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COMPARISON OF CORE STABILIZATION EXERCISE AND ELASTIC RESISTANCE BAND EXERCISE FOR IMPROVING CORE MUSCLES STRENGTH TO REDUCE NON - SPECIFIC LOW BACK PAIN

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Abstract

Background & Purpose

The human lumbar spine without muscles and viscera collapses easily. To allow movement, carry loads and protect the spinal cord and nerve roots "stability" is required. Stability is provided in a coordinated manner by the active (e.g. muscles), passive (e.g. lumbar spine) and control (e.g. neurological systems) There is controversy and some confusion on the definition of the term "core stability". Traditionally this term has referred to the active component to the stabilizing system including deep/local muscles that provide segmental stability (e.g. transvers's abdominis, lumbar multifidus) and/or the superficial/global muscles (e.g. rectus abdominis, erector spinae) that enable trunk movement/torque generation and also assist in stability in more physically demanding tasks. Different proponents have advocated different types of core stability exercises ranging from the abdominal drawing in maneuver.

To achieve strengthening of these core muscles, exercise program is administered employing various equipment's like Elastic Resistance, Swiss Ball, springs, sand bags etc. The use of elastic resistance products in therapeutic exercise programs has become widespread in rehabilitation and has been shown to be an effective method of resistance and improving muscle strength.

Literature shows core muscle weakness to be major factor causing LBP. Many studies have been done to study effectiveness of strengthening of core muscles to treat NSLBP using exercising with Pilates, Swiss ball, Elastic Resistance, Yoga etc., Elastic Resistance exercises and Core stabilization exercises have unique approaches but target the core muscle strength. However, there are no studies that compare Elastic resistance band exercises and Core stabilization exercises on NSLBP so as to find the better of the two.

Design: A Comparative Experimental study
Participants: 60 physiotherapy students, 30 in each group.
Interventions: Group A received elastic band exercises and group B received Core stabilization exercise for two weeks i.e., 5days/week
Outcome Measure: Oswestry Disability Index, NPRS, Pressure Biofeedback.
Result: Elastic resistance band exercises resulted in significant improvement in pain reduction, Core strength, functional disability than Core Stabilization Exercise at one week of intervention.
Conclusions: Though the study showed beneficial results in both groups, results reflected that 10 sessions of elastic resistance band exercises showed better improvement than the Core Stabilization Exercises in Patients with chronic NSLBP

Keywords: Non-specific low back pain; Elastic resistance band; Core Stabilization; Pressure biofeedback; Core muscle

Introduction

Understanding the Lower Back

Lower back is made up of vertebrae, intervertebral disc, nerves, muscles and its ligaments. The region between the top of the legs and bottom of the ribs is considered as lower back. It is also called as "LUMBOSACRAL AREA" of the back.[1]Before going towards the explanation of nonspecific low back pain. Let's know about the functional spinal unit of the spine muscles. The unit consists of two parts, one is the vertebrae and other one is intervertebral disc connected each other with muscles, ligament, tissue and facet joints.

Lumbar region is divided into the three sub regions according to their specific function, which are explained below:

a. Frontal lumbar region
b. Middle lumbar region
c. Rear lumbar region

a. It consists of Intervertebral disc and Vertebral body and its Function is to prevent Shock absorber, support body part against gravitational force.
b. It consists of Vertebral arch, process such as transverse and spinous and facet joints and its Function is to provide attachment to tissue and muscles and protection during extreme movement.
c. It consists of vertebral canals and its Function is to protect the spinal cord in it's canal.[2]

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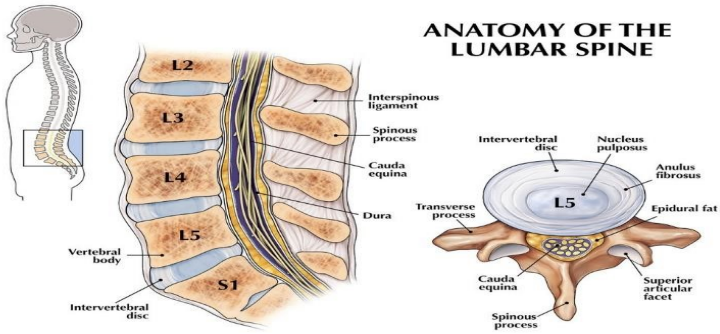

FIG. 1.1 Anatomy of Lumbar Spine

Which are Core Muscles?

