EFFICACY ON MYOFASCIAL RELEASE TECHNIQUE AMONG THE NECK PAIN PATIENT

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

EFFICACY ON MYOFASCIAL RELEASE TECHNIQUE AMONG THE NECK PAIN PATIENT

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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 my supervisor.

Signature: **Date:**

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Abbreviations

&: And

Cm: Centimeter

CRP: Center for Rehabilitation of Paralyzed

Lt: Left

MR: Myofascial Release

NP: Neck Pain

NSAID: No Steroid Anti-inflammatory Drug

RCT: Randomize Control Trial

Rt: Right

SCM: Sternocliodomustoid Muscle

SNAGs: Sustained Natural Apophyseal Glides

TENS: Transcutaneous Electrical Nerve Stimulation

VAS: Visual Analogue Scale

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Abstract

Purpose: To find out the Efficacy on Myofascial Release technique among the Neck pain patient. *Objectives:* To assess the effect on pain after introducing Myofascial release at different functional position. To find out the effect on pain after introducing Myofascial release during travelling. To estimate the range of motion after introducing Myofascial release. To investigate the effect on reducing discomfort after introducing Myofascial release. *Methodology:* the study design was randomize control trial. 10 patients with neck pain conveniently allocated to Myofascial release with conventional physiotherapy group and 10 patients to the only conventional physiotherapy group for this study. Visual analogue scale was used to measure pain intensity in different functional position and Goniometer are used to measure range of motion in different physiological range. *Results:* Following treatment the study found that the experimental group showed a high response significant improvement ($P<0.01$ in general intensity, pain intensity in sitting position($p<0.01$),pain at lying($p<0.025$), pain at neck turning($p<0.025$), pain at neck bending($p<0.025$)and pain at standing($p<.01$). A good response rate was achieved ($P<0.05$) in traveling. But, only in walking significant pain reduction was not found where $P <0.10$. Study was showed significant change in range of motion, during ($p<0.025$) flexion, ($p<0.025$) extension, ($p<0.01$) side flexion (Rt), ($p<0.10$) side flexion (Lt), ($p<0.005$) rotation(Rt), ($p<0.01$) rotation (Lt).*Conclusion:* This true experimental study shows that Myofascial release with conventional physiotherapy is more effective than only conventional physiotherapy for neck pain patient.

CHAPTER-I: INTRODUCTION

1.1 Background Information

Bangladesh is one of the least development and most densely populated countries in the world. According to the official census held in 2001, the total population was 123.2 million compared to 109.9 million as recorded in 1991 censes (Bangladesh Buru of statistics, 2009).For the vast population 26.3% people are suffering from musculoskeletal pain. Among them neck pain are very common. Pain and stiffness can make it difficult to turn round. Symptoms may appear suddenly, as when someone wakes up with a stiff and painful neck, or gradually. The pain may be limited to the neck or may be accompanied by headaches and dizziness, or pain and pins and needles down the arm or hand. Most neck pain does not have one simple cause, but is a result of a range of conditions that affect joints, muscles, tendons and the other tissues in the neck. Factors that can contribute include tension and sustained or repetitive activity, such as using the telephone a lot, sitting at computer screens or in front of the television, playing a musical instrument, and long-distance driving. (Bland, J.H 1994)

About 70% of adults will experience neck pain during their lifetime, and its point prevalence in the general population is around 22%. After low back pain, neck pain is the most common reason patients need physiotherapy. The cause of neck pain is multi factorial and can be due to musculoskeletal conditions, trauma, systemic conditions, infections, inflammatory conditions or neoplasm. Usually, the underlying cause of neck pain is nonspecific and cannot be related to a particular pathology as cause of the presenting symptoms (Gemmell and Miller, 2010).

It has been acknowledged (Moffett and Mclean 2006, p. 371) that, neck pain is responsible for huge personal and societal costs, and major cause of work disability. Traditionally it is belief that neck pain is a problem that always resolves itself. Recurrences are usual and their course is very variable.

Peter, Anita, Charles and Paul (1996, p. 1291) acknowledge, Many treatment are available to treat the neck pain patient. These are include medication, physiotherapy and education of the patient. Various physiotherapy treatment protocols has been established such as, stretching, mobilization, traction, ultrasound, IRR, and Myofascial release. Myofascial release has been one of the physical therapy treatments given in the chronic condition that causes tightness and restriction in soft tissues, asymmetrical muscle weakness due to peripheral neuropathy and in inflexible rib cage due to chronic respiratory disease and also in neck pain.

Myofascial release is a soft tissue mobilization technique. If condition is treated in the acute stage, then symptoms will be aggravated. If treated in the chronic stage, the symptoms will alleviate. Myofascial release techniques stem from the foundation that fascia, a connective tissue found throughout the body, reorganizes itself in response to physical stress and thickness along the lines of tension. By Myofascial release there is a change in the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. and this has been clarified by Suman, Khatri and Jeba (2009).

1.2 Justification of the study

There is no research investigation to find out the efficacy of Myofascial release with conventional physiotherapy comparing with only conventional physiotherapy. This study will design to investigate the efficacy of Myofascial release with conventional physiotherapy alone. The result of this study may help to guide Physiotherapists to give the best treatment in neck pain. There are some researches and articles, which are published in this area. This are helps to know about Myofascial release and it effectiveness but I think my study get better result that make the therapist interested to apply this approach.

1.3 Operational Definition

1.3.a Myofascial Release: It is a safe and very effective hands-on technique that involves applying gentle sustained pressure into the Myofascial connective tissue restrictions to eliminate pain and restore motion. This essential "time element" has to do with the viscous flow and the piezoelectric phenomenon: a low load (gentle pressure) applied slowly will allow a viscoelastic medium (fascia) to elongate.

1.3.b Neck pain: It is a pain full condition in the neck and remote which may be localized or referred**.**

1.4 List of variable:

- Independent variable: Myofascial Release
- Dependent variable: Neck pain

1.5 Aim

Identify the effectiveness of Myofascial release with conventional physiotherapy for neck pain.

1.6 Objectives

1.6.a General objective

To identify the effectiveness of Myofascial Release in Neck pain

1.6.b Specific objective

- To assess the effect on pain after introducing Myofascial release at different functional position.
- To find out the effect on pain after introducing Myofascial release during travelling.
- To estimate the range of motion after introducing Myofascial release.
- To investigate the effect on reducing discomfort after introducing Myofascial release.

1.7 Hypothesis

Myofascial release along with conventional physiotherapy is better than only conventional physiotherapy for the treatment of neck pain.

1.8 Null hypothesis

Myofascial release along with conventional physiotherapy is no more effective than only conventional physiotherapy for the treatment of neck pain patient.

CHAPTER-II : LITARATURE REVIEW

Epidemiology:

Gemmell H and Miller P (2010) stated that Neck pain of a mechanical nature is a common complaint seen by practitioners of manual medicine, who use a multitude of methods to treat the condition. It can come from a number of disorders and diseases of any structure in the neck. Neck pain is also referred to as cervical pain. In a More than half of people develop about of neck pain at some time in their life. A survey done in the UK found that show that adults aged 45-75 years, about 1 in 4 women and about 1 in 5 men had current neck pain (Neck pain in adults 2006).

Corrigan and Maitland (1983, p. 354) state that neck pain is a common condition. Neck pain comes from a number of disorders and diseases of any structure in the neck (William 2005). Akter et al. (1996) cited by FTCM (2004) stated that chronic neck pain is a distressing condition with high emotional and personal costs, negatively impacting on quality of life. "Neck pain is one of the most common problems affecting the health of Americans and is a leading reason for using complementary or alternative medical (CAM) therapies" (Evaluating Therapeutic Massage for Chronic Neck Pain 2005).

Systematic reviews of commonly used treatments for neck pain, including medication, physiotherapy, exercise, local injections and patient education, have shown that their effectiveness remains open to question. At any specific time, 12% of the adult female population and 9% of the adult male population experience pain in the neck, with or without associated arm pain and 35% of people can recall an episode of neck pain (Bland 1994, p.3).

About 15% of people in a hospital based physiotherapy service and 30% of patients in a chiropractic service are being treated for neck pain (Gross et al, 2000). More than half of the population develops about of neck pain at some time in their life (Pillinger & Rutherford 2005). Acute (Sudden onset) bouts of neck pain are seen due to minor injuries or bad posture and full recovery occurs in most cases. The usual advice is to keep the neck active as possible. Chronic (Persistent) pain develops in some cases and future treatment may then be needed (Patient UK 2005).

In the condition of neck pain accounts for 15% of all soft tissue problems seen in general practice and are a common reason for referral for Physiotherapy treatment. In any one year, 30% of adults will report neck pain, and 5-10% will be disabled with it. Although neck pain has been regarded as self limiting and benign, it consumes a substantial proportion of healthcare resources. A recent survey of 10 community Physiotherapy departments in the east Yorkshire area has shown that of 7899 subjects referred, 1060 (13.4%),had neck complaints (Moffett et al. 2005).

The physiotherapy profession is a very new and developing profession in Bangladesh, to mention about this we need to some up to date information that can help both the patient and therapist. Although there is very little research for neck pain patients in Bangladesh from the physiotherapy point of view, if this area is explore then it could produce good result for our profession (Islam 2005, p.2).

Pain in the neck is such an everyday events that it is often used to describe a situation, certain people an unpleasant job to be done, or an institution (Bland, 1987). Neck is made up of bones, muscles, ligaments, nerves, and blood vessels that help to support the head. Muscles in the neck and shoulders play an important role in maintaining a healthy neck. Many different structures in the neck are capable of causing pain. Poor posture, injuries, arthritis or stress may contribute to your neck problems, causing pain and Hunting the ability to perform the daily activities. (National Healthcare Group, 2003).

Pillinger & Rutherford, (2003) said that neck pain is more frequently seen in women than men. Most people will experience pain in the neck at some point in their life. According to Ylinen (2003) most patients who present with neck pain have "non-specific (simple) neck pain," where symptoms have a postural or mechanical basis. Etiological factors are poorly understood and are usually multifactorial, including poor posture, anxiety, depression, neck strain, and sporting or occupational activities. Neck pain after whiplash injury also fits into this category, provided no bony injury or neurological deficit is present. When mechanical factors are prominent, the condition is often referred to as "cervical Spondylosis," Randomized controlled trials identified by systematic reviews provide moderate evidence that various exercise regimens using proprioceptive, strengthening, endurance, or coordination exercises are more

effective than usual care (analgesics, non-steroidal anti-inflammatory drugs, or muscle relaxants.

Anatomy of cervical spine:

According to Bland, (1994) functional anatomy by definition is the interpretation of physical properties of anatomic structure according to their functional purpose.

The anatomy of the cervical spine has characteristics quite different from those of the thoracic or lumber spine, Frankel (1989) cited by Kesson (1995) the cervical spine has great range of motion in all direction and placed by supporting ligaments, capsular, muscular, and cartilaginous structure. The cervical spine is the most complicated articular structure of the body (Bland, 1994). The cervical spine permits a wide range of motion for the head in relation to the trunk (McKenzie, 1989).

The neck contains the top end of the spinal column or spine, which supports the head and also protects the spinal cord. The 7 bones in the neck are known as cervical vertebrae. Between the bones are discs of gristle (cartilage) known as intervertevral discs. The sides of the bones are linked by facet joints. Many ligaments and muscles are attached to the spine and fan out from the neck to the shoulder blades and back (What is in this booklet 2004).

There are seven vertebrae that are the bony building blocks of the spine in the neck (the cervical vertebrae) that surround the spinal cord and canal. Between these vertebrae are discs, and nearby pass the nerves of the neck. Within the neck, structures include the neck muscles, arteries, veins, lymph glands, thyroid gland, parathyroid glands, esophagus, larynx, and trachea (Shiel 2005).

