#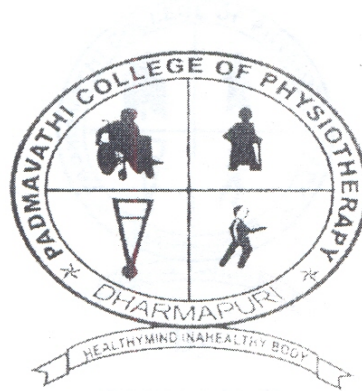 A COMPARATIVE STUDY TO FIND THE EFFECTIVENESS OF PRESSURE BIOFEEDBACK VERSUS ISOMETRIC EXERCISES OF DEEP NECK FLEXORS IN REDUCING CHRONIC NECK PAIN USING NECK DISABILITY INDEX

By

(Reg. No . 27101805)

PADMAVATH COLLEGE OF PHYSIOTHERAPY

PERIYANAHALLI

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Under the guidance of

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Submitted in Partial fulfillment of the requirements for the

Degree of **Master of Physiotherapy**

From

The Tamilnadu Dr. M.G.R. Medical University,

Chennai

PADMAVATH COLLEGE OF PHYSIOTHERAPY
PERIYANAHALLI
DHARMAPURI

CERTIFICATE

This is to certify that the project entitled **"A COMPARATIVE STUDY TO FIND THE EFFECTIVENESS OF PRESSURE BIOFEEDBACK VERSUS ISOMETRIC EXERCISES OF DEEP NECK FLEXORS IN REDUCING CHRONIC NECK PAIN USING NECK DISABILITY INDEX"**

Submitted by   the candidate

(Reg. No . 27101805)

is a bonafide work done in partial fulfillment of the requirements for the

Degree of **Master of Physiotherapy** from

The Tamilnadu Dr. M.G.R. Medical University,

Chennai

Guide   **Principal**

Viva-voce Examination held on _____

Internal Examiner   **External Examiner**

DECLARATION

I hereby declare and present my dissertation entitled entitled **"A COMPARATIVE STUDY TO FIND THE EFFECTIVENESS OF PRESSURE BIOFEEDBACK VERSUS ISOMETRIC EXERCISES OF DEEP NECK FLEXORS IN REDUCING CHRONIC NECK PAIN USING NECK DISABILITY INDEX"** the outcome of the original research work undertaken and carried out be me , under the guidance of **Mr. K. KUMAR , M.P.T. , MIAP.,** Associate Professor , Padmavathi College of Physiotherapy, Periyanahalli, Dharmapuri , Tamilnadu.

I also declare that the material of this dissertation had not formed in any basis for the award of any other Degree previously from the Tamilnadu Dr. M.G.R. Medical University, Chennai.

(SITHARTHAN. M)

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First and foremost I thank **LORD ALMIGHTY** for showering the blessings who always been my source of strength and guided me in all endeavors leading to the completion of this project.

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(SITHARTHAN. M)

DEDICATED TO MY BELOVED

PARENTS , STAFFS

AND

LOVABLE FRIENDS

TABLE OF CONTENTS

INTRODUCTION

Neck pain is a major problem in the society, with an increasing sedentary population especially with reliance on computer technology in the workplace.

Pain is defined as a sensation characterized by a group of unpleasant perceptual and emotional experiences that triggers autonomic, psychologic and somatomotor response associated with actual (or) potential damage to the tissues[1]. Mechanical neck pain may be defined as pain secondary to overuse of a normal anatomic structure (or) pain secondary to injury (or) deformity of an anatomic structure[2].

Neck pain is considered to be chronic if it last for more than 3 months of duration and pain that continues after the stimulus is removed (or) the tissue damage heals. Chronic neck pain is becoming increasingly prevalent in society estimations indicated that 67% of individuals will suffer neck pain at some stage throughout life. The current research incidence of chronic neck pain in Bangalore has been estimated as 35% and the median age as 27 years and its ranges between 18 to 52 years.

It is estimated that the Osteo -ligamentous system contributes 20% to the mechanical stability of the cervical spine, while 80% is provided by

the surrounding neck musculature. The ligaments role in stabilization occurs mainly at end of range postures[3]. While muscles supply dynamic support in activities around the neutral and mid range postures, which are commonly adopted during functional daily tasks. In the presence of injury (or) pathology, the role of the muscular system becomes even greater which highlights the need to address the muscle system during both the assessment and rehabilitation of patient with neck pain.

Considerable clinical knowledge and theory exists about the nature of the muscle dysfunction and postural change in the neck and upper functional kinetic chain that can occur with painful dysfunction of the craniocervical and cervical regions as well as of the cranio mandibular complex. The dysfunction in the muscular system appears to be related to disproportionate activity levels between different muscle, which may be provocative (or) reactive to painful musculoskeletal dysfunction. It is thought that this imbalanced muscle activity may arise from inherently poor sensorimotor integration (or) may be acquired through the effects on the muscular system of motor patterns used in life style activities (or) acquired from the effects of trauma and pain on articular and soft tissues. This imbalanced activity can result in postural change and poor patterns of movement in the neck. The articular tissues often fail to receive sufficient active, protective support from muscular having a prime

stabilization role with resulting altered mechanics and an altered load distribution on articular and soft tissues the cervical tissues are subjected to adverse stress and chronic strain with resultant pain.

Further more it was demonstrated that these stresses could be relieved if the supporting muscles principally the upper and deep cervical flexors were functioning at a level where they could repeatedly hold a low load inner range contraction without postural function. There is clinical evidence that the upper and deep cervical flexor that are the important muscles for cervical segmental and postural control lose their endurance capacity in patients with neck pain. The increased understanding of the tonic supporting role of the deep neck flexors and their functional differentiation from the superficial flexors realizes the need to develop a test that would target these muscles in relative isolation from their superficial counterparts.

To test this hypothesis a low load craniocervical flexion test has been developed by Jull et al to investigate the anatomical action of the deep cervical flexors, specifically of the longus colli in synergy with the longus capitis. The craniocervical flexion test (CCFT) is a clinical test used to assess an individual's ability to slowly perform and hold a precise upper cervical flexion action without flexion of mid and lower cervical

spine. It is based on the anatomical interrelated action of the deep muscles to support and stabilize the cervical spine as well as produce a flattening of the normal cervical spine lordosis[4]. This test is conduced in supine lying with the head neck region supported in neutral position. The action is reasoned to recruit all the deep neck flexors to hold the head and cervical region in a static position. As the muscles are deep and unable to be palpated directly, an indirect quantification of their ability to hold the cervical spine position is gained by monitoring the steady position of he neck with an inflatable air filled pressure sensor (stabilizer Chattanooga south pacific) that is positioned sub occipitally behind the neck. Work is currently proceeding to establish the validity of this test although initial clinical data suggest that it can depict a deficit in function in patients with neck pain. This dysfunction improves with retraining and parallels a reduction in symptoms.

Segmental instability has been defined as occurring in patients with neck problems whose clinical status is unstable, with symptoms fluctuating between mild and severe symptoms in response to even minor provocations. Frymoyer et al defined segmental instability as "a condition where there is loss of spinal stiffness, such that normally tolerated external loads will result in pain, deformity, or place neurological structures at risk"

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Panjabi introduced an innovative model of the spinal stabilization system which serves as an appropriate model for understanding the entity of spinal stability and instability and fits the clinical paradigm for the assessment and treatment in the neck pain patients.

The model incorporates

➢ Passive subsystem - osseous and articular structures and the spinal ligaments.

➢ Active subsystem - force generating capacity of the muscles.

➢ Neural control subsystem – control of these muscles.

This model recognizes that muscles need to be programmed in response to feedback (e.g. from sensory cues from ligaments), in order to adjust to any condition in any point in time so that the appropriate muscles are activated to the appropriate level. The three subsystems are interdependent components of the spinal stabilization system with one capable of compensating for deficits in another. Neck pain can occur as a consequence of deficits in control of the spinal segment when abnormally large segment motions cause compression or stretch on neural structures or abnormal deformation of the ligaments and pain sensitive structures.

It appears the local stability system dysfunction only develops after the onset of pain and pathology. Patient education may be an important component in the non surgical treatment of patients with segmental instability. . Patients also should be made aware of the importance of maintaining muscle strength and endurance, particularly in the muscles of the cervical spine. Fatigue can adversely affect the ability of the spinal muscles to respond to imposed loads, and general strengthening programs have been shown to be effective in patients with chronic Neck pain[5].

Anecdotal evidence suggests that cervical flexor muscles become dysfunctional in the presence of neck pain, further simple clinical mechanical measures have demonstrated a reduction in the strength and endurance capabilities of the deep cervical flexor muscles in neck pain patients.

SPB plays an important role in enhance motor learning of the affected muscles by visual feedback and helps in increasing the strength of the muscles and improves stabilization and relieves pain[6.] Isometric exercise helps in improving the muscle tension and strengthens the muscles there by helps in relieving pain.

ANATOMY

FIGURE 1

(Courtesy: Neck surgery.com)

The Cervical spine is made up of first seven vertebrae in the spine; it starts just below the skull and ends at the top of thoracic spine. The Cervical spine has a backward "C" shape lordotic curve and is much more mobile than either of thoracic or lumbar regions of the spine. The Cervical spine has special openings in each vertebra for the arteries that carry blood to the brain.

The first two vertebral bodies in the cervical spine are called Atlas and Axis. Atlas is named after a mythical Greek god who supported the weight of the world on his shoulders because this is the vertebral body that supports the weight of the head. The Atlas and Axis vertebra in the cervical spine differ from all other vertebrae because they are designed primarily for rotation.