Core muscles are divided into two types: the stabilizers and the movers:

1.Stabilizers:	2.Movers:
Transverse abdominis	Rectus abdominis
Internal oblique's	External oblique's
Lumbar multifidus	Erector spinae
Pelvic floor muscles	Latissimus dorsi
Diaphragm[3]	Hamstrings
	Hip adductors
	Hip abductors [3]

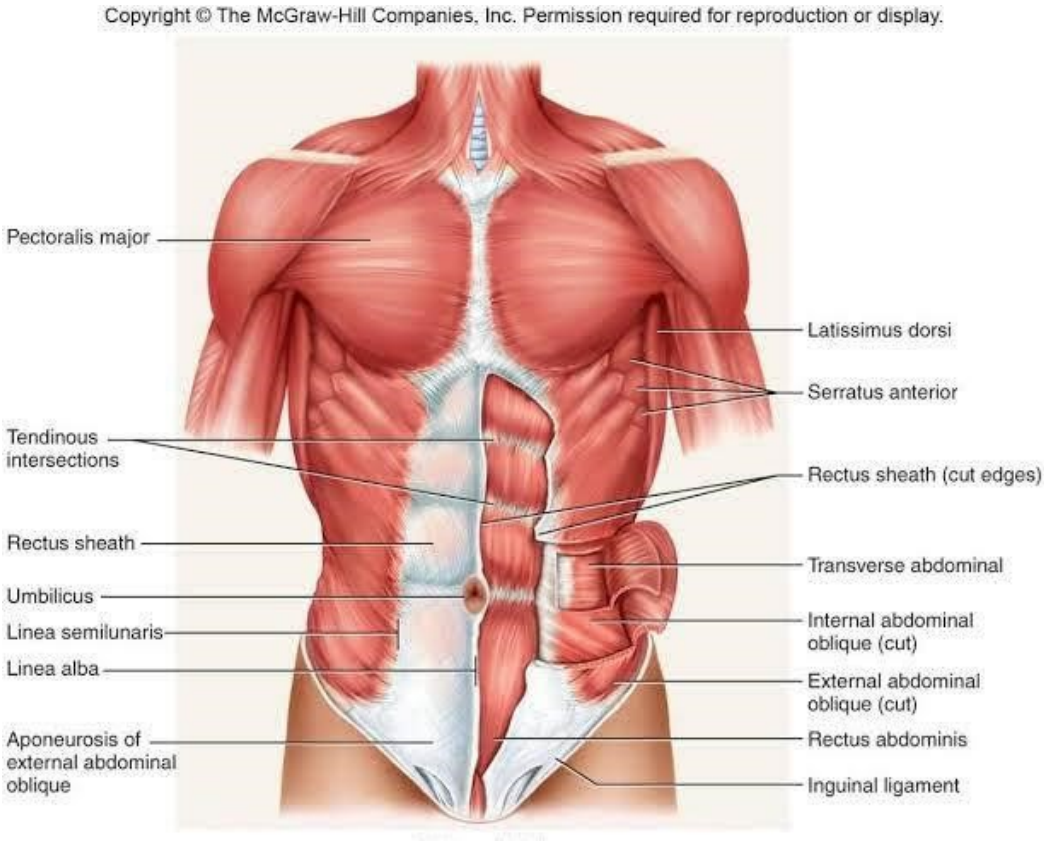

FIG. 1.2 Core Muscles

What is Non-Specific Low Back Pain?