In other word we can say that the neck (cervical spine) is composed of vertebrae which begin in the upper torso and end at the base of the skull. The bony vertebrae along with the ligaments (like thick rubber bands) provide stability to the spine. The muscles allow for support and motion. The neck has a significant amount of motion and supports the weight of the head (Neck Pain 2000).

Definition of pain:

Pain is a specific sensation brought about by damage or threat of damage. Although of causes there is no outside form of energy called pain. International Association of the Study of Pain (ASP) define as

"An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in term of such damage. Komald and Kanner (1997) described it state explicitly that pain always has a subjective component. It is both of physiologic sensation and an emotional reaction to that sensation"

In the concept of Komald Kanner (1997) is that pain is a sensation plus is action to that sensation either physical or psychological issue is at play in suffering and pain may be only a small component. Defining pain is somewhat difficult. Pain has been described as the perception of noxious stimuli or the distressing sensations that result from tissue damage. Perhaps the most useful definition is that suggested by Margo mccaffery, pain is "Whatever the experiencing person says it is and exists whenever he says it does" (Wallace 1980, p.682)

Types of pain:

The report of the Quebec Task Force recommends the adoption of a revised formula for classifying acuteness of spinal disorders (Mckenzie 1990, p.59). Acute pain is usually temporary, of sudden onset and localized (Fritz 2000, p.200). Acute pain present for less than seven days. Sub acute pain present for seven days to seven weeks. Chronic pain is pain present for longer than seven weeks (Mckenzie 1990, p.59).

When pain lasts for a long time, it is called chronic pain (ANS 2005). Chronic pain is that persists or recurs for indefinite periods, usually for longer than 6 months (Fritz 2000, p.200). Others say that pain is often of less intensity than acute pain but is of long duration (Wallace 1980, p.688). Chronic pain can take away our strength and sprit and can put relationships with the people closest to you at risk. Chronic pain is a major health problem for appropriately 25% of the population (ANS 2005)

Chronic pain is defined as “Pain lasting for long periods of time and commonly persists beyond the time of healing of an injury and frequently there may not be any clearly identifiable cause” (Ready& Edwards 1992)

Today, chronic pain is one of the most critical healthcare issues in the world. In the United States alone, more than 100 million people suffer with some type of chronic pain. More than half of these chronic pain sufferers are particularly or totally disabled. In fact, chronic pain disables more people than cancer or heart disease. Chronic pain takes its tool on personal lives, healthcare resources and the economy. This has led to the United States Congress to declare this decade the “Decade of Pain Control and Research” (ANS 2005)

Mechanism of pain production:

Pain is produced either by chemical or mechanical stimulus of free nerve ending. Chemical, mechanical trauma, tissue damage and deformation, postural stress and abnormal forces are causes pain (Mckenzie 1990, p. 21)

Causes of neck pain:

Neck pain may result from abnormalities in the soft tissues. Soft tissues are the muscles, ligaments and nerves around the spine. The most common causes of neck pain are soft tissue abnormalities due to injury or prolonged wear and tear. In rare cases, infection or tumors may cause neck pain. In some people, neck problems may be the source of pain in the upper back, shoulders or arms. Degenerative and inflammatory diseases that cause of neck pain include osteoarthritis and rheumatoid arthritis. Osteoarthritis usually occurs in older people as a result of wear of the joints in the neck. Both of these major types of arthritis can cause stiffness and pain. Cervical disc degeneration also can cause pain.

The disc act as a shock absorber between the bones in the neck. In cervical disc degeneration (typically age 40 onwards), the normal gelatin like centre of the disc degenerates and the space between the vertebrae narrows. As the disc space narrows, added stress is applied to the joints of the spine causing further wear and degenerative disease. The cervical disc may also protrude and cause pressure on the spinal cord or nerve roots when the rim of the disc weakens. This is known as a herniated cervical disc (AAOS 2000)

Falling asleep in an awake position and prolong use of a computer keyboard also causes of neck pain (Pillinger & Rutherford 2005). The neck is so flexible and because it supports the head, it is extremely vulnerable to injury. Motor vehicle or diving accidents, contact sports and falls may result in the neck injury (American Academy of Orthopedic Surgeon 2000)

There are several theories about why so many people suffer neck pain, but they are not supported by scientific proof. For most people, no specific reason for the pain can be found (Pillinger & Rutherford 2005)

Mechanical cause of neck pain:

Mechanical neck pain is the most common type of chronic neck pain. Causes include minor injuries or sprains to muscles or ligaments in the neck. Poor posture is also a common cause. Neck pain is more common in people who spend much of their working day at a desk with a bend forward posture (Patient UK 2005).

Pain is experience as soon as mechanical deformation of innervated structure is sufficient to irritate free nerve endings. Pain will arise by the application of forces sufficient to stress or deform the structures. It is not necessary to actually damage tissues containing the free nerve ending in order to provoke pain. Pain will disappear when the application of the force is terminated and this often occurs by a mere change of position. A good example is the pain incurred during prolonged sitting which disappears on standing upright (Mckenzie 1990, p. 22)

Whiplash is a mechanical cause of neck pain. This type of injury often follows a rear-end collision in a car. In this type of collision, first the body is carried forward and the head flips backwards. Then, as the body stops, the head is thrown forwards. Following a whiplash injury there is often a delay before the pain and stiffness start (What is in this booklet 2004). "A whiplash injury, most commonly due to a car crash, causes neck pain" (Neck pain in adults, 2006).

Common symptoms of mechanical neck pain:

- “General pain located in the neck area as well as stiffness in the neck muscles.
- The pain may radiate down to the shoulder or between the shoulder blades.

- It may also radiate out into the arm, the hand or up into the head causing a one sided or double side headache.
- The muscles in the neck are tense, sore and feel hard to the touch.
- Acute pain can give rise to abnormal neck posture in which the head is forced to turn to one side and the condition is known as torticollis.
- There may be a prickly or tingling sensation in the arms and fingers" (Pillinger & Rutherford 2005)

Pathological causes of neck pain:

Injury or degeneration affecting muscles or ligaments, soft tissue strain.

[The term cervical Spondylosis is commonly used for these conditions. Degenerative diseases that cause neck pain include osteoarthritis and rheumatoid arthritis. Cervical disk degeneration also can cause neck pain (Neck Pain 2000). Osteoarthritis is one of the most common types of arthritis. Anyone can be affected; however, since osteoarthritis is the result of high usage of the joints of the body. Osteoarthritis is characterized by the breakdown of cartilage, the firm cushion found between two bones to stop them from grinding together (Neck and shoulder pain 2006).]

- Inflammation, for example, rheumatoid arthritis, ankylosing spondylitis.
- Infection, for example, discitis, epidural abscess, meningitis.
- Infiltration, for example, metastatic carcinoma, osteoid osteoma, spinal cord tumors (Tsang 2001)

Other causes of neck pain:

When these muscles work too hard it can cause neck pain and tension headaches (What is in this booklet 2004). Does not mean that your neck is damaged and often it happens in people whose necks 'would appear completely normal under an x-ray. It is the most common type of neck pain and often disappears after a few days (What is in this booklet 2004). The bad posture can cause neck pain by putting extra strain on ligaments and muscles. Standing with the shoulders slouched and chin jutted forward, working with your head down for long periods of time, slumping while seated and sleeping face-down are common postural problems that affect the neck"(Neck and shoulder pain 2006).

There is also some cause as like If severe neck pain occurs following an injury (motor vehicle accident, diving accident, fall), a trained professional, such as a paramedic, should immobilize the patient to avoid the risk of further injury and possible paralysis. Medical care should be sought immediately (Neck Pain 2000).

Incidence/Prevalence:

"About two thirds of people will experience neck pain at some time in their lives. Prevalence is highest in middle age. In the United Kingdom about 15% of hospital based physiotherapy and in Canada 30 percent of chiropractic referrals are for neck pain. In the Netherlands, neck pain contributes up to 2 percent of general practitioner consultations" (BINDER 2005). Neck pain is a common complaint with a point prevalence from 10% to 18% and life time prevalence from 30% to 50 (Irnich et al. 2001). Neck pain is common, especially among women, and around 67% of adults will have neck pain sometime during their life. Neck pain is particularly prevalent in certain occupations, such as office work. The cost of treating neck pain in the Netherlands in 1996 was around $868m (£620m; €540m) (Viljanen et al. 2003)

"Chronic neck pain is a common complaint in the Netherlands with a point prevalence of 14.3%. Neck pain is a common complaint that causes substantial morbidity in western countries with a reported prevalence ranging from 9.5 to 22%. Of all musculoskeletal pains in the Netherlands, neck pain are one of the three most reported with a point prevalence of 21 % "(Vonk et al. 2004).

Neck pain is a common complaint, with a point prevalence of nearly 13% and lifetime prevalence of nearly 50 % (Aker et al, 1996).

Risk Factors:

Most uncomplicated neck pain is associated with poor posture, anxiety and depression, neck strain, occupational injuries, or sporting injuries. With chronic pain, mechanical and degenerative factors (often referred to as cervical spondylosis) are more likely. Some neck pain results from soft tissue trauma, most typically seen in whiplash injuries. Rarely, disc prolapsed and inflammatory, infective, or malignant conditions affect the cervical spine and present as neck pain with or without neurologic features (BINDER 2005).

Prognosis:

Neck pain usually resolves within days or weeks but can recur or become chronic. In some industries, neck-related disorders account for as much time off work as low back pain. The percentage of people in whom neck pain becomes chronic depends on the cause but is, thought to be about 10 percent, 1 similar to low back pain. Neck pain causes severe disability in 5 percent of affected people (BINDER 2005).

Management:

Pharmacological Management:

Painkillers are often helpful in the medical management of neck pain. It is best to take painkillers regularly until the pain cases. This better than taking them now and again just when the pain is very bad. If you take them regularly, that may prevent the pain from getting severe and enable you to exercise and keep your neck active (Patient UK 2005).

There are few randomized controlled trials specifically testing drug treatments for neck pain. Paracetamol is safe and effective for the treatment of mild to moderate pain when used correctly (Prodigy Knowledge 2005). We found insufficient evidence on the effects of analgesics, NSAIDs, antidepressants, or muscle relaxants for neck pain, although they are widely used (Binder 2005).

There is a lack of good evidence to support the use of one NSAID over another in the treatment of neck pain. Consequently Ibuprofen, Diclofenac and Naproxen are recommended on the basis of the balances between their general efficacy and adverse effect profile, which are more favorable than for other NSAIDs. Several muscle relaxants have been studied for neck pain. Diazepam is usually the preferred choice. A short course of Diazepam is recommended because the risk of developing Benzodiazepine dependency is high (Prodigy Knowledge 2005).

Physiotherapy Management:

David et al. (1998) stated that physiotherapy is the mainstay of treatment of neck pain. Neck pain is a common complaint managed by physiotherapist (Costello &Jull 2002). Common treatment of neck pain consists of drugs, manual treatments, physiotherapy and exercise, local and epidural injections and patient education (Irnich et al. 2001).

How neck pain is treated depends on what the diagnosis reveals. However, most patients are treated successfully with rest, medication, immobilization, physical therapy, exercise, activity modification or a combination of these methods (AAOS 2000). Early mobilization and return to a normal active lifestyle will improve the outcomes. Poor posture should be corrected if the range of motion of the neck is restricted. A firm pillow may provide comfort at night (Prodigy Knowledge 2005).

When neck pain persists or is chronic, the orthopedist recommend a rehabilitation program that includes exercise program and various types of physical therapy to help you relieve your pain and prevent it from coming back American Academy of Orthopedic Surgeon 2000). People with weak neck muscles are more prone to neck problems and in such cases, an exercise programme to strengthen the neck is a good idea (Pillinger & Rutherford 2005). The purpose of the exercise is to abolish pain and where appropriate, to restore normal function- that is, to regain full mobility in the neck or much movement as possible under the given circumstances. Postural correction and maintenance of the correct posture should always follow the exercise (McKenzie 1983, p.38).