The Atlas has a thick anterior arch and thin posterior arch with two prominent masses. The Axis sits underneath the Atlas and has a bony knob called the Odontoid Process that articulates up with the Atlas. It is this mechanism that allows the head to turn side to side.

There are special ligaments between these two vertebrae to allow for rotation between these two bones. Between each vertebra in the cervical spine are discs which acts as shock absorbers and also permits some movement between the vertebral bodies.
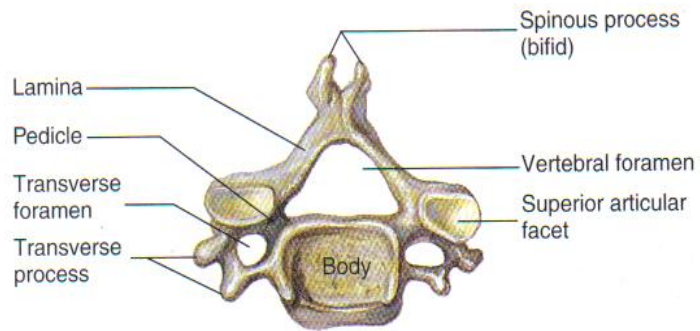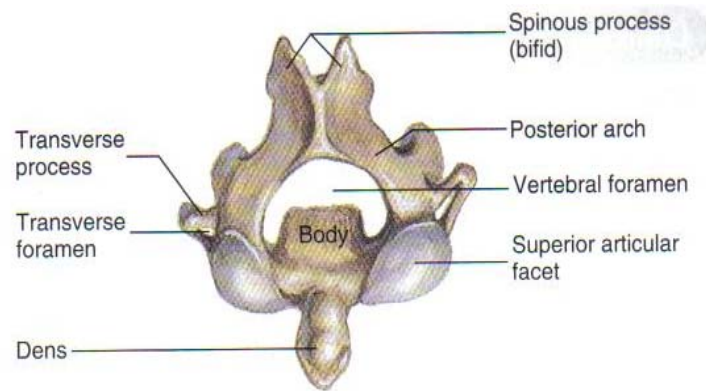
VERTEBRAE

Posterior arch
Transverse process
Vertebral foramen
Superior articular facet (articulates with occipital condyle)
Transverse foramen
Facet for dens
Anterior arch

Spinous process (bifid)
Transverse process
Posterior arch
Vertebral foramen
Transverse foramen
Body
Superior articular facet
Dens

Spinous process (bifid)
Lamina
Pedicle
Transverse foramen
Vertebral foramen
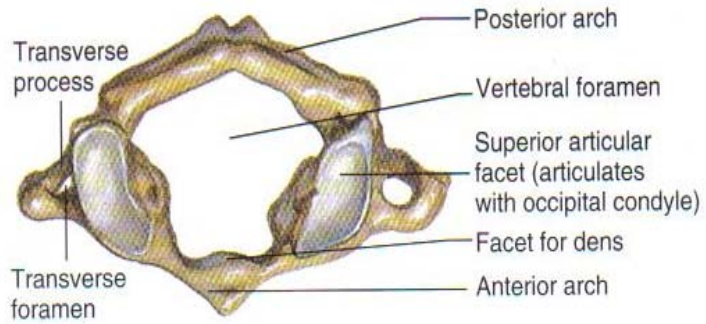Superior articular facet
Transverse process
Body

FIGURE 2

(Courtesy: Seeley textbook of Anatomy and Physiology)

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The entire Spinal column is joined together by ligaments that allow the Spine to bend and twist carrying the weight of the human body with just the right balance of strength and flexibility. Special joints between each of the vertebral bodies called Facet joints allow the individual bones of the spine to move and rotate with respect to each other .These joints are important because they can be source of pain if they become arthritic.

Each vertebra is shaped in a special way so that when they are stacked together, Spinal cord is protected from damage or injury by the bones of the entire spinal column. Vertebrae support the majority of the weight imposed on the spine. The body of each vertebra is attached to a bony ring that consists of several parts.

A bony projection on either side of the vertebral body called the Pedicle supports the arch that protects the Spinal canal. The laminae are the parts of the vertebrae that form the back of the bony arch that surrounds and covers the spinal canal. There is a transverse process on either side of the arch where some of the muscles of the Spinal column attach to the vertebrae. The Spinous process is the bony portion of the vertebral body that can be felt as a series of prominence in the centre of the person's neck and back.

INTERVERTEBRAL DISC

It is located in between each vertebrae and functions as a shock absorber and as joints; they are designed to absorb the stresses carried by the Spine while allowing the vertebral bodies to move with respect to each other. They are made up of a strong outer ring of fibers called the Annulus Fibrosis and a soft centre called the Nucleus Pulposus. The outer layer Annulus Fibrosis helps to keep the inner layer Nucleus Pulposus intact. The Annulus is made up of very strong fibers that connect each vertebra together. The Nucleus of the disc has a very high water content making it very moist.
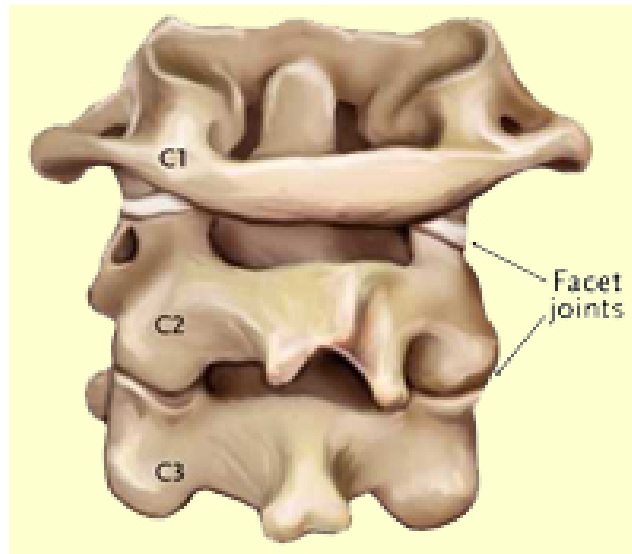
FACET JOINT

FIGURE 3

(Courtesy: Neck surgery.com)

The Facets connect the bony arches of each of the vertebral bodies. There are two Facet joints between each pair of vertebrae, one on each side. Facet joints connect each vertebra with the next vertebrae above and below. They are primarily designed to allow the vertebral bodies to rotate with respect to each other.

NEURAL FORAMEN

The Neural foramen is the opening where the nerve roots exit the spine and travel to the rest of the body. There are two Neural foramen located between each pair of vertebrae, one on each side. The foramen creates a protective passage way for the nerves that carry signals between the Spinal cord and rest of the body.

SPINALCORD AND NERVE ROOTS

The Spinal cord extends from the base of the brain to the area between bottom of first lumbar vertebrae and top of second lumbar vertebrae. The Spinal cord ends by dividing into individual nerves that travel out to lower body and legs. This group of nerves at end of the Spinal cord called CaudaEquina or Horse Tail. For the short distance these nerves travel through the Spinal canal before they exit out the Neural Foramen. The Duramater is the protective membrane that covers the Spinal cord; the Duramater forms a water tight sac around the Spinal cord and Nerves.

The Spinal cord is surrounded by spinal fluid inside this sac. The nerves in each area of the Spinal cord connect to specific parts of the body. The nerves of the cervical spine go to the upper chest and arms, the nerves also carry electrical signals back to the brain creating sensations. Damage to the nerves, nerve roots or spinal cord can lead to symptoms such as pain, tingling, numbness and weakness.

LIGAMENTS OF CERVICAL VERTEBRAL COLUMN

The vertebral bodies are bordered front and back by two major ligaments. The anterior longitudinal ligament is a broad, strong ligament on the anterior and antero lateral aspects of the vertebral bodies from the atlas too the sacrum. The posterior longitudinal ligament lies on the posterior surface of the bodies of the vertebrae from the axis to the sacrum. Supraspinous and interspinous ligaments are present between adjacent Spinous processes. The articulations between the vertebral arches are maintained by the Supraspinous ligaments, which become ligament nuchae in cervical spine, the interspinous ligaments, the ligamentum flavum and the synovial facet joints and capsules. Supraspinous ligament is thin which is composed of high percentage of elastic tissue, and runs over the tips of the Spinous processes. In humans this structure extends from the vertebrae prominence to the external

occipital protuberance and it is probably a major stabilizer of head and neck.

MUSCLES AND FASCIA OF THE CERVICAL SPINE

The muscles of the neck can be defined by anatomic limits, innervations or function. Because the cervical spine is the most mobile section of the spine, it contains the most elaborate a specialized muscle system of the spine. Many muscle groups that move the trunk and limbs also attach to the spinal column.

The muscles that closely surround the bones of the spine are important for maintaining posture and help the spine to carry the loads created during normal activities, work and play. The four pre vertebral muscles of the neck are the longus colli (cervicis), the longus capitis, rectus capitus anterior and rectus capitis lateralis. These are weak flexors of the head and neck. They extend from the base of the skull to superior mediastinum. They partially cover the anterior aspect of the vertebral column. They are covered anteriorly by the thick pre vertebral fascia. These fascia forms planes and compartments in which deeper structures of the neck are organized.

The three fascial layers of the cervical spine are superficial, intermediate and deep fascia. The superficial fascia surrounds

subcutaneous fat, the platysma muscle, the external jugular vein and cutaneous sensory nerves. The superficial layer surrounds all the deeper structures of neck. Next to the anterior to the cervical spine are oesophagus, trachea and thyroid gland. These structures are covered by intermediate fascial layer separate from the prevertebral fascia. The middle layer of the deep cervical fascia encloses the strap muscles and extends laterally to the scapula. The deepest layer of the deep fascia is the prevertebral fascia, which covers the scalenus muscles, longus colli muscles and the anterior longitudinal ligament. A number of important structures are located between these fascial layers.