Non specific low back pain is defined as low back pain with non recognizable, known specific pathology. Pain in the back region without any specific diseases is considered as non specific low back pain. In some cases it may cause due to inter vertebral disc problem and sometimes due to sprain of the ligaments or muscles or sometime because of the problems in facet joints between two Vertebrae. It can also be due to the structural and tissue problems of the back which leads to cause lower back pain.[4] It is not possible to find the cause of the lower back pain through the test. So, it is not possible for the clinicians, to find the exact location of the pain and in some cases it was not possible to find the cause of the lower back pain. After many different diagnosing by researcher, it has been Concluded that there is no significant reason or diseases behind non specific low back pain. Pain in lower back region may result from lifting heavy weight sometimes, or can be due to age related changes of spine over time.[5]Lower back pain can be occurred due to sedentary life style and sometimes also due to insufficient exercise in a weekday routine. It may also due to job related loads too.[5]

About the Signs and Symptoms of Non Specific Low Back Pain

Pain causing typically in particular area of the back, but in some cases it starts to spread over single limb or bilateral limbs. Pain may cause immediately on lifting heavy weight or after twisting movement. Non specific low back pain is generally called as common back pain. That doesn't Means that the intensity of the pain is less. It gets decreased usually on lying on a straight surface for certain period of time. Non specific low back pain get decreased with appropriate exercise and proper care with time. It is sometime considered as mechanical because it get varies with posture and activity. However, if pain is cured than also proper care and proper Exercise is to be done on daily basis to prevent it from causing pain again.[6]

Prevalence of Low Back Pain

Low back pain is now a days common problem of majority of the population at some point in their lifespan. About more than 80% of the population worldwide is suffering from lower back pain in their life span.[7] About 23 – 24 % of the population from prevalence of about 49% having low back pain get disabled due to the back pain. About 19 out of 20 cases of the sudden cause of low back pain are classified as non specific. So, it can also be said that majority of the population feels low back pain in certain point of their lifespan.[8]

Back-Care Education

One of the important parts of Non - Specific low back pain treatment is the Backcare education. This includes modifications in activities of daily living, ergonomic back care and the do's and don'ts.[9]

Core Stabilization Exercise

Core stabilization strengthens the muscles of the core and helps you learn to use the inner muscles before you begin to maneuver. The main center of interest is on stability, breathing, and smooth, coordinated movement.[10] To make the spine more stable, the parts are all connected with layers of sentimental tissue like cartilage and ligaments. They are also connected by muscles. If these muscles are strong and dealing within the proper order, you've got a solid base for movement and for absorbing the impact of the bottom through your body. Core stabilization is that the general term for a way the muscles of your trunk keep your spine and body stable.[11] This helps you stay balanced when you move. If your core muscles are strong and that they contract once they should:

- Your posture is better.
- Your body is balanced.
- Your movement is more efficient and powerful.
- You may be less likely to be injured.[12]

Core stability benefits everyone, from geriatric population to top professional athletes. Exercises for core stabilization are often a part of every conditioning program, alongside flexibility, strength, and aerobic training.[12]

Elastic Resistance Band Exercise

Elastic bands helps to strengthen muscles. By using the resistance that Elastic Resistance band provide, muscles can be strengthened easily. Elastic resistance bands are made of latex rubber, but there are non-latex varieties available for those people who are allergic to latex. It helps from injury or illness that results in problems with functional mobility.[13] Elastic Resistance Band Exercise provides resistance to back, with it's exercise. Which helps to improve the strength of back muscles.

Numeric Pain Rating Scale(NPRS)

The Numeric Pain Rating Scale (NPRS) is a unidimensional measure of pain intensity in adults,[14,15] those with pain due to some reasons.[15,16]

Modified Oswestry Low Back Pain Disability Questionnaire

Patient-completed questionnaire which gives a subjective percentage score of level of 2function (disability) in activities of daily living.[17]

Bio Feed Back For Back Strength

Biofeedback as an add-on therapy to standard exercise in the restoration of the functional abilities of the trunk extensor muscles in patients suffering from non - specific low-back pain (NSLBP). A controlled experimental investigation was conducted to study the effectiveness of using the proposed treatment modality in the management of the low-back pain problem. The result indicates that proposed methodology was effective tool to find the strength of lumbar para spinal muscles of Non – Specific low back pain patients. [18]

Need of Study

The need of the study is to document effectiveness of methods of physiotherapy core stabilization exercise and elastic band exercise for improving core muscle strength to reduce non – specific low back pain.