Conventional physiotherapy for neck pain:

There is no clear definition of conventional physiotherapy. But Oxford Advanced Learner dictionary (1995, p. 254) states that conventional means tending to follow what is done or considered acceptable or following what is traditional or the way that has been that has been done for a long time. Therefore conventional physiotherapy refers to what is done or following traditional physiotherapy treatment that has been done for a long time in the department of physiotherapy. (Moffett, 2004a).

Conventional physiotherapy is a combination of different treatment approach which is used in the physiotherapy department.

In CRP outdoor physiotherapy department used traditionally, in conventional treatment

- Mechanical directional movements:
- Mobilization

- Accessory movement
- Strengthening
- Traction
- Mulligan approach
- Infra red radiation
- Transcutaneous electrical nerve stimulation (TENS)

Mechanical directional movements:

The McKenzie method is popular amongst physiotherapists as a management approach for spinal pain (Clare, Adams & Maher 2004). In McKenzie 12 procedures and techniques are applied for neck pain. Those are

- Retraction (With overpressure, sitting or standing)
- Retraction and extension (With overpressure, sitting or standing)
- Retraction and extension (With overpressure, lying supine or prone)
- Retraction and extension with traction and rotation (Lying supine)
- Extension mobilization (Lying prone)
- Retraction and lateral flexion (With overpressure, sitting , standing or lying supine)
- Lateral flexion mobilization (Sitting lying supine)
- Retraction and rotation (With overpressure, sitting or standing)
- Rotation mobilization (Sitting or lying supine)
- Flexion (With overpressure, sitting or standing)
- Flexion mobilization (Lying supine)
- Cervical traction (Lying supine) (McKenzie 1990, p. 115)

Mobilization:

A number of different mobilization techniques are used in the treatment of neck pain. There are three commonly used technique for upper cervical and seven com techniques for lower cervical spine problem.

For upper cervical spine:

- Longitudinal movement

- Posterior anterior (PA) central pressure
- PA unilateral pressure

For lower cervical spine:

- The above three
- Lateral flexion
- Transverse vertebral pressure
- Rotation
- Anterior posterior (AP) unilateral pressure (Brukner & Khan 1993, p. 185).

Strengthening:

Exercises for whiplash or neck pain may include specific neck exercises, shoulder exercises, active exercise, stretching, strengthening, postural, functional, kinesthetic, eye-fixation and proprioception exercises (the last two exercises help with balance and control of movement) (Whiplash 2008).

There is limited evidence of benefit for strengthening, stretching and strengthening or eye-fixation exercises for neck disorder with headache (Kay, TM et al. 2005)

Traction:

Traction may be an effective technique in any patient with neck pain. It is the treatment of choice in the cervical disc prolapsed. Traction can be performed manually by the therapist or by the machine (Brukner & Khan 1993, p. 187).

Mulligan approach:

Sustained natural apophyseal glides (SNAGs) are described by Mulligan as useful techniques for treatment of the spinal column. However the understanding of the how or why the procedures are able to benefit patient has not widely researched (Mulligan cited in Horton 2002, p. 103)

Unique to this concept is the mobilization of the spine whilst is in a weight bearing position and directing the mobilization parallel to the spinal facet plan (Mulligan, sited in Exelby 2002, p. 64).

Infra red radiation:

Therapeutic uses of infrared radiation (IRR) are pain relief and reduction of muscle spasm (Low & Reed 2000, p. 349).

TENS:

Evidence from two small trials suggests that Transcutaneous Electrical Nerve Stimulation (TENS) or pulsed electromagnetic field therapy may provide relief from neck pain in the short term (Akter, PD et al. 1996).

Myofascial Release

Definition of Myofascial Release

Guimberteau JC (2008) stated that Myofascial Release is a safe and very effective hands-on technique that involves applying gentle sustained pressure into the Myofascial connective tissue restrictions to eliminate pain and restore motion. In the word "Myofascial," "myo" refers to muscle and "fascia" is a continuous layer of connective tissue that spreads throughout the body. Fascia is like a three-dimensional web that extends from head to foot and protectively surrounds every muscle, bone, nerve, blood vessel, and organ in the body. A good way to envision fascia is to imagine slicing a grapefruit in half. After removing the fruit from the rind, it is easy to see all of the individual compartments that are left. These translucent walls give shape and definition to the object. Fascia in our bodies acts very similar to these compartment walls.

Fascia in its normal healthy state is relaxed, stretching and moving without restriction. When the neck is impacted by physical trauma, posture, repetitive stress injuries, scarring, and/or inflammation, however, there are cumulative effects. The fascia in the neck and surrounding areas loses its pliability. It becomes tight, restrictive, and a source of tension affecting the entire body. This fascia produces pain or a decreased range of motion (ROM), affects flexibility and stability, and even hinders the ability to cope with strain and stress. Unfortunately myofascial restrictions do not show up in standard testing, so it can be misdiagnosed for a long period of time, thus compounding the issue. (Myofascial Release for neck pain ,2010)

Procedure of Myofascial Release

Myofascial Release sessions usually last about twenty minute and can occur from one to three times a week. During the initial session, the physiotherapist and the patient will discuss the patient's pain, treatment goals, and how Myofascial Release will help achieve those goals. The physiotherapist will also do a visual evaluation of the physiotherapist patient's posture and movement to help pinpoint potential sources of the pain. Therapy is individualized based on the patient's pain and the feedback the physiotherapist gets from working with the patient's body.The patient usually wears a loss groun and pants to provide the physiotherapist maximum access to the body. No lubricant is used. The physiotherapist will use light pressure, compression, and traction to stretch the affected fascia. The process is slow and generally comfortable for the client. The process increases blood flow to the site and encourages the fascia to relax, unwind, and correct itself.The physiotherapist also uses gentle pressure to find any painful trigger points and determines which part of the body needs work based on the feedback obtained from touch. Often only one or two parts of the body are worked on in a single session. Nevertheless, because all fascia is connected, working on one area will benefit the entire body. (Myofascial Release for Chronic Pain,2010)

Mechanism of reducing neck pain

An overview of Myofascial Release for neck pain (2010), Muscles of the neck that are usually targeted for Myofascial release include the trapezius and suboccipitals, located along the back of the neck, which help extend the neck; the sternocleidomastoid (SCM) and levator scapula, which help provide neck rotation; the longus colli, longus capitis, and infra hyoids, located in the front of the neck, which provide flexion; and the scalenes, which flex the neck to the side.

The Myofascial release practitioner will visually observe the client's body as well as palpate, or feel, the tissue texture and various fascial layers in the neck. The client will be asked to take his/her neck through a range of motion (ROM) in various directions, looking for restriction and pain. Based on this information, treatment will be performed.

A specific Myofascial release technique involves the therapist slowly providing therapeutic compression, while having the client move the neck in a slow back and

forth motion, thus stretching the targeted muscles. As a result, the fascia is softened and stretched, and trigger points—hyperirritable “knots” in the tissue that send pain elsewhere—will be released. The client will usually experience increased range of motion, increased strength, and improved circulation. This technique can be done by addressing multiple muscles of the neck, and directing the neck through various ranges of motion: chin to chest, right ear to right shoulder, left ear to left shoulder, head at 45 degree angle, and chin pointed down to respective collar bones. The treatment is combined with proper stretching and strengthening of the involved tissues.

CHAPTER-III: METHODOLOGY

This research was a quantitative evaluation of the of the Myofascial Release along with conventional physiotherapy for neck pain. To identify the efficacy of this treatment approach Visual Analogue Scale (VAS) was used as measurement tools for measuring the pain intensity in several functioning position and range of motion was measured by Goniometer.

3.1 Study design

Experimental hypothesis predicts a relationship between two variables. The simplest way to find out whether this relationship actually exists is to alter one of these variables to see what difference it makes to the other. This is the basis of the experimental design. This alteration is known as manipulation of variables.

The Study was done using a quantitative true(or classic) experimental different subject design. The researcher selected the design because true experimental design was the best known design for beginning researcher (Depoy and Gatlin 1998, p. 109).

So the study is a true experimental between different subject design. Myofascial release and conventional Physiotherapy was applied to the experimental group and conventional Physiotherapy was applied to the control group. After manipulation of independent variables, the out comes were compared.

A pretest (before intervention) and post test (after intervention) was administered with each subject of both groups to compare the pain effects before and after the treatment. So, according to Depoy & Gitlin (1998, p. 110) the design could be shown by-

r o x o (experimental group)

r o o (control group)

3.2. Setting

The study was conducted in one settings. One setting is musculoskeletal department Savar. This setting was specialized for musculoskeletal physiotherapy

2.3 Study population and sample

20 patients with neck pain were selected through simple random sampling. . Sample frame was made from the appointment record of respective units and after that the investigator has given particular ID to each participant of the sample frame. Subsequently, individual sample was picked up from the sample frame through lottery. Participants were selected from CRP because they were easily accessible for the researcher. Samples are selected through some exclusion and inclusion criteria. 'Random assignment improves internal validity of experimental research' (Hicks 1997, p.46).

3.3. A Inclusion criteria

- Age group(14-60 year)
- Both sex
- Any neck pain patient with dysfunction.
- Neck pain in local tenderness.
- All wryneck patients.
- Central and symmetrical neck pain.
- Patients who will willing to participate.

3.3. B Exclusion criteria

- Patients with clinical disorder where Myofascial Release is contraindicated such as infective conditions of neck, dermatitis, malignancy,
- Diagnosis of tumor, fracture and osteoporosis.
- Surgery to the neck or thoracic spine.
- Refereed pain below shoulder.

3.4 Methods of data collection

3.4. A Measurement tool

Visual analogue scale (VAS) – for measuring pain intensity in several function positions. Visual analogue scale is one of the most frequently used measurement scales in health care research. The VAS is most commonly known and used for measurement of pain' (Johnson 2002).VAS is a line of a defined length (10 cm), usually horizontal, anchored at each end by a descriptive word or phase representing the extremes (e.g. worse, best) (Bowling 1997).

Goniometer (Double-armed) – for assessing a joint range of motion most commonly used is Double-armed Goniometer, with one arm stationary and another arm is movable. The pin or axis of the movable arm is placed directly over the center of the joint. The stationary arm is held in the line with the stationary segment of joint. Then the movement should perform. At the completion of movement the indicator show the number of degree through which the segment has moved. (luttgens and Hamilton, p.34 ,2001)

3.4. B Process of data collection

Researcher formatted an assessment form for assessing the pain intensity and reange of motion at different functional position. Data collection was completed in two sessions from subjects; one before starting the treatment, which was pre test data another after completing the treatment which was post test data.

The researcher gave a assessment from to each subject before starting treating treatment and requested to put mark on that line of VAS according to their intensity of pain and qualified physiotherapist take ROM measurement by Goniometer.

The researcher did not give treatment to the both group. It was given by the physiotherapists. The researcher had given a responsibility to physiotherapist to collect the data during the pre test and post test on both group.

In order to reduce the change of error, the therapist provided with specific measurement and treatment guideline and assessment form. The study was done by single blind procedure. At the end of the study, specific test was performing for statistical analysis.

3.5 Duration of data collection

Within ten weeks the researcher conducted research with the participant and collected data carefully.

3.6 Data analysis

The data was analyzed by unrelated *t*-test.

According to Hicks (1998, p.92), experimental studies with the different subject design where two groups are used and each tested in two different conditions and the data is interval or ratio should be analyzed with unrelated 't' test.

3.6. A Unrelated *t*- test

This test is used when' the experimental design compares two separate or different unmatched groups of subjects participating in different conditions. When calculating the unrelated t test , you find the value called 't' which you then look up in the probability tables associated with the *t* test to find out whether the *t* value represents a significant difference between the results from your two groups (Hicks 2000, p. 180).

3.7 Ethical Consideration

The researcher will submit the proposal to the ethical committee. Again before beginning the data collection, permission will be obtained from the concerned authorities ensuring the safety of participants. In order to eliminate ethical claims, the participants were set free to receive treatment for other purposes as usual. 4 sessions for the study will be arranged with the help of the concerned physiotherapists. Only the measurement of the initial and last session was compared for the study. The participants were informed about the study before the beginning and also were informed that they reserve the right to reject the study anytime. After being informed the participants signed the consent forms.

The subjects of experimental group received Myofascial Release. For ethical consideration both experimental and control group received conventional physiotherapy.

3.8 Informed Consent

The researcher obtained consent to participate from every subject. A signed informed consent form was received from each subject. All subjects stopped taking medicine willingly. If the participant got worse or thought that treatment was not enough to control his/her condition then they were meet with the outdoor doctor. Subjects were informed that they were completely free to decline answering any questions during the study and were free to withdraw their consent and terminate participation at any time. If they withdraw their participation from the study, it would not affect their treatment in the physiotherapy department and they would still get the same facilities. Every subject had the opportunity to discuss their problem with the senior authority or administration of CRP and have any questioned answer to their satisfaction.

Data analysis was done with statistical calculation using inferential statistical parametric unrelated ‘t’ test which is perform during ratio data system as conveniently selected of the subjects were done for the two groups of this parametric study. Depoy & Gitlin 1998. P.247 state that, Statistical analysis is concerned with the organization and interpretation of data according to well defined, systematic and mathematical procedures and rules.

All participants were code according to ground to keep confidentially. All subjects in the conventional physiotherapy with Myofascial release and conventional physiotherapy alone group score their intensity of pain on VAS and ROM on Goniometer before starting treatment and after completing treatment. The researcher then use a ruler scale for measuring pain intensity in centimeters (cm) scores for VAS and nearest normal score will count. Range of motion data was collect on degree. Difference was calculated by comparing the pre -test and post -test.

Data of pain intensity which was collected by pre-test and post-test in the conventional physiotherapy with Myofascial release group and difference between pre-test and post-test score is reduction of the pain intensity. Data of pain intensity which was collected by pre-test and post-test in the conventional physiotherapy group and difference between pre-test and post-test score is reduction of the pain intensity.

As it was experimental and had unmatched groups of different subjects, who will conveniently allocated to conventional physiotherapy with Myofascial release group and only conventional physiotherapy group. Measurement of the outcome came from collecting VAS score and Goniometer score and considers of interval and ratio data. For this reason this study use parametric unrelated‘t’ test to calculated the significance level of the study. There‘t’ test was used to find out whatever the‘t’ value represented a significance difference between the result from different treatment group.

Unrelated‘t’ test and mean different will calculated to test the hypothesis on the basis of the following assumptions.

- Data were ratio
- Two different set of subjects in two conditions

The‘t’ formula-

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(x_2)^2}{n_2}\right)}{(n_1 - 1) - (n_2 - 1)} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}}$$

Where

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

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

$\sum x_1^2$= the square of the each individual score from treatment group totaled.

$\sum x_2^2$= the square of the each individual score from control group totaled.

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

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

n_1= number of subjects from treatment group.

n_2= number of subjects from control group.

Significant level

To find out the significant level of the P (Probability) value. This experimental study hypothesis was one tailed because it was producing a specific direction of the result. If P value is < .05 which will be accepted by the researcher to show the significant result of the study to prove or support the hypothesis and reject the null hypothesis. 'The statistical approach to determining sample size is the power calculation. Statistical power is a measure of how likely the result is to produce a statistically significant result for a difference between groups of a given magnitude' (Bowling 1997, p.149).

Statistical test of significant apply probability theory to work out the changes of obtaining the observer result the significance levels of 0.05, 0.01, 0.001 are commonly used an indicated of statistically significant difference between variables (Bowling 1997, p. 170).

Limitation of the study

The main limitation of this study was its short duration. This study was used 20 patients with neck pain. This was a very small number of samples in both groups which was not sufficient for the study to generalize to wider population of neck pain.

This research carried out in CRP Savar such a small environment; it was very difficult to keep confidential the aims of the study for blinding procedure.

The samples were selected between the age group of 14-60 year, but the researcher couldn't find out which age group patients were more effective. If the most effective age group were found then the result will be more specific.

There was no available research done in this area in Bangladesh. So, relevant information about neck pain patient with specific intervention of Bangladesh was very limited in this study.

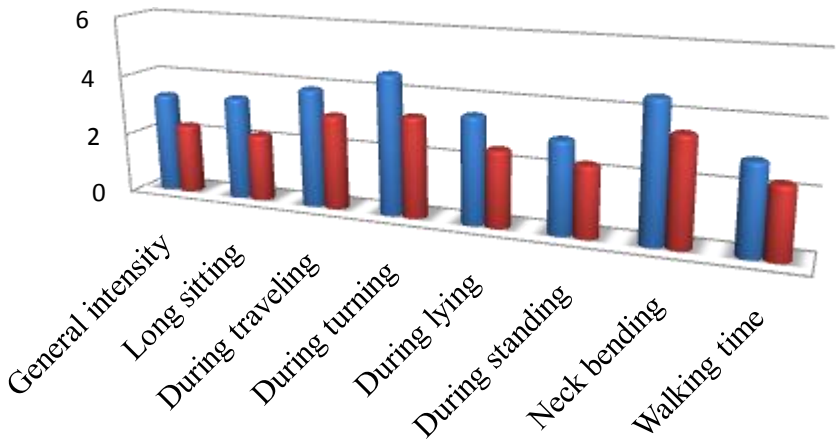
CHAPTER -IV: RESULTS

Initially in the research, 20 patients were enrolled in the study. 10 in the Myofascial release with conventional treatment group (experimental group) and 10 in the only conventional treatment group (control group). The whole subject of both experimental and control group scored their pain on VAS scale and take ROM measurement before and after completing treatment.

Table no 01:

Mean difference of reduction of pain intensity between pre-test and post-test in conventional physiotherapy with Myofascial release and only conventional physiotherapy group.

Name of the variables	**Conventional physiotherapy with Myofascial release group**	**Only conventional physiotherapy group**
General intensity	3.3	2.3
Long sitting	3.4	2.2
During traveling	3.9	3.1
During turning	4.6	3.3
During lying	3.5	2.5
During standing	3.0	2.3
Neck bending	4.5	3.3
Walking time	2.9	2.3



	General intensity	Long sitting	During traveling	During turning	During lying	During standing	Neck bending	Walking time
Experimental Group	3.3	3.4	3.9	4.6	3.5	3	4.5	2.9
Control Group	2.3	2.2	3.1	3.3	2.5	2.3	3.5	2.3

Figure- 1: Mean difference of reduction of pain intensity between pre-test and post test in experimental and control group.

Table no 02:

General pain intensity: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	4	16	C_1	1	1
E_2	2	4	C_2	2	4
E_3	3	9	C_3	3	9
E4	5	25	C4	2	4
E_5	3	9	C_5	4	16
E_6	4	16	C_6	2	4
E_7	3	9	C_7	3	9
E_8	2	4	C_8	2	4
E_9	3	9	C_9	2	4
E_{10}	4	16	C_{10}	2	4
	$\sum X_1=33$	$\sum X_1^2=117$		$\sum X_2=23$	$\sum X_2^2=59$

$\bar{X}_1=3.3$

$\sum X_1^2=117$

$(\sum X_1)^2=1089$

$n_1=10$

$\bar{X}_2=2.3$

$\sum X_2^2=117$

$(\sum X_2)^2=1089$

$n_2=10$

Calculating the degree of freedom from the formula

$$df = (n_1 - 1) + (n_2 - 1)$$

$$= (10 - 1) + (10 - 1) = 18$$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\left[\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1 - 1) + (n_2 - 1)}} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}\right]}$$

$$t = \frac{3.3 - 2.3}{\left[\sqrt{\frac{117 - \frac{1089}{10} + 59 - \frac{529}{10}}{(10-1) + (10-1)}} \times \sqrt{\left(\frac{1}{10} + \frac{1}{10}\right)}\right]}$$

t= 2.525

Table no 10:

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

No	Variables	Observed 't' value	Observed P value
1.	General pain intensity	2.525	0.01
2.	Pain on sitting	2.684	0.01
3.	Pain at traveling	2.046	0.05
4.	Pain at neck turning	2.398	0.025
5.	Pain at sleeping	2.182	0.025
6.	Pain at neck bending	2.191	0.025
7.	Pain at standing	1.561	0.10
8.	Pain at walking	1.474	0.10

Table no 11:

Mean difference of reduction of Range of motion between pre-test and post-test in conventional physiotherapy with neck muscle endurance exercise and only conventional physiotherapy group.

Name of the variables	**Conventional physiotherapy with Myofascial release group**	**Only conventional physiotherapy group**
Flexion	17.0	11.5
Extension	16.5	12.0
Side bending(Rt)	14.5	10.0
Side bending(Lt)	15.0	12.0
Rotation(Rt)	15	9.5
Rotation(Lt)	17.0	12.5

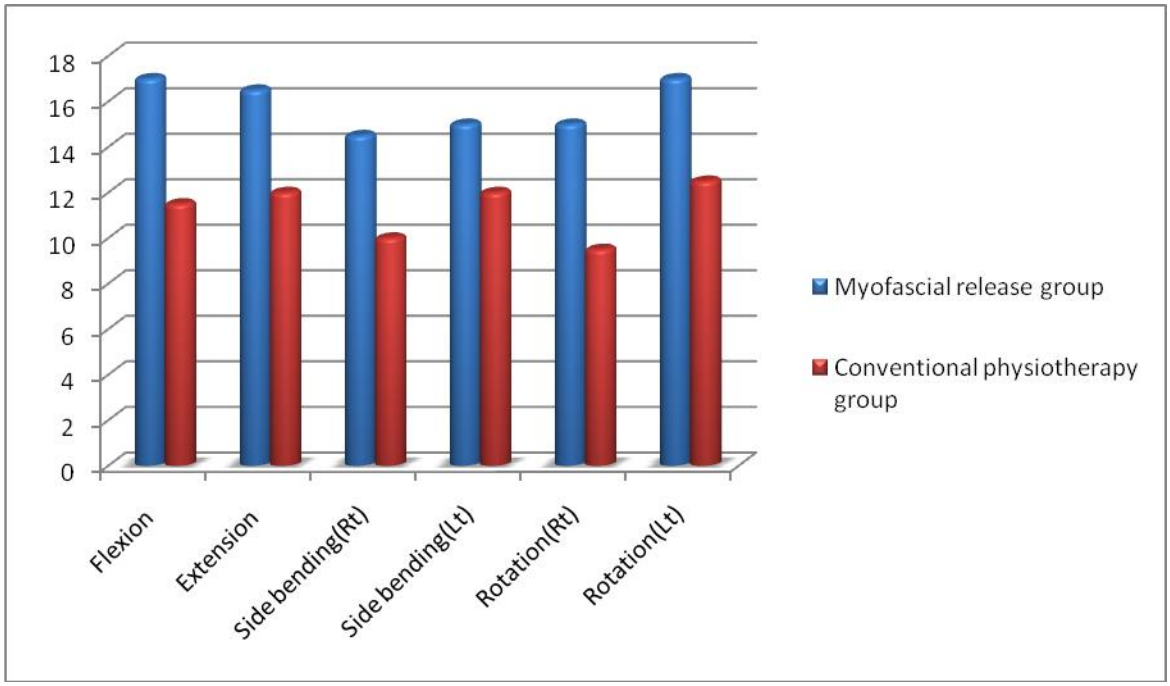


Figure- 2: Mean difference Range of motion between pre-test and post-test in conventional physiotherapy with neck muscle endurance exercise and only conventional physiotherapy group.

Table no 12:

Flexion: Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in flexion were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores ($X_{2)}$	X_2^2
E_1	15	225	C_1	10	100
E_2	20	400	C_2	15	225
E_3	15	225	C_3	10	100
E4	15	225	C4	10	100
E_5	20	400	C_5	10	100
E_6	10	100	C_6	5	25
E_7	15	225	C_7	10	100
E_8	20	400	C_8	10	100
E_9	20	400	C_9	20	400
E_{10}	20	400	C_{10}	15	225
	$\sum X_1=170$	$\sum X_1^2=2910$		$\sum X_2=115$	$\sum X_2^2=1375$

$\bar{X}_1=17.0$ $(\sum X_1)^2=28900$

$\sum X_1^2=2910$ $n_1=10$

$\overline{X}_2$=11.5 $(\sum X_2)^2$=13225

$\sum X_2^2$=1375 n_2=10

Calculating the degree of freedom from the formula

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

= (10 -1) + (10 - 1) =18

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\left[\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}} \times \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}\right]}$$

$$= \frac{17.0 - 11.5}{\left[\sqrt{\frac{2910 - \frac{28900}{10} + 1375 - \frac{13225}{10}}{(10-1)+(10-1)}} \times \sqrt{\left(\frac{1}{10} + \frac{1}{10}\right)}\right]}$$

t= 2.246

Table no 18:

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

No	Variables	Observed 't' value	Observed P value
1.	Flexion	2.246	0.025
2.	Extension	2.415	0.025
3.	Side bending(Rt)	2.862	0.01
4.	Side bending(Lt)	1.50	0.10
5.	Rotation(Rt)	3.495	0.005
6.	Rotation(Lt)	2.862	0.01

5.1 Interpretation of results (VAS score)

The researcher interprets the results in different functional position using the values that come from this study.

General pain intensity

20 patients were enrolled and 10 patient assigned to active intervention. The rest of 10 patients were assigned to the controlled group. Mean scores of conventional physiotherapy with Myofascial release (experimental group) and only conventional physiotherapy (control group) was 3.3 and 2.3. Following application of treatment the study found that the experimental group showed a significant improvement ($p<0.01$) in case of general pain intensity.

Pain intensity during lying

Subjects who received conventional physiotherapy combined with Myofascial release were significantly more likely to decrease pain then the only conventional physiotherapy treatment group. In lying position, the subject experienced less pain after 4 session of treatment. Here $t=2.182$, $df=18$, $p<0.025$ which means the result was found to be significant.

Pain intensity in sitting

20 patients were enrolled and 10 patient assigned to active intervention. The rest of 10 patients were assigned to the controlled group. Mean scores of conventional physiotherapy with Myofascial release (experimental group) and only conventional physiotherapy (control group) was 3.4 and 2.2. Following application of treatment the study found that the experimental group showed a significant improvement ($p<0.01$) in case of sitting position.

Pain intensity during neck bending:

A good response rate was achieved ($t=2.191$, $p=0.025$) in pain reduction in neck bending position. This means that the result was significant.

During neck turning:

Subjects who received conventional physiotherapy combined with Myofascial release were significantly more likely to decrease pain then the only conventional physiotherapy treatment group. During neck turning, the subject experienced less pain after 4 session of treatment. Here t=2.398, df=18, p<0.025 which means the result was found to be significant.

During standing

The mean score of experimental and control group was 3.0 and 2.3. in the terms of presenting situation, significant(t=1.561 p<0.10)result was observed this means that 2.5% random error can occur during the study in this functional position.

During walking:

During walking the result was not statistically significant where p<0.10. The mean score of experimental and control group was 2.9 and 2.3.

Pain intensity during travelling:

A good response rate was achieved (t=2.046, p=0.05) in pain reduction during travelling. This means that the result was significant.

5.2 Interpretation of results (Goniometer score)

Flexion

20 patients were enrolled and 10 patient assigned to active intervention. The rest of 10 patients were assigned to the controlled group. Mean scores of conventional physiotherapy with Myofascial release (experimental group) and only conventional physiotherapy (control group) was 17.0 and 11.5. Following application of treatment the study found that the experimental group showed a significant improvement (p<0.025) in case of flexion.

Extension

Subjects who received conventional physiotherapy combined with Myofascial release were significantly increase range of motion then the only conventional physiotherapy treatment group. In extension, the range of motion increase after 4 session of treatment. Here t=2.415, df=18, p<0.025 which means the result was found to be significan

Side bending(Rt)

The mean score of experimental and control group was 14.5 and 10.0. in the terms of presenting situation, significant(t=2.862 p<0.01)result was observed this means that 2.5% random error can occur during the study in this physiological range.

Side bending(Lt)

20 patients were enrolled and 10 patient assigned to active intervention. The rest of 10 patients were assigned to the controlled group. Mean scores of conventional physiotherapy with Myofascial release (experimental group) and only conventional physiotherapy (control group) was 15.0 and 12.0. Following application of treatment the study found that the experimental group showed a significant improvement (p<0.10) in case of Side bending(Lt).

Rotation(Rt)

A good response rate was achieved (t=3.495, p=0.005) in range of motion neck Rotation (Rt). This means that the result was significant.

Rotation(Lt)

Subjects who received conventional physiotherapy combined with Myofascial release were significantly more likely to decrease pain then the only conventional physiotherapy treatment group. During Rotation (Lt), the range of motion increase after 4 session of treatment. Here t=2.862, df=18, p<0.01 which means the result was found to be significant.

CHAPTER-V: DISCUSSION

The study was indicated a process that could be continuing to establish the result. Here the aim of this study could be achieved if the researcher could show effective support. The purpose of this study was to evaluate the effectiveness of the Myofascial release with conventional physiotherapy compare to only conventional physiotherapy for neck pain.

In this experimental study 20 patients with neck pain were conveniently allocated to the conventional physiotherapy with Myofascial release group or the only conventional physiotherapy group among them 10 patients to the conventional physiotherapy with Myofascial release group and 10 patients to the only conventional physiotherapy group. The first group received conventional physiotherapy with Myofascial release and the second group received only conventional physiotherapy. Each group attended for 4 sessions (each session for 30 minutes) of treatment within 4 weeks in the physiotherapy outdoor department of CRP Savar. And the outcome measured of pain intensity using VAS and measured of range of motion by Goniometer.

According to David et al. (1998) physiotherapy appears to be effective in the management of the neck pain. Moffett et al. (2994b) did a research on 286 patients at 12 months with subacute and chronic neck pain that were referred by their general practitioner and saw that usual physiotherapy significantly improve of that patient.

In general, significant ($p<.05$) pain reduction was found between the two groups. The mean reduction of pain intensity in the experimental or conventional with Myofascial release group was 3.638 and conventional physiotherapy alone group was 2.588 which means that pain reduction in conventional with Myofascial release group was greater than the conventional physiotherapy alone group. And the result is statistically significant.

Significant ($p<.05$) range of motion improvement was found between the two groups. The mean of range of motion in the experimental or conventional with Myofascial

release group was 15.834 and conventional physiotherapy alone group was 11.25. Which means that improvement of range of motion in conventional with Myofascial release group was greater than the conventional physiotherapy alone group. And the result is statistically significant.

During sitting, significant ($p<.01$) pain reduction was found between the two groups. The mean reduction of pain intensity in the experimental or conventional with Myofascial release group was 3.4 and conventional physiotherapy alone group was 2.2 which means that pain reduction in conventional with Myofascial release group was greater than the conventional physiotherapy alone group. And the result is statistically significant.

McKenzie (1995, p.115) suggested that to be a passenger is better than to drive or long journey. This means that travelling is an aggravating factor for neck pain. After traveling, significant ($P<0.05$) pain was found between the two groups. The mean reduction of pain intensity in the experimental or conventional with Myofascial release group was 3.9 and conventional physiotherapy alone group was 3.1 which means that pain reduction in conventional with Myofascial release group was greater than the conventional physiotherapy alone group. And the result is statistically significant.

CHAPTER-VI : CONCLUSION

The result of the study have identified the effectiveness of conventional physiotherapy with Myofascial release was better than the conventional physiotherapy alone for Neck pain patient at different functional position which was a Quantitative experimental study. The result of the current study indicates that the conventional physiotherapy with Myofascial release can be an effective therapeutic approach for patient with mechanical neck pain. Participants in the conventional physiotherapy with Myofascial release group showed a greater benefit than those in the only conventional physiotherapy group. The result indicate that the significant changes in both groups are due to the selection of a well- defined population of mechanical neck pain patients using specific inclusion and exclusion criteria. It may be helpful for patient with mechanical neck pain to increase return to normal daily activities, work and to measure longer term effects to determine cost effectiveness of Myofascial release in conjunction with conventional physiotherapy as an intervention for mechanical neck pain.

CHAPTER-VII: RECOMMENDATION

In this study, the researcher provided 4 session of treatment to both groups and measure pain intensity and range of motion in different functional positions. In these four sessions, researcher only observed the pain intensity and range of motion after treatment.

As a consequence of the research it is recommended that with further well-controlled double blinding study include comparison of the conventional physiotherapy with Myofascial release group with the conventional physiotherapy alone and assessing effects and efficacy of these treatments. In particular, since the neck is sensitive area which is direct connects with the brain and this is a frequent cause of functional disability and pain. This study directed towards an assessment of the specific management in treating neck of specific neck problem in an outpatient, if pursued further could prove extremely fruitful. Furthermore, chronic associated with many cases of neck pain, and the extensive pathology that exists in the surrounding structure that was joints, tissues and bone, may suggest a further study of a longer duration as this may give even better results.

These samples were selected between the age group of 14-60 years, but the researcher could not find out which age group was more effective. If the most effective age group were found then the study will be more effective.

The researcher did random assigned in both group rather than random selection. That’s why researcher recommended to do further study with enough time and by maintaining random selection to make the study more valid.

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Appendix

সম্মতি পত্র

গবেষনার স্থানঃ পক্ষাঘাত গ্রস্থদের পূনর্বাসন কেন্দ্র, সাভার ,ঢাকা।

এ গবেষনার শিরোনামঃ " ঘাড়ের ব্যাথায় মাইওফেসিয়াল রিলিজ চিকিৎসার প্রভাব "। গবেষক তানভীর আহমেদ ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অন্তর্ভুক্ত বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউটের ৪র্থ প্রফেশনাল বি এস সি ইন ফিজিওথেরাপি এর ছাত্র।

অংশগ্রহনকারীকে নিন্মলিখিত তথ্য সমূহ পাঠ করার পর এই গবেষনায় অংশ গ্রহণ করার জন্য অনুরোধ করা হচ্ছে।

এ গবেষনায় কোয়ান্টিটেটিভ রিসার্চ মেথড ব্যাবহৃত হবে। এ গবেষনার কোন ব্যাবস্থাপনা অংশগ্রহণকারীর জন্য সম্ভাব্য কোন ঝুকির উদ্রেক ঘটাবে না। অংশগ্রহণকারী যে কোন সময় গবেষনা কার্যক্রম থেকে নিজেকে প্রত্যাহার করতে পারেন। গবেষনায় অংশগ্রহনকারী কোনরূপ আর্থিক সুবিধা পাবেন না। আশা করা যায় এ গবেষনার ফলাফল থেকে ঘাড়ের ব্যাথা চিকিৎসার জন্য একটি প্রমান সিদ্ধ ফিজিওথেরাপি চিকিৎসা ব্যাবস্থা প্রতিষ্ঠা করা যাবে, যা থেকে ভবিষ্যতে এ সমস্যার একটি ভাল ব্যাবস্থাপনা ফিজিওথেরাপিষ্ট গণ অনুসরণ করতে পারবেন।

এ গবেষনা পত্র প্রকাশ কালে অংশগ্রহনকারীর পরিচয় ও অন্যান্য তথ্য সমূহ গোপনীয়তার সাথে রক্ষা করা হবে।

আমি ..... ঘোষনা দিচ্ছি যে, উপোরক্ত সকল তথ্য জানার পর এই গবেষনায় অংশ গ্রহণ কারার ইচ্ছা পোষন করছি।

অংশগ্রহণকারীর স্বাক্ষরঃ তারিখঃ

সাক্ষীর স্বাক্ষরঃ তারিখঃ

গবেষকের স্বাক্ষর : তারিখঃ

Inform consent

Clinical setting: "Outdoor Service, Physiotherapy Department, C.R.P., Saver, Dhaka"

The study entitled "Efficacy on Myofascial Release technique among the Neck pain patient." The researcher Tanvir Ahmed is a 4th Professional B.Sc. in physiotherapy student of Bangladesh Health Profession Institute under the University of Dhaka and it is a part of his study. The participants are requested to participate in the study after reading the following information. The study is conducted to establish evidence based treatment for neck pain. The study will follow quantitative method. The study does not pose any potential risk as no interventions are being tested.