BLOODSUPPLY OF THE CERVICAL SPINE

The vertebral artery is the major source of blood supply for the cervical spine and the cervical portion of the spinal cord. The vertebral arteries are usually the first and largest branch of the subclavian artery on each side.

BIOMECHANICS OF CERVICAL SPINE

The normal function of the cervical spine requires both flexibility to move the head and endurance of the musculature. The neck normally moves more than 600 times each hour, whether a person is awake (or) asleep. A basic understanding of the clinically relevant biomechanics of

the cervical spine is necessary for making a complete assessment of the neck of patients who have cervical problems. The normal biomechanics and pathomechanics of the cervical spine have been learned from static mechanical testing of cadaveric specimens in the laboratory. It is well established that forces and stresses can be applied to the spine in any combination of flexion, extension, rotation and shear. These stresses affect the entire Motion segment including the intervertebral disc, zygapophyseal ligaments, un co vertebral joints and the other ligamentous structures. The muscles and fascial attachments interact with the cervical spine to accommodate load, alter forces and direct motion.

The cervical spine is better suited for mobility and is not required to transmit heavy loads. The head weights only 5 to 7 pounds. All vital nerve centers are in the skull and allow coordination of vision, vestibular balance and auditory direction, precise control of head position and movement is essential for normal functioning of those senses. The biomechanical studies involving the cervical spine have to concentrate on two major areas like clinical stability and kinematics. Stability as it applies to the spine, which may be defined as the ability of the spine under physiologic loads of limit patterns of displacement.

Damage or irritation of the spinal cord and nerve roots in addition, to prevent incapacitating deformity (or) pain due to structural changes, while the issue of clinical instability is particularly germane to traumatic injuries of cervical spine, the subject also applies to inflammatory disorders such as rheumatoid arthritis and degenerative spondylolisthesis. Range of motion in the sub axial cervical spine can be helpful in making decisions about instability. The maximum anteroposterior translation on a lateral radiograph under physiologic loads has been measured. A difference in angulations greater than 11^0 between two cervical segments on a lateral radiograph also suggests abnormal motion.

Kinematics is the examination of the motion of bodies without consideration of the influencing forces. The two factors that determine the kinematics of vertebral motion are the geometry of the articulating surfaces and the mechanical properties of the connecting structures. The function of cervical spine may be divided into two sections, that of the upper segment above C_3 and that of the lower segment from C_3 to C_7. Most of the axial rotation in upper cervical spine occurs at the atlantoaxial joint.

The articular surfaces are convex with a horizontal orientation, allowing for maximum mobility. Atlantoaxial rotation averages 47^0,

which represents about 50% of the axial rotation in the neck, with the lower cervical spine contributing the other 50% of rotation. There are also about 4^0 of axial rotation at the occipito cervical junction. The rotation of C_2 on C_3 is physically limited by the anatomic locking of the anterior tip of the articular process of C_3 on the lateral process of the axis. The lower cervical segment includes C_3 through C_7 with foraminal openings for the spinal nerve roots that supply the upper extremities. Motion in the lower cervical spine includes flexion, extension, lateral flexion, and rotation.

In forward flexion, the anterior disc space undergoes compression with widening posteriorly simultaneous separation and shear of the posterior elements occur. An anterior shearing force is placed on the disc with elongation of annular fibrosis. Forward gliding of superior vertebrae occurs on the inferior vertebrae with widening of facet joint. In extension of the cervical spine, the posterior aspect of the disc compresses and the anterior portion elongates. The facet joint glides posteriorly positions of the cervical spine affect intra discal pressure. In supine it is least and in extension it is greatest.

Flexion of the cervical spine is limited by the posterior longitudinal ligament, the posterior inter vertebral ligaments that attach to the transverse processes, posterior superior spine and the limited elasticity of the fascia of the extensor musculature excessive extension is limited by

direct contact of the vertebral laminae, zygapophyseal joints and the posterosuperior Spinous process.

As the neck flexes the spinal canal lengthens with the posterior wall elongating to a greater degree than the anterior wall. Conversely when the neck extends, the canal shortens, with the anterior wall. The spinal cord ascends and descends in the spinal canal as the neck is flexed and extended posture is a neuromuscular reaction to proprioceptive impulses from the periphery and the feeling that posture is appropriate is a learned process. The posture will be considered normal by the nervous system even if the places the musculoskeletal system at a mechanical disadvantage. In later life these positions may result in fatigue and neck pain.

NECK DISABILITY INDEX

Neck Disability Index questionnaire is used to measure the level of neck pain, which was modeled after the Oswestry questionnaire by Vernon and Mior in 1991. Similar to Oswestry, subjects choose the statement that best describes the situation in each of the ten sections. The section is concerned with impairments like pain intensity, personal care, lifting, reading, sleeping, concentration, work, driving, sleeping, and

recreation. Total score can range from 0 to 50 where 0 is considered as highest level of function and 50 has lowest level of function.

MUSCLE HOLDING CAPACITY

Muscle holding capacity is used to measure the holding capacity of low load, inner range isometric contraction of the muscle.

CRITERIA FOR MECHANICAL NECK PAIN [7]

➢ Pain is usually cyclic and episodic.

➢ Morning stiffness or pain is common.

➢ There is pain on forward flexion and often also on returning to erect position.

➢ Pain is often produced or aggravated by extension, lateral flexion, rotation and exercises.

➢ Pain usually becomes worse over the course of the day.

➢ Pain is relieved by change of position especially when lying down or in flexed Posture.

➢ Neck pain lasting more than one day.

NEED FOR THE STUDY

"Pleasure is often a visitant but pain cruelly clanged on us" kart M.

Pain is defined as the sensory, emotional experience associated with actual (or) potential damage to the tissues, it is predicted that prevalence rate of neck pain will continue to rise as the computers have made a sweeping and drastic change in our working environment. These complaints are often grouped together as occupational overuse syndromes (or) work related neck disorders.

Mechanical neck pain remains an almost universal condition. Mechanical Neck

pain is a descriptive term commonly used for a mechanically originating, non- discogenic

Neck pain, which is provoked by physical activity and relieved by rest. This is a chronic

dull aching pain of varying intensity affecting the spine.

In general terms poor and sustained postures and repetitive and static activity of the neck are considered provocative factors for neck pain. Jull 2000 demonstrated impairment in the deep cervical muscles, which are considered to be functionally important for joint support and

control. Deficits in muscle coordination which could result in poor support and potential overload on cervical structures.

Mayoux et al (1994) highlighted the importance of longus colli for postural control of the cervical curve. Beeton and Jull in 1994 found that there is a evidence that the upper and deep cervical flexors tend to lose their endurance capacity in patients with neck pain.

Effective management of this condition is vital not only for the relief of symptoms but perhaps more importantly, for the prevention of recurrent episodes of cervical pain personal suffering and lost work productivity. A number of studies have demonstrated a reduction in the strength and endurance capabilities of both deep and superficial cervical flexes muscles in patients with neck pain.

Exercise interventions are important for effective management of patients with neck pain. However there is a consensus on optimal exercise prescription.

The increased understanding of the tonic supporting role of the deep neck flexors and their functional differentiation from the superficial flexors realizes the need to develop a test that would target these muscles in relative isolation from their superficial counterparts. To test this

hypothesis a low load craniocervical flexion test has been developed by Jull et al to investigate the anatomical action of the deep cervical flexors, specifically of the longus colli in synergy with the longus capitis.

Various methods are used to treat patients with neck pain. These include exercise therapy, massage, ergonomic advice, electrotherapy, short-wave diathermy and spinal manipulative therapy. Manipulative or manual therapy is one of the fundamental treatment methods used by physical therapists, osteopaths, chiropractors and manual medicine practitioners in the management of neck pain.

There is evidence that manipulative therapy can be effective for the relief of pain and restoration of motion in the short term, but this therapy has not met the challenge of lessening persistent and recurrent episodes of neck pain. This was also our clinical experience and, in addition, general neck exercises appeared to have equal limitations for the goal of controlling pain and preventing recurrent or persistent episodes of pain.

New direction in therapeutic exercise for spinal joint stabilization has been developed over several years, its development involving clinical problem solving and technical skills as well as basic and applied scientific research. It was initially through studying how the muscles

could provide cervical segmental stabilization that insight was gained into the type of therapeutic exercise that may be beneficial for supporting the spinal joints, controlling pain and preventing recurrent bouts of neck pain.

Based on the available evidence on the spinal joint stabilization, I intended to study stabilization programme using the muscle system to protect the spinal joint structures from further repetitive micro trauma, recurrent pain and degenerative changes. Pressure biofeedback is a device designed to teach and measure various muscle functions. So using pressure biofeedback which may be more beneficial in re-educating deep neck flexors, which are the major small muscles directly attached to the cervical vertebrae, and more prone to weakness in neck pain patients.

Using stabilizer pressure biofeedback the repeated practice of exercise will enhance motor learning and therefore an exercise program to perform during the days and during functional activities is essential. Studies have proved that Isometric exercises or static exercises helps in improving the muscle tension and strength without any movement in the joint, and there by relieve neck pain by strengthening the deep neck muscles. NDI Questionnaire has been designed to give the information as to how the Neck pain has affected the patients ability in everyday life.