Objective Of The Study

- To find out whether core stabilization or elastic resistance band is more effective in treating non – specific low back pain.
- To find out whether Elastic Resistance Band Exercise is superior to back care education and improving core muscle strength.
- To find out whether core stabilization exercise is superior to back care education and improving core muscle strength.

Study Design and Setting

Study Design & Study Duration

- A Comparative Experimental study.
- 1 Year (5sessions / week for 2 weeks)

Population:

- Subjects with non- specific low back pain between 25-40 years of both sexes.

Selection Criteria

Inclusion criteria:

1. AGE: 25-40 years
2. Patients diagnosed with non – specific low back pain by Orthopedics Doctors
3. Subjects willing to participate
4.

Exclusion criteria:

1. Patients taking 3 or more; tablets of 500mg Paracetamol in a day for pain relief.
2. Neurological disorders
3. Any other condition than non – specific low back pain.
4. Currently undertaking exercise or yoga for low back pain.

Sampling Method and Sample Size

- Sampling Method: Simple Random Sampling
- Sample size 60

Procedure

60 Subjects will be selected according to the selection criteria and an informed consent will be obtained from them. They will be assessed with Modified Oswestry disability Questionnaire's, PBF and NPRS and their respective scores will be documented.
The selected subjects will be randomly divided into 2 groups A & B with 30 subjects in each group.
Both groups will be advised with back care education. They will be provided with hand-outs having the following:

- Correct postural habits while sitting, standing, walking and sleeping
- Back ergonomics and modifications in Activities of daily living- Correct way of turning, lifting, driving, etc.
- Correct choices of bed, chair, footwear, etc.

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Do's and Don'ts:
Do's-

- Proper weight lifting
- Sitting with buttocks tucked under
- While driving push the seat forward to raise the knees and decrease the lordosis
- Turn to side and then get up

Don'ts: -

- Sleep in the prone position
- Rise from sitting position suddenly
- Bend over a wash basin
- Wear high heels
- Use of too high chair
- Use soft mattress.[27]

Group A: These subjects will be assigned for Core Stabilization Exercises regime. The techniques of the exercises will be demonstrated and the do's and don'ts instructions will be given to the subjects. The protocol which will be followed is given below:

1. Lumbo - pelvic stabilization (includes Modified side plank & Hip abduction in side lying)
2. Curl-ups
3. Bridging
4. Bird-dog exercise.
5.

The contraction of the core muscles in each of the above exercises should be held for 10 seconds with ten repetitions of each exercise. The normal breathing with the contraction should be assured.


FIG.: 7.1 MODIFIED SIDE PLANK.


FIG.: 7.2 HIP ABDUCTION IN SIDE LYING


FIG.: 7.3 CURLUP


FIG.: 7.4 BRIDGING


FIG.: 7.5 BIRD – DOG EXERCISE

Group B: These subjects will be assigned for Elastic Resistance Band Exercises regime. The techniques of the exercises will be demonstrated and the do's and don'ts instructions will be given to the subjects. Elastic Resistances band Exercise contains of group of exercises which were done ten times in single session.

1. Thera band abdominal crunch in crook lying
2. Thera band abdominal oblique crunch in crook lying
3. Thera band abdominal crunch (lower abs)

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4. Thera band trunk extension (in long sitting)
5. Thera band trunk rotation (in sitting)
6. Thera band trunk "Lift". [34]

Treatment is given for two weeks, five sessions per week and 45 min per session.

FIG.: 7.6 THERABAND ABDOMINAL CRUNCH IN CROOK LYING

FIG.: 7.7 THERABAND ABDOMINAL OBLIQUE CRUNCH IN CROOK LYING

FIG.: 7.8 THERABAND ABDOMINAL CRUNCH (LOWER ABS)

FIG.: 7.9 THERABAND TRUNK EXTENSION (LONG SITTING)