The participants reserve the right to refuse the study at any time. The findings of the study will serve a great role to explore information about the evidence based quality management of the neck pain and will make worth physiotherapist to provide best service for the disorder.

The information obtained from the study would be kept secret and at the time of publishing the result of the study, personal identification of the participant would not be published.

I ---------- declare that, I am giving my consent to participating in the study after being informed about all the above information in details.

Sign of the participant …… Date-

Sign of the witness ……... Date-

Sign of the researcher …… Date-

To

The Head of the Physiotherapy Department,

Center for the Rehabilitation of the Paralyzed (C.R.P.),

Savar, Dhaka.

Subject: Prayer for permission of data collection for the research project.

Sir,

I beg most respectfully to state that, I am a student of B Sc in Physiotherapy in Bangladesh Health Profession Institute (BHPI) under University of Dhaka. As a part of my curriculum, I have to conduct a research project. The area of my research project is musculoskeletal physiotherapy and title is "Efficacy on Myofascial Release technique among the Neck pain patient". The samples of my research project are patient with Neck pain. The setting of the project is outdoor service physiotherapy department CRP Savar Dhaka. So I need to collect data of those patients from your department. I will follow all the fact written in my consent form and will not do any harm for the patients.

I therefore, pray and hope that you would be kind enough to give me the permission to collect data and complete the research project successfully from your department.

Yours faithfully

Tanvir Ahmed

4th professional B.Sc. in physiotherapy (B.H.P.I.)

C.R.P. Savar, Dhaka

Date:

Data collection form (Research purpose only)

Code no:

Age: …….. Sex:……...

Adders: Village: …… P.O.: …….

Thana: …… District: ……

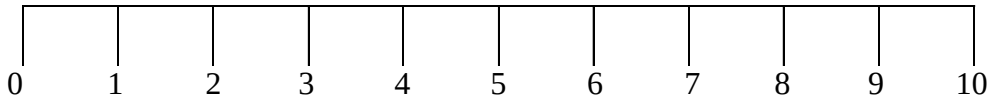
Occupation:

Date:

How long have you had neck pain?

Years…….. Months…… Weeks……..

This questionnaire is designed for your neck pain. With each question there is long line. The line represents your pain situation. The left hand end represents no pain, as you move along the line the pain you feel is increasing. At the right hand end the pain is the worse. Always remember that the point at the left side no pain and point right side is intolerable pain.

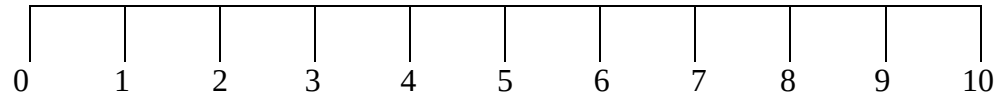


No pain Excruciating pain Sever pain

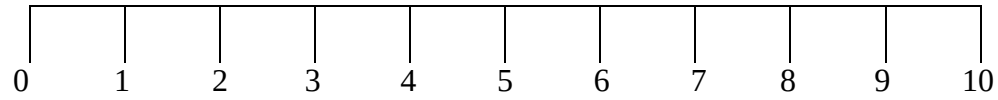
Please a mark (X) on the line where you feel it shows how much pain you have.

1. How would you describe your neck pain in general intensity? Point out on the scale, mark with a (X) on the scale.

Pre treatment

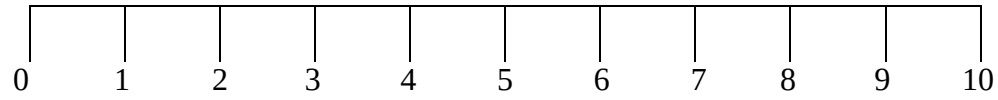


Post treatment

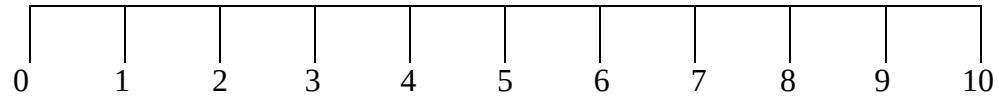


2. How much pain increases your neck during long sitting (above 30m minutes)? Point out on the scale, mark with a (X) on the scale.

Pre treatment

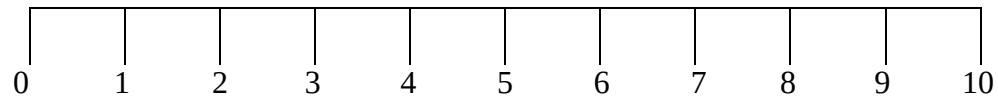


Post treatment

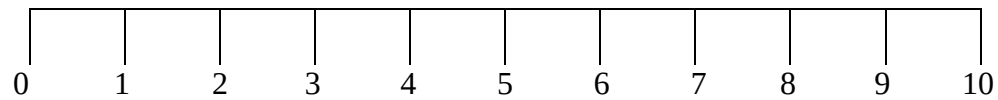


3. How much pain increases your neck during traveling? Point out on the scale, mark with a (X) on the scale.

Pre treatment

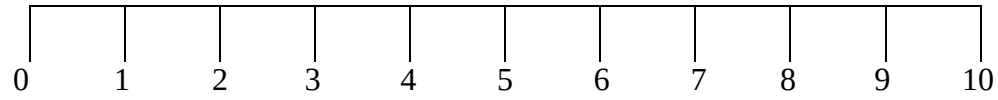


Post treatment

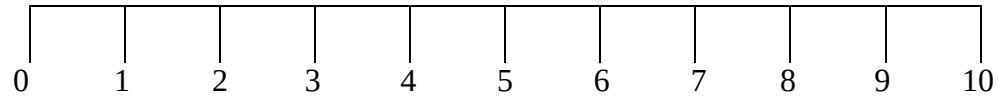


4. How much pain increases your neck during turning? Point out on the scale, mark with a (X) on the scale.

Pre treatment

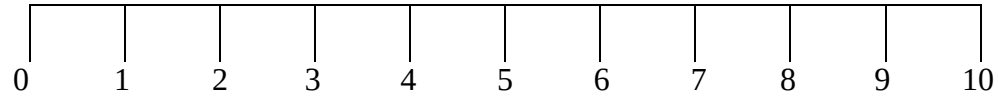


Post treatment

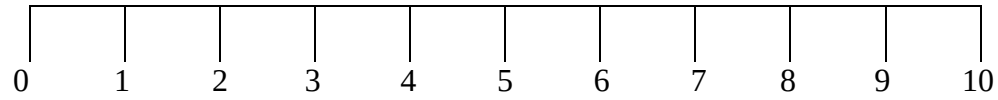


5. How much pain increases your neck during lying? Point out on the scale, mark with a (X) on the scale.

Pre treatment

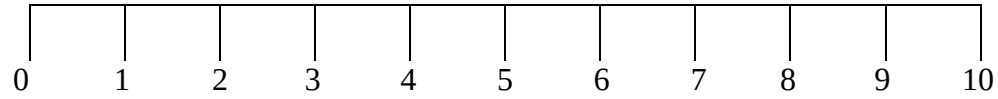


Post treatment

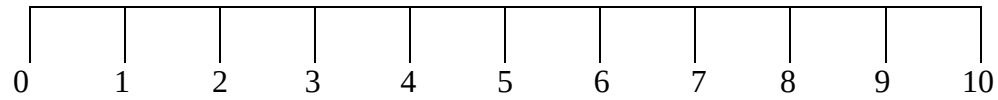


6. How much pain increases your neck during standing? Point out on the scale, mark with a (X) on the scale.

Pre treatment

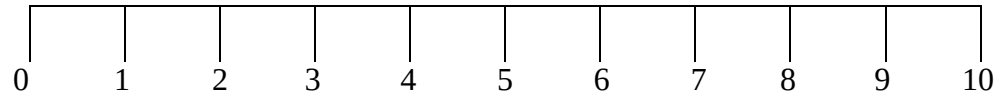


Post treatment

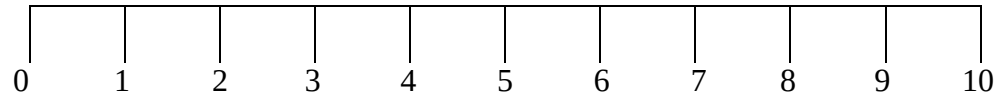


7. How much pain increases your neck during neck bending? Point out on the scale, mark with a (X) on the scale.

Pre treatment

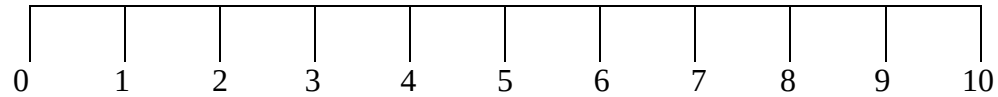


Post treatment

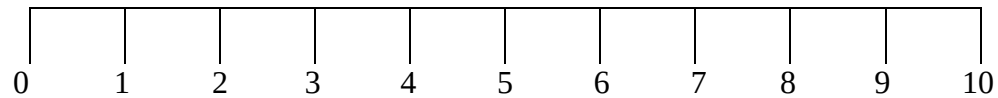


8. How much pain increases during your walking time ? Point out on the scale, mark with a (X) on the scale.

Pre treatment



Post treatment



Range Of Motion:

This part of questionnaire is designed for neck range of motion measurement. Goniometer is use for taking measurement.

Movement	**Pre treatment**	**Post treatment**
Flexion		
Extension		
Side bending(Rt)		
Side bending(Lt)		
Rotation(Rt)		
Rotation(Lt)		

Thanks

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4th Professional, B.H.P.I.

Dhaka University

তথ্য সংগ্রহ পত্র

কোড নং ঃ

বয়স ঃ

লিঙ্গ ঃ

ঠিকানা ঃ গ্রাম ঃ..... পোষ্ট ঃ.....

থানা ঃ..... জেলা ঃ.....

পেশা ঃ

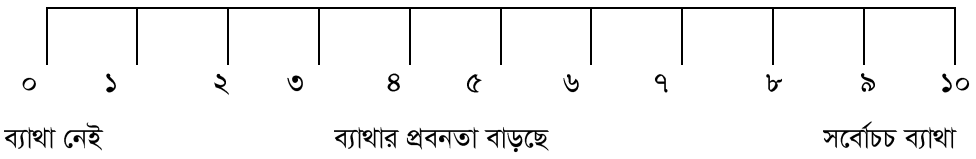
তারিখ ঃ

আপনার ঘাড়ে কতদিন যাবৎ ব্যাথা হচ্ছে?

.....বৎসর ..... মাস ..... দিন

এ প্রশ্নপত্র ঘাড়ে ব্যাথার জন্য করা হয়েছে । প্রত্যেক প্রশ্নে একটি করে লম্বা দাগ দেয়া আছে । দাগটি আপনার ব্যথার অবস্থা নির্দেশ করে । আপনি মনে করুন দাগের সর্বপ্রথম বাম দিকে আপনার ব্যাথা শুরূ এবং সর্ব ডান দিকে আপনার ব্যাথার সর্বোচ্চ প্রবনতা । অর্থাৎ বাম দিকের শুরূতে কোন ব্যাথা নেই এবং ব্যাথা বাড়তে বাড়তে ডান দিকে সর্বোচচ ব্যাথা সেটা দাগের শেষ বলা হয়েছে ।

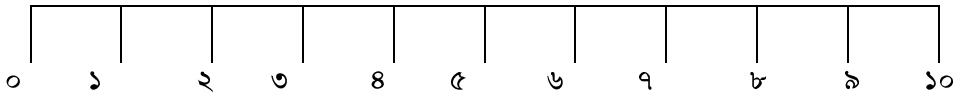
যেমন ঃ



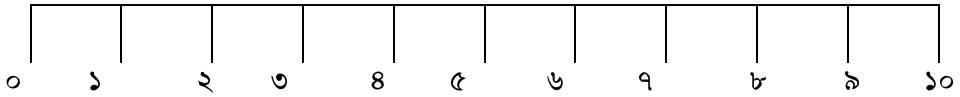
আপনি যে মুহুর্তে ঘাড়ের ব্যাথার প্রশ্ন পত্রটি পূর্ণ করবেন সেই মুহুর্তে আপনার ব্যাথার প্রবণতাটি দাগের সঠিক জায়গায় কলম দিয়ে ক্রস (ঢ) একটি দাগ দিন ।

১। আপনার ঘাড়ের ব্যাথার প্রবনতা আজকে কতটুকু তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন।

চিকিৎসার পূর্বে

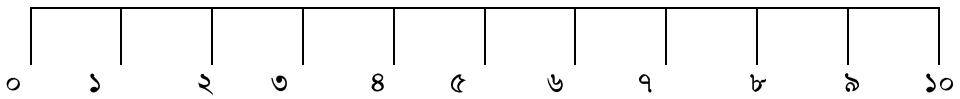


চিকিৎসার পরে

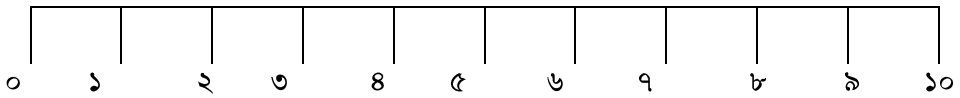


২। দীর্ঘক্ষণ (আধঘন্টার বেশি) বসে থাকলে আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

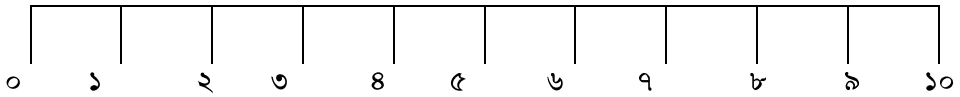


চিকিৎসার পরে

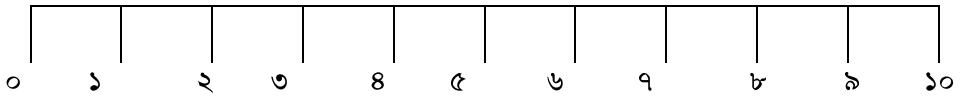


৩। আপনি যখন ভ্রমন করেন তখন ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

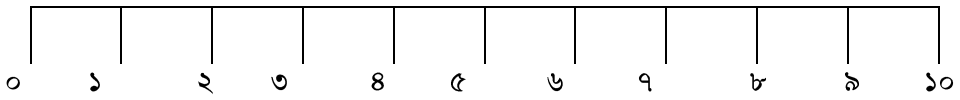


চিকিৎসার পরে

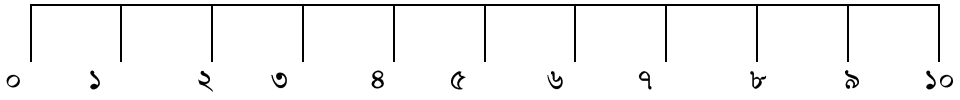


৪। আপনি যখন ঘাড় ঘুড়ান তখন আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

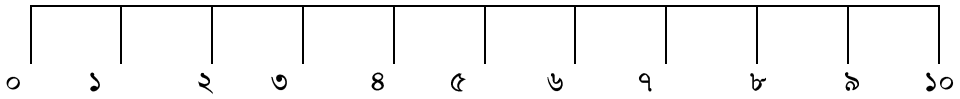


চিকিৎসার পরে

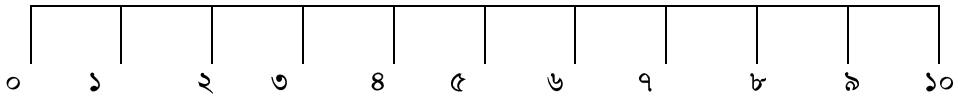


৫। শোয়া অবসথায় আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

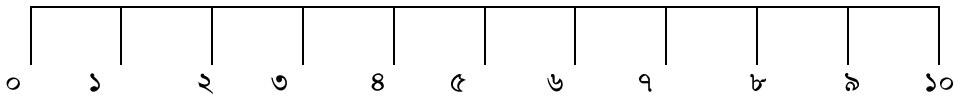


চিকিৎসার পরে

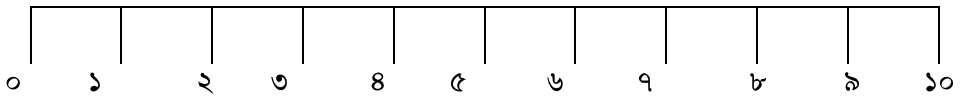


৬। সামনে ঝুকলে আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

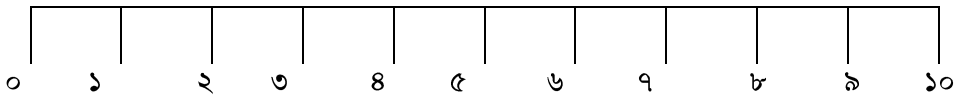


চিকিৎসার পরে

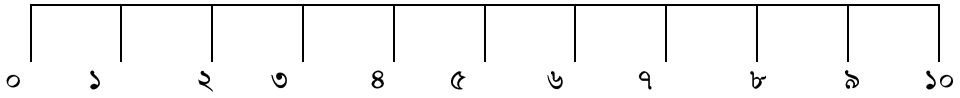


৭। হাটলে আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে

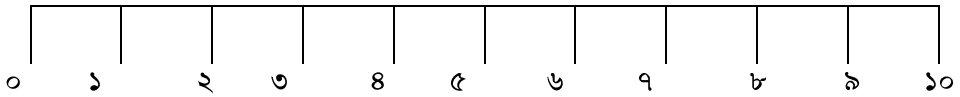


চিকিৎসার পরে

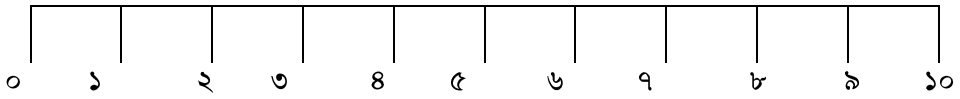


৮। দারানো অবসথায় আপনার ঘাড়ের ব্যাথার প্রবণতা কেমন হয় তা ক্রস (ঢ) চিহ্নের সাহায্যে প্রকাশ করুন ।

চিকিৎসার পূর্বে



চিকিৎসার পরে



অস্থি সন্ধির নড়াচরার পরিমাপঃ

Movement	Pre treatment	Post treatment
Flexion		
Extension		
Side bending(Rt)		
Side bending(Lt)		
Rotation(Rt)		
Rotation(Lt)		

ধন্যবাদান্তে

তানভীর আহমেদ

বি.এস.সি. ইন ফিজিওথেরাপি

৪র্থ প্রফেশনাল,ঢাকা বিশ্ববিদ্যালয়

Table no 03:

Long sitting: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the Long sitting were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	4	16	C_1	1	1
E_2	2	4	C_2	1	1
E_3	5	25	C_3	3	9
E4	3	9	C4	3	9
E_5	2	4	C_5	2	4
E_6	2	4	C_6	3	9
E_7	3	9	C_7	3	9
E_8	4	16	C_8	2	4
E_9	4	16	C_9	2	4
E_{10}	5	25	C_{10}	2	4
	$\sum X_1=34$	$\sum X_1^2=103$		$\sum X_2=22$	$\sum X_2^2=54$

$\bar{X}_1=3.4$ $\bar{X}_2=2.2$

$\sum X_1^2=103$ $\sum X_2^2=54$

$(\sum X_1)^2=1156$ $(\sum X_2)^2=484$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t=\frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2-\frac{(\sum x_1)^2}{n_1}\right)+\left(\sum x_2^2-\frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}\times\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$t=\frac{3.4-2.2}{\sqrt{\frac{103-\frac{1156}{10}+54-\frac{484}{10}}{(10-1)+(10-1)}\times\left(\frac{1}{10}+\frac{1}{10}\right)}}$$

t= 2.684

Table no 04:

During traveling: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	3	9	C_1	4	16
E_2	4	16	C_2	3	9
E_3	3	9	C_3	2	4
E4	3	9	C4	3	9
E_5	5	25	C_5	4	16
E_6	4	16	C_6	3	9
E_7	3	9	C_7	4	16
E_8	5	25	C_8	2	4
E_9	4	16	C_9	4	16
E_{10}	5	25	C_{10}	2	4
	$\sum X_1=39$	$\sum X_1^2=159$		$\sum X_2=31$	$\sum X_2^2=103$

$\bar{X}_1=3.9$ $\bar{X}_2=3.1$

$\sum X_1^2=159$ $\sum X_2^2=103$

$(\sum X_1)^2=1521$ $(\sum X_2)^2=961$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \sqrt{\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$t = \frac{3.9-3.1}{\sqrt{\frac{159-\frac{1521}{10}+103-\frac{961}{10}}{(10-1)+(10-1)} \times \sqrt{\left(\frac{1}{10}+\frac{1}{10}\right)}}}$$

t= 2.046

Table no 05:

During turning: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	4	16	C_1	4	16
E_2	6	36	C_2	3	9
E_3	6	36	C_3	4	16
E4	4	16	C4	3	9
E_5	5	25	C_5	4	16
E_6	6	36	C_6	2	4
E_7	3	9	C_7	2	4
E_8	2	4	C_8	5	25
E_9	4	16	C_9	3	9
E_{10}	6	36	C_{10}	3	9
	$\sum X_1=46$	$\sum X_1^2=230$		$\sum X_2=33$	$\sum X_2^2=117$

$\bar{X}_1=4.6$ $\bar{X}_2=3.2$

$\sum X_1^2=230$ $\sum X_2^2=117$

$(\sum X_1)^2=2116$ $(\sum X_2)^2=1089$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{4.6 - 3.3}{\sqrt{\frac{230 - \frac{2116}{10} + 117 - \frac{1089}{10}}{(10-1)+(10-1)} \times \left(\frac{1}{10} + \frac{1}{10}\right)}}$$

$t = 2.398$

Table no 06:

During standing: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	2	4	C_1	2	4
E_2	4	16	C_2	3	9
E_3	3	9	C_3	2	4
E4	4	16	C4	2	4
E_5	3	9	C_5	3	9
E_6	3	9	C_6	2	4
E_7	5	25	C_7	4	16
E_8	2	4	C_8	1	1
E_9	3	9	C_9	2	4
E_{10}	1	1	C_{10}	2	4
	$\sum X_1=30$	$\sum X_1^2=102$		$\sum X_2=23$	$\sum X_2^2=59$

$\bar{X}_1=3.0$ $\bar{X}_2=2.3$

$\sum X_1^2=102$ $\sum X_2^2=59$

$(\sum X_1)^2=900$ $(\sum X_2)^2=529$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10 -1) + (10 - 1) =18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left(\frac{\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}}{(n_1-1)+(n_2-1)}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)} \times \sqrt{\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$t = \frac{3.0-2.3}{\sqrt{\frac{102-\frac{900}{10}+59-\frac{529}{10}}{(10-1)+(10-1)} \times \sqrt{\left(\frac{1}{10}+\frac{1}{10}\right)}}}$$

t= 1.561

Table no 07:

During lying: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	3	9	C_1	2	4
E_2	2	4	C_2	1	1
E_3	4	16	C_3	2	4
E4	5	25	C4	3	9
E_5	2	4	C_5	3	9
E_6	4	16	C_6	3	9
E_7	3	9	C_7	2	4
E_8	5	25	C_8	3	9
E_9	2	4	C_9	2	4
E_{10}	5	25	C_{10}	3	9
	$\sum X_1=35$	$\sum X_1^2=137$		$\sum X_2=24$	$\sum X_2^2=62$

$\bar{X}_1=3.5$ $\bar{X}_2=2.5$

$\sum X_1^2=137$ $\sum X_2^2=62$

$(\sum X_1)^2=1225$ $(\sum X_2)^2=576$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{3.5-2.5}{\sqrt{\frac{137 - \frac{1225}{10} + 62 - \frac{576}{10}}{(10-1)+(10-1)} \times \left(\frac{1}{10} + \frac{1}{10}\right)}}$$

t= 2.182

Table no 08:

Neck bending: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	4	16	C_1	3	9
E_2	6	36	C_2	2	4
E_3	5	25	C_3	3	9
E4	4	16	C4	3	9
E_5	5	25	C_5	4	16
E_6	5	25	C_6	3	9
E_7	3	9	C_7	4	16
E_8	4	16	C_8	5	25
E_9	4	16	C_9	3	9
E_{10}	5	25	C_{10}	4	16
	$\sum X_1=45$	$\sum X_1^2=209$		$\sum X_2=33$	$\sum X_2^2=122$

$\bar{X}_1=4.5$ $\bar{X}_2=3.3$

$\sum X_1^2=209$ $\sum X_2^2=122$

$(\sum X_1)^2=2025$ $(\sum X_2)^2=1089$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{4.5 - 3.3}{\sqrt{\frac{209 - \frac{2025}{10} + 122 - \frac{1089}{10}}{(10-1)+(10-1)} \times \left(\frac{1}{10} + \frac{1}{10}\right)}}$$

t= 2.571

Table no 9:

Walking time: Reduction of pain scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in the general pain intensity were differences between pre-test and post-test pain scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	Pain scores (X_1)	X_1^2	Subjects	Pain scores ($X_{2)}$	X_2^2
E_1	4	16	C_1	2	4
E_2	4	16	C_2	2	4
E_3	2	4	C_3	2	4
E4	3	9	C4	3	9
E_5	3	9	C_5	2	4
E_6	3	9	C_6	4	16
E_7	2	4	C_7	2	4
E_8	4	16	C_8	3	9
E_9	1	1	C_9	2	4
E_{10}	3	9	C_{10}	1	1
	$\sum X_1=29$	$\sum X_1^2=93$		$\sum X_2=23$	$\sum X_2^2=59$

$\bar{X}_1=2.9$ $\bar{X}_2=2.3$

$\sum X_1^2=93$ $\sum X_2^2=59$

$(\sum X_1)^2=841$ $(\sum X_2)^2=529$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} = \frac{2.9-2.3}{\sqrt{\frac{93-\frac{841}{10}+59-\frac{529}{10}}{(10-1)+(10-1)} \times \left(\frac{1}{10}+\frac{1}{10}\right)}}$$

t= 1.474

Table no 13:

Extension: Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in Extension were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores (X_2)	X_2^2
E_1	20	400	C_1	15	225
E_2	15	225	C_2	10	100
E_3	20	400	C_3	10	100
E4	15	225	C4	10	100
E_5	20	400	C_5	15	225
E_6	20	400	C_6	10	100
E_7	10	100	C_7	15	225
E_8	10	100	C_8	5	225
E_9	15	225	C_9	10	100
E_{10}	20	400	C_{10}	20	400
	$\sum X_1=165$	$\sum X_1^2=2875$		$\sum X_2=120$	$\sum X_2^2=1600$

$\bar{X}_1=16.5$ $\bar{X}_2=12.0$

$\sum X_1^2=2875$ $\sum X_2^2=1600$

$(\sum X_1)^2=27225$ $(\sum X_2)^2=14400$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula

$$t = \frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2-\frac{(\sum x_1)^2}{n_1}\right)+\left(\sum x_2^2-\frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}\times\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} = \frac{16.5-12.0}{\sqrt{\frac{2875-\frac{27225}{10}+1600-\frac{14400}{10}}{(10-1)+(10-1)}\times\left(\frac{1}{10}+\frac{1}{10}\right)}}$$

t= 2.415

Table no 14:

Side bending (Rt): Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in Side bending(Rt**)** were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores (X_2)	X_2^2
E_1	10	100	C_1	05	25
E_2	10	100	C_2	10	100
E_3	15	225	C_3	10	100
E4	15	225	C4	10	100
E_5	20	400	C_5	15	225
E_6	10	100	C_6	10	100
E_7	20	400	C_7	10	100
E_8	15	225	C_8	05	25
E_9	15	225	C_9	15	225
E_{10}	15	225	C_{10}	10	100
	$\sum X_1=145$	$\sum X_1^2=2225$		$\sum X_2=100$	$\sum X_2^2=1100$

$\bar{X}_1=14.5$ $\bar{X}_2=10.0$

$\sum X_1^2=2225$ $\sum X_2^2=1100$

$(\sum X_1)^2=21025$ $(\sum X_2)^2=10000$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2-\frac{(\sum x_1)^2}{n_1}\right)+\left(\sum x_2^2-\frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}\times\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$= \frac{14.5-10.0}{\sqrt{\frac{2225-\frac{21025}{10}+1100-\frac{10000}{10}}{(10-1)+(10-1)}\times\left(\frac{1}{10}+\frac{1}{10}\right)}}$$

t= 2.862

Table no 15:

Side bending (Lt): Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in Side bending(Lt**)** were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores (X_2)	X_2^2
E_1	10	100	C_1	15	225
E_2	15	225	C_2	10	100
E_3	20	400	C_3	15	225
E4	20	400	C4	10	100
E_5	20	400	C_5	10	100
E_6	10	100	C_6	10	100
E_7	15	225	C_7	10	100
E_8	10	100	C_8	05	25
E_9	20	400	C_9	15	225
E_{10}	10	100	C_{10}	20	400
	$\sum X_1=150$	$\sum X_1^2=2450$		$\sum X_2=120$	$\sum X_2^2=1600$

$\bar{X}_1=15.0$ $\bar{X}_2=12.0$

$\sum X_1^2=2450$ $\sum X_2^2=1600$

$(\sum X_1)^2=22500$ $(\sum X_2)^2=14400$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$df = (n_1-1) + (n_2-1)$

$= (10-1) + (10-1) = 18$

Now 't' formula-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left[\frac{\left(\sum x_1^2 - \frac{(\sum x_1)^2}{n_1}\right) + \left(\sum x_2^2 - \frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)} \times \left(\frac{1}{n_1} + \frac{1}{n_2}\right)\right]}}$$

$$t = \frac{15.0 - 12.0}{\sqrt{\left[\frac{\left(2450 - \frac{22500}{10}\right) + \left(1600 - \frac{14400}{10}\right)}{(10-1)+(10-1)} \times \left(\frac{1}{10} + \frac{1}{10}\right)\right]}}$$

t= 1.50

Table no 16:

Rotation (Rt): Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in Rotation(Rt) were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores ($X_{2)}$	X_2^2
E_1	15	225	C_1	10	100
E_2	10	100	C_2	10	100
E_3	20	400	C_3	5	25
E4	15	225	C4	10	100
E_5	15	225	C_5	10	100
E_6	10	100	C_6	15	225
E_7	20	400	C_7	10	100
E_8	20	400	C_8	5	25
E_9	15	225	C_9	10	100
E_{10}	10	100	C_{10}	10	100
	$\sum X_1=150$	$\sum X_1^2=2400$		$\sum X_2=95$	$\sum X_2^2=975$

$\bar{X}_1=15.0$ $\bar{X}_2=9.5$

$\sum X_1^2=2400$ $\sum X_2^2=975$

$(\sum X_1)^2=22500$ $(\sum X_2)^2=9025$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$$df = (n_1-1) + (n_2-1)$$

$$= (10-1) + (10-1) = 18$$

Now 't' formula-

$$t=\frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2-\frac{(\sum x_1)^2}{n_1}\right)+\left(\sum x_2^2-\frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}\times\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$t=\frac{15.0-9.5}{\sqrt{\frac{2400-\frac{22500}{10}+975-\frac{9025}{10}}{(10-1)+(10-1)}\times\left(\frac{1}{10}+\frac{1}{10}\right)}}$$

t= 3.495

Table no 17:

Rotation (Lt): Increased range of motion scores in conventional physiotherapy with Myofascial release group and only conventional physiotherapy group in Rotation(Lt) were differences between pre-test and post-test ROM scores.

Conventional physiotherapy with Myofascial release group			Only Conventional physiotherapy group		
Subjects	ROM scores (X_1)	X_1^2	Subjects	ROM scores (X_2)	X_2^2
E_1	20	400	C_1	15	225
E_2	15	225	C_2	15	225
E_3	15	225	C_3	10	100
E4	20	400	C4	15	225
E_5	15	225	C_5	15	225
E_6	20	400	C_6	10	100
E_7	10	100	C_7	5	25
E_8	15	225	C_8	15	225
E_9	20	400	C_9	10	100
E_{10}	20	400	C_{10}	15	225
	$\sum X_1=170$	$\sum X_1^2=3000$		$\sum X_2=125$	$\sum X_2^2=1675$

$\bar{X}_1=17.0$ $\bar{X}_2=12.5$

$\sum X_1^2=3000$ $\sum X_2^2=1675$

$(\sum X_1)^2=28900$ $(\sum X_2)^2=15625$

$n_1=10$ $n_2=10$

Calculating the degree of freedom from the formula

$$df = (n_1-1) + (n_2-1)$$

$$= (10-1) + (10-1) = 18$$

Now 't' formula-

$$t = \frac{\bar{x}_1-\bar{x}_2}{\sqrt{\frac{\left(\sum x_1^2-\frac{(\sum x_1)^2}{n_1}\right)+\left(\sum x_2^2-\frac{(\sum x_2)^2}{n_2}\right)}{(n_1-1)+(n_2-1)}\times\sqrt{\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}}$$

$$t = \frac{17.0-12.5}{\sqrt{\frac{3000-\frac{28900}{10}+1675-\frac{15625}{10}}{(10-1)+(10-1)}\times\sqrt{\left(\frac{1}{10}+\frac{1}{10}\right)}}}$$

t= 2.86

Table A2.5 Critical values of *t* (related and unrelated *t* tests) at various levels of probability. For your *t* value to be significant at a particular probability level, it should be *equal* to or *larger than* critical values associated with the df in your study (Reproduced from Lindley DV, Scott WF (1984) New Cambridge Elementary Statistical Tables, 10th edn. Cambridge University Press, with permission.)

	Level of significance for one-tailed test					
	.10	.05	.025	.01	.005	.0005
	Level of significance for two-tailed test					
df	.20	.10	.05	.02	.01	.001
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.598
3	1.638	2.353	3.182	4.541	5.841	12.941
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.859
6	1.440	1.943	2.447	3.143	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.405
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1.372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
17	1.333	1.740	2.110	2.567	2.898	3.965
18	1.330	1.734	2.101	2.552	2.878	3.922
19	1.328	1.729	2.093	2.539	2.861	3.883
20	1.325	1.725	2.086	2.528	2.845	3.850
21	1.323	1.721	2.080	2.518	2.831	3.819
22	1.321	1.717	2.074	2.508	2.819	3.792
23	1.319	1.714	2.069	2.500	2.807	3.767
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725
26	1.315	1.706	2.056	2.479	2.779	3.707
27	1.314	1.703	2.052	2.473	2.771	3.690
28	1.313	1.701	2.048	2.467	2.763	3.674
29	1.311	1.699	2.045	2.462	2.756	3.659
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
	1.282	1.645	1.960	2.326	2.576	3.291

NB When there is no exact df use the next lowest number, except for very large dfs (well over 120), when you should use the infinity row. This is marked