NDI is considered as a primary tool in this study, since all of its components deals with pain and in this study pain is considered as a primary problem. Hence in order to have an objective tool muscle holding capacity is selected. Thus for retraining these muscles both the stabilizer pressure biofeedback exercises and isometric neck exercises were used to compare and to show the efficacy of reduction of pain by using NDI in this study.

OBJECTIVES

➢ To study the efficacy of stabilizer pressure biofeedback of Deep Neck flexors helps in reducing chronic neck pain using Neck Disability Index.

➢ To study the efficacy of isometric exercises of Deep Neck flexors helps in reducing chronic neck pain using Neck Disability Index.

➢ To compare the results obtained by stabilizer pressure biofeedback and isometric exercises of Deep Neck flexors in reducing chronic neck pain using Neck Disability Index.

HYPOTHESIS

NULL HYPOTHESIS

There is no significant difference between the effectiveness of stabilizer pressure biofeedback and isometric neck exercises of Deep Neck flexors in reducing chronic neck pain using Neck Disability Index.

RESEARCH HYPOTHESIS

There is significant difference between the effectiveness of stabilizer pressure biofeedback and isometric neck exercises of Deep Neck flexors in reducing chronic neck pain using Neck Disability Index.

REVIEW OF LITERATURE

➢ Falla D (2004)[8] has analyzed deficits in the motor control of deep and superficial cervical flexor muscles in people with chronic neck pain.

➢ Grand R J, Jull G A (1997)[9] found that an exercise programme that focuses on specific load training of key supporting muscles of the neck and shoulder girdle has potential beneficial effects to upper quadrant musculoskeletal system.

➢ Ylinen J, Tkala (2003)[10] Concluded in his study that strength and endurance training with a 12 day institutional programme followed by advice to exercise regularly at home were effective methods for decreasing pain and disability in women with chronic neck pain.

➢ Gustawa Stendig-Lindberg (2004)[11] stated that daily application of isometric exercise for 6 seconds only by using two thirds of maximal contractile force, results in a optimal increase of muscle strength.

➢ Thomas Tai wing Chiu et al (2005)[12] concluded that performance on the CCFT by subjects with chronic neck pain was significantly lower than that of a matched asymptomatic control group and further results of the study adds to the evidence that poor ability to

perform the CCFT may be clinical evidence of an impairment that characterizes neck pain, regardless of origin.

➢ Dr. Deepak sharan (2001-2006)[13] found that the age between 18 to 52 are usually affected by neck pain and the median age is 27 years.

➢ Peter D Aker (1996)[14] concluded that there is a little clinical data available from clinical trails to support many of treatments for mechanical neck pain and in general conservative interventions have not been studied enough in detail to assess the efficacy (or) effectiveness adequately.

➢ Vernon (1991)[15] demonstrated that the neck disability index has achieved a high degree of reliability and internal consistency.

➢ Panjabi (1998)[16] stated that the osteoligamentous system contributes 20% to the mechanical stability of the cervical spine while 80% is provided by the surrounding neck musculature.

➢ Janda (1994)[17] suggests that the cervical flexors muscles become dysfunctional in the presence of neck pain and further demonstrated a reduction in the strength and endurance capabilities of cervical flexor muscles in neck pain patients.

➢ Cote (1998)[18] estimated that 67% of individuals will suffer from neck pain at some stage of life.

- Merskey H (1986)[19] stated that pain occurs (or) is associated with actual (or) potential damage to the tissues.

- Taimola (2000)[20] stated that if the neck pain lasts for more than 3 months of duration is said to be chronic.

- Chiu TT (2002)[21] have demonstrated a reduction in the strength and endurance capabilities of both deep and superficial cervical flexor muscles in patients with neck pain.

- Mayoux (1994)[22] highlighted the importance of longus colli for postural control of cervical curve.

- Beeton and Jull (1994)[23] concluded that there is a evidence that the upper and deep cervical flexor lose their endurance capacity in patients with neck pain

- Falla D, Jull G (2006)[24] concluded that an endurance - strength exercise regime for the cervical flexors muscles is effective in reducing myoelectric manifestations of superficial cervical flexor muscle fatigue as well as increasing cervical flexion strength in group of patients with chronic non severe neck pain.

- Moseley GL, Hodges PW (2005)[25] suggested that altered postural adjustments of the trunk muscles during pain are nor caused by pain interference but are likely to reflect development and adoption of an alternate postural adjustment strategy, which may serve to

limit the amplitude and velocity of trunk excursion caused by arm movement.

➤ Panjabi MM (2003) [26]found that the spinal muscles provide significant stability to the spine as shown by both in vitro experiments and mathematical models concerning the role of neuromuscular control system, increased body sway has been found in patients with low back pain, indicating a less efficient muscle control system with decreased ability to provide the needed spinal stability.

➤ Peter white (2004)[27] concluded that short core neck pain questionnaire has been found to be valid as a brief neck disability index questionnaire for use of patients with mechanical neck pain.

➤ Michael S, Conley (1995)[28] concluded from the results of his study, has proved that few selected muscles which have been examined in human electromyographic studies neck muscle function and morphology can be studied at a detailed level using exercise induced shifts in magnetic resonance images.

➤ Deborah L Falla (2004)[29] suggested few data which confirms that reduced performance of the craniocervical flexion test is associated with dysfunction of the deep cervical flexor muscles and supports the validity of this test for patients with neck pain.

- Pierre cot e (1998) [30]in his cross sectional study shows that neck pain is highly prevalent in Saskatchewan and that it significantly disables 4.6% of the adult population.

- Hodges and Richardson (1996-1997)[31] suggested that specific muscles with a muscle group have been found to be dysfunctional they are the deep muscles h direct vertebral attachments that span the vertebrae and have more influence on joint control rather than torque production.

- Watson and Trott (1993)[32] suggested there is a clinical evidence that the upper and deep cervical flexors that are important muscles for cervical segmental and postural control lose their endurance capacity in patients with neck pain.

- Winters and Peles (1990)[33] on studying the interaction of several neck muscles by computer modeling, noted that if only the large muscles of the neck were simulated to produce movement, this resulted in regions of local segmental instability particularly in near upright or neutral postures deep muscle activists was required to stiffen (or) stabilize the segments in functional mid ranges.

- Cholewicki and Mc Gill (1996)[34] suggested that the deep muscles of the neck which is attached directly to the vertebrae appears to have a particular role for joint support.

➢ Jull (1994)[35] suggested that the holding capacity of the upper and deep cervical flexors were determined by their ability to sustain an inner range upper cervical flexion position in supine lying.

➢ Jull G, Barrett C (1999)[36] in his clinical use of the test suggests that an ideal controlled performance of the deep cervical flexors can increase the pressure to 30mmHg and hold this pressure for 10 seconds.

➢ Falla et al (2003)[37] demonstrated that an average 24.9% of the full range of craniocervical flexion was used to reach the first target of the CCFT (22mmHg) followed by linear increments up to 80% for the last stage of the test (30mmHg).

MATERIALS AND METHODOLOGY

POPULATION

➢ Chronic Neck pain subjects between 25-50 yrs of both genders

SOURCE OF DATA

➢ Government General Hospital, Tamilnadu.

➢ Padmavathi College of Physiotherapy, OPD, Dharmapuri.

➢ Clinics in and around Dharmapuri.

SAMPLE SIZE

➢ Sample size is 30

SAMPLING DESIGN

➢ Simple Random Sampling

RESEARCH DESIGN

➢ Experimental evaluation comparative study.

INCLUSION CRITERIA

➢ Subject with Chronic neck pain

➢ Subjects between the age of 25-50 years

➢ Both genders

> Subject with Mechanical neck pain

EXCLUSION CRITERIA

> Acute cervical disc prolapse

> Recent cervical vertebral Fracture

> Recent ligament and muscle injuries in neck region

> Subject with cervical spinal deformities

> Subject with radiating pain along the upper limb and head

> Subject with neurological problem.

> Open wounds around neck.

> Tumors of cervical origin

> Vertebro Basilar Insufficiency

> Recent dental fracture and conditions like mandibular fracture

MATERIALS

> Stabilizer Pressure Biofeedback

> Towel

> Couch / Treatment Table

FIGURE 4

TOOLS

> ➢ Neck Disability Index

> ➢ Muscle Holding Capacity using stabilizer pressure
> biofeedback

PROCEDURE

Subjects were selected randomly after getting informed consent before starting the Treatment. The subjects are positioned comfortably and assessed thoroughly about his/her condition. Pre treatment

assessment includes Neck Disability Index and Muscle Holding Capacity was taken once in every week for four weeks, with treatment sessions carried out thrice every week.

Subjects are divided into two groups by Random sampling method.

Group A- Stabilizer pressure biofeedback

Group B- Isometric Exercise

Group A was treated with SPB in supine lying with Chin tuck in, to strengthen the deep neck flexors for 10 sec hold for 10 repetitions for 4 weeks duration

Training of Deep Neck Flexors using SPB

Patient lies supine with the head and cervical spine in neutral position. A folded towel may be placed beneath the patient head to obtain neutral position if necessary. The patient is instructed to place the tip of the tongue on the roof of the mouth and keep the jaw relaxed this prevents the patient from fixing the jaw and substituting the hyoid muscles.

Inflate the SPB to a baseline of 20 mm Hg and squeezed several times to distribute the air in the bag evenly. If the pressure drops after distributing the air in the bag it should be readjusted to the baseline

pressure. Position the 3 folded pressure cell under the neck so that it abuts against the occiput and reading should be checked to maintain it in 20 mm Hg. The movement patient has to perform is a gentle nodding of the head, as if they are saying 'Yes'. Instruct the patient to gently nod and just one mark on the pressure dial and see if the patient can hold the position steadily. If successful relax and repeat at each target position up to 30 mm Hg, Hold for 10 sec breathe normally. Perform 10 repetitions each, twice daily, three days per week for four weeks[38 39].

Group B was treated with Isometric exercises in supine lying with Chin tuck in, to strengthen the deep neck flexors for 6 sec hold for 10 repetitions for 4 weeks duration

Training of Deep Neck Flexors using Isometric Neck Exercise

The patient is asked to lie in supine position and head placed in neutral position, then by placing the rolled towel behind the neck and instruct the subject to perform slight chin tuck and then press the towel placed behind the neck and hold the contraction for 6 sec without any movement. Perform 10 repetitions, twice daily, three days per week for four weeks[40, 41, 42].

Each week NDI and Muscle holding capacity is recorded in each group respectively.

RESULTS

RESEARCH DESIGN

A Experimental evaluation comparative study consisting of 30 patients with Neck pain randomized in to two groups; 15 subjects in Group A (Stabilizer Pressure Biofeedback) and 15 subjects in Group B (Isometric Exercise) is undertaken to study and compare the effects of treatment in reducing the neck pain.

TABLE 1

AGE AND SEX DISTRIBUTION

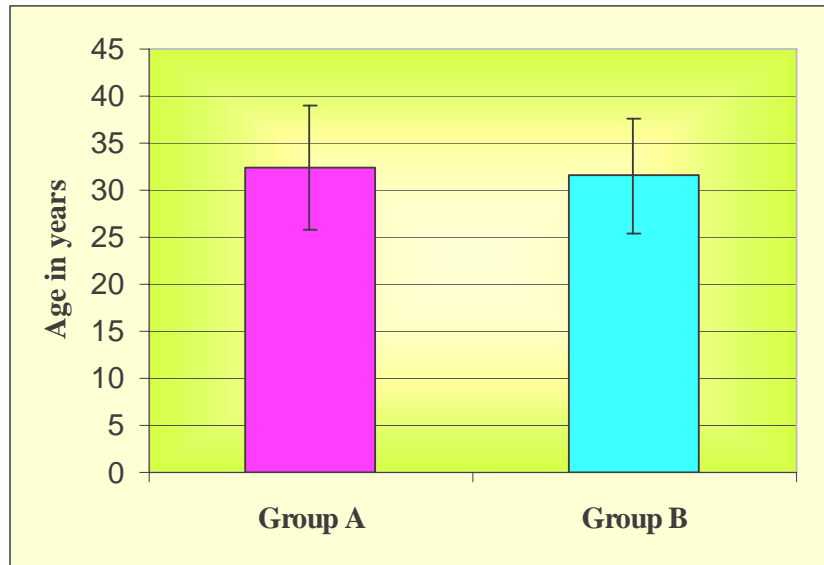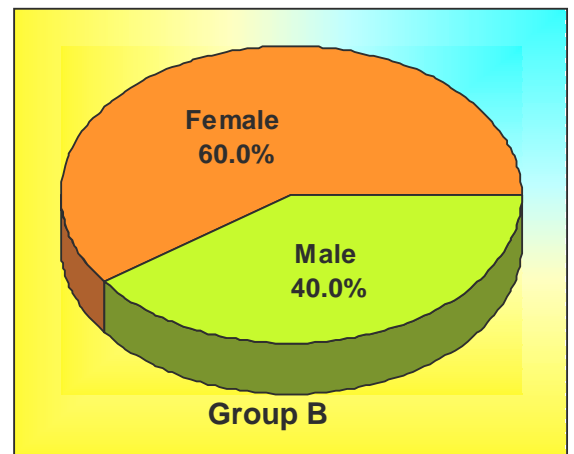| Age and sex distribution	Group A	Group B	P value and Remark
Number	15	15	-
Age in years (Mean ± SD)	32.40 ± 6.54 (25-50)	31.60 ± 6.10 (26-45)	P=0.732 Samples are age matched
Sex	Male=10 (66.7%) Female=5(33.3%)	Male=6(40.0%) Female=9(60.0%)	P=0.143 Samples are sex matched

FIGURE 7

FIGURE 8
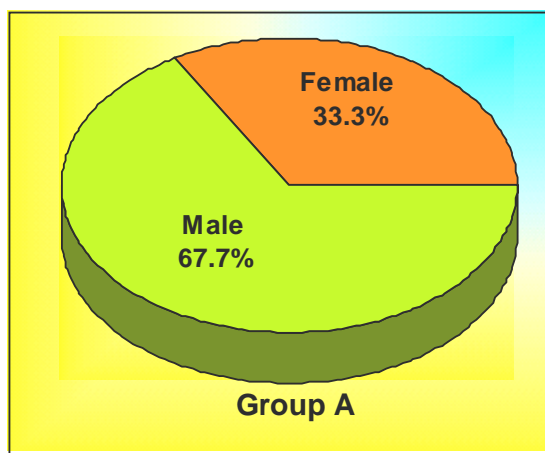
TABLE 2

NECK DISABILITY INDEX

Study period	Neck disability Index Mean ± SD (Min-Max)		P value by Student t test
	Group A	Group B	
Week1	18.13±4.37 (10-24)	19.60±2.95 (16-24)	0.291
Week2	12.93±4.71 (6-20)	14.80±4.52 (8-22)	0.278
Week3	8.13±3.42 (4-16)	9.33±3.90 (4-16)	0.378
Week4	3.33±3.24 (2-10)	5.33±3.59 (6-10)	0.121
P value by Repeated measures ANOVA	P<0.001	P<0.001	-
% Change	81.63%	72.81%	-

\# Analysis of Covariance has been used to find the significance NDI at Week 4 taking into account of variations at Week1, week2 and Week3.

FIGURE 9
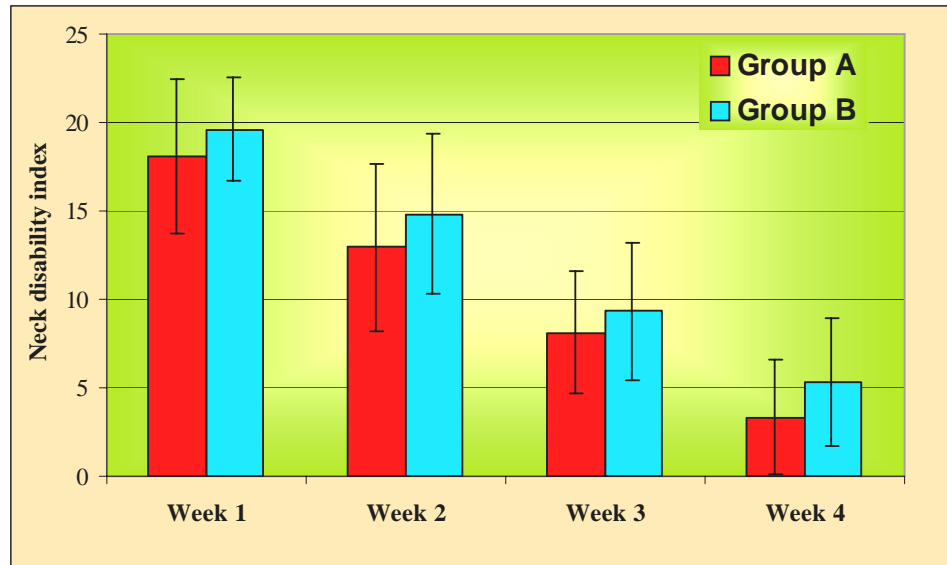
FIGURE 10
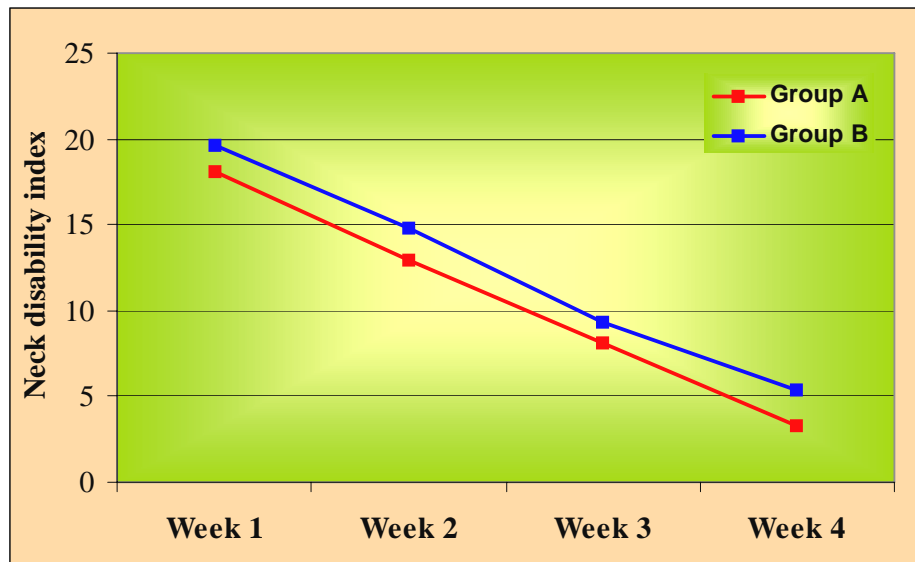
TABLE 3

MUSCLE HOLDING CAPACITY

Study period	Muscle holding capacity Mean ± SD (Min-Max)		P value by Student t test
	Group A	Group B	
Week1	22.00±1.51 (20-24)	22.27±1.98 (20-26)	0.682
Week2	24.93±1.49 (22-28)	24.53±1.77 (22-28)	0.508
Week3	27.73±1.67 (24-30)	26.93±1.28 (24-28)	0.152
Week4	29.33±0.98 (28-30)	28.27±1.49 (26-30)	0.028*
P value by Repeated Measures ANOVA	P<0.001**	P<0.001**	-
% Change	33.32%	26.94%	-

Analysis of Covariance has been used to find the significance MHC at

Week 4 taking into account of variations at Week1, week2 and Week3.

** Significant at P<0.001 (highly significant)

FIGURE 11
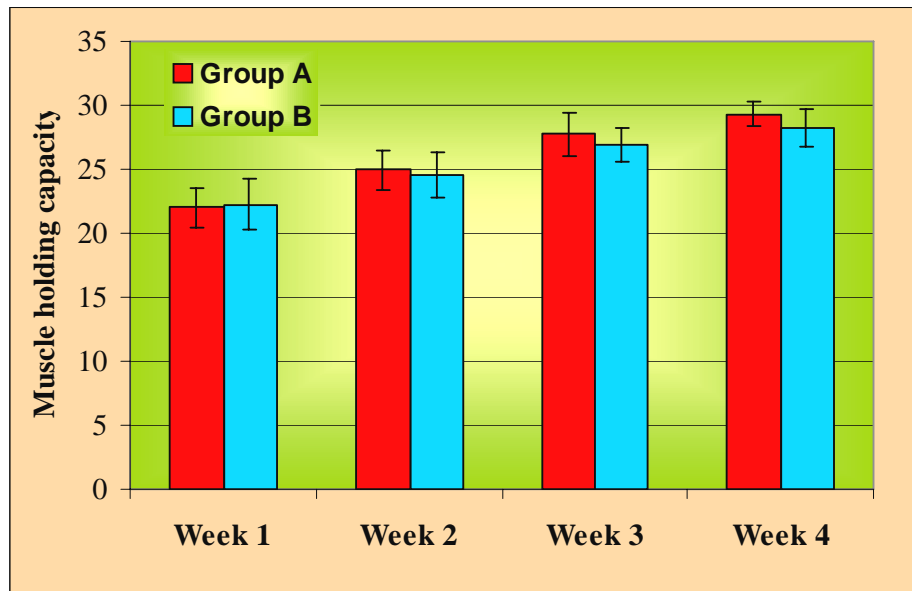
FIGURE 12
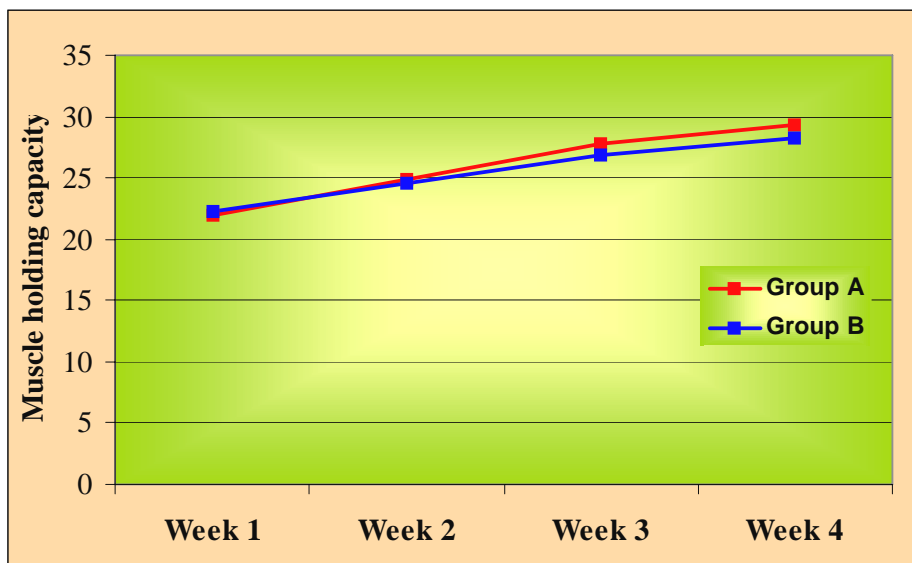
TABLE 4

COMPARISON OF NDI BETWEEN TWO GROUPS

Study Period	Group	Neck Disability Index				
		Normal	Mild Disability	Moderate disability	Severe disability	Complete disability
Week 1	Group A (n=15)	-	2(13.3%)	13(86.7%)	-	-
	Group B (n=15)	-	-	15(100.0%)	-	-
Week 2	Group A (n=15)	-	10(66.7%)	5(33.3%)	-	-
	Group B (n=15)	-	9(60.0%)	6(40.0%)	-	-
Week 3	Group A (n=15)	3(20.0%)	11(73.3%)	1(6.7%)	-	-
	Group B (n=15)	1(6.7%)	11(73.3%)	3(20.0%)	-	-
Week 4	Group A (n=15)	12(80.0%)	3(20.0%)	-	-	-
	Group B (n=15)	9(60.0%)	6(40.0%)	-	-	-

FIGURE 13
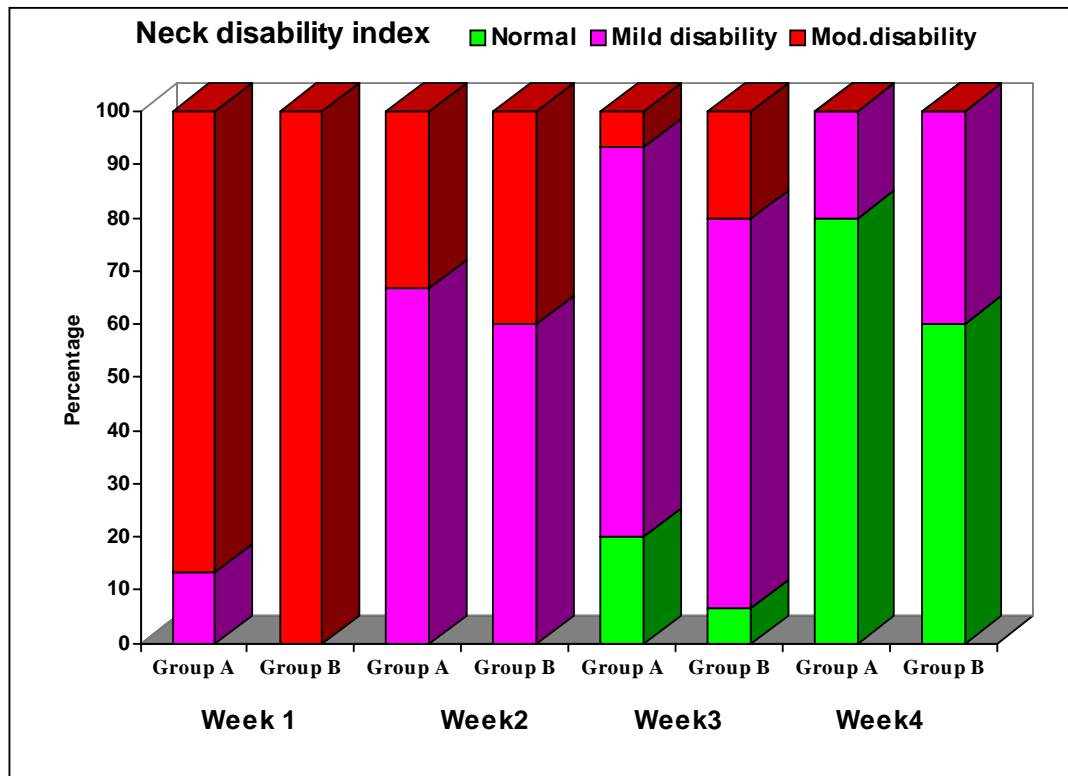
TABLE 5

COMPARISON OF NDI INDIVIDUAL TASKS BETWEEN TWO GROUPS

Tasks	Group	Study period			
		Week1	Week2	Week3	Week4
		Mean ± SD (Median)			
Pain intensity	A	2.60±0.74 (2)	2.00±0.66 (2)	1.53±0.64 (1)	0.73±0.59 (1)
	B	2.81±0.74 (3)	2.13±0.92 (2)	1.33±0.49 (1)	1.00±0.54 (1)
Personal care	A	2.67±0.72 (3)	1.93±0.79 (2)	1.40±0.63 (1)	0.27±0.46 (0)
	B	2.93±0.70 (3)	2.13±0.92 (2)	1.07±0.59 (1)	0.53±0.52 (1)
Lifting	A	2.47±0.83 (3)	1.87±0.64 (2)	1.13±0.64 (1)	0.53±0.52 (1)
	B	2.47±0.92 (2)	2.09±0.79 (2)	1.20±0.56 (1)	0.60±0.63 (1)
Reading	A	2.13±0.64 (2)	1.67±0.90 (2)	0.73±0.70 (1)	0.20±0.41 (0)
	B	2.53±0.74 (2)	2.07±0.70 (2)	1.07±0.70 (1)	0.40±0.63 (0)
Headache	A	0	0	0	0
	B	0	0	0	0
Concentration	A	2.60±0.51 (3)	1.40±0.74 (1)	0.80±0.78 (1)	0.27±0.59 (0)

	B	2.33±0.49 (2)	1.80±0.68 (2)	1.20±0.56 (1)	0.60±0.74 (0)
Work	A	2.20±0.68 (2)	1.80±0.68 (2)	1.27±0.46 (1)	0.80±0.68 (1)
	B	2.13±0.35 (2)	1.73±0.70 (2)	1.20±0.41 (1)	0.87±0.52 (1)
Driving	A	1.20±1.20 (2)	0.60±0.91 (0)	0.40±0.63 (0)	0.20±0.41 (0)
	B	2.07±0.26 (2)	1.53±0.74 (2)	1.00±0.66 (1)	0.40±0.51 (0)
Sleeping	A	0	0	0	0
	B	0	0	0	0
Recreation	A	2.27±0.70 (2)	1.67±0.72 (2)	0.87±0.64 (1)	0.33±0.62 (0)
	B	2.27±0.46 (2)	1.73±0.59 (2)	1.27±0.46 (1)	0.87±0.64 (0)

STATISTICAL METHODS

Chi-square / Fisher Exact test has been used to find the significance of Neck disability Index between Group A and Group B during the study period. Student t test (Two tailed) has been used to find the significance of Neck disability Index and Muscle holding capacity between Group A and Group B. Repeated Measures ANOVA has been used to find the significance of Neck disability Index and Muscle holding capacity during the study period for each group separately.

1. Chi-Square Test

$\chi^2 = \dfrac{\sum (Oi - Ei)^2}{Ei}$, Where Oi is observed frequency and Ei is Expected frequency

2. Fisher Exact Test

TABLE 6

	Class1	Class2	Total
Sample1	a	b	a + b
Sample2	c	d	c + d
Total	a + c	b + d	N

Fisher Exact Test statistic= $\sum p = \dfrac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!}\dfrac{1}{\sum a!b!c!d!}$

3. "t" –test for two population means (variance unknown but equal)

Objective: To investigate the significance between the means of two populations

$$t = \frac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s^2(1/n1 + 1/n2)}}$$

Where $s^2 = \dfrac{(n1-1)\sum\limits_{i=1}^{n1}(x1 - \overline{x1})^2 + (n2-1)\sum\limits_{i-1}^{n2}(x2 - \overline{x2})^2}{n1 + n2 - 2}$

4. **ANACOVA:** Analysis of Covariance has been used to find the significance of difference of post treatment between groups keeping the Pre treatment scores as covariates.

Procedure is as follows

$SP_T = \sum\sum xy - \dfrac{TxTy}{N}$, y is post treatment scores and x is Pre treatment scores

$$SP_B = \sum \frac{TxiTyi}{ni} - \frac{TxTy}{N}$$

$$SP_W = SP_T - SP_B$$

$$SS`_{YT} = SS_{yt} - \frac{SP^2_T}{SS_{xt}} : \quad SS`_{YW} = SS_{Yw} - \frac{SP^2_w}{SS_{XW}} : \quad SS`_{YB} = SS`_{YT} - SS`_{YW}$$

ANACOVA TABLE

TABLE 7

Source of variation	df	SSx	SP	SSy	SS`y	MSS`y	F ratio
Between groups	(k-1)	SS_{XB}	SP_B	SS_{YB}	$SS`_{YB}$	$MSS`_{YB}$	F
Within groups	(N-k-1)	SS_{XW}	SP_W	SS_{YW}	$SS`_{YW}$	$MSS`_{YW}$	-
Total	(N-2)	SS_{XT}	SP_T	SS_{YT}	$SS`_{YT}$	-	-

Total number of subjects taken for the study N = 30. The total number of subjects in Group A = 15 (male 10, female 5) with the mean age of 32.40 $\pm$ 6.54.The total number of subjects in Group B = 15 (male 6, female 9) with the mean age of 31.60 $\pm$ 6.10.

There is no significant difference between age and sex distribution between the Group A and Group B

Comparison of decrease of NDI between Group A and Group B

There is a significant decrease of NDI to 3.33 in Group A which is much lower when compared to Group B 5.33, with p = 0.169#. Hence research or alternate hypothesis is accepted.

Comparison of NDI individual tasks between 2 groups

There is significant difference in all individual tasks expect in headache and sleeping components.

Comparison of increase of MHC between Group A and Group B

MHC is significantly increased in Group A which when compared to Group B with p = 0.006.

STATISTICAL SOFTWARE

The Statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc [43,44].

DISCUSSION

This study is an attempt to assess the efficacy of stabilizer pressure biofeedback and isometric exercise to reduce chronic neck pain by activating the deep neck flexor muscles in chronic neck pain subjects.

Patients with chronic neck pain who were treated with stabilizer pressure biofeedback (Group A) have shown statistically better improvements in reduction of pain and muscle holding capacity than the isometric exercise (Group B). The design of the study (which include random assignment to study group)

The effect of the treatment were achieved in four weeks of duration that most probably due to the effective activation of deep neck flexors. Most of previous studies suggested that in neck pain patients, deep neck flexors activation is decreased and also the muscle holding capacity is reduced.

Jull G stated that the anatomical interrelated action of the deep neck muscles are to support and stabilize the cervical.

Janda in his study stated that cervical flexor muscles become dysfunctional in the presence of neck pain and demonstrated that there is reduction in the strength and endurance capabilities of cervical flexor muscles in neck pain patients.

Watson and Trott stated that the upper and deep cervical flexors contraction is important to stabilize the spine by creating a tension over the cervical fascia. In turn this stabilizes the cervical spine and forms stable base for the movement and functional activities. The current study was focused on generalized neck pain, mechanical in origin.

Beeton and Jull stated that deep neck flexors are the key muscle for the stabilization of the cervical spine. There is a significant dysfunction of this muscle has also been implicated in neck pain patients.

Hence the deep neck flexors help in improving the strength and there by relieve chronic neck pain. SPB was proved as a preventive measure, retraining the stabilization capacity of the deep neck flexors might reduce the effect of cervical structures from stress. Chi Square Test / Fisher Exact Test have been used to find the significance of NDI between Group A and Group B the study period. Student t test has been used to find the significance of difference of pre and post set groups keeping the NDI and MHC during the study period for each group separately.

The improvements in NDI mean standard deviation difference is reduced to (3.33) in Group A which is much lower when compared to

Group B (5.33) with p=0.169 by ANACOVA test. Improvement in MHC is significantly increased in Group A which when compared to Group B with the p=0.006** by ANACOVA test.

The percentage reduction of NDI also significantly reduced in Group A (80%) compared with Group B (60%). test. When individual components are compared between Group A and Group B, the Pain intensity, personal care, reading, concentration, driving and recreation components shows marked improvement in reduction of NDI value at the end of 4th week and there is more difference is seen in between the values of Group A and Group B. when comparing components of lifting and work there is marked reduction in the NDI value but the difference between the groups is less, and components of Headache and sleeping has equal score of Zero from the initial procedure, Since the mechanical neck pain relieves during rest and headache is excluded from the study.

The design of this study precludes determination of which aspect of the treatment program produced the changes in neck pain.

This study result had not been influenced by the age characteristics, because the Mean ±SD are almost equal in NDI of both the groups.

Both the Groups showed significant improvement in first two weeks and third and fourth week Group B has shown slight improvement it may be due to isolation of specific muscle group contraction, motor control and relearning due to visual feedback. Increase in isometric group may be due to involvement of other global muscles. when comparing NDI and MHC of both the groups , Group A showed significantly better improvement   due to visual biofeedback.

This study also coincides with Grant Jull who states that the stabilizer pressure biofeedback is more significant in isolating the Deep neck flexors muscles specifically and there by relieve neck pain.

This study may show marked significant changes in statistical and theoretical aspect when carried out for a longer duration.

Stabilizer pressure biofeedback may help in the learning process of muscular control and helps in improving the joint stability. Biofeedback may be contributed to the increased force by motor unit recruitment or by increasing firing rates in the active motor units. Basmajian has stated that by the help of the visual signals, patients could control the recruitment as well as the frequency of discharge of motor units, which could produce the great amount of tension.[45]

Isometric exercises also help in reducing neck pain, but the effect is little bit slow compared to SPB, Since Stabilizer pressure biofeedback has proven to be effective treatment measure in reducing chronic neck pain.

LIMITATIONS

➢ The outcome measure was only neck disability index and muscle holding capacity.

➢ Study population is selected only from Bangalore.

➢ Confounding variables like Range of motion, postural adjustment are not used.

➢ Manipulation technique was not considered.

➢ Only isometric exercise was given with an emphasize to strengthen deep neck flexor exercise.

RECOMMENDATIONS AND SUGGESTIONS

➢ This study revealed only with deep flexors muscles, other muscle groups also can be considered in further studies in reducing neck pain.

➢ The same study may be explored for specific neck pain conditions

➢ This study can also be done for radiating pain conditions.

➢ The beneficial treatment effect can be followed for the persistence of recovery

➢ The present study may be done in larger population for better outcomes

➢ The study was focused in supine lying position only. This can also be done in other functional positions

➢ The study can be carried out for longer duration to show better results.

➢ This study can be further carried out in combination of both treatment.

CONCLUSION

This study concluded that the SPB have better improvement in reduction of pain by giving correct feedback for the isolation of deep neck flexors contraction in chronic neck pain patients with the help of NDI score. From this study it is also noted that the basic characteristics of age and sex are not having a direct impact on chronic neck pain subjects.

SUMMARY

The study is done to find out the comparison of stabilizer pressure biofeedback and isometric exercise for reduction of pain by contracting the deep neck flexors in chronic neck pain subjects with the help of NDI value.

This study included thirty pain subjects between the age group of 25-50 years ,they are divided into two groups randomly (A &B Experimental groups).Group A were treated with stabilizer pressure biofeedback and Group B were treated with isometric neck exercise. Group A was treated with 10 sec hold for 10 repetitions twice daily, three times a week. Group B was treated with 6 sec hold for 10

repetitions twice daily, three times a week. Study design is experimental evaluation comparative study. Sources of data collected from Victoria hospital, Bangalore. Sathya hospital Bangalore and physiotherapy and physical rehabilitation center, the oxford college of physiotherapy. Group A were shown statistically better improvement in neck disability index at p=0.162# and significant increased in muscle holding capacity with the p=0.006**# when compared with group B isometric exercise. This study shows that the stabilizer pressure biofeedback is effectively good and statistically significant in reduction of pain and increase of muscle holding capacity for patients with chronic neck pain.

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APPENDICES

ANNEXURE I

INFORMED CONSENT FORM

TITLE

Comparison of Stabilizer pressure biofeedback and Isometric Neck exercises in reducing Chronic Neck pain using NDI.

PURPOSE OF THE STUDY

I …………………………have been informed by Mr. M. Sitharthan that this study is done to find out stabilizer pressure biofeedback/Isometric Neck exercise will reduce pain, this study has role to play in reducing Chronic Neck pain and improve my function by reducing the disability.

PROCEDURE

I understand that I will be randomized and put into one of the exercise protocol, either stabilizer pressure biofeedback for 10 sec hold for 10 repetitions or Isometric exercises for 6 sec hold and 10 repetitions. I will be explained about the intensity at which I have to perform the exercises. I also understand that I will work out the exercises under the

supervision and guidance of Mr. M. Sitharthan and follow the instructions given by her.

RISK AND DISCOMFORT

I understand that there is no potential risk associated with the treatment programme, and I will not experience any discomfort during the exercises.

I understand that Mr. M. Sitharthan will accompany me during the Treatment

BENEFITS

The Stabilizer pressure biofeedback and Isometric Neck exercises will help in reducing pain

ALTERNATIVES

Other treatment alternatives are explained to me with their benefits and limitations.

CONFIDENTIALITY

I understand that the information produced by this study will be confidential. If the data are used for publication in the medical literature or for teaching purpose, no names will be used and other literatures such

as photographs and audio or video tapes will be used only with permission

REQUEST FOR MORE INFORMATION

I understand that I may ask any question about the study at any time to Mr. M. Sitharthan and she is available to answer my question. Copy of this concern form will be given to me to keep for my careful reading

REFUSAL OR WITHDRAWAL OF PARTICIPATION

I understand that my participation is voluntary and I may refuse to withdraw consent and discontinue participation at any time. I also understand that she may terminate my participation in the study at any time after she has explained the reasons for doing so

INJURY STATEMENT

I understand that the exercises which I am going to perform are most unlikely to cause any injury or further deteriorate my condition if performed under the guidance of Mr. M. Sitharthan. In such case medical attention will be provided, but no further compensation will be provided. I understand my agreement to participate in this study and I am not waiving any of my legal rights.

I confirm that Mr. M. Sitharthan has explained me about the purpose of the study, the study procedure and the possible risk and benefits that I may experience. I have read and I have understood this concern to participate as a subject in this study

………………

      ………………

SUBJECT

 DATE

…………………………..

………………

WITNESS   TO SIGNATURE

DATE

I have explained to sri /smt………………………………..the purpose of the research, the procedure required and the possible risks and benefits, to the best of my ability.

………………….

……………

INVESTIGATOR

 DATE

ASSESSMENT PROFORMA

o Patient Name :

o Age :

o Sex :

o Occupation :

o Address :

o Study setup/ Source :

o Presenting Complaint :

o Past History :

o Personal History :

o Occupational History :

o Subjects with Age group 25-50 : Yes / No

o Subjects with Chronic Mechanical Neck pain : Yes / No

o Subjects with cervical vertebral fractures : Yes / No

o Subjects with cervical dislocations : Yes / No

o Subjects with Radiating pain to upper limb and head : Yes / No

o Subjects with TMJ dysfunction: Yes / No

o Subjects with Tumor of cervical origin : Yes / No

o Subject with Recent ligament and muscular tears : Yes / No

o Subjects with migraine : Yes / No

- o Subjects with Migraine : Yes / No

- o On Observation :

- o On palpation :

- o On Examination :

Neck Disability Index

Week	1	2	3	4
Stabilizer Pressure Biofeedback				
Isometric Exercise				

Muscle Holding Capacity

Week	1	2	3	4
Stabilizer Pressure Biofeedback				
Isometric Exercise				

- o Spurling / Compression Test : Positive / Negative

- o VBI Test : Positive / Negative

- o Investigations :

o Diagnosis :

o Management :

NECK DISABILITY INDEX

1.PAIN INTENSITY	2.PERSONAL CARE(Washing, Dressing) etc
o I've no pain at the moment o The pain is very mild at the moment o The pain is moderate at the moment o The pain is fairly severe at the moment o The pain is very severe at the moment o The pain is the worst imaginable at the moment	o I can look after myself normally without causing extra pain o I can look after myself normally, but it causes extra pain o It is painful to look after myself, I am slow and careful o I need some help but manage most of my personal care o I need help every day in most aspects of self care o I don't get dressed, wash with difficulty and stay in bed
3.LIFTING	4.READING
o I can lift heavy weights without extra pain o I can lift heavy weights but it gives me extra pain o Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, for example on a table o Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned o I can lift very light weights o I cannot lift or carry anything at all.	o I can read as much as I want to with no pain in my neck o I can read as much as I want to with slight pain in my neck o I can read as much as I want with moderate neck pain o I can't read as much as I want because of moderate neck pain o I can hardly read at all because of severe pain in my neck o L cannot read at all

5.HEADACHES	6.CONCENTRATION
o I have no headaches at all o I have slight headaches which come in frequently o I have moderate headaches which come infrequently o I have moderate headaches which comes frequently o I have severe headaches which comes frequently o I have headaches almost all the time	o I can concentrate fully when I want to with no difficulty o I can concentrate fully when I want to with slight difficulty o I have fair degree of difficulty in concentrating when I want to o I have a lot of difficulty in concentrating when I want to o I have a great deal of difficulty in concentrating when I want to o I cannot concentrate at all
7.WORK	8.DRIVING
o I can do as much work as I want to do o I can only do my usual work, but no more o I can do my usual work, but no more o I cannot do my usual work o I can hardly do any work at all o I can't do any work at all	o I can drive my car without any neck pain o I can drive my car as long as I want with slight pain in my neck o I can drive my car as long as I want with moderate pain in my neck o I can't drive my car as long as I want because of moderate pain in my neck o I can hardly drive at all because of severe pain in my neck o I can't drive my car at all

9.SLEEPING	10. RECREATION
o I have no trouble sleeping o My sleep is slightly disturbed(less than 1 hr. sleepless) o My sleep is mildly disturbed(1-2 hrs. sleepless) o My sleep is moderately disturbed (2-3 hrs. sleepless) o My sleep is greatly disturbed(3-5 hrs. sleepless) o My sleep is completely disturbed (5-7 hrs. sleepless)	o I am able to engage in all my recreation activities with no neck pain at all o I am able to engage in all my recreation activities. With some pain in my neck o I am able to engage in most, but not all of my usual recreation activities because of pain in my neck o I am able to engage in a few of my usual recreation activities because of pain in my neck o I can hardly do any recreation activities because of pain in my neck o I can't do any recreation activities at all

SCORES (OUT OF 50)

0-4 = NO DISABILITY

5-14 = MILD DISABILITY]

15-24 = MODERATE DISABILITY

25-34 = SEVERE DISABILTY

ABOVE 35 = COMPLETE DISABILITY

MASTER CHART

STABILIZER PRESSURE BIOFEEDBACK

SL NO	AGE	SEX	WEEK1		WEEK2		WEEK3		WEEK4	
			NDI	MHC	NDI	MHC	NDI	MHC	NDI	MHC
1	40	F	16	22	10	26	8	30	4	30
2	25	F	10	24	6	26	4	28	0	30
3	30	M	22	22	18	24	12	24	8	28
4	34	F	24	20	20	22	10	26	4	28
5	32	M	18	22	10	26	8	30	2	30
6	35	M	16	22	8	24	4	28	0	30
7	29	F	22	20	18	24	10	28	4	30
8	50	M	24	20	20	24	16	28	10	28
9	32	M	16	24	12	26	6	28	0	30
10	35	M	10	24	8	28	4	30	0	30
11	26	F	18	24	10	26	8	26	3	28
12	25	M	16	22	12	24	6	28	0	30
13	26	M	22	20	18	24	12	26	8	28
14	32	M	20	22	14	24	8	28	4	30
15	35	M	18	22	10	26	6	28	3	30

ISOMETRIC EXERCISE

SL No	AGE	SEX	WEEK 1		WEEK 2		WEEK 3		WEEK 4	
			NDI	MHC	NDI	MHC	NDI	MHC	NDI	MHC
1	36	F	24	20	20	24	16	28	8	28
2	30	F	22	20	18	22	12	26	12	26
3	28	M	18	22	14	24	8	26	4	28
4	42	M	24	20	22	24	16	28	10	28
5	28	M	18	24	14	26	6	28	4	30
6	27	F	16	24	12	26	6	28	2	30
7	38	M	22	20	18	22	10	26	6	26
8	30	F	16	24	10	26	8	28	4	28
9	26	M	18	24	8	26	4	28	0	30
10	26	F	20	22	14	24	8	26	4	28
11	28	F	18	26	8	28	6	28	4	30
12	227	F	24	20	22	22	16	24	10	26
13	28	F	20	22	16	24	8	26	8	28
14	45	F	18	22	14	24	8	26	4	28
15	35	M	16	24	12	26	8	28	0	30