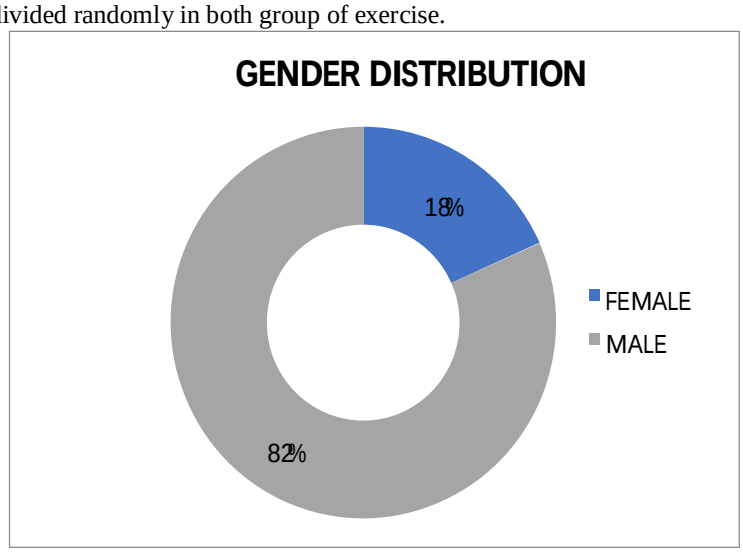
FIG.: 7.10 THERABAND TRUNK ROTATION (HIGH SITTING)

FIG.: 7.11 THERABAND TRUNK "LIFT"

Result

I.Gender Distribution

There was 30 participants in each group taken after matching the criteria's taken. Total 60 participants are taken from which 11 are Females and 49 are Males are divided randomly in both group of exercise.



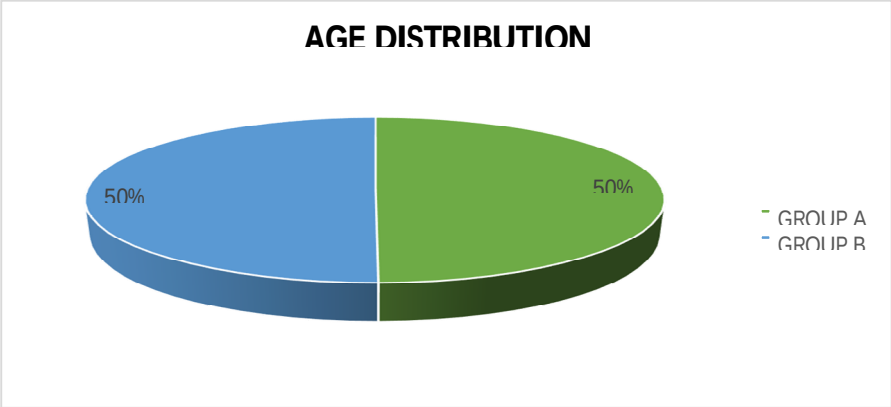
GRAPH: 8.1.1 Gender Distribution

II.Age Distribution

The mean age of ERB exercises group participants is years 32.20 ± 4.51 and the mean age of Core Stabilization exercises group participants is years 32.03 ± 4.13.

MEASURES	MEAN	STANDARD DEVIATION
GROUP A (CORE STABILIZATION)	32.03	4.13
GROUP B (ERB)	32.20	4.51

Table: 8.1 Mean and SD of Age Distribution of ERB and Core Stabilization Exercise group



GRAPH:8.1.2 Age Distribution

Clinical Parameters:

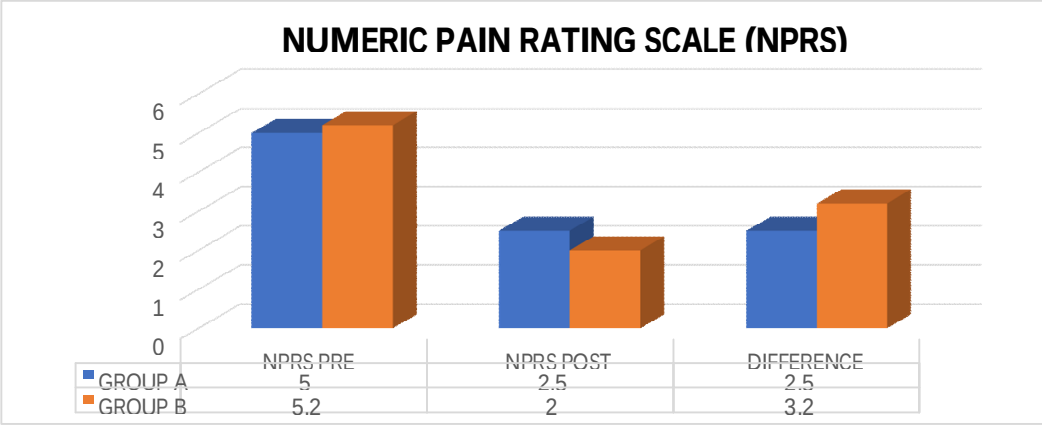
The participants in both group show's significant result in decreasing pain intensity, improving functional ability and increasing core muscle strength.

III.NPRS (Numeric Pain Rating Scale)

In ERB group, the treatment given for 2 weeks and it's pre and post treatment difference is 2.5 ± 1.25 and In Core Stabilization group, the treatment given for 2 weeks and it's pre and post treatment difference is 2.0 ± 0.94.

MEASURES	NPRS (NUMERIC PAIN RATING SCALE)		DIFFERENCE	TVALUE	PVALUE
	PRE	POST			
GROUP A (CORE STABILIZATION)	5.0 ± 1.31	2.5 ± 1.25	2.5 ± 0.81	17.2	<0.01
GROUP B (ERB)	5.2 ± 1.11	2.0 ± 0.94	3.2± 1.03	17.0	<0.01

Table:8.2 Comparison of within and between Groups for NPRS (Numeric Pain Rating Scale).



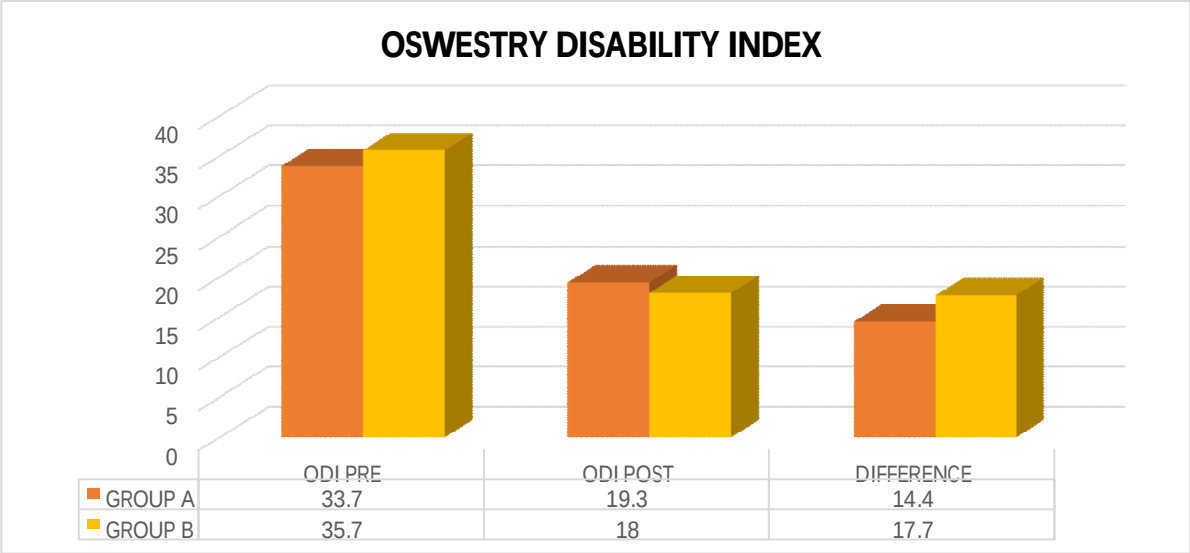
GRAPH:8.2 Comparison of within and between Groups for NPRS (NUMERIC PAIN RATING SCALE)

IV.Modified Oswestry Low Back Pain Disability Questionnaire(MODQ)

In ERB group, the treatment given for 2 weeks and it's pre and post treatment difference is 14.4 ± 3.25 and In Core Stabilization group, the treatment given for 2 weeks and it's pre and post treatment difference is 17.7 ± 2.90.

MEASURES	MODQ		DIFFERENCE	TVALUE	PVALUE
	PRE	POST			
GROUP A (CORE STABILIZATION)	33.7 ± 4.16	19.3 ± 5.51	14.4 ± 3.25	24.3	<0.01
GROUP B (ERB)	35.7 ± 3.21	18 ± 2.77	17.7 ± 2.90	33.4	<0.01

TABLE:8.3 Comparison of within and between Groups for MODQ.



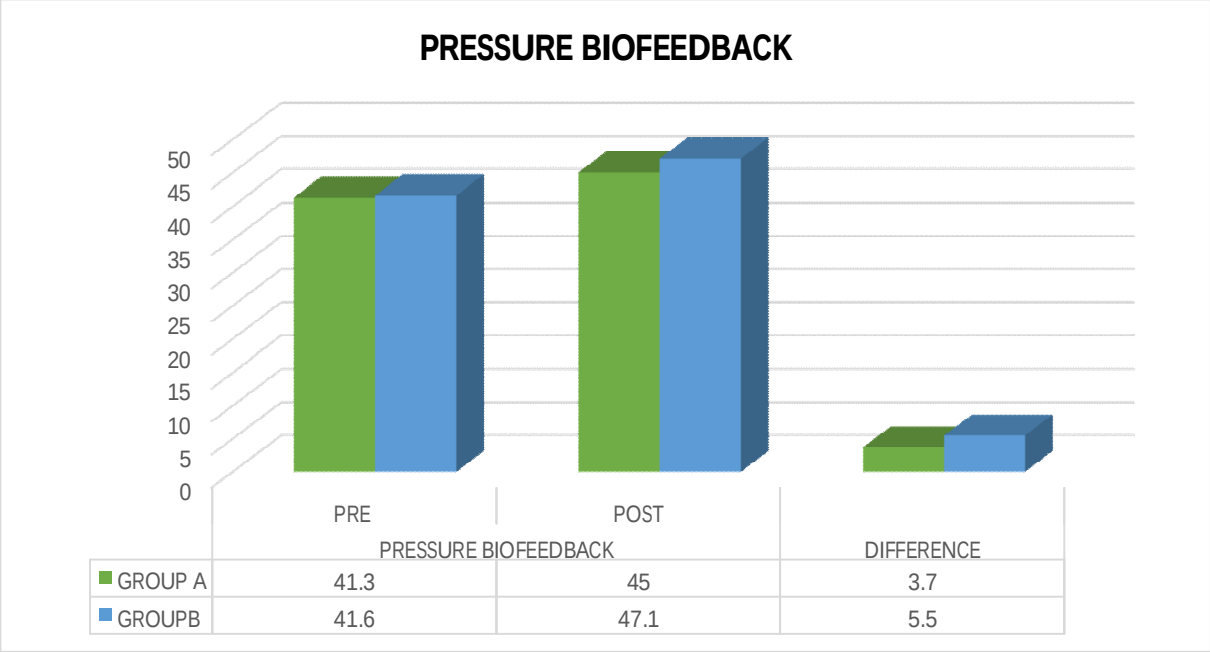
GRAPH:8.3 Comparison of within and between Groups for MODQ.

V.PRESSURE BIOFEED BACK (PBF)

In ERB group, the treatment given for 2 weeks and it's pre and post treatment difference is 3.6 ± 2.22 and In Core Stabilization group, the treatment given for 2 weeks and it's pre and post treatment difference is 5.5 ± 1.57.

MEASURES	PBF		DIFFERENCE	TVALUE	PVALUE
	PRE	POST			
GROUP A (CORE STABILIZATION)	41.3 ± 1.12	45 ± 2.22	3.6 ± 2.22	8.96	<0.01
GROUP B (ERB)	41.6 ± 1.27	47.1 ± 1.38	5.5 ± 1.57	19.18	<0.01

TABLE:8.4 Comparison of within and between Groups for PBF.



GRAPH:8.4 Comparison of within and between Groups for PBF.

Discussion

Result of this study showed that both the exercises proved to be effective in the management of Non Specific Low Back Pain (NSLBP) