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Effectiveness of increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial.

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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 from the Supervisor & Department of Physiotherapy of Bangladesh Health Professions Institute (BHPI).

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List of Acronyms

Abbreviation	Elaboration
ARAT	Action arm research test
BHPI	Bangladesh Health Professions Institute
CRP	Centre for the Rehabilitation of the Paralysed
CT	Computed Tomography
CVA	Cerebro Vascular Accident
DF	Degree of freedom
DVT	Deep vein thrombosis
IRB	Institutional Review Board
ROM	Range of motion
SPSS	Statistical Package for Social Sciences
TOT	Task oriented training
TOST	Task oriented strength training

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ABSTRACT

Background: Stroke is a disorder where brain is damaged either by blockage in the blood vessels or rupture of the blood vessels. Stroke often leads to significant arm weakness and impaired motor function, affecting daily activities and quality of life. Task-oriented strength training, which focuses on repetitive, goal-directed movements, has shown promise in improving arm function after stroke. **Objective**: The main objective of the study is to determine if higher intensity training leads to greater improvements in muscle strength, motor control, and overall functional use of the affected arm compared to standard or lower-intensity training protocols. insights for optimizing rehabilitation strategies and improving patient outcomes. **Methodology**: A randomized controlled trial design was used in this study to investigate the effectiveness of increasing intensity of task-oriented strength training exercises for enhancing upper limb function in individuals who have experienced a stroke. The tools used to measure improvements in upper limb function included the Action Research Arm Test (ARAT), the Barthel Index Scale, and a goniometer. **Results**: The study evaluated the effectiveness of an intervention on upper limb muscle strength, motor function (ARAT), and functional independence (Barthel Index) using independent and paired t-tests. The mean age among 30 participants was 51.31. Males comprised 60% in the control and 53.33% in the experimental group. Ischemic stroke was more prevalent (86.67% control, 80% experimental). In the experimental group, significant improvements were found in multiple muscle movements with p-values < 0.05, such as shoulder adduction ($p = 0.0001$), elbow flexion ($p = 0.0000$), and finger flexion ($p = 0.0000$). ARAT subtests also showed highly significant improvements (Grasp: $p = 0.0000$, Grip: $p = 0.0000$). The Barthel Index improved significantly in the experimental group ($p = 0.034$) but not in the control group ($p = 0.065$). These results confirm the intervention's positive impact for the post stroke patients. **Conclusion**: Increasing the intensity of task-oriented strength training exercises results in significantly greater improvements in arm function among stroke survivors. These findings support the integration of higher-intensity protocols into upper limb rehabilitation programs post-stroke to enhance functional recovery.

Keywords: Stroke, task-oriented training, upper limb function, strength training, exercise intensity

CHAPTER – I INTRODUCTION

1.1 Background

Stroke is also known as a cerebrovascular accident (CVA), occurs when the blood supply to part of the brain is interrupted or reduced, depriving brain tissue of oxygen and nutrients. This can result in brain cell death within minutes. Strokes can be caused by a blockage (ischemic stroke) or a rupture (hemorrhagic stroke) of blood vessels in the brain (Gunarathne et al., 2023).

Stroke is the sudden death of brain cells due to lack of oxygen when the blood flow to the brain is lost by blockage or rupture of an artery to the brain (Owolabi et al., 2025). Stroke is the rapidly developing loss of brain function due to a disturbance in the blood supply to the brain. This can be due to ischemia caused by blockage or due to a hemorrhage. After a stroke, motor, sensory, perceptual, or cognitive deficits may occur, and these impairments can have various impacts on individual functioning through generation of disabilities and affect rehabilitation potential (Sims & Muyderman, 2020).

Stroke is considered as a precious disease from human, family and community perspectives (Carlo, 2019). Stroke ranks number four among all causes of death after heart disease, cancer and chronic lower respiratory disease in terms of mortality (Legge et al., 2021). Stroke constitutes a substantial health care problem and is characterized by a high burden of disease from health care and public health perspectives in both worldwide and in the United States and the incidence rate of stroke is higher in African American than Caucasian (Sergeev, 2021).

It is a second commonest cause of death approximately 9% (Mondal et al., 2022). Stroke is the fourth major cause of disease burden after heart disease, HIV/AIDS and unipolar depression worldwide (Joubert et al., 2018). Stroke is associated with a significant burden of disability and loss of quality-adjusted life years (Mu¨ller-Nordhorn et al.,2016). In China, stroke has been a major public health problem (Zhang et al., 2021).

Stroke is responsible of severe disabilities in adults. Disability rate of stroke is 50 to 65%. After a successful rehabilitation program about 70% patients walk independently. It appears a small number of patients are able to walk functionally in the community (Mudge et al., 2019). By occurring stroke cognitive, psychological and physical function has been lost. It responsible for long-term disability (Rabin et al., 2022).

Stroke considered as a one of the principal causes of morbidity and mortality in elderly (Kalvin & Margaret, 2021) in the developed world and in all industrialized countries and it is the leading cause of disability (Belda-Lois et al., 2021). About 30% of stroke survivors are permanently disabled and require assistance to perform their activities of daily living (ADL) (Kalvin & Margaret,2021).

Stroke occurring rate is the same in men and women but women are more probable to die (Mensah, 2018). Stroke, either ischemic or hemorrhagic is more common in men than in women (Zhang et al., 2021). Stroke incidence was about 30% higher in men than in women in Western Europe (Appelros et al., 2019). Stroke is the third and fourth leading cause of death in women and men in the United States respectively (Sergeev, 2021).

Modifiable risk factors are the same for both younger and older age groups. However, the prevalence of these risk factors is not the same in these two age groups. Hypertension, heart disease (including atrial fibrillation), and diabetes mellitus are the most common risk factors among the elderly (Smajlovic et al., 2023).

In contrast, among 1,008 young stroke patients in Finland, the most common vascular risk factors were dyslipidemia (60%), smoking (44%), and hypertension (39%) (Putaala et al., 2019). In another study, Putaala et al. (2022) investigated the distribution of vascular risk factors in 3,944 young stroke patients from three distinct geographic regions in Europe. The three most frequent risk factors were current smoking (49%), dyslipidemia (46%), and hypertension (36%). Furthermore, among 990 young stroke patients with first-ever ischemic stroke, those without well documented risk factors had less frequent recurrent ischemic strokes and non-cerebrovascular arterial events, as well as lower long-term mortality rates than those with one or more risk factors (Zang et al., 2022). The investigators concluded that numbers of risk factors add independent prognostic information regarding non cerebrovascular events and mortality in young adults.

Worldwide, stroke is a major cause of disability (Mondal et al., 2022). About 2.9% of the adult have had a stroke, of whom nearly a third live with a disability in American (Sergeev, 2021). In Scotland, it is the third commonest cause of death and the most frequent cause of severe adult disability (SIGN, 2020). In every society, stroke is a considerable cause of death and disability which is both a preventable and a treatable disease (Galvin et al., 2022).

In 2022, stroke mortality in black men and women in the United States were 81.7 and 71.8 per 100 000 population respectively (Mensah, 2018). Under the age of 65 years more than half of men and women who have a stroke die within 8 years (Gordon et al., 2024).

In UK, the age adjusted annual death rate from stroke is about 200 per 100,000 in 12% of all death (Mondal et al., 2022). The age-standardized mortality rates for adults aged 30-69 years old in Nigeria and Tanzania are several-fold higher than the rates in Canada, the United Kingdom, Brazil, Pakistan, India, China and these rates are exceeded only by the high stroke mortality in the Russian Federation (Mensah, 2021).

Around two thirds of the affected patients are above 65 years a stroke may occur at all ages, even in very young children, and can have many causes (Geurts et al., 2024). In the United States, Europe and Australia approximately 400/100 000 persons over the age of 45 years have a first stroke each year (Yavuz, 2020).

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., 2024) 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, 2021) (Krishnamurthi et al., 2024).

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 was 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, 2025).

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.,2022).

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 beta cells in the cerebral cortex, which are responsible for hand control. (Kim, Lee & Lee, 2017).

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,2023).

As a consequence of the ageing population and increasing prevalence of obesity, the number of individuals with stroke has shown a substantial growth in the last years (Mitchell et al., 2025). Stroke is a leading cause of long-term disability in adults and has great impact on the quality of life (Jaracz et al., 2024).

Individuals with stroke often face upper extremity dysfunction, with only 5% recovering their complete upper extremity function (Kwakkel et al.,2023). This decrease in function can be caused by spasticity, loss of dexterity, sensory loss, and loss of muscle strength (Tsu et al., 2024). The latter appears to make the highest contribution to limitations in activities in daily life (Ada et al., 2016) stated that strength training in individuals with stroke has a beneficial effect on both muscle strength and activity, and recommended to implement strength training in the stroke rehabilitation.

Stroke is the major cause for disability in worldwide and it is increasing day by day with high risk factors including modifiable and non-modifiable. So, it is a great concern about the burden of the society now days. Physiotherapy is playing a vital role for rehabilitation of the stroke patients and other neurological, musculoskeletal patients among the worldwide.

Earlier, strength training in individuals with stroke was believed to increase muscle spasticity (Bobath et al., 2020). However, several studies have shown that strength training can be given to individuals with stroke without increasing spasticity, or even suggested the contrary (Abdullahi et al., 2015).

At present, it remains unclear which strengthening intervention is most feasible and effective. Researchers pointed out that eccentric strength is more preserved than concentric strength following a stroke, and that eccentric strength training is more effective in improving leg strength than concentric strength training (Clark et al., 2033). In addition, eccentric Exercises appear to be well tolerated in hemiplegic patients since they require a smaller degree of energy expenditure (Hammami et al., 2022). These findings suggest that eccentric training could be the most suitable strength training for individuals with stroke. Task-oriented training, which emphasizes the practice of functional tasks, has gained recognition as an effective rehabilitation strategy. When integrated with strength training, task-oriented exercises can further promote neuroplasticity and functional recovery. However, the optimal intensity of such training protocols remains underexplored, particularly in relation to upper limb rehabilitation after stroke.

Emerging evidence suggests that increasing the intensity of training can enhance motor recovery through mechanisms such as increased cortical activation and muscle re-education. Despite these promising findings, there is limited high-quality clinical trial data specifically evaluating the dose-response relationship of task-oriented strength training in improving arm function. This randomized clinical trial aims to investigate the effectiveness of increasing intensity in task-oriented strength training exercises on arm function in stroke survivors. The study seeks to determine whether a higher intensity regimen leads to greater functional gains compared to conventional intensity protocols, providing valuable insights into optimizing rehabilitation strategies for upper limb recovery post-stroke.

In recent years, task-oriented training has emerged as a key approach in neurorehabilitation, grounded in the principles of motor learning and neuroplasticity. This form of therapy emphasizes repetitive practice of meaningful, goal-directed tasks, simulating real-life activities to encourage motor relearning. When paired with strength training, task-oriented exercises may not only improve movement patterns but also increase muscular strength, endurance, and coordination all critical components for functional arm recovery (Kumar & Gupta, 2025).

While task-oriented training is well-supported in the literature, the intensity of such interventions is increasingly recognized as a crucial factor influencing outcomes. Higher intensity exercise has been associated with improved neuroplastic changes, enhanced muscle recruitment, and better functional outcomes. Yet, the ideal intensity level for upper limb rehabilitation post-stroke remains unclear, with many rehabilitation programs still utilizing moderate or low-intensity protocols due to safety concerns or lack of definitive evidence (Dey et al., 2025).

This gap highlights the need for a rigorous, randomized clinical trial to investigate whether increasing the intensity of task-oriented strength training can yield superior improvements in arm function compared to standard protocols. The findings could provide evidence-based guidance for rehabilitation professionals, ultimately enhancing recovery and quality of life for individuals affected by stroke.

1.2 Rational

Stroke is a leading cause of long-term disability worldwide, with hemiplegia being a common condition among stroke patients. There are two main types of strokes: ischemic and hemorrhagic, both resulting in upper motor neuron lesions, leading to increased muscle tone 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. Functional recovery of the arm is critical for improving independence in daily activities and overall quality of life in stroke survivors. Despite various rehabilitation strategies, regaining optimal upper limb function remains a significant challenge, particularly in the chronic phase post-stroke. Task-oriented training, which emphasizes repetitive practice of goal-directed functional tasks, has shown promising outcomes in enhancing motor recovery. However, the role of intensity in task-oriented strength training remains under-investigated. While current guidelines support exercise-based rehabilitation, they often lack specificity regarding the optimal dosage and intensity needed to maximize upper limb functional gains. This study addresses a critical gap by evaluating whether increasing the intensity of task-oriented strength training can lead to superior improvements in arm function compared to conventional approaches. A randomized clinical trial (RCT) design ensures robust evidence by minimizing bias and enhancing the validity of results. Findings from this study will contribute to evidence-based practice, inform rehabilitation protocols, and potentially lead to more effective and individualized therapeutic interventions for stroke survivors. Ultimately, this research aims to optimize rehabilitation outcomes, reduce long-term disability, and improve the functional independence of individuals affected by stroke.

1.3 Research Question

- Does the intensity of task-oriented strength training exercises lead to significant improvements in arm strength and motor function compared to standard intensity training after stroke?

1.4 Aim

The aim is to evaluate the effectiveness of increasing intensity in task-oriented strength training exercises on improving arm function in individuals who have experienced stroke. Specifically, the study seeks to investigate whether a progressive increase in exercise intensity leads to greater functional recovery of arm strength.

1.5 Objectives

1.5.1 General objective

The primary objective of this study is to determine whether a progressive increase in exercise intensity leads to significant improvements in motor function, strength, and overall arm performance, compared to standard rehabilitation protocols.

1.5.2 Specific Objectives

1. To find out the socio-demographic characteristics on post stroke patients.
2. To assess the impact of increasing intensity in task-oriented strength training exercises on improving arm function in post-stroke individuals.
3. To compare the outcomes of high-intensity task-oriented strength training exercises versus low-intensity exercises in enhancing arm mobility and strength of post-stroke patients.
4. To explore the long-term effects of increasing intensity in strength training exercises on arm function after stroke.

1.6 Hypothesis

1.6.1 Null hypothesis ((Ho)

Increasing the intensity of task-oriented strength training exercises does not have a significant effect on arm function in individuals after a stroke, compared to a lower-intensity training regimen.

Ho: $\mu 1-\mu 2 = 0$ or $\mu 1=\mu 2$, where the experimental group and control group initial and final mean different is same.

Where:

$\mu 1$ = mean difference (final – initial) for the experimental group

$\mu 2$ = mean difference (final – initial) for the control group

1.6.2 Alternative hypothesis (Ha)

Increasing the intensity of task-oriented strength training exercises have a significant effect on arm function in individuals after a stroke, compared to a lower-intensity training regimen.

Ha: $\mu 1-\mu 2 \neq$ or $\mu 1 \neq \mu 2$, where the experimental group and control group initial and final mean difference is not same.

Where:

$\mu 1$ = mean difference (final – initial) for the experimental group

$\mu 2$ = mean difference (final – initial) for the control group

1.7 Operational Definition

Stroke: According to WHO, Stroke is a clinical syndrome characterized by rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin.

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.

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.

Intensity: Intensity refers to the measurable degree or strength of a specific phenomenon or activity. In various contexts, it can be defined and quantified differently, but the general principle remains the same: intensity is an observable and quantifiable characteristic that indicates the magnitude or power of an event, force, or activity.

Muscle strength: Muscle strength can be defined as the maximum amount of force that a muscle or group of muscles can generate during a single voluntary contraction.

Task oriented strength training: Task-oriented strength training refers to a structured exercise regimen designed to enhance an individual's muscular strength and performance in relation to specific functional tasks or activities. The training focuses on improving strength through movements that replicate or simulate the demands of daily activities or work-related function.

CHAPTER-II LITERATURE REVIEW

Stroke or cerebro-vascular accident occurs when a blood vessel in the brain bursts or when the blood supply to part of the brain is suddenly interrupted. Stroke leads to spilling blood into the spaces surrounding brain cells. Lack of oxygen and nutrients from the blood or there is sudden bleeding into or around the brain causes cells die of the brain (National institute of neurological disorder and stroke, 2024).

Stroke is a leading cause of long-term disability which results from brain cell damage due to either an interruption of the blood supply to the brain or hemorrhage into the brain tissue. Globally, 70% strokes and 87% of both stroke related deaths and disability adjusted life years occur in low- and middle-income countries (Feigin et al., 2020).

There are two forms of stroke: ischemic and hemorrhagic (National institute of neurological disorder and stroke, 2024). Ischemic stroke or cerebral infarct (80% of strokes) occurs due to blockage or a reduction of blood flow in artery that supplies brain. They are caused either by a clot which blocks the blood vessel or by the buildup of plaque often due to cholesterol within the arteries which narrows vessel resulting in a loss of blood flow. Hemorrhagic stroke is due to the rupture of an artery within the brain triggering an intra cerebral hemorrhage (15% of strokes) or to the rupture of aneurysm or AVM entailing sub arachnoids hemorrhage (5% of strokes) (Braunwald et al., 2023).

Stroke is most common medical emergency. The annual incidence of stroke between 180 and 300 per 100000. In many developing countries the incidence raises sequent with age due to adopting of less healthy life style. Stroke is the second commonest cause of death. The average incidence of stroke is 2:1,000. After the age of 50 the incidence rate doubles every decade (Choo et al.,2019).

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 2021 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, 2024).

In a study conducted by Mohammad et al. (2021), 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., 2022).

Over the last four decades, the stroke incidence in low- and middle-income countries has more than doubled. During these decades stroke incidence has declined by 42% in high income countries (Feigin et al., 2020). On average, stroke occurs 15 years earlier in – and causes more deaths of – people living in low- and middle-income countries, when compared to those in high-income countries (Owolabi et al., 2025).

Strokes mainly affect individuals at the peak of their productive life. Despite its enormous impact on countries' socio-economic development, this growing crisis has received very little attention to date. The risk factors for stroke are similar to those for coronary heart disease and other vascular diseases. Effective prevention strategies include targeting the key modifiable factors: hypertension, elevated lipids and diabetes. Risks due to lifestyle factors can also be addressed: smoking, low physical activity levels, unhealthy diet and abdominal obesity (Johnston et al., 2019). Combinations of such prevention strategies have proved effective in reducing stroke mortality even in some low-income settings (Xavier et al., 2020)

Each year in United States, approximately 730,000 people have stroke. And nearly 400,000 survive with some level of neurology impairment and disability. Each year in China, there were about 1.5-2.0 million new stroke patients. It has been a major public health problem in China. The clinical factors would not be the same in ischemic and hemorrhagic stroke. The pathogenesis of ischemic stroke is different from that of hemorrhagic stroke. In East China, a study showed that 78% ischemic patient and 22% hemorrhagic patients. The incidence rate of ischemic stroke was higher than that of hemorrhagic stroke (Zhang et al., 2021).

Depending on the part of the brain injured the severity of the injury and the person's general health consequence of stroke may differ from man to man (Boon et al., 2019).

One of the most prominent features in the acute phase is hemiparesis (Flansbjer et al., 2025) which is occurs in 80-90% of all stroke patients and may be accompanied by hemi hyperesthesia. Other remarkable features are represented by cognitive deficits such as aphasia, apraxia and hemi neglect (Hendricks, 2023). Motor impairment is the most common and widely recognized impairment following stroke and mostly focus of stroke rehabilitation is on the recovery of impaired movements and related functions (Galvin et al., 2022).

Muscle weakness, pain, spasticity and poor balance can lead to a reduced tolerance to activity and further sedentary lifestyle which occurs due to impairments resulting from stroke. Community-dwelling individuals with stroke undertake extremely low levels of physical activity (Eng & Tang, 2017).

After a CVA individual may show sensitive and cognitive impairments, the motor impairments such as muscular weakness, hypertonia, abnormal movement patterns and physical deconditioning are the most common. Individuals with CVA have some musculoskeletal disorders which are considered as important impairments and usually determine limitations in performing functional activities and activities of daily living like gait, stair ascent and descent (Nascimento et al., 2021).

Stroke may also causes some problem with language, including difficulty understanding speech or writing known as aphasia and knowing words but has difficulty to saying them clearly refers to dysarthria, problem with memory, thinking, attention or learning, possible inability to recognize object, recognize body parts of the body that is affected or understand instructions, difficulty in swallowing (Edwards, 2016). Other problems are in bowel and bladder control, fatigue, depression, loss of body function, along with dependency to others (Stokes, 2021).

At onset of stroke other deficits may be present such as loss of consciousness, dysfunction of the cranial nerves, postural imbalance, coordination disorders and loss of sphincter control. In the sub-acute and chronic phase some complications secondary to the initial neurological deficits may develop. These consist of shoulder-hand syndrome due to multiple traumatization in patients with paralysis of the upper extremity and hemi neglect or contractures resulting from severe spasticity (Hendricks, 2023).

After stroke chest infection, epileptic seizures, DVT (Deep Venous Thrombosis), pulmonary embolism, contracture, painful shoulder, pressure sore, urinary tract infection, constipation, depression and anxiety may also occur. Other psychological problems like depression, unrealistic state, labile state and personality changes (Boon et al.,2019) Stroke may also resulting activity limitations which sometimes referred to as disabilities are manifested by reduced ability to perform daily functions, such as dressing, bathing or walking. The level of activity limitation is generally related to but not completely dependent on the level of body impairment such as severity of stroke (Gordon et al., 2024). Balance disturbances may occur due to decreased muscle strength, range of movement, abnormal muscle tone, motor coordination, sensory organization, cognition and multisensory integration (Oliviera et al., 2018).

Adjustment of multiple risk factors throughout a combination of inclusive lifestyle interventions and proper pharmacological therapy is now accepted as the keystone of initiatives aimed at the avoidance of frequent stroke and acute cardiac events in stroke survivors (Gordon et al., 2024). The physical management process aims to maximize functional ability and prevent secondary complications to enable the patient to resume all aspects of life in his or her own environment (Braunwald et al., 2023). After stroke restoring functions is a complex process involving spontaneous recovery and the effects of therapeutic interventions. Actually, some interaction between the stage of motor recovery and the therapeutic intervention must be noticed (Belda-Lois et al., 2021).

The impact of stroke in socio-economic condition is always considerable, both in industrialized and non-industrialized countries of the world. Furthermore, as most guidelines are based on high-income country data, uncertainty remains regarding best management of stroke of unknown type in low- and middle-income countries. For example, in low- and middle-income countries, 34% of strokes (versus 9% in high-income countries) are of hemorrhagic subtype and up to 84% of stroke patients in low- and middle-income countries (versus 16% in high income countries) die within three years of diagnosis (Owolabi et al., 2025).

Approximately 85% of patients who have had a stroke regain gait by 6 months post-stroke have shown in several prospective cohort studies and about 20% of all stroke survivors show significant deterioration in mobility status between 1 and 3 years after stroke (Wevers et al, 2021). After stroke, between 52% and 85% of patient’s re-gain the

capacity to walk but, their gait usually remains different from that of healthy subjects (Pradon et al., 2023). Recently, evidence was found on improved walking ability not only associated with improved motor control of the paretic lower limb but also rather with the development of compensation movement strategies and improved loss of function in enhancing the ability to maintain balance over the non-paretic lower limb (Outremont et al., 2020).

Stroke seems an increasing impact in terms of media attention, patient and career knowledge, service developments and research. The sequence of stroke varies and it's depending on the part of the brain injured, the severity of the injury and the person's general health. The symptoms of a stroke include sudden numbness or weakness, especially on one side of the body; sudden confusion or trouble speaking or understanding speech; sudden trouble seeing in one or both eyes; sudden trouble with walking, dizziness, or loss of balance or coordination or sudden severe headache with no known cause (National institute of neurological disorder and stroke, 2024).

The objective of rehabilitations t" return the patient to home and to exploit recovery by providing a safe, progressive treatment which is appropriate to the individual patient and suggesting that physical therapy can employ unused neural pathways (Braunwald et al., 2023).

Rehabilitation of stroke patient include the comprehensive assessment of medical problems, impairments and disabilities, active physiological management, early mobilization and avoidance of bed rest, skilled nursing care, early setting of rehabilitation plans involving carers and early assessment and planning for discharge needs (Peppen et al.,2024). To deliver rehabilitation effectively, predictions need to be made about the patients' expected degree of recovery to set suitable therapeutic goals, develop effective treatment plans and facilitate discharge planning (Carr & Shepherd, 2023).

There is a positive and negative association between stroke and obesity. The outcome of stroke is associated with body weight. In a study showed that BMI is associate with stroke but the direction and strength of association depend on stroke subtype. Increased risks for both ischemic stroke and hemorrhagic stroke among men with BMI above the reference range (22 to 23 kg/m2) (Song et al., 2024). Obese stroke patient has lower prognosis. In stroke, obesity can lead to death Obesity is an independent risk factor for

cardiovascular events. In Asia-Pacific region, the prevalence of obesity and overweight is much among stroke patient (Choo et al.,2019).

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Physiotherapy plays an important role in rehabilitation. Used techniques are exercise, manipulation, massage, skills training and electrical treatment which are used to help heal and recover movement. After stroke the main focus of physiotherapy is to help learn to use both sides of body again and regain as much strength and movement as possible (Stroke association, 2022). The physiotherapist plays a major role in the physical management of stroke using skills acquired during education and professional development, to identify and manage problems of stroke using scientific principles (Carr & Shepherd, 2003). After stroke organized multidisciplinary care and rehabilitation increase patient survival and self-determination as well as reducing the length of inpatient stay (Peppen et al., 2024).

Besides eccentric strength training, studies on task-oriented training also showed promising results. For example, Yang et al. (2020) concluded that strength improves due to the fact that a task-oriented strength training could carry over into improvement in function. Similar results were found in another study, where it was concluded that a

two-week long task-oriented training program is effective towards improving both performance during daily activities and upper limb strength (Park et al., 2025). Dynamic, task specific force production is critical to functional motor performance (Clark et al., 2016).

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.

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 d 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).

In recent years, task-oriented strength training exercises have emerged as a promising approach to improve motor function in stroke survivors. Task-oriented training (TOT) focuses on performing activities or exercises that closely replicate functional tasks the patient needs to accomplish in daily life, such as reaching, grasping, or lifting objects. The application of progressive resistance training (PRT) to these tasks has shown to improve muscle strength, coordination, and overall function.

Task-oriented strength training (TOS) integrates functional movement exercises with resistance training, targeting both strength and functional mobility. It has been proposed that combining task-specific activities with progressive resistance exercises can enhance neuromuscular adaptation and promote greater recovery in patients with

stroke. Several studies have demonstrated the benefits of TOS in improving motor function, muscle strength, and overall arm dexterity post-stroke. TOS is particularly beneficial because it emphasizes repetitive practice of functional movements, which are essential for neuroplasticity and motor learning. Through such repetitive, task-specific exercises, stroke survivors may retrain their brain to reorganize itself and improve motor function. In addition, task-oriented exercises have been found to stimulate the central nervous system, allowing for more effective motor control and coordination (Lang et al. (2023)

Increasing the intensity of task-oriented strength training exercises is a key factor in enhancing rehabilitation outcomes. Research suggests that higher training intensity, when appropriately applied, leads to greater improvements in strength and functional performance. The principle of progressive overload in strength training posits that muscles adapt to increased resistance, leading to greater strength gains and improved function over time (Lennon et al., 2020).

A number of studies have investigated the effects of high-intensity strength training on stroke rehabilitation. For example, a study (Dobkin et al.,2020) found that high-intensity resistance training significantly improved arm strength and function in individuals with chronic hemiparetic stroke. Similarly, a study demonstrated that an increase in exercise intensity during task-oriented training resulted in significant improvements in both muscle strength and functional movement in stroke survivors (Young et al.,2022).

Stroke patients who participated in a high-intensity task-oriented strength training program showed marked improvements in arm function, as measured by the Fugl-Meyer Assessment and the Wolf Motor Function Test. These findings suggest that increasing the intensity of task-oriented exercises may provide a more effective rehabilitation approach for enhancing arm function (Aday et al., 2024).

The high-intensity exhibited significantly greater improvements in motor function, strength, and quality of life. These findings were consistent with a systematic review (Mehrholz et al.,2015), which concluded that high-intensity training programs had a moderate to large effect on improving upper limb function and strength in stroke survivors (Jørgensen et al., 2022).

In contrast, a study focused on the timing and intensity of interventions, finding that the optimal intensity of training might vary based on the stage of recovery. For patients in the subacute phase of stroke recovery, moderate-intensity task-oriented strength training yielded better outcomes compared to high-intensity training, suggesting the need for individualized treatment approaches (Kwakkel et al., 2024)

The mechanism behind the effectiveness of increased intensity in task-oriented strength training lies in its ability to promote neuroplasticity—the brain's ability to reorganize and form new neural connections. Task-oriented exercises activate specific neural pathways involved in functional movements, and the intensity of these exercises can enhance the recruitment of motor units and muscle fibers, leading to increased strength and better motor control.

The Intensity of training may also influence the neurophysiological adaptations in the brain. High-intensity strength training is thought to promote greater activation of the motor cortex and other regions involved in motor planning and execution. This, in turn, leads to improved voluntary control over the affected arm and enhanced functional recovery (Peppen et al., 2024).

Despite the promising findings, several challenges remain in determining the optimal intensity and duration of task-oriented strength training exercises for stroke rehabilitation. Variability in patient characteristics, such as age, stroke severity, and comorbid conditions, may impact the effectiveness of high-intensity interventions. Additionally, the risk of fatigue and injury during high-intensity training warrants further investigation. Future research should aim to refine the intensity guidelines for task-oriented strength training, considering individual patient factors and recovery phases. Moreover, long-term follow-up studies are necessary to determine the sustainability of gains achieved through high-intensity training and the impact on long-term independence and quality of life (Mehrholz et al., 2024).

In summary, increasing the intensity of task-oriented strength training exercises appears to be an effective intervention for improving arm function in stroke survivors. RCTs consistently support the benefits of high-intensity training in enhancing strength, motor function, and quality of life. However, future research should explore optimal intensity levels, individualized training protocols, and long-term outcomes to further refine rehabilitation strategies and maximize the recovery potential for stroke patients.

CHAPTER -III METHODOLOGY

3.1 Study Design

This study is 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 and Stroke Rehabilitation Unit, Department of the Physiotherapy at the Centre for The Rehabilitation of the Paralysed (CRP), Savar, Dhaka.

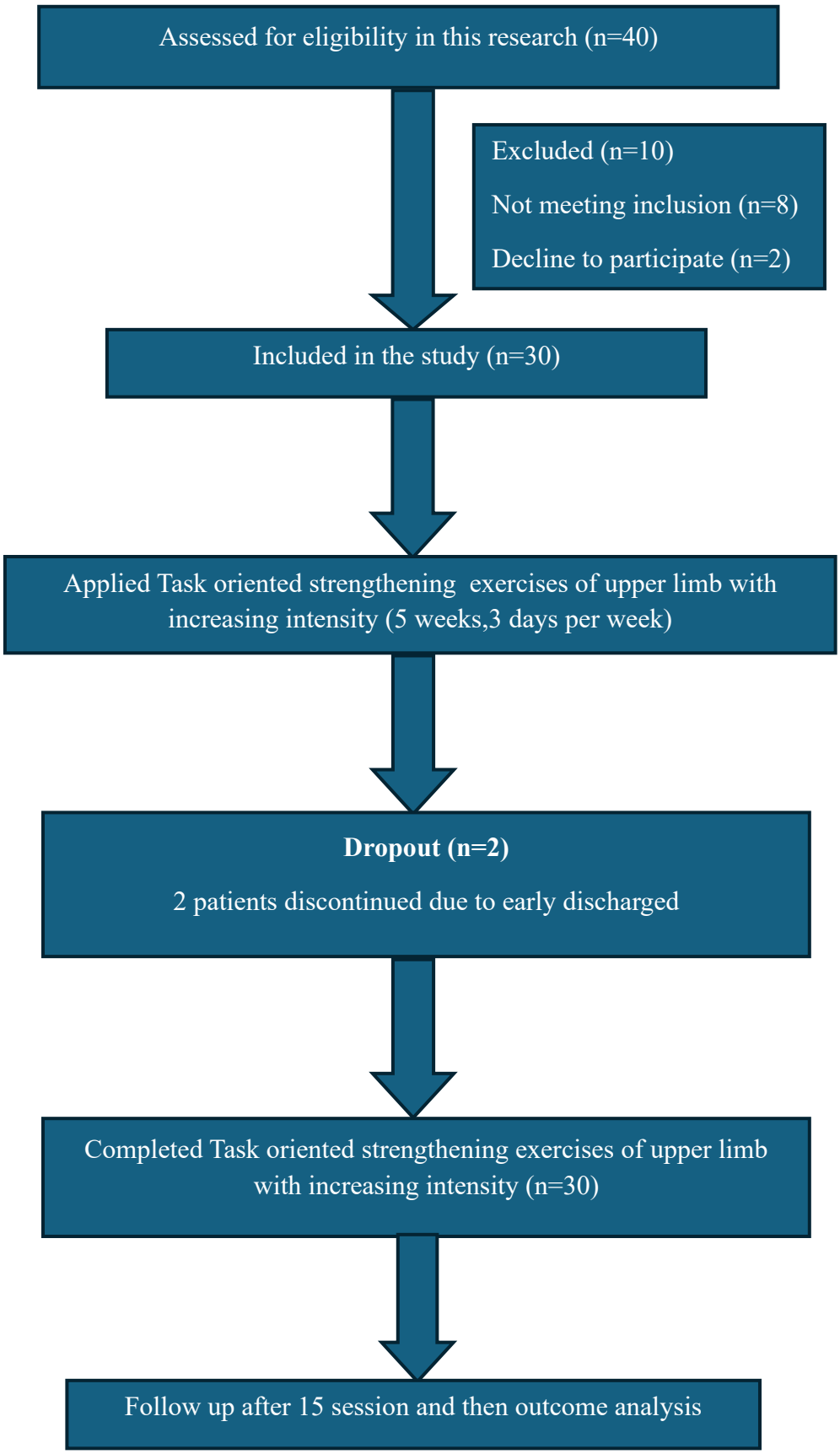
3.3 Study Population

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

3.4 Duration of data collection

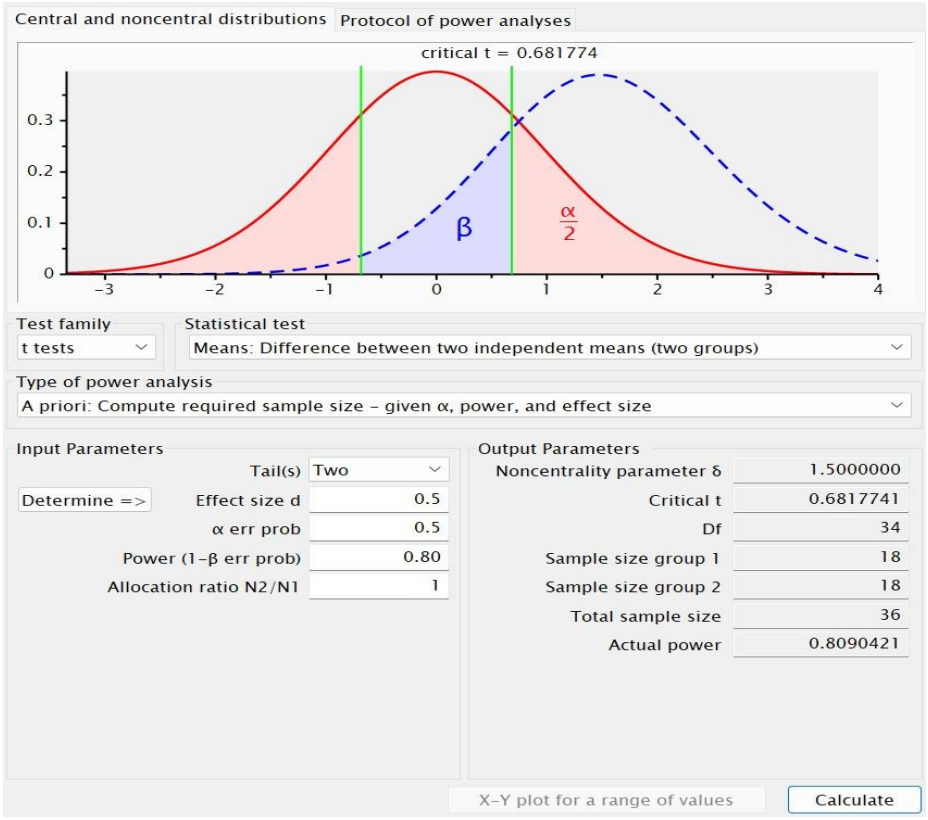
Data was collected carefully and confidentially and maintained all ethical considerations. The researcher gave each participants a particular time to collect the data. Data was collected from December 2024 to March 2025.

3.5 CONSORT framework



3.6 Sample Size

Sample is calculated by G*power calculator software and the estimated sample size was 18. But researcher took 30 participants from outdoor Neurology and Stroke rehabilitation unit, Department of Physiotherapy, CRP, Savar, Dhaka who met the criteria was included in the study. People who did not meet the criteria was excluded. So, sample size for this thesis was 30 among them 15 participants were in trial group and 15 participants in control group.



3.7 Sampling process

Participants with stroke who met the inclusion criteria selected conveniently from outpatient neurological unit of physiotherapy department of CRP, Savar and Dhaka. All the participants had equal probability of assessing to any of two groups and 15 patients were randomly assigned to experimental group comprising of treatment approaches of task-oriented physiotherapy along with conventional physiotherapy and 15 participants to control group treated by usual conventional therapy for this study. Single blinding procedure was followed in this study. The participants were assigned into experimental group and control group by using computed generated random number from 1 to 30. An initial randomization was done by computer to identify the participants of experimental and control group and the first participants came out in the experimental group.

3.8.1 Inclusion Criteria

The inclusion criteria for participants were as follows: -

1. Patients diagnosed with stroke by neurologist. (Harris et al., 2009)
2. Age range between 30-70 years (Dhawale et al.,2018).
3. Inclusion of both male and female participants. (Moon, Park, Kim and Na, 2018)
4. At least one and a half months' post-stroke. (Bosch et al., 2014)
5. Experiencing paralysis of the upper limb. (Colomer et al.,2016)
6. Demonstrating a fairly good cognitive condition. (Colomer et al.,2016)
7. Able to perform reach to grasp movement (Michaelson, Dannenbaum and Levin, 2006).
8. Absence of other neurological deficits. (Song et al., 2013).

3.8.2 Exclusion Criteria

The exclusion criteria for participants were as follows:

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

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

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

4.Hemiplegic patients with cognitive and perceptual disorders. (Michealson, Dannenbaum and Levin, 2006).

5. Patient who could not communicate with therapists as a consequence of severe aphasia (Ko et al., 2016).

6.Facture (Onwudiweetal., 2018).

7.Participants with, severe spasticity or severe flaccidity in lower limbs and upper limbs were excluded (Sharma & Kaur., 2017).

8.Any spinal deformities that affect the normal alignment of the patient.

3.9 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 (15) for the control group and E1 (15) 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.

3.10 Data Collection Tools

The data collection tools employed in this study consisted of: -

- Consent Form.
- A written structured questionnaire.
- Goniometer.
- Barthes Index Scale.
- Stop Watch
- Meter scale.
- Pen, Papers, Pencil.

3.11 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.

3.12 Outcome Measurement tools

3.12.1 Goniometer

Goniometer is a tool to measure range of motion of the joints. Validity and reliability of this scale is about 90%.

3.12.2 Action arm research test

Action arm research test is a measurement tools to find out upper limb. Validity and reliability of this test is more than 90%. 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.

3.12.3 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.Its criterion Validity (predicting outcomes): 75% to 90% and inter-rater Reliability: 80% to 95%.

3.13Experimental Intervention

Table-3.13.1: Experimental Intervention

Exercise (**Task**)	**Description**	**Control Group** (Repetition)	**Experimental Group** (Repetition)
Exercise -1: Active Range of Motion (AROM) Exercises	Active ROM exercises focusing on muscle strengthening.	10 repetition ×1set	10 repetition × 3 set
Exercise -2: Wrist and Grasping Strengthening	Soft grip ball squeezes (use a stress ball or small therapy ball).	10 repetition ×7 sec hold×1set	10 repetition×7 sec hold×3 set
Exercise-3: Shoulder and Elbow Task-Oriented Training	Wall push-up to simulate functional pushing/pulling motions.	10 repetition ×7 sec hold×1set	10 repetition ×7 sec hold×3 set
Exercise - 4: Functional Reach and Reach-to-Grasp Tasks	Task-oriented dynamic reaching (e.g., picking up and placing objects back onto a shelf).	10 repetition ×1set	10 repetition ×3 set
Exercise -5: Elbow Flexion and Extension with Resistance	Increase resistance with a band or small dumbbell and perform controlled elbow flexion and extension.	10 repetition ×1set	10 repetition ×3 set
Exercise-6: Task-Oriented	Open a water bottle hold it while pouring, or carry lightweight	10 repetition × 1set	10 repetition × 3 set

Simulated Daily Activities (e.g., Opening a water bottle Lifting and Carrying)	items between short distances.		
Exercise-7: Arm Cycling	Controlled cycling by arm with low resistance.,	10 repetition × 1set	10 repetition × 3 set

Time Duration: 3 days per week for 5 weeks.

3.14 Data analysis

- Data was analyzed with the software named Statistical Package for Social Science (SPSS) version 26 and Microsoft excel 2016.
- Baseline data is compared by using Chi square test.
- Statistical comparison between the groups had made using independent t test for parametric statistics.
- Statistical comparison within the group had made using paired t test for parametric statistics.

3.15 Ethical Consideration

The study protocol was submitted to the BHPI review board for approval as per the existing rules. This study followed the World Health Organization (WHO) & Bangladesh Medical Research Council (BMRC) guidelines and strictly maintained the confidentiality. Permission from in charge of Physiotherapy department of CRP was taken to conduct the study. Written consent (appendix) was taken from the participant including signature and informing them about the purpose of the study, anonymity, their rights to refuse answering any question, withdrawn from the study at any point of time and other issues mentioned in the form before starting the interviews. The participants were informed clearly that their information would be kept confidential a secure place.

CHAPTER – IV RESULTS

The main purpose of the study is to find out high intensity or low intensity task-oriented strength training which is more effective for the improvement of upper limb strength specially for the post stroke patients. Total 30 participants were enrolled. 15 patients assigned to the control group and 15 patients in the experimental group. The intervention group demonstrated significant improvements compared to the control group. These findings highlight the potential benefits of this specific training approach for the stroke rehabilitation programs. It will enhance more recovery and functional outcomes for the post stroke patient with upper limb impairments

Comparison of Baseline Data

Table 4.1.1: Age of the participants

Variable	Control group (Mean with SD)	Experimental group (Mean with SD)	P value
Age	51.27(±9.41)	51.85(±9.03)	0. 889

Among the 30 participants age ranges were in between 30-70 years. In the control group mean age was 51.27 (n=15) and maximum age was 67 and minimum age was 33. In the experimental group mean age was 51.85 (n=15) and the maximum age was 70 and minimum age was 35. Here p value is more than 0.05 and statistically not significant which means the baseline is not so different between experimental and control group.

4.1.2: Socio-demographic information (Both Experimental and Control Group)

Variable	Experimental Group n (%)	Control Group n (%)	P value
Gender			
Male	8(53.33%)	9(60%)	0.134
Female	7(46.67%)	6(40%)	0.122
Living Area			
Rural area	5(33.33%)	7(46.67%)	0.678
Semi-Urban	3(20%)	2(13.33%)	0.765
Urban	7(46.67%)	6(40%)	0.677
Educational Qualifications			
Primary	9(60%)	8(53.33%)	0.864
Secondary	4(26.67%)	3(20%)	0.833
Graduation	2(13.33%)	4(26.67%)	0.854
Family type			
Joint family	2(13.33%)	4(26.67%)	0.378
Nuclear family	13(86.67%)	11(73.33%)	0.443
Occupational Status			
Housewife	7(46.47%)	6(40%)	0.663
Teacher	2(13.33%)	1(6.67%)	0.787
Service holder	1(6.67%)	3(20%)	0.856
Farmer	1(6.67%)	2(13.33%)	0.912
Business	3(20%)	2(13.33%)	0.765
Retired	1(6.67%)	1(6.67%)	-

Among the 30 participants, both male and female participants were included. In the experimental group 53.33% were male and 46.67% were female participants. In the

control group 60% were male participants and 40% were female participants. In the experimental group 33.33% participants were from rural areas,20% from semi- urban areas and 46.67% were from urban areas. In the control group 46.67% were from rural areas, 13.33% were from semi- urban areas and 40% participants were from urban areas Here in the both group there were both primary, secondary and graduation level participants. In the experimental group 60% participants educational qualification was primary level where 26.67% were secondary and 13.33% were graduates. In the control group there were about 53.33% primary, 20% secondary and 26.67% graduate. Fr the 30 participants most of the family are nuclear family. In the experimental group only 13.33% participants were from joint family and 86.67% were from nuclear family. On the other side in the control group 26.67% were from joint family and 73.33% participants were from nuclear family. Occupational status varies between the two groups, with housewife and service-related jobs, teacher, business common in both. Interestingly, the experimental group has 46.47% housewife, 13.33% teacher, 6.67% service holder, 6.67% farmer, 20% businessman and 6.57% retired participants. In the control group 40 % were housewife, 6.67% teacher, 20% service holder, 13.33% farmer, 13.33% business and 6.67% retired. This comprehensive socio-demographic analysis outlines the diverse backgrounds of participants, which may affect the interpretation and applicability of the RCT findings. The noted differences emphasize the significance of including socio-demographic considerations in the analysis of the trial results. All **P-values > 0.05**, indicating **no statistically significant differences** in demographic variables between the experimental and control groups. This suggests that the groups are **well matched** at baseline, reducing the likelihood of confounding in the study results.

4.2 Stroke related variables

4.2.1 Type of Stroke

Out of the 30 patients enrolled in the study, 25 were diagnosed with ischemic stroke, while 5 had hemorrhagic stroke. Ischemic strokes were more common, making up 83.33% of all cases. In the experimental group of 15 participants, 80% (n=12) were diagnosed with ischemic stroke, whereas in the control group of 15 participants, 86.67% (n=13) had ischemic stroke. Hemorrhagic strokes accounted for 16.67% of the total cases, with 20% (n=3) in the experimental group and 13.33% (n=2) in the control group. This distribution highlights the higher prevalence of ischemic strokes in both groups, offering important context for understanding treatment outcomes and interventions in the randomized controlled trial.

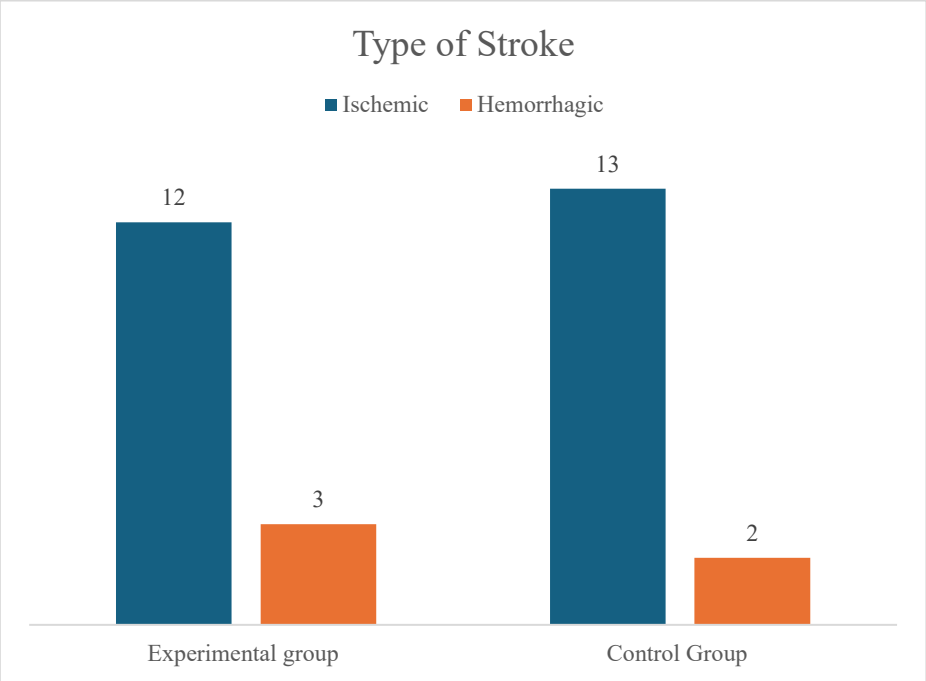


Figure -1: Type of Stroke

4.2.2 Time of taking intervention since stroke in both group

The timing of interventions following a stroke reveals distinct patterns within both the experimental and control groups. A large proportion of participants in both groups began their interventions more than 1 months after the stroke. Specifically, 53.33% of participants in the experimental group and 60% in the control group-initiated interventions after this period. A notable portion of participants in both groups started interventions 6 months or later post-stroke, with 33.33% in the experimental group and 26.67% in the control group. Additionally, 13.33% of those in the experimental group and 13.33% in the control group began interventions after 1 year or more. This breakdown of intervention initiation times offers valuable insights into the timing distribution of treatments in the randomized controlled trial. This time distribution when interventions occur is essential for evaluating their effectiveness and potential impact on patient outcomes, thus enhancing the interpretation of the trial's findings.

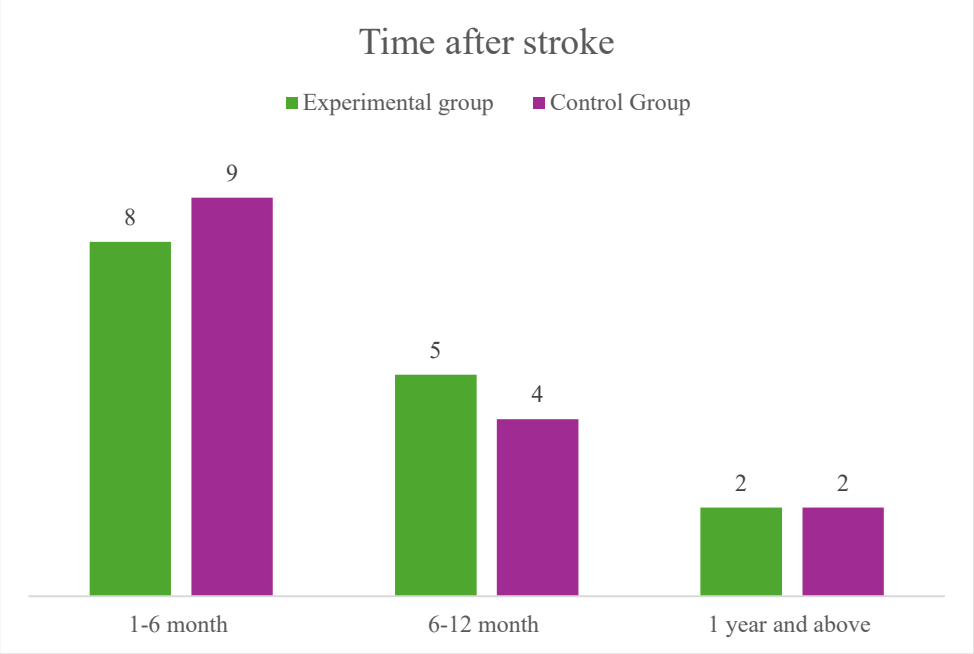


Figure -2: Time of taking intervention since stroke in both group

4.2.3 Co-morbidities with stroke

In the analysis of co-morbidities in both the experimental and control groups of this Randomized Clinical Trial (RCT), several health conditions were observed. Heart disease was present in 13.33% of the experimental group and 6.67% of the control group. Diabetes mellitus was found in 13.33% of the experimental group and 20% of the control group. Hypertension was notably more common, affecting 66.67% of the experimental group and 73.33% of the control group. Asthma was reported by 6.67% in experimental group only. Interestingly, thyroid conditions were noted in 6.67% of the control group, but none of the experimental group participants had thyroid-related issues. These results provide important context for understanding how underlying health conditions may influence the trial outcomes. Here all the P-values are greater than 0.05, indicating that there are no statistically significant differences in the stroke related variable between the experimental and control groups. This implies that both groups are comparable at baseline, minimizing the risk of confounding factors affecting the study outcomes.

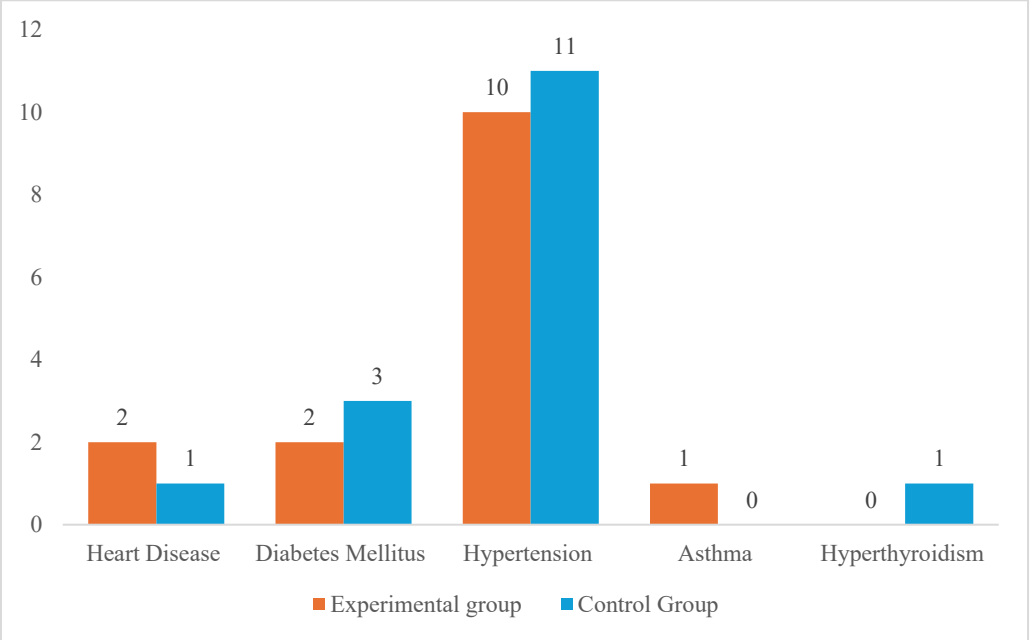


Figure -3: Co-morbidities with stroke

Table 4.3.1 Comparison of Muscle Strength between Group (Independent t test)

Variable	Mean±SD	Observed t value	df	P value
Shoulder flexion	3.01±0.67	2.01	28	0.056
Shoulder extension	3.07±0.8	1.89	28	0.069
Shoulder abduction	3.18±0.63	1.95	28	0.063
Shoulder adduction	4.11±0.72	2.67	28	0.012*
Shoulder medial rotation	4.37±0.85	2.77	28	0.011*
Shoulder lateral rotation	3.38±0.61	1.73	28	0.094
Elbow flexion	4.15±0.75	2.58	28	0.014*
Elbow extension	3.47±0.66	2.03	28	0.052
Wrist flexion	4.04±0.86	2.61	28	0.014*
Wrist extension	3.19±0.77	1.04	28	0.312
Finger flexion	4.16±0.78	2.84	28	0.008*
Finger extension	3.16±0.70	1.52	28	0.138

This table presents the results of an independent t-test conducted to assess muscle strength differences in various upper limb movements between two groups. The table includes the mean and standard deviation (Mean ± SD) for each movement, along with the observed t value, degrees of freedom (df = 28), and the corresponding p value indicating statistical significance. The movements tested include those at the shoulder, elbow, wrist, and fingers.

*The data show that five muscle movements demonstrated statistically significant differences between the groups ($p < 0.05$): shoulder adduction ($p = 0.012$), shoulder medial rotation ($p = 0.011$), elbow flexion ($p = 0.014$), wrist flexion ($p = 0.014$), and finger flexion ($p = 0.008$). These results suggest that the groups differed significantly in muscle strength for these specific movements. Several other movements showed near-significant differences, with p-values between 0.05 and 0.1. These included shoulder flexion ($p = 0.056$), shoulder extension ($p = 0.069$), shoulder abduction ($p = 0.063$), elbow extension ($p = 0.052$), and shoulder lateral rotation ($p = 0.094$). While not statistically significant, these values indicate a trend toward significance and may suggest potential differences that could be confirmed with a larger sample size.

On the other hand, wrist extension ($p = 0.312$) and finger extension ($p = 0.138$) did not show significant differences between the groups, indicating similar muscle strength in these areas. Overall, the table highlights specific areas where muscle strength varies significantly between groups, especially in movements involving the shoulder, elbow, and fingers. The results are valuable for identifying which upper limb movements may be most affected in the population under study and can guide targeted rehabilitation or training interventions.

Table 4.3.2 Independent t test of Action arm research Test (Comparison between Group)

Variable	Mean±SD	Observed t value	df	P value
ARAT Grasp	14.78±2.02	3 .421	28	0.001*
ARAT Grip	8.07±1.026	3.056	28	0.005*
ARAT Pinch	13.92±1.58	2.095	28	0.04*
ARAT Gross movement	8.25±1.54	2.842	28	0.008*

*The analysis indicates statistically significant differences across all four ARAT sub-components between the two independent groups. Each p-value is below the conventional alpha level of 0.05, suggesting that the observed differences are unlikely to have occurred by chance. The Grasp component showed the highest level of statistical significance ($t = 3.421$, $p = 0.001$), indicating a notable improvement in this domain. The Grip component also demonstrated a significant difference ($t = 3.056$, $p = 0.005$). The Gross Movement sub-score was significantly different between the groups as well ($t = 2.842$, $p = 0.008$). The Pinch sub-score, while statistically significant, had the highest p-value among the components ($t = 2.095$, $p = 0.040$), indicating a comparatively smaller but still meaningful effect. The Independent t-test results suggest that the intervention had a significant positive impact on upper limb motor function across all sub-domains of the ARAT. These findings support the effectiveness of the intervention in improving hand and arm function.

Table 4.3.3: Independent t test in Barthel index (Comparison between Group)

Variable	Mean±SD	Observed t value	df	P value
Barthel Index	60.54±12.436	2.672	28	0.0121*

*The independent t-test comparing the Barthel Index scores between the experimental and the control groups showed a statistically significant difference ($t = 2.672$, $p = 0.0121$), indicating a notable disparity in functional independence between the groups. The experimental group achieved a mean Barthel Index score of 69.54 ± 12.436. This statistical outcome highlights the effectiveness of the intervention in improving participants ability to perform daily living tasks. The significant t-value and p-value serve as key indicators of the intervention's impact in the context of the randomized controlled trial.

Table 4.3.4 Comparison of Muscle Strength within Groups (Paired t test)

Variable	Experimental group			Control Group		
	Observed t value	df	P value	Observed t value	df	P value
Shoulder flexion	3.43	14	0.004*	1.89	14	0.078
Shoulder extension	2.51	14	0.025*	2.33	14	0.036*
Shoulder abduction	4.33	14	0.0008*	3.01	14	0.009*
Shoulder adduction	5.59	14	0.0001*	3.44	14	0.0046*
Shoulder medial rotation	6.22	14	0.0000*	3.81	14	0.0028*
Shoulder lateral rotation	2.03	14	0.063*	1.88	14	0.082
Elbow flexion	6.53	14	0.0000*	3.62	14	0.0036*
Elbow extension	3.79	14	0.0026*	2.76	14	0.084
Wrist flexion	3.50	14	0.0038*	2.59	14	0.076
Wrist extension	2.08	14	0.059	1.43	14	0.173
Finger flexion	7.12	14	0.0000*	3.71	14	0.003*
Finger extension	3.08	14	0.0078*	2.38	14	0.055

This table presents the results of paired t-tests conducted to evaluate changes in muscle strength across various upper limb movements for two groups: The Experimental group and the Control group. Each muscle action is analyzed for its observed t-value, degrees of freedom (df), and the corresponding p-value, which indicates the statistical significance of the observed changes.

*For the Experimental group, the muscle strength improvements are statistically significant ($p < 0.05$) in most movements, reflecting notable gains post-intervention. For example, shoulder flexion showed a t-value of 3.43 with a p-value of 0.004, shoulder abduction had a highly significant t-value of 4.33 ($p = 0.0008$), and shoulder adduction showed an even higher t-value of 5.59 ($p = 0.0001$). Other significant results include shoulder medial rotation ($t = 6.22$, $p < 0.0000$), elbow flexion ($t = 6.53$, $p < 0.0000$), and finger flexion ($t = 7.12$, $p < 0.0000$), indicating robust improvements in these muscle groups. Some movements, like shoulder lateral rotation ($p = 0.063$) and wrist extension ($p = 0.059$), approached but did not reach statistical significance in this group.

In contrast, the Control group demonstrated fewer statistically significant improvements, with many p-values exceeding the conventional 0.05 threshold. For instance, shoulder flexion ($p = 0.078$) and shoulder lateral rotation ($p = 0.082$) were not significant.

*In the control group shoulder extension ($p = 0.036$), shoulder abduction ($p = 0.009$), and shoulder adduction ($p = 0.0046$) showed moderate significance. Finger flexion ($p = 0.003$) and elbow flexion ($p = 0.0036$) also revealed significant changes, albeit generally less pronounced than in the Experimental group. Overall, this table indicates that the Experimental group experienced more consistent and significant improvements in muscle strength across a range of shoulder, elbow, wrist, and finger movements compared to the Control group, suggesting that the intervention applied to the Experimental group was effective in enhancing muscular strength.

Table 4.3.5 Paired t test of action arm research test (Comparison within Groups)

Variable	Experimental group			Control Group		
	Observed t value	df	P value	Observed t value	df	P value
ARAT Grasp	7.89	14	0.0000*	4.01	14	0.0012*
ARAT Grip	9.49	14	0.0000*	5.11	14	0.0001*
ARAT Pinch	8.77	14	0.0000*	4.56	14	0.0004*
ARAT Gross movement	8.58	14	0.0000*	5.09	14	0.0001*

Table 4.3.5 presents the results of paired t-tests conducted to evaluate the effectiveness of an intervention on upper limb function, measured by the Action Research Arm Test (ARAT) across different subscales: Grasp, Grip, Pinch, and Gross Movement. The table compares two groups: An Experimental group and a Control group, each with 15 participants (degrees of freedom, df = 14).

* For the Experimental group, the observed t-values are notably high across all ARAT subtests—7.89 for Grasp, 9.49 for Grip, 8.77 for Pinch, and 8.58 for Gross Movement. Corresponding p-values are all reported as 0.0000, indicating extremely statistically significant improvements post-intervention. These results suggest the intervention had a strong positive effect on the participants' upper limb motor functions in this group.

* The Control group also shows statistically significant improvements, albeit with lower t-values compared to the Experimental group: 4.01 for Grasp, 5.11 for Grip, 4.56 for Pinch, and 5.09 for Gross Movement. Their p-values, ranging from 0.0012 to 0.0001, confirm that the changes observed were significant but less pronounced than in the Experimental group. In summary, both groups demonstrated improvements on the

ARAT subscales, but the Experimental group exhibited significantly greater functional gains, highlighting the efficacy of the tested intervention.

Table 4.3.6: Paired t test of Barthel index (Comparison within Groups)

Variable	Experimental group			Control Group		
	Observed t value	**df**	**P value**	**Observed t value**	**df**	**P value**
Barthel Index	2.34	14	0.034*	2.01	14	0.065

Table 4.3.6 presents the results of a paired t-test assessing changes in the Barthel Index for both experimental and control groups. *In the experimental group, the observed t-value is 2.34 with 14 degrees of freedom (df) and a statistically significant p-value of 0.034, indicating a meaningful improvement in functional independence. In contrast, the control group shows a t-value of 2.01 with the same df, but the p-value of 0.065 is not statistically significant. This suggests that the experimental intervention may have had a greater impact on improving the participants functional abilities compared to the control condition.

CHAPTER -V DISCUSSION

5.1 Discussion

The baseline socio-demographic characteristics of the participants in both control and experimental groups provide essential context for interpreting the outcomes of the randomized controlled trial (RCT). The two groups were well matched in terms of age, with mean ages of 51.27 and 51.85 years for the control and experimental groups, respectively. This similarity suggests that age-related factors are unlikely to bias the intervention's effects, as participants were comparable in terms of this fundamental demographic variable (Galvin et al., 2022). The age range of 30 to 70 years across both groups represents a middle-aged to older adult population, which may be relevant depending on the condition or intervention under study (Choo et al.,2019).

Gender distribution was relatively balanced across groups, with a slight predominance of males 60% in control, 53.33% in experimental (Wasay, Khatri, & Kaul, 2024). The near-equal representation of males and females supports generalizability of the results across genders, although the slightly higher male proportion in the control group should be noted when considering gender-related response differences.

Living area data revealed some variation, with a higher proportion of rural participants in the control group (46.67%) compared to the experimental group (33.33%), and more urban participants in the experimental group (46.67% vs. 40%). These differences could influence outcomes, as access to healthcare resources, lifestyle factors, and environmental exposures often differ between rural and urban settings (Eng & Tang, 2017). The presence of semi-urban participants, though a smaller proportion, further adds diversity to the sample.

Educational qualifications showed that the majority of participants in both groups had primary education, followed by secondary and graduation levels. The experimental group had a higher percentage with primary education (60% vs. 53.33%), while the control group had more graduates 26.67% vs. 13.33% (Zhang et al., 2021). Education level can impact participants' health literacy, adherence to interventions, and outcome reporting, highlighting the need to account for this factor in analyses.0

Family type distribution showed that most participants belonged to nuclear families, more so in the experimental group (86.67%) than the control group (73.33%). Family support systems can affect health behaviors and recovery, potentially influencing intervention efficacy (Eng & Tang, 2017).

Occupational status varied between groups but included housewives, teachers, service holders, farmers, businessmen, and retired individuals. The higher proportion of housewives in the experimental group (46.47%) versus the control (40%) and more service holders in the control group (20% vs. 6.67%) could reflect socioeconomic and lifestyle differences influencing health outcomes. Overall, these socio-demographic variations underscore the importance of considering participant backgrounds when analyzing trial results (Wasay, Khatri, & Kaul, 2024). While most variables were balanced, some differences, particularly in living area and occupational status, should be considered potential confounders. Including these factors in multivariate analyses or subgroup assessments may enhance the validity and applicability of findings.

The analysis of stroke-related variables in this randomized controlled trial provides critical insights into the patient characteristics and intervention timing that could influence treatment outcomes. The predominance of ischemic stroke across both groups (83.33% overall) aligns with global epidemiological trends, where ischemic strokes are more common than hemorrhagic strokes. The slight variation between groups, with 80% in the experimental and 86.67% in the control group diagnosed with ischemic stroke, suggests a comparable baseline distribution, which is essential for the internal validity of the trial (Choo et al.,2019). This similarity supports that any differences in outcomes are less likely to be due to stroke type disparities.

The timing of intervention initiation post-stroke reveals important patterns, with the majority of patients beginning treatment within the first six months. This early intervention window (1–6 months) is crucial as it often represents a period when rehabilitation can be most effective due to brain plasticity and recovery potential. Both groups showed similar timing distributions, with over half of participants starting interventions within this period. The presence of patients who started interventions beyond six months and even after a year highlights the variability in patient trajectories and healthcare access, which could affect responsiveness to treatment. Understanding

this timing helps in interpreting the effectiveness of the interventions in the context of stroke recovery phases.

Co-morbidities such as hypertension, diabetes mellitus, and heart disease were prevalent among participants, with hypertension being the most common in both groups. These conditions are known risk factors for stroke and can complicate recovery, potentially influencing the efficacy of interventions. The slightly higher prevalence of hypertension and diabetes in the control group may have implications for comparative outcomes (Aday et al., 2024). The unique presence of asthma in the experimental group and hyperthyroidism in the control group adds another layer of patient variability, which should be considered when evaluating results. These findings underscore the importance of accounting for co-morbid health conditions and intervention timing when assessing treatment effectiveness in stroke populations.

The results presented collectively demonstrate the significant impact of the intervention on upper limb muscle strength, motor function, and functional independence. The independent t-tests reveal meaningful differences between the experimental and control groups, underscoring the effectiveness of the intervention in improving physical and functional outcomes (Lennon et al., 2020). Here found significant improvements in muscle strength in specific upper limb movements. Five muscle groups—shoulder adduction, shoulder medial rotation, elbow flexion, wrist flexion, and finger flexion—showed statistically significant differences favoring the intervention group. This indicates targeted strength gains in these areas, which are critical for functional upper limb use. Notably, other shoulder and elbow movements such as flexion, extension, and abduction approached significance, suggesting that with a larger sample size or longer intervention period, these might also reach statistical significance (Young et al.,2022). The lack of significant differences in wrist and finger extension implies that these movements may be less responsive to the intervention or require different approaches. Overall, the muscle strength data suggest the intervention effectively enhances key muscle groups that contribute to upper limb function.

These findings further reinforce the positive impact on upper limb motor performance, as measured by the Action Research Arm Test (ARAT). All four subcomponents—Grasp, Grip, Pinch, and Gross Movement—showed significant improvements in the intervention group compared to controls (Aday et al., 2024). The strongest effects were

observed in grasp and grip, essential components for fine motor control and everyday activities. Improvements in gross movement indicate enhanced ability to perform larger arm motions, contributing to overall arm functionality. These results suggest that the intervention not only increases muscle strength but also translates into better coordinated and functional motor skills.

Finally, the result shows a significant difference in the Barthel Index, indicating improved independence in activities of daily living for the intervention group. This functional outcome is critical as it demonstrates that muscle strength and motor improvements are clinically meaningful, positively affecting participants' quality of life and autonomy.

This intervention yields robust benefits across multiple domains of upper limb function. Enhanced muscle strength in key movements correlates with improved motor control and practical function, as shown by ARAT and Barthel Index results. These findings support the use of the intervention in rehabilitation programs aiming to restore upper limb strength and functional independence, ultimately contributing to better patient outcomes (Lennon et al., 2020). Future research might explore optimizing the intervention to target less responsive movements and confirm trends noted in near-significant results.

The paired t-tests in demonstrate that the Experimental group experienced statistically significant improvements in most muscle strength variables, with t-values ranging from moderate (e.g., shoulder extension, $t = 2.51$, $p = 0.025$) to very strong (e.g., finger flexion, $t = 7.12$, $p < 0.0001$). These findings suggest that the intervention had a robust effect on muscle groups critical for upper limb movement and control. In contrast, the Control group showed fewer significant changes and generally lower t-values, indicating limited muscle strength gains over the same period.

Notably, some movements in the Experimental group, such as shoulder lateral rotation and wrist extension, showed improvements that approached but did not reach statistical significance, suggesting that these particular muscle actions may require longer or more targeted interventions for measurable gains. Conversely, the Control group showed significant gains in fewer movements and with smaller effect sizes, emphasizing the relative inefficacy of the control condition or natural recovery alone.

Significant functional improvements in upper limb performance as measured by the Action Research Arm Test (ARAT). The Experimental group showed markedly higher t-values and extremely low p-values across all ARAT subscales (Grasp, Grip, Pinch, and Gross Movement), indicating substantial functional recovery and enhanced motor control post-intervention (Young et al.,2022). Although the Control group also showed significant functional improvements, the magnitudes were consistently lower than those observed in the Experimental group. These e results underscore the intervention's efficacy in not only increasing muscle strength but also translating these gains into meaningful improvements in functional upper limb tasks. This highlights the importance of targeted rehabilitation protocols that can effectively enhance both muscle performance and functional ability in patients.

The paired t-test results indicate that the experimental group experienced a significant improvement in the Barthel Index, reflecting enhanced functional independence after the intervention. The t-value of 2.34 and p-value of 0.034 confirm this meaningful change. In contrast, the control group's improvement was not statistically significant, with a t-value of 2.01 and p-value of 0.06 (Eng & Tang, 2017). This suggests that while some improvement occurred in both groups, the experimental intervention was more effective in enhancing participants' functional abilities. These findings support the potential benefit of the experimental treatment in promoting greater independence in daily activities.

Overall, this study present that increasing intensity Task-oriented strength training exercises effectively improves upper limb function in stroke survivors, with marked progress in various measures. The results correspond with earlier research and additionally emphasize distinctive benefits of this intervention in stroke rehabilitation.

5.2 Limitations of the Study:

i. The researcher relied on a single assessor for data collection, which could introduce variability and potential bias in the results.
ii. Data was gathered from only one clinical setting (CRP in Savar), which may have influenced the outcome and generalizability of the results.
iii. Treatment and exercise sessions were occasionally interrupted due to public holidays and physiotherapists taking leave, which may have impacted the data collection process.
iv. The sample size was small, and the ARAT tool used may not have been sufficient to fully assess upper limb function.
v. The mean age and gender distribution of the two groups differed, which could have influenced the results.
vi. The study was constrained by limited time.

CHAPTER -VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This randomized clinical trial investigated the effectiveness of increasing intensity in task-oriented strength training (TST) for improving arm function after stroke. Arm weakness is a common and disabling consequence of stroke, often hindering daily activities. Traditional rehabilitation methods have shown limited success in restoring function, prompting interest in more targeted, intensive approaches. The study's findings reveal that higher-intensity TST significantly enhances motor strength and functional outcomes in stroke survivors compared to lower-intensity or standard rehabilitation programs. Participants undergoing high-intensity training exhibited greater improvements in arm strength and functional ability, as measured by validated clinical tools. These results support the principle that exercise intensity plays a key role in driving neuroplasticity—the brain's ability to reorganize and recover after injury. Furthermore, the task-oriented nature of the exercises, which simulated real-life activities, contributed to functional gains by promoting the relearning of purposeful movements essential for independence. This approach aligns with modern rehabilitation models that prioritize functional recovery over isolated strength gains. However, while the benefits of increased intensity are evident, patient-specific considerations remain critical. Stroke survivors vary widely in their physical capacities; thus, training intensity must be carefully individualized to avoid fatigue or injury. The study also highlights the need for long-term follow-up to determine whether functional improvements persist over time. In summary, the results suggest that increasing the intensity of task-oriented strength training is an effective strategy to improve arm function post-stroke. This evidence supports integrating high-intensity, task-specific training into rehabilitation protocols. Future research should aim to optimize intensity levels, assess durability of outcomes, and explore how such programs can be adapted into standard clinical practice to maximize recovery in stroke patients.

6.2 Recommendation

Future research should involve multiple assessors to reduce bias and improve data reliability. Treatment schedules need to account for potential disruptions, with backup staff available to ensure continuity in therapy sessions. Increasing sample size and using a broader range of measurement tools will provide a more detailed understanding of upper limb function. It is also important to ensure that control groups are demographically matched, especially regarding age and gender, to prevent confounding factors. Allocating sufficient time for research and exploring additional variables will facilitate a more comprehensive investigation. By implementing these recommendations, future studies can contribute significantly to advancing stroke rehabilitation. This will help refine rehabilitation strategies, leading to better therapeutic outcomes and improved quality of life for stroke patients.

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Appendix

Consent Form

(Please read out to the participants)

Greeting!!

I am **Refayat Islam Tanzina,** a student of the B.Sc. in Physiotherapy course, Session 2019-2020 at Bangladesh Health Profession Institute, under the Faculty of Medicine, University of Dhaka. I have to complete a thesis to earn my B.Sc. in Physiotherapy degree. My thesis title is "**Effectiveness of increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial.** The purpose of the study is to evaluate the more effective intensity of physiotherapy treatment specially strength training exercises of arm function for the stroke patient which helps to improve more functional activity of arm and make it easier for better quality of life of the patient. 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 30 to 40 minutes to fill up. Please give me the correct answers to the questions and enable the data collector to evaluate your health. If you have any questions, contact with researcher **Refayat Islam Tanzina** or my supervisor **Dr. Shazal Kumar Das PhD,** Assistant Professor & Head, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka - 1343. 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……

Questionnaire (English)

Title: "Effectiveness of increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial".

Patient Information

Patient ID:	
Date of Interview:	
Name of the participant:	
Code Number:	
Address: **village:** **Post office:** **Upazila:** **District:**	
Phone Number:	

Part-1: Socio-demographic Information

QN	Questions	Categories of response	Response
1.1	Age	Age in years	
1.2	Gender	1.Male. 2. Female	
1.3	Marital status	1.Married. 2.Unmarried	
1.4	Level of education	1.Primary. 2. Secondary 3.Graduation 4. Others	
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	The average income in taka per month	
1.11	The average expenditure for treatment	The average total expense in taka per month	

Part-2: Stroke related Questions

QN	Questions	Categories of response	Response
2.1	Type of stroke	1.Ischemic. 2.Hemorrhagic	
2.2	Duration of stroke	How many days/ month /years ago did you have the last stroke?	
2.3	Co – morbidities (Answer may be multiple)	1.Heart disease 2.Diabetes mellitus 3.High blood pressure 4.Asthma 5.Epilepsy 6. Hypothyroidism 7. Other related disease	
2.4	Which side of hemiplegia do you have?	1.Right 2. Left 3. Bilateral	
2.5	Number of stroke	1.First 2. Second 3. Multiple	

Pre -test

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

QN	Joint	Movement	Range (Right)	Range (Left)
3.1	Shoulder	Flexion Extension Abduction Adduction Medial rotation Lateral rotation		
3.2	Elbow	Flexion Extension Supination Pronation		

3.3	Wrist	Flexion Extension		
3.4	Fingers	Flexion Extension		

Part -4: Muscle Power of affected limbs (Measured by Oxford manual muscle testing)

QN	Joint	Movement	Muscle Power (Right)	Muscle Power (Left)
4.1	Shoulder	Flexion Extension Abduction Adduction Medical rotation Lateral rotation		
4.2	Elbow	Flexion Extension Supination Pronation		
4.3	Wrist	Flexion Extension Radial Deviation Ulnar Deviation		
4.4	Fingers	Flexion Extension		

Part -5: Upper Extremity Motor Performances (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	
	Subtotal	/18

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 -6: 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)	

Post -Test

Part -1: Range of motion of affected limbs (ROM was measured by Goniometer)

QN	Joint	Movement	Range (Right)	Range (Left)
3.1	Shoulder	Flexion Extension Abduction Adduction Medial rotation Lateral rotation		
3.2	Elbow	Flexion Extension Supination Pronation		
3.3	Wrist	Flexion Extension		
3.4	Fingers	Flexion Extension		

Part -2: Muscle Power of affected limbs (Measured by Oxford manual muscle testing

QN	Joint	Movement	Muscle Power (Right)	Muscle Power (Left)
4.1	Shoulder	Flexion Extension Abduction Adduction		

		Medical rotation Lateral rotation		
4.2	Elbow	Flexion Extension Supination Pronation		
4.3	Wrist	Flexion Extension Radial Deviation Ulnar Deviation		
4.4	Fingers	Flexion Extension		

Part -3: Upper Extremity Motor Performances (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	
	Subtotal	/18
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 -4: 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)	

অনুমতি ফর্ম

(অংশগ্রহণকারীদের কাছে পড়ে শোনান)

স্বাগতম!!

আমি রিফায়াত ইসলাম তানজিনা, বাংলাদেশ হেলথ প্রফেশন ইনস্টিটিউটের ফিজিওথেরাপি কোর্সের ২০১৯-২০২০ সেশন-এর একজন শিক্ষার্থী, যেটি ঢাকা বিশ্ববিদ্যালয়ের মেডিসিন ফ্যাকাল্টির অধীনে। আমি আমার বি.এসসি. ইন ফিজিওথেরাপি ডিগ্রি সম্পূর্ণ করার জন্য একটি থিসিস করতে চাই। আমার থিসিসের শিরোনাম হলো "স্ট্রোক রোগীদের বাহুর কার্যক্ষমতার জন্য টাস্ক-অরিয়েন্টেড স্ট্রেন্থ ট্রেনিং এক্সারসাইজের তীব্রতা বৃদ্ধির কার্যকারিতা - একটি রেন্ডমাইজড ক্লিনিকাল ট্রায়াল।"এই গবেষণার উদ্দেশ্য হলো স্ট্রোক রোগীদের বাহুর কার্যক্ষমতা উন্নত করার জন্য ফিজিওথেরাপির বিশেষ করে স্ট্রেন্থ ট্রেনিং এক্সারসাইজের কোন তীব্রতা বেশি কার্যকর তা মূল্যায়ন করা, যা রোগীর কার্যকারিতা বৃদ্ধি করবে এবং তাদের জীবনযাত্রার মান উন্নত করবে। এই থিসিসের জন্য আমি আপনার কাছে দুইবার আসব: প্রথমবার হস্তক্ষেপের আগে এবং দ্বিতীয়বার হস্তক্ষেপ শেষ হওয়ার পর। আমি আপনাকে আশ্বস্ত করছি যে, আপনাকে প্রদত্ত চিকিৎসা কোনো ক্ষতি করবে না। এছাড়া, ফিজিওথেরাপিস্টরাই চিকিৎসা প্রদান করবেন। আপনার দেওয়া তথ্য গোপনীয় থাকবে এবং শুধুমাত্র থিসিসের উদ্দেশ্যে ব্যবহার করা হবে। আপনার অংশগ্রহণ যেকোনো সময় বন্ধ করার অধিকার আপনি রাখেন। এছাড়াও, যদি কোনো প্রশ্নের উত্তর দিতে অস্বস্তি বোধ করেন, তবে সেই প্রশ্নটি আপনি এড়িয়ে যেতে পারেন। প্রশ্নমালা পূরণ করতে ৩০ থেকে ৪০ মিনিট সময় লাগবে। দয়া করে প্রশ্নগুলোর সঠিক উত্তর দিন যাতে তথ্য সংগ্রাহক আপনার স্বাস্থ্য মূল্যায়ন করতে পারে। যদি আপনার কোনো প্রশ্ন থাকে, তবে গবেষক রিফায়াত ইসলাম তানজিনা অথবা আমার সুপারভাইজার ডঃ সজল কুমার দাস, পি এইচ ডি, সহকারী অধ্যাপক ও প্রধান, ফিজিওথেরাপি বিভাগ, বিএইচপিআই, সিআরপি, সাভার, ঢাকা-১৩৪৩-এর সাথে যোগাযোগ করুন।

আপনি সম্মতি দিলে আমরা শুরু করতে পারি।

হ্যাঁ না

আপনার অংশগ্রহণ এবং তথ্য দেওয়ার জন্য ধন্যবাদ।

অংশগ্রহণকারীর স্বাক্ষর:

তারিখ :.....

তথ্য সংগ্রাহকের স্বাক্ষর .....

তারিখ .....

শিরোনাম

"স্ট্রোক রোগীদের বাহুর কার্যক্ষমতার জন্য টাস্ক-অরিয়েন্টেড স্ট্রেন্থ ট্রেনিং এক্সারসাইজের তীব্রতা বৃদ্ধির কার্যকারিতা - একটি রেন্ডমাইজড ক্লিনিকাল ট্রায়াল ।

রোগীর তথ্যাবলী

রোগীর আইডি:	
সাক্ষাৎকারের তারিখ:	
অংশগ্রহণকারীর নাম:	
কোড নম্বর:	
ঠিকানা: গ্রাম পোস্ট অফিস উপজেল জেলা	
মোবাইল নং:	

পার্ট-১: সামাজিক-জনতাত্ত্বিক তথ্য

নং	প্রশ্ন	প্রতিক্রিয়ার বিভাগ	প্রতিক্রিয়া
১.১	বয়স	বছরে বয়স	
১.২	লিঙ্গ	১. পুরুষ. ২. মহিলা	
১.৩	বৈবাহিক অবস্থা	১. বিবাহিত ২. অবিবাহিত	
১.৪	শিক্ষার স্তর	১. প্রাথমিক ২. মাধ্যমিক ৩. গ্র্যাজুয়েশন ৪. অন্যান্য	
১.৫	বসবাসের স্থান	১. গ্রামীণ ২. উপ-শহর ৩. শহর	
১.৬	পেশা		
১.৭	পরিবারের ধরন	১. জয়েন্ট ২. একক	
১.৮	পরিবারের সদস্য সংখ্যা	পরিবারের মোট সদস্য সংখ্যা	
১.৯	উপার্জনকারী সদস্যের সংখ্যা	মোট উপার্জনকারীর সংখ্যা	
১.১০	পরিবারের গড় আয়	প্রতি মাসে গড় আয়	

পার্ট-২: স্ট্রোক সম্পর্কিত প্রশ্ন

নং	প্রশ্ন	প্রতিক্রিয়ার বিভাগ	প্রতিক্রিয়া
২.১	স্ট্রোকের ধরণ	১. ইস্কেমিক ২. হেমোরেজিক	
২.২	স্ট্রোকের সময়কাল	কত দিন/মাস/বছর আগে আপনার শেষ স্ট্রোক হয়েছিল?	
২.৩	কো - মর্বিডিটি (উত্তর একাধিকবার হতে পারে)	১. হৃদরোগ ২. ডায়াবেটিস মেলিটাস ৩. উচ্চ রক্তচাপ ৪. হাপানি ৫. মৃগী ৬.হাইপারথাইরয়েডিজম	
২.৪	কোন ধরণের হেমিপ্লেজিয়া?	১.ডান ২. বাম ৩. উভয়	
২.৫	স্টোক সংখ্যা	১.প্রথম ২.দ্বিতীয় ৩.বহু	

প্রাক-পরীক্ষা

পার্ট -৩: প্রভাবিত অঙ্গগুলির গতির পরিসীমা রেঞ্জ পরীক্ষা (গনিওমিটার দ্বারা পরিমাপ করা)

নং	জয়েন্ট	মুভমেন্ট	রেঞ্জ (ডানে)	রেঞ্জ (বামে)
৩.১	কাধ	ফ্লেকশন এক্সটেনশন এবডাকশন এডাকশন মিডিয়াল রোটেশন লেটারাল রোটেশন		

৩.২	কুনুই	ফ্লেকশন এক্সটেনশন সুপাইনিশন প্রোনেশন		
৩.৩	কব্জি	ফ্লেকশন এক্সটেনশন		
৩.৪	আঙ্গুল	ফ্লেকশন এক্সটেনশন		

পার্ট -৪ : মাসল পাওয়ার পরিমাপ(অক্সফোর্ড গ্রেডিং স্কেল)

নং	জয়েন্ট	মুভমেন্ট	মাসল পাওয়ার (ডান)	মাসল পাওয়ার (বাম)
৪.১	কাধ	ফ্লেকশন এক্সটেনশন এবডাকশন এডাকশন মিডিয়াল রোটেশন লেটারাল রোটেশন		
৪.২	কুনুই	ফ্লেকশন এক্সটেনশন সুপাইনিশন প্রোনেশন		
৪.৩	কব্জি	ফ্লেকশন এক্সটেনশন		
৪.৪	আঙ্গুল	ফ্লেকশন এক্সটেনশন		

পার্ট -৫: আপার এক্সট্রিমিটি মোটর পারফরম্যান্স (অ্যাকশন রিসার্চ আর্ম টেস্ট দ্বারা পরিমাপ)

উপসেট	বিষয়োপকরণ	স্কোর
আঁকড়ে ধরুন	১. ব্লক, কাঠ, ১০-সেমি ঘনক্ষেত্র (যদি স্কোর = ৩, মোট = ১৮ এবং গ্রিপে এগিয়ে যান) একটি ১০ সেমি ব্লক বাছাই করুন	
	২. ব্লক, কাঠ, ২.৫ সেমি ঘনক্ষেত্র (যদি স্কোর = ০, মোট = ০ এবং গ্রিপে এগিয়ে যান) একটি ২.৫ সেমি ব্লক বাছাই করুন	
	৩. ব্লক, কাঠ, ৫ সেমি ঘনক্ষেত্র	
	৪. ব্লক, কাঠ, ৭.৫ সেমি ঘনক্ষেত্র ব্যাস	
	৫. বল (ক্রিকেট), ৭.৫ সেমি ব্যাস	
	৬. পাথর ১০ *২.৫* ১ সেমি	
	সাবটোটাল	/১৮
গ্রিপ	১. গ্লাস থেকে গ্লাসে পানি ঢালুন (যদি স্কোর = ৩, মোট = ১২ এবং চিমটি কাটাতে এগিয়ে যান)	
	২. টিউব ২.২৫ সেমি (যদি স্কোর = ০, মোট = ০ এবং চিমটি কাটাতে এগিয়ে যান	
	৩. টিউব ১ সেমি এক্স ১৬ সেমি	
	৪. বোল্টের উপরে ওয়াশার (৩.৫ সেমি ব্যাস)	
	সাবটোটাল	/১২
চিমটি কাটা	১. বল বিয়ারিং, ৬ মিমি, ৩য় আঙুল এবং থাম্ব (যদি স্কোর = ৩, মোট = ১৮ এবং স্থূল আন্দোলনের দিকে এগিয়ে যান)	
	২. মার্বেল, ১.৫ সেমি, তর্জনী এবং থাম্ব (যদি স্কোর = ০, মোট = ০ এবং স্থূল আন্দোলনের দিকে এগিয়ে যান)	
	৩. বল বিয়ারিং, দ্বিতীয় আঙুল এবং বুড়ো আঙুল	
	৪. বল ভারবহন করা, ১ ম আঙুল এবং থাম্ব	
	৫. মার্বেল, তৃতীয় আঙুল এবং বুড়ো আঙুল	
	৬. মার্বেল, ২য় আঙুল ও বুড়ো আঙুল	

	সাবটোটাল	/১৮
গ্রস মুভমেন্ট	১. মাথার পেছনে হাত রাখুন (যদি স্কোর = ৩, মোট = ৯ এবং সমাপ্তি বা যদি স্কোর = ০, মোট = ০ এবং সমাপ্ত)	
	২. মাথার উপরে হাত রাখুন	
	৩. মুখে হাত	
	সাবটোটাল	/৯

পার্ট -৬: দৈনন্দিন জীবনযাত্রার ক্রিয়াকলাপগুলি বার্থেল ইনডেক্স দ্বারা মূল্যায়ন করা হয়

	স্কোর
খাওয়ানো ০ = অক্ষম ৫ = কাটা, মাখন ছড়ানো ইত্যাদি সাহায্য প্রয়োজন, বা পরিবর্তিত খাদ্য প্রয়োজন ১০ = স্বতন্ত্র	
গোসল ০ = নির্ভরশীল ৫ = স্বাধীন (বা ঝরনায়)	
গ্রুমিং ০ = ব্যক্তিগত যত্নের জন্য সাহায্য প্রয়োজন ৫ = স্বাধীন মুখ / চুল/দাঁত / শেভিং (সরঞ্জাম সরবরাহ করা হয়েছে)	
ড্রেসিং ০ = নির্ভরশীল ৫ = সাহায্য প্রয়োজন তবে প্রায় অর্ধেক বিনা সহায়তায় করতে পারেন ১০ = স্বতন্ত্র (বোতাম, জিপ, লেইস ইত্যাদি সহ)	
বাওয়েল ০ = ইনকন্টিনেন্ট (পারেনা) ৫ = অনিয়মিত দুর্ঘটনা ১০ = একা পরিচালনা করতে সক্ষম	
মূত্রাশয়	

০ = ইনকন্টিনেন্ট, বা ক্যাথেটারাইজড এবং একা পরিচালনা করতে অক্ষম ৫ = অনিয়মিত দুর্ঘটনা ১০ = একা পরিচালনা করতে সক্ষম	
টয়লেট ব্যবহার ০ = নির্ভরশীল ৫ = কিছু সাহায্য প্রয়োজন, কিন্তু একা কিছু করতে পারেন ১০ = স্বতন্ত্র (চালু এবং বন্ধ, ড্রেসিং, মোছা)	
স্থানান্তর (বিছানা থেকে চেয়ার এবং পিছনে) ০ = অক্ষম, বসার ভারসাম্য নেই ৫ = মেজর হেল্প (এক বা দুজন ব্যক্তি, শারীরিক), বসতে পারেন ১০ = ছোটখাটো সাহায্য (মৌখিক বা শারীরিক) ১৫ = স্বতন্ত্র	
গতিশীলতা (সমতলে) ০ = অচল বা < ৫০ গজ ৫ = হুইলচেয়ার স্বাধীন, কোণ সহ, >৫০ গজ ১০ = এক ব্যক্তির সাহায্যে হাঁটা (মৌখিক বা শারীরিক)> ৫০ গজ ১৫ = স্বাধীন (তবে কোনও সহায়তা ব্যবহার করতে পারে; উদাহরণস্বরূপ, লাঠি)> ৫০ গজ	
সিঁড়ি ০ = অক্ষম ৫ = সাহায্য প্রয়োজন (মৌখিক, শারীরিক, বহন সহায়তা) ১০ = স্বতন্ত্র	
মোট = (০ - ১০০)	

পরবর্তী -পরীক্ষা

পার্ট - ১ : প্রভাবিত অঙ্গগুলির গতির পরিসীমা রেঞ্জ পরীক্ষা (গনিওমিটার দ্বারা পরিমাপ করা)

নং	জয়েন্ট	মুভমেন্ট	রেঞ্জ (ডানে)	রেঞ্জ (বামে)
৩.১	কাধ	ফ্লেকশন এক্সটেনশন এবডাকশন এডাকশন মিডিয়াল রোটেশন লেটারাল রোটেশন		
৩.২	কুনুই	ফ্লেকশন এক্সটেনশন সুপাইনিশন প্রোনেশন		
৩.৩	কব্জি	ফ্লেকশন এক্সটেনশন		
৩.৪	আঙ্গুল	ফ্লেকশন এক্সটেনশন		

পার্ট -২: মাসল পাওয়ার পরিমাপ(অক্সফোর্ড গ্রেডিং স্কেল)

নং	জয়েন্ট	মুভমেন্ট	মাসল পাওয়ার (ডান)	মাসল পাওয়ার (বাম)
৪.১	কাধ	ফ্লেকশন এক্সটেনশন এবডাকশন এডাকশন মিডিয়াল রোটেশন লেটারাল রোটেশন		

৪.২	**কুনুই**	**ফ্লেকশন** **এক্সটেনশন** **সুপাইনিশন** **প্রোনেশন**		
৪.৩	**কব্জি**	**ফ্লেকশন** **এক্সটেনশন**		
৪.৪	**আঙ্গুল**	**ফ্লেকশন** **এক্সটেনশন**		

পার্ট -৩: আপার এক্সট্রিমিটি মোটর পারফরম্যান্স (অ্যাকশন রিসার্চ আর্ম টেস্ট দ্বারা পরিমাপ)

উপসেট	বিষয়োপকরণ	**স্কোর**
আঁকড়ে ধরুন	১. ব্লক, কাঠ, ১০-সেমি ঘনক্ষেত্র (যদি স্কোর = ৩, মোট = ১৮ এবং গ্রিপে এগিয়ে যান) একটি ১০ সেমি ব্লক বাছাই করুন	
	২. ব্লক, কাঠ, ২.৫ সেমি ঘনক্ষেত্র (যদি স্কোর = ০, মোট = ০ এবং গ্রিপে এগিয়ে যান) একটি ২.৫ সেমি ব্লক বাছাই করুন	
	৩. ব্লক, কাঠ, ৫ সেমি ঘনক্ষেত্র	
	৪. ব্লক, কাঠ, ৭.৫ সেমি ঘনক্ষেত্র ব্যাস	
	৫. বল (ক্রিকেট), ৭.৫ সেমি ব্যাস	
	৬. পাথর ১০ * ২.৫ *১ সেমি	
	সাবটোটাল	/১৮
গ্রিপ	১. গ্লাস থেকে গ্লাসে পানি ঢালুন (যদি স্কোর = ৩, মোট = ১২ এবং চিমটি কাটাতে এগিয়ে যান)	
	২. টিউব ২.২৫ সেমি	

	(যদি স্কোর = ০, মোট = ০ এবং চিমটি কাটাতে এগিয়ে যান	
	৩. টিউব ১ সেমি এক্স ১৬ সেমি	
	৪. বোল্টের উপরে ওয়াশার (৩.৫ সেমি ব্যাস)	
	সাবটোটাল	/১২
চিমটি কাটা	১. বল বিয়ারিং, ৬ মিমি, ৩য় আঙুল এবং থাম্ব (যদি স্কোর = ৩, মোট = ১৮ এবং স্থূল আন্দোলনের দিকে এগিয়ে যান)	
	২. মার্বেল, ১.৫ সেমি, তর্জনী এবং থাম্ব (যদি স্কোর = ০, মোট = ০ এবং স্থূল আন্দোলনের দিকে এগিয়ে যান)	
	৩ ।বল বিয়ারিং, দ্বিতীয় আঙুল এবং বুড়ো আঙুল	
	৪. বল ভারবহন করা, ১ ম আঙুল এবং থাম্ব	
	৫. মার্বেল, তৃতীয় আঙুল এবং বুড়ো আঙুল	
	৬. মার্বেল, ২য় আঙুল ও বুড়ো আঙুল	
	সাবটোটাল	/১৮
গ্রস মুভমেন্ট	১. মাথার পেছনে হাত রাখুন (যদি স্কোর = ৩, মোট = ৯ এবং সমাপ্তি বা যদি স্কোর = ০, মোট = ০ এবং সমাপ্ত)	
	২. মাথার উপরে হাত রাখুন	
	৩. মুখে হাত	
	সাবটোটাল	/৯

পার্ট -৪ : দৈনন্দিন জীবনযাত্রার ক্রিয়াকলাপগুলি বার্থেল ইনডেক্স দ্বারা মূল্যায়ন করা হয়

	স্কোর
খাওয়ানো ০ = অক্ষম ৫ = কাটা, মাখন ছড়ানো ইত্যাদি সাহায্য প্রয়োজন, বা পরিবর্তিত খাদ্য প্রয়োজন ১০ = স্বতন্ত্র	
গোসল ০ = নির্ভরশীল	

৫ = স্বাধীন (বা ঝরনায়)	
গ্রুমিং ০ = ব্যক্তিগত যত্নের জন্য সাহায্য প্রয়োজন ৫ = স্বাধীন মুখ / চুল/দাঁত / শেভিং (সরঞ্জাম সরবরাহ করা হয়েছে)	
ড্রেসিং ০ = নির্ভরশীল ৫ = সাহায্য প্রয়োজন তবে প্রায় অর্ধেক বিনা সহায়তায় করতে পারেন ১০ = স্বতন্ত্র (বোতাম, জিপ, লেইস ইত্যাদি সহ)	
অন্ত্র ০ = ইনকন্টিনেন্ট (একা পরিচালনা করতে অক্ষম) ৫ = অনিয়মিত দুর্ঘটনা ১০ = একা পরিচালনা করতে সক্ষম	
মূত্রাশয় ০ = ইনকন্টিনেন্ট, বা ক্যাথেটারাইজড এবং একা পরিচালনা করতে অক্ষম ৫ = অনিয়মিত দুর্ঘটনা ১০ = একা পরিচালনা করতে সক্ষম	
টয়লেট ব্যবহার ০ = নির্ভরশীল ৫ = কিছু সাহায্য প্রয়োজন, কিন্তু একা কিছু করতে পারেন ১০ = স্বতন্ত্র (চালু এবং বন্ধ, ড্রেসিং, মোছা)	
স্থানান্তর (বিছানা থেকে চেয়ার এবং পিছনে) ০ = অক্ষম, বসার ভারসাম্য নেই ৫ = মেজর হেল্প (এক বা দুজন ব্যক্তি, শারীরিক), বসতে পারেন ১০ = ছোটখাটো সাহায্য (মৌখিক বা শারীরিক) ১৫ = স্বতন্ত্র	
গতিশীলতা (সমতলে) ০ = অচল বা < ৫০ গজ ৫ = হুইলচেয়ার স্বাধীন, কোণ সহ, >৫০ গজ ১০ = এক ব্যক্তির সাহায্যে হাঁটা (মৌখিক বা শারীরিক)> ৫০ গজ ১৫ = স্বাধীন (তবে কোনও সহায়তা ব্যবহার করতে পারে; উদাহরণস্বরূপ, লাঠি)> ৫০ গজ	
সিঁড়ি ০ = অক্ষম	

৫ = সাহায্য প্রয়োজন (মৌখিক, শারীরিক, বহন সহায়তা) ১০ = স্বতন্ত্র	
মোট = (০ - ১০০)	

Application for ethical approval

Date: 06.10.2024

The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI)
CRP-Savar, Dhaka-1343, Bangladesh

Subject: **Application for review and ethical approval.**

Sir,

With due respect, I would like to draw your kind attention that I am a student of B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI).I would like to conduct a research titled, "**Effectiveness of increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial.**" with myself, as the principal investigator and Dr. Shazal Kumar Dash ,Assistant Professor & Head (Acting) ,Department of Physiotherapy, Bangladesh Health Professions Institute (BHPI),CRP,Savar-1343, Dhaka, as my thesis supervisor. The purpose of the study is to evaluate the more effective intensity of physiotherapy treatment specially strength training exercises of arm function for the stroke patient which helps to improve more functional activity of arm and make it easier for better quality of life of the patient.

Oxford Grading scale, Action Research Arm test(ARAT), Functional Independence Measure Test(FIM) Questionnaire will be used in the study that will take about 30 to 40 minutes . Other related information will be collected from self -structured questionnaire. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential.

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

Sincerely yours,

Refayat Islam

Refayat Islam Tanzina
4th Year B.Sc. in Physiotherapy
Session: 2019-2020, Student ID:112190499
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Recommendation from the thesis supervisor :

Dr.Shazal Kumar Das
Assistant Professor & Head (Acting) ,Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI),CRP,Savar-1343,Dhaka, Bangladesh.

Approval Letter of the thesis

বাংলাদেশ হেলথ্ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/12/2024/1009 Date: 15/12/2024

To
Refayat Islam Tanzina
4th Year B.Sc. in Physiotherapy
Session: 2019-2020, Student ID: 112190499
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Subject: Approval of the thesis proposal "Effectiveness of increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial." by ethics committee.

Dear Refayat Islam Tanzina,
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. Shazal Kumar Dash, PhD, Assistant Professor & Head (Acting) ,Department of Physiotherapy (BHPI), CRP, Savar, Dhaka, as thesis supervisor. The Following documents have been reviewed and approved:

Sl No.	Name of the Documents
1	Research Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

The purpose of the study is to determine the increased intensity of task - oriented strength training exercises for arm function of stroke patients that will improve more functional activity of arm and quality of life of the patient. The study involves questionnaire and intervention to see the improvement that may take 30 to 40 minutes to answer the questionnaire and there is no likelihood of any harm to the participants and participation in the study may benefit the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at **9AM on 15 July, 2024 at BHPI (44th 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 and Course Coordinator , MRS
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

Data collection permission letter

31th December, 2024

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 research project.

Sir,

With due to respect and humble submission to state that I am Refayat Islam Tanzina , a 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 increasing intensity of task – oriented strength training exercises for arm function after stroke – A Randomize Clinical Trial" under the supervision of Dr. Shazal Kumar Dash , PhD, Assistant Professor & Head (Acting) ,Department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Neurology Unit of Physiotherapy Department at CRP-Savar, Dhaka-1343. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

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

Yours faithfully,

Refayat Islam Tanzina

4th Year B.Sc. in Physiotherapy

Class Roll: 02; Session: 2019-20

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP-Chapain, Savar, Dhaka-1343.

Forwarded

Skdy

11.01.2025

Dr. Shazal Kumar Das, PhD
Assistant Professor and Head
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343.

Approved

11/01/25

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