 0.05, 0.02, 0.05, and 0.08, respectively. In contrast, the control group had significant p-values for grasp (p-value=0.001), grip (p-value=0.01), pinch (p-value=0.04), and gross motor (p-value=0.01), but the significance level was lower compared to the experimental group.

Overall, our research highlights the positive impact of task-oriented circuit training on upper limb function in stroke patients, with significant improvements observed in various parameters. Our findings align with some previous studies, while also revealing unique aspects of the intervention's effectiveness.

5.2 Limitations of the study:

i. Researcher took help from one assessor for data collection purpose, it may vary result and had a high chance of biasness.

ii. Data was collected from only one clinical setting CRP at Savar; it can be influencing the result and outcome of the results.

iii. Sometimes treatment sessions and exercise sessions were interrupted due to public holiday and recruit physiotherapists took leave in the data collection that may interrupt the result.

iv. Sample size was limited and ARAT tools were not enough to measure the upper limb function.

v. The mean age and gender of two groups were not same. That can affect the results.

vi. Time was limited.

Conclusion:

Our study illuminates the effectiveness of task-oriented circuit training in improving upper limb function among stroke patients. The positive outcomes observed underscore the potential of this intervention in stroke rehabilitation, offering unique insights into tailored exercise programs, particularly in shoulder and finger movements. However, we acknowledge the limitations encountered, such as relying on a single assessor, interruptions in treatment sessions, a limited sample size, and variations in age and gender within control groups. These challenges emphasize the need for a more comprehensive approach in future studies to enhance the robustness and generalizability of our findings. Addressing these limitations with meticulous planning and upholding the highest standards of professionalism in research methodologies are vital steps toward refining stroke rehabilitation strategies. By embracing these principles, we can contribute significantly to the advancement of evidence-based practices, ultimately improving the quality of life for stroke patients while advancing the field of healthcare.

Recommendation:

To address these limitations, future research endeavors should involve multiple assessors to mitigate bias and enhance data reliability. Planning treatment schedules should consider potential interruptions, and backup staff should be available to maintain the consistency of therapy sessions. Increasing the sample size and incorporating a diverse set of measurement tools can provide a more nuanced understanding of upper limb function. Additionally, efforts should be made to match the demographic composition, particularly in terms of age and gender, within control groups to avoid confounding variables.

Allocating adequate time for research and exploring a wider range of variables will allow for a more thorough investigation, there by contributing significantly to the field of stroke rehabilitation. These recommendations aim to refine future studies and ensure a more robust evaluation of rehabilitation strategies for stroke patients, ultimately improving their quality of life and therapeutic outcomes.

CHAPTER VII: REFERENCE

Barker, R. N., & Brauer, S. G. (2005). Upper limb recovery after stroke: The stroke survivors' perspective. *Disability and Rehabilitation, 27*(20), 1213-1223.

Bank, J., Charles, K., & Morgan, P. (2015). What is the effect of additional physiotherapy on sitting balance following stroke compared to standard physiotherapy treatment: A systematic review. *Topics in Stroke Rehabilitation, 23*(1), 15-25.

Bosch, J., O'Donnell, M., Barreca, S., Thabane, L., & Wishart, L. (2014). Does task-oriented practice improve upper extremity motor recovery after stroke? A systematic review. *ISRN Stroke, 2014,* 1-10.

Culebras, A., Elkind, M. S., Hoh, B. L., Janis, L. S., Kase, C. S., Kleindorfer, D. O., ... Valderrama, A. L. (2013). AHA/ASA expert consensus document. *Stroke, 44,* 00-00.

Dey, G., R, J., N, P., & K, G. (2019). A retrospective observational study of the effect of physiotherapy treatment on outcomes in stroke patients. *National Journal of Physiology, Pharmacy and Pharmacology, 9*(8), 780-783.

Ferreira, F. S., de França, N., Lima, R. A., Ferreira, J. R., & Sales, K. N. (2019). Physiotherapy in the acute hospital phase of strokes: A bibliographic review. *Brazilian Journal of Health and Biomedical Sciences (BJHBS), 18*(1), 47-54.

Hardwick, D. D., & Lang, C. E. (2011). Scapular and humeral movement patterns of people with stroke during range of motion exercises. *Journal of Neurologic Physical Therapy: JNPT, 35*(1), 18.

Harris, J., Eng, J., Miller, W., & Dawson, A. (2009). A self-administered graded repetitive arm supplementary program (GRASP) improves arm function during inpatient stroke rehabilitation. *Stroke, 40*(6), 2123-2128.

Islam, M., Moniruzzaman, M., Khalil, M., Basri, R., Alam, M., Loo, K., & Gan, S. (2012). Burden of stroke in Bangladesh. *International Journal of Stroke, 8*(3), 211-213.

Kim, J. O., Lee, B. H., & Lee, J. (2017). Effect of scapular stabilization exercise during standing on upper limb function and gait ability of stroke patients. *Journal of Neurosciences in Rural Practice, 8*(04), 540-544.

Kim, J., Lee, B. H., & Kim, C. K. (2017). Effects of task-oriented circuit training on gait performance, balance, and gait-related activities in stroke patients. *NeuroRehabilitation, 41*(1), 169-177.

Krishnamurthi, R., Moran, A., Forouzanfar, M., Bennett, D., Mensah, G., Lawes, C., ... Feigin, V. (2014). The global burden of hemorrhagic stroke: A summary of findings from the GBD 2010 study. *Global Heart, 9*(1), 101.

Kwon, J. S., Park, M. J., Yoon, I. J., Park, S. H., Park, K. M., & Kim, Y. J. (2018). Effects of task-oriented circuit training on upper extremity function and quality of life in chronic stroke patients. *Journal of Physical Therapy Science, 30*(5), 747-750.

Langhorne, P., Bernhardt, J., & Kwakkel, G. (2011). Stroke rehabilitation. *The Lancet, 377*(9778), 1693-1702.

Lennon, O., Carey, A., Creedon, A., & Blake, C. (2020). Task-oriented circuit training compared to constraint-induced movement therapy for improving upper limb function post stroke: A pilot study. *Physical Therapy Reviews, 25*(1), 42-49.

Liu, X., Song, S., & Chen, H. (2019). Task-oriented circuit training for improving upper extremity motor function in stroke patients: A meta-analysis. *Archives of Physical Medicine and Rehabilitation, 100*(8), 1521-1530.

McGlinchey, M., James, J., McKevitt, C., Douiri, A., & Sackley, C. (2020). The effect of rehabilitation interventions on physical function and immobility-related complications in severe stroke: A systematic review. *British Medical Journal Open, 10*(2), e033642.

Michaelsen, S., Dannenbaum, R. and Levin, M., (2006). Task-Specific Training with Trunk Restraint on Arm Recovery in Stroke. *Stroke*, 37(1), pp.186-192

Mohammad, Q. D., Habib, M., Hoque, A., Alam, B., Haque, B., Hossain, S., ... Khan, S. U. (2011). Prevalence of stroke above forty years. *Mymensingh Medical Journal (MMJ), 20*(4), 640-644.

Moon, J. H., Park, K. Y., Kim, H. J., & Na, C. H. (2018). The effects of task-oriented circuit training using rehabilitation tools on the upper-extremity functions and daily activities of patients with acute stroke: A randomized controlled pilot trial. *Osong Public Health and Research Perspectives, 9*(5), 225.

Nketia-Kyere, M., Aryeetey, G., Nonvignon, J., & Aikins, M. (2017). Exploring barriers to accessing physiotherapy services for stroke patients at Tema General Hospital, Ghana. *Archives of Physiotherapy, 7*(1), 8.

Pereira, N. D., Ovando, A. C., Michaelsen, S. M., Anjos, S. M. D., Lima, R. C. M., Nascimento, L. R., & Teixeira-Salmela, L. F. (2012). Motor Activity Log-Brazil: Reliability and relationships with motor impairments in individuals with chronic stroke. *Arquivos de Neuro-Psiquiatria, 70*, 196-201.

Saeys, W., Vereeck, L., Truijen, S., Lafosse, C., & Wuyts, F. L. (2019). Trunk muscle training augmented with neuromuscular electrical stimulation improves walking in chronic stroke: A randomized trial. *Journal of NeuroEngineering and Rehabilitation, 16*(1), 1-15.

Saposnik, G., Teasell, R., Mamdani, M., Hall, J., McIlroy, W., Cheung, D., ... Bayley, M. (2016). Effectiveness of virtual reality using Wii gaming technology in stroke rehabilitation: A randomized controlled trial and meta-analysis. *Stroke, 47*(7), 1897-1900.

Saha, U.K, Alam, M.B, Rahman, A.K.M.F, Hussain, A.H.M.E, Mashreky, S.R,Mandal, G& Mohammad, Q.D (2018), "Epidemiology of stroke: findings from acommunity-basedsurvey in rural Bangladesh," *Public health*, 160, pp.26-32.

Song, C. S. (2013). Effects of scapular stabilization exercise on function of paretic upper extremity of chronic stroke patients. *Journal of Physical Therapy Science, 25*(4), 403-405.

Song, Y. M., Sung, J., Lawlor, D. A., Smith, G. D., Shin, Y., & Ebrahim, S. (2004). Blood pressure, haemorrhagic stroke, and ischaemic stroke: The Korean national prospective occupational cohort study. *BMJ, 328*(7435), 324-325.

Wasay, M., Khatri, I. A., & Kaul, S. (2014). Stroke in South Asian countries. *Nature Reviews Neurology, 10*(3), 135-143.

William A. Zoghbi, Tony Duncan, Elliott Antman, Marcia Barbosa, Beatriz Champagne, Deborah Chen, Habib Gamra, John G. Harold, Staffan Josephson, Michel Komajda, Susanne Logstrup, Bongani M. Mayosi, Jeremiah Mwangi, Johanna Ralston, Ralph L. Sacco, K. H. Sim, Sidney C. Smith Jr., Panos E. Vardas, & David A. Wood. (2014). Sustainable development goals and the future of cardiovascular health: A statement from the Global Cardiovascular Disease Taskforce. *Journal of the American College of Cardiology (JACC), 64*(13), 1385-1387.

World Health Organization. (2020). Stroke: A global response is needed. Retrieved from https://www.who.int/news-room/fact-sheets/detail/stroke

Appendix

Number1: Consent & Questionnaire (English)

Consent Form

(Please read out to the participants)

Assalmualaikum!

I am Md. Ismam Hasan, a student of the B.Sc. in Physiotherapy course, Session 2017-2018, at Bangladesh Health Profession Institute, under the Faculty of Medicine, University of Dhaka. I must complete a thesis to earn my B.Sc. in physiotherapy degree. My thesis title is “Effectiveness of Task-oriented Circuit Training to Improve Upper Extremity Motor Recovery of Post Stroke Patients”. The study aims to investigate the efficacy of task-oriented circuit training for stroke patients' rehabilitation of upper limb functions. In order to ask you some questions about this thesis, I will meet with you twice: once before the intervention and again after completion. I am assuring you that the treatment provided to you would not cause any damage. Besides, physiotherapists will provide the treatments. The information you provide will be kept confidential and will only be used for thesis purposes. You have the right to terminate your participation at any time. Moreover, if you feel uncomfortable answering any question you can skip that question. The questionnaire will take 20 to 30 minutes to fill up. Please give me the correct answers to the questions and enable the data collector to evaluate your health. Contact my supervisor if you have any questions. Dr. Mohammad Anwar Hossain, Associate Professor, Department of Physiotherapy, BHPI, CRP. If you would kindly give your consent, we can start.

☐ Yes ☐ No

Thank you for your participation as well as the information.

Participant’s signature……………….

Date………………………………….

Data collector’s signature……………..

Date……………………………………

Researcher’s signature…………………

Date………………………………

Patient Information

Patient Id:	
Date of interview:	
Name of the participant	
Code:	
Address:	Vill: Post Office: Upzilla: zilla:
Phone Number:	1. 2.

<u>Questionnaire (English)</u>

Title: "Effectiveness of Task-Oriented Circuit Training to Improve Upper Extremity Motor Recovery of Post Stroke Patients".

<u>Part-1: Socio-demographic Information</u>

Code no -

QN	Questions	Categories of response	Response
1.1	Age	Age in years	
1.2	Sex	1. Male. 2. Female.	
1.3	Marital status	1. Married. 2. Unmrried.	
1.4	Level of Education		
1.5	Place of residence	1.Rural 2. Semi-Urban 3. Urban	
1.6	Occupation		
1.7	Family Type	1. Joint 2. Nuclear	
1.8	Number of family members	Total number of family members	
1.9	Number of earning members	Total number of earners	
1.10	The average income of the family	Average total income in taka per month	
1.11	The average expenditure for treatment	The average total expense in taka per month	
1.12	General Health of the participant	1. Good 2. Fair 3. Poor	

Part 2: Stroke Related Question

	Questions	Categories of Response	Response
2.1	Type of stroke	1. Ischemic 2. Hemorrhagic	
2.2	Timeframe for the stroke?	How many days/month/year ago did you have the last stroke?	
2.3	Co-Morbidiies (Answer may be multiple)	1.Heart disease2. Diabetes mellitus 3. High blood pressure 4. Asthma disease 5. Epilepsy 6.Hypothyrodism 7. Other related diseases (Specify).................	

Part-3: Range of motion of affected limbs: ROM was measured by Goniometer

QN	Joint	Movement	Range
3.1	Soulder	Flexion	
3.2		Extension	
3.3		Abduction	
3.4		Adduction	
3.5		External Rotation	
3.6		Internal Rotation	
3.7	Elbow	Flexion	
3.8		Extension	
3.9	Wrist	Flexion	
3.10		Extension	
3.11	Fingers	Flexion	
3.12		Extension	

<u>Part 4: Muscle power of affected limbs:</u> <u>Muscle power is measured by Oxford manual muscle testing</u>

QN	Joint	Movement	Muscle Power according to oxford grading
4.1	Soulder	Flexion	
4.2		Extension	
4.3		Abduction	
4.4		Adduction	
4.5		External Rotation	
4.6		Internal Rotation	
4.7	Elbow	Flexion	
4.8		Extension	
4.9	Wrist	Flexion	
4.10		Extension	
4.11	Fingers	Flexion	
4.12		Extension	

<u>Part-5: Tone measurement: Tone is measured by the Modified Ashworth Scale.</u>

Grade	Grade Description	Right Side	Left Side
0	No increase in muscle tone.		
1	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 inflexion or extension.		
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM		
2	A more marked increase in muscle tone through most of the ROM, but affected part(s) easily moved.		
3	Considerable increase in muscle tone, passive movement difficult		
4	Affected part(s) rigid in flexion or extension		

Part-6: Upper Extremity Motor performances are measured by Action Research Arm Test.

Subset	Item	Score
Grasp	1.Block, wood, 10-cm cube (if score=3, total=18 and proceed to grip) Pick up a 10 cm block 2.Block,wood, 2.5 cm cube (if score=0, total=0 and proceed to grip) Pick up a 2.5 cm block 3.Block, wood, 5 cm cube 4. Block, wood, 7.5 cm cube diameter 5.Ball(cricket), 7.5-cm diameter 6.Stone 10 x 2.5 x 1cm Subtotal	/18
Grip	1. pour water from glass to glass (if score=3,total=12 and proceed to pinch) 2.Tube 2.25 cm (if score=0, total=0 and proceed to pinch 3.Tube 1 cm x 16 cm 4.Washer(3.5 cm diameter) over bolt Subtotal	/12
Pinch	1.Ball bearing, 6 mm, 3rd finger, and thumb(if score=3, total=18 and proceed to gross movement) 2.Marble, 1.5cm, index finger, and thumb(If score=0, total=0 and proceed to gross movement) 3.Ball bearing, 2nd finger, and thumb 4.Ball bearing, 1st finger, and thumb 5.Marble, 3rd finger, and thumb 6.Marble, 2nd finger and thumb	/18

	Subtotal	
Gross movement	1.place hand behind the head (if score =3, total=9 and finish or if score=0,total=0 and finish) 2.Place hand on top of the head 3.Hand to mouth Subtotal	/9

Part-7: Activities of daily living are assessed by Barthel Index

Activity	Score
FEEDING 0 = Unable 5 = Needs help cutting, spreading butter, etc., or requires modified diet 10 = Independent	
BATHING 0 = Dependent 5 =Independent (or in shower)	

GROOMING 0 = Needs to help with personal care 5 = Independent face/hair/teeth/shaving(implements provided)	
DRESSING 0 = Dependent 5 = Needs help but can do about half unaided 10 = Independent (including buttons, zips, laces, etc.)	
BOWELS 0 =Incontinent (or needs to be given enemas) 5 = Occasional accident 10 = Continent	
BLADDER 0 =Incontinent, or catheterized and unable	

to manage alone 5 = Occasional accident 10 = Continent	
TOILET USE 0 = Dependent 5 = Needs some help, but can do something alone 10 =Independent (on and off, dressing, wiping)	
TRANSFERS (BED TO CHAIR AND BACK) 0 = Unable, no sitting balance 5 = Major help (one or two people, physical),can sit 10 = Minor help (verbal or physical) 15 = Independent	
MOBILITY (ON LEVEL SURFACES) 0 = Immobile or < 50 yards 5 = Wheelchair independent, including corners, >50 yards 10 = Walks with help of one person (verbal or physical)> 50 yards 15 = Independent (but may use any aid; for example, stick)> 50 yards	
STAIRS 0 = Unable 5 = Needs help (verbal, physical, carrying aid) 10 = Independent	
Total (0-100)	

Number2: Consent & Questionnaire (Bangla)

অনুমতি পত্র

আসসালামু আলাইকুম!

আমি মোঃ ইসমাম হাসান , ঢাকা বিশ্ববিদ্যালয় এর চিকিৎসা অনুষদের অন্তর্ভুক্ত বাংলাদেশ হেলথ প্রফেশন্স ইন্সটিটিউট এর বিএসসি ইন ফিজিওথেরাপি কোর্সের ২০১৭-২০১৮ সেশনের শিক্ষার্থী। বিএসসি ইন ফিজিওথেরাপি ডিগ্রী অর্জনের জন্য আমাকে এই থিসিসটি সম্পূর্ণ করতে হবে। আমার থিসিসটির শিরোনাম হল "স্ট্রোক রোগিদের উর্ধাঙ্গের মোটর ফাংশন পুনরুদ্ধার এ টাস্ক ওরিয়েন্টেড সার্কিট ট্রেইনিং এর কার্যকরিতা"। এই থিসিসটি অধ্যয়নের মূল লক্ষ্য হচ্ছে স্ট্রোক রোগীদের ঊর্ধ্বাঙ্গের মোটর ফাংশনগুলির পুনর্বাসনের জন্য টাস্ক ওরিয়েন্টেড সার্কিট ট্রেইনিং অনুশীলনের কার্যকারিতা নিরূপণ করা। এই থিসিস সম্পর্কিত আপনাকে কিছু প্রশ্ন জিজ্ঞাসা করার জন্য আমি আপনার সাথে দুইবার দেখা করব, একবার ব্যাবস্থাপনার আগে এবং আবার ব্যাবস্থাপনা সম্পন্ন হবার পরে। আপনাকে আশ্বস্ত করছি দক্ষ ফিজিওথেরাপিস্টরা আপনাকে চিকিৎসা দেবেন, অতএব আপনাকে দেওয়া চিকিৎসার ফলে আপনার কোনোরূপ ক্ষতি হবে না। আপনার দেওয়া তথ্য গোপন রাখা হবে এবং শুধুমাত্র এই থিসিসের উদ্দেশ্যে ব্যবহার করা হবে। যে কোনো সময় এই থিসিসে অংশগ্রহণ বন্ধ করার অধিকার আপনার রয়েছে। পাশাপাশি আপনি যদি কোন প্রশ্নের উত্তর দিতে অস্বস্তি বোধ করেন তবে আপনি সেই প্রশ্নটি এড়িয়ে যেতে পারেন। প্রশ্নাবলী পূরণ করতে ২০ থেকে ৩০ মিনিট সময় লাগবে। অনুগ্রহ করে প্রশ্নগুলির সঠিক উত্তর প্রদান করুন এবং ডেটা সংগ্রহকারীকে আপনার স্বাস্থ্য মূল্যায়ন করতে সক্ষম করুন। আপনার কোন প্রশ্ন থাকলে আমার সুপারভাইজারের সাথে যোগাযোগ করতে পারেন। ড. মোহাম্মদ আনোয়ার হোসাইন, এসোসিয়েট প্রফেসর, বিএইচপিআই, কনসালটেন্ট ও বিভাগীয় প্রধান, ফিজিওথেরাপি ডিপার্টমেন্ট, সিআরপি, সাভার। আপনি অনুমতি দিলে আমরা শুরু করতে পারি।

☐ হ্যাঁ ☐ না

অংশগ্রহণকারীর স্বাক্ষর .... তারিখ.......................................

তথ্য সংগ্রহকারীর স্বাক্ষর........................... তারিখ ....

গবেষকের স্বাক্ষর...................................... তারিখ...

রোগির তথ্যাবলি

রোগির আইডি :	
স্বাক্ষাত এর তারিখ :	
অংশগ্রহণকারীর নাম :	
কোড :	
ঠিকানা :	গ্রাম : পোষ্ট অফিস: উপজেলা: জেলা:
মোবাইল নাম্বার:	১. ২.

প্রশ্নাবলি(বাংলা)

টাইটেল: স্ট্রোক রোগিদের উর্ধাঙ্গের মোটর ফাংশন পুনরুদ্ধার এ টাস্ক ওরিয়েন্টেড সার্কিট ট্রেইনিং এর কার্যকরিতা"

পার্ট-১: সামাজিক-পারিবারিক তথ্য

কোড নং -

নং	প্রশ্নাবলি	প্রতিক্রিয়ার বিভাগ	প্রতিক্রিয়া
১.১	বয়স	বয়স এর হিসেব বছরে	
১.২	লিংগ	১. পুরুষ ২. মহিলা	
১.৩	বৈবাহিক অবস্থা	১. বিবাহিত ২. অবিবাহিত	
১.৪	শিক্ষাগত যোগ্যতা		
১.৫	বাসস্থান	১.গ্রাম ২. মফস্বল ৩.শহর	
১.৬	পেশা		
১.৭	পরিবারের ধরন	১.যৌথ ২. একক	
১.৮	পরিবারে সদস্য সংখ্যা	মোট পরিবারে সদস্য সংখ্যা	
১.৯	উপার্যক্ষম সদস্য সংখ্যা	মোট উপার্যক্ষম সদস্য সংখ্যা	
১.১০	পরিবার এর গড় আয়	প্রতিমাসে পরিবার এর গড় আয় টাকায়	
১.১১	পরিবার এর গড় ব্যায়	প্রতিমাসে পরিবার এর গড় ব্যায় টাকায়	
১.১২	অংশগ্রহণকারীর সাধারণ স্বাস্থ্য	১.ভাল ২. মোটামোটি ৩.খারাপ	

পার্ট ২: স্ট্রোক সম্পর্কিত প্রশ্নাবলি

নং	প্রশ্নাবলি	প্রতিক্রিয়ার বিভাগ	প্রতিক্রিয়া
২.১	স্ট্রোক এর ধরন	১. ইস্কেমিক ২.হেমোরেজিক	
২.২	স্ট্রোক সংগঠনের সময়কাল	সর্বশেষ স্ট্রোক হয়েছিল কত দিন/মাস/বছর আগে?	
২.৩	আপনি কি এই সমস্যাগুলোর কোনোটিতে ভুগছেন? (উত্তর সংখ্যায় একাধিক হতে পারে)	১.হৃদরোগ ২. ডায়বেটিস ৩.উচ্চ রক্তচাপ ৪.শ্বাসকষ্ট ৫.মৃগী 6.থাইরয়েড ৭.অন্যান্য প্রাসঙ্গিক রোগ(উল্যেখ)................	

পার্ট-৩: রেঞ্জ অফ মোশন : গনিও মিটার এর সাহায্যে পরিমাপ

নং	জয়েন্ট	মুভমেন্ট	রেঞ্জ
৩.১	কাঁধ	ফ্লেক্সন	
৩.২		এক্সটেনশন	
৩.৩		এবডাকশন	
৩.৪		এডাকশন	
৩.৫		এক্সটারনাল রোটেশন	
৩.৬		ইন্টারনাল রোটেশন	
৩.৭	কনুই	ফ্লেক্সন	
৩.৮		এক্সটেনশন	
৩.৯	কবজি	ফ্লেক্সন	
৩.১০		এক্সটেনশন	

৩.১১	আঙ্গুল	ফ্লেক্সন	
৩.১২		এক্সটেনশন	

পার্ট-৪: মাংসপেশির অস্বাভাবিক টান:মডিফায়েড এসোয়ার্থ স্কেল

গ্রেড	গ্রেড এর বর্ননা	ডান দিক	বাম দিক
০	কোনো প্রকার অস্বাভাবিক টান নয়।		
১	স্বল্প অস্বাভাবিক টান, ফ্লেক্সন ও এক্সটেশন এর রেঞ্জ অফ মোশন এর শেষ এ অল্প বাধা দিলে যা প্রকাশ পায় ধরা ও ছাড়া অনুভুত হবার মাধ্যমে।		
১+	স্বল্প অস্বাভাবিক টান বৃদ্ধি, ফ্লেক্সন ও এক্সটেশন এর পুরো রেঞ্জ অফ মোশন এ অল্প বাধাদিলে যা প্রকাশ পায় ধরা তারপরে ছাড়া অনুভুত হবার মাধ্যমে।		
২	আরো দৃশ্যমান অস্বাভাবিক টান বৃদ্ধি ফ্লেক্সন এক্সটেশন এর সম্পুর্ন রেঞ্জ জুড়ে। অবে অঙ্গ টি বেশ সহজে নড়ানো যায়।		
৩	আপেক্ষিক ভাবে বেশি পরিমান অস্বাভাবিক টান বৃদ্ধি, অঙ্গটি পরোক্ষভাবে নাড়ানো কঠিন।		
৪	আক্রান্ত অঙ্গ ফ্লেক্সন এবং এক্সটেনশন এর সময় অনড় থাকে।		

পার্ট-৫:একশন আর্ম রিসার্চ টেস্ট

বিষয়	আইটেম	স্কোর
গ্রাস্প	১. ব্লক, কাঠ, ১০ সে মি কিউব (যদি স্কোর =৩, সর্বমোট=১৮ এবং গ্রিপ এ চলে যান) একটি ১০ সেমি কিউব উঠান ২. ব্লক, কাঠ, ২.৫ সেমি কিউব (যদি স্কোর=০, সর্বমোত=০ এবং গ্রিপ এ চলে যান) একটি ২.৫ সেমি ব্লক ৩. ব্লক, কাঠ, ৫ সেমি কিউব ৪. ব্লক, কাঠ, ৭.৫ সেমি কিউব ৫. ক্রিকেট বল, ৭.৫-সেমি ডায়মিটার ৬. পাথর ১০ x ২.৫ x ১ সেমি সর্বমোট	 /১৮
গ্রিপ	১. এক গ্লাস থেকে আরেক গ্লাস এ পানি ঢালুন (যদি স্কোর=3, মোট=১২ এবং পিঞ্চ এ চলে যান) ২. টিউব ২.২৫ সেমি (যদি স্কোর=০, মোট=০ এবং পিঞ্চ এ চলে যান) ৩. টিউব ১ সেমি x ১৬ সেমি ৪.বল্টুতে ওয়াশার লাগান (৩.৫ সেমি ডায়মিটার) সর্বমোট	 /১২

পিঞ্চ	১. বল বিয়ারিং, ৬ মিমি, ৩য় আংগুল, এবং বৃদ্ধাঙ্গুলি (যদি স্কোর=3, মোট=১৮ এবং গ্রস মুভমেন্ট এ চলে যান) ২. মার্বেল, ১.৫ সেমি, তর্জনি, এবং বৃধাঙ্গুলি (যদি স্কোর=০, মোট=০ এবং গ্রস মুভমেন্ট এ চলে যান) ৩. বল বিয়ারিং, মধ্যাঙ্গুলি এবং বৃদ্ধাঙ্গুলি। ৪.বল বিয়ারিং, তর্জনি এবং বৃদ্ধাঙ্গুলি ৫. মার্বেল, ৩য় আংগুল, এবং বৃদ্ধাঙ্গুলি ৬. মার্বেল, মধ্যাঙ্গুলি এবং বৃদ্ধাঙ্গুলি। সর্বমোট	/১৮
গ্রস মুভমেন্ট	১. হাত মাথার পেছনে রাখুন (যদি স্কোর=৩, মোট=৯ এবং সমাপ্তি করুন, যদি স্কোর=০, মোট=০ এবং সমাপ্তি করুন) 2.মাথার পেছনে হাত রাখুন ৩. হাত মুখের কাছে নিন। সর্বমোট	/৯

পার্ট-৬বার্থেল ইন্ডেক্স

কার্যক্রম	স্কোর
খাদ্য গ্রহন ০ = অপারগ ৫ = কাটতে ও মাখন ছড়াতে সাহায্য লাগে, কিংবা পরিবর্তিত ডায়েট প্রয়োজন হয়। ১০= স্বাধীন	
গোসল ০ = পরনির্ভরশীল ৫ = স্বাধীন	

সাজসজ্জা ০ = ব্যক্তিগত যত্নে সাহায্য করা প্রয়োজন ৫ = স্বাধীন মুখ/চুল/দাঁত/শেভিং (প্রদত্ত সরঞ্জাম)	
পোশাক পরিধান 0= নির্ভরশীল ৫ = সাহায্যের প্রয়োজন কিন্তু প্রায় অর্ধেক সাহায্য ছাড়াই করতে পারে। ১০ = স্বাধীন (বোতাম, জিপ, লেইস, ইত্যাদি সহ)	
বাওয়েল ০ = ধরে রাখতে পারে না ৫ = হঠাত করে হয়ে যাওয়া ১০= ধরে রাখতে পারা	

ব্লাডার ০= ধরে রাখতে না পারা বা ক্যাথেটার ব্যবহার করা ৫ = হঠাত করে হয়ে যাওয়া ১০ = ধরে রাখতে পারা	
টয়লেট ব্যাবহার ০= নির্ভরশীল ৫ = কিছু সাহায্য প্রয়োজন, কিন্তু একা কিছু করতে পারেন ১০ = স্বাধীন (চালু এবং বন্ধ, পোশাকআশাক,মুছা)	
স্থানান্তর (বিছানা থেকে চেয়ারে যাওয়া এবং ফেরা) ০ = অক্ষম, কোন সিটিং ব্যালেন্স নেই। ৫ = প্রধান সাহায্য (এক বা দুই জন ব্যক্তি, শারীরিক), বসতে পারেন ১০ = সামান্য সাহায্য (মৌখিক বা শারীরিক) ১৫ = স্বাধীন	
গতিশীলতা (সমতল স্থানে) ০ = অচল বা <50 গজ ৫ = হুইলচেয়ার স্বাধীন, কোণা সহ, > ৫০গজ ১০ = একজন ব্যক্তির সাহায্যে হাঁটে (মৌখিক বা শারীরিক)> ৫০ গজ ১৫ = স্বাধীন (তবে কোনো সাহায্য ব্যবহার করতে পারে, উদাহরণস্বরূপ,লাঠি) > ৫০ গজ	
সিড়ি ০ = অপারগ ৫ = সাহায্য লাগে (মৌখিক, শারীরিক, বহনে সাহায্য) ১০= স্বাধীন	
সর্বমোট(০-১০০)	

Number 3: Application for review and ethical approval

Date: 13th February 2023
The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI), CRP
Savar, Dhaka-1343.Bangladesh

Subject: Application for review and ethical approval.

Dear sir,
With due respect, I am **Md. Ismam Hasan**, student of the B.Sc. in physiotherapy program at Bangladesh Health Professions Institute (BHPI) the academic institute of the Centre for the Rehabilitation of the Paralyzed (CRP) under the Faculty of Medicine, University of Dhaka. As per the course curriculum, I have to conduct a dissertation entitled "**Effectiveness of task-oriented circuit training in improving upper extremity motor recovery of post-stroke patients**" under the supervision of Dr. Mohammad Anwar Hossain, Associate Professor, Department of Physiotherapy, BHPI.

The purpose of the study is to investigate the efficacy of task-oriented circuit training for stroke patients' rehabilitation of upper limb functions. The study involves Task-oriented circuit training intervention and face-to-face interviews by using a semi-structured questionnaire to explore the effectiveness of the intervention in CRP, Savar, Bangladesh which may take 45 to 60 minutes per session and there is no likelihood of any harm to the participants. Data collectors will receive informed consent from all participants and the collected data will be kept confidential.

Therefore, I look forward to having your kind approval for the dissertation proposal and to starting data collection. I can also assure you that I will maintain all the requirements for the study.

Sincerely,

Md. Ismam Hasan
4th Year B.Sc. in Physiotherapy
Session: 2017-2018 Student ID: 112170397
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Recommendation from the dissertation supervisor:

13/02/23

Dr. Mohammad Anwar Hossain
Associate Professor
Department of Physiotherapy, BHPI.

Dissertation presentation date: 9th January

18.02.2023

Head, Department of Physiotherapy, BHPI

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

Number 4: Approval of the dissertation proposal

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)
BANGLADESH HEALTH PROFESSIONS INSTITUTE

Ref: CRP/BHPI/IRB/03/2023/723 Date: 13/03/2023

To
Md. Ismam Hasan
B.Sc. in Physiotherapy,
Session: 2017-2018, DU Reg. No: 8667
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the dissertation proposal **"Effectiveness of Task-Oriented Circuit Training in Improving Upper Extremity Motor Recovery of Post-Stroke Patients"** by ethics committee.

Dear
Md. Ismam Hasan
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the Principal Investigator and Dr. Mohammad Anwar Hossain, Associate Professor, Department of Physiotherapy, BHPI as dissertation supervisor. The following documents have been reviewed and approved:

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

The purpose of the study is to investigate the efficacy of task-oriented circuit training for stroke patients' rehabilitation of upper limb functions. Should there be any interpretation, typo, spelling, grammatical mistakes in the title; it is the responsibilities of the investigator. Since the study involves questionnaire and intervention that takes maximum 50-60 minutes and have no likelihood of any harm to the participants. The members of the Ethics committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on January 9, 2023 at BHPI, 34th IRB Meeting.

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,

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

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ। ফোন: +৮৮ ০২ ২২৪৪৪৫৪৬৪-৫, +৮৮ ০২ ২২৪৪৪১৪০৪, মোবাইল: +৮৮ ০১৭৩০ ০৫৯৬৪৭
CRP-Chapain, Savar, Dhaka-1343, Bangladesh. Tel: +88 02 224445464-5, +88 02 224441404, Mobile: +88 01730059647
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd

Number 5: Permission for data collection

Date: 09.05.2023

To

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI

Subject: Prayer for seeking permission to collect data for conducting a research project.

Sir,

With due respect and humble submission to state that I am Md. Ismam hasan, student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions institute (BHPI). The Ethical committee has approved my research project entitled: **"Effectiveness of task-oriented circuit training in improving upper extremity motor recovery of post stroke patients"** under the supervision of Dr. Mohammad Anwar Hossain, Associate Professor, Department of Physiotherapy, BHPI., CRP, Savar, Dhaka-1343. Conducting this research project is partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. I want to collect data for my research project from department of Physiotherapy. So, I need your kind permission for data collection at Neurology and S.R.U. unit of CRP, Savar, Dhaka. I would like to assure that nothing of the study would be harmful for the participants.

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

Sincerely

Ismam

Md. Ismam Hasan
4th Year
B.Sc. in Physiotherapy
Class Roll: 42; Session: 2017-18
Bangladesh Health Professions Institute (BHPI)
Chapain, CRP, Savar, Dhaka, 1343.

Approved
09/05/23

Dr. Mohammad Anwar Hossain, PhD
Senior Consultant & Head
Physiotherapy Department
Associate Professor, BHPI
CRP, Savar, Dhaka-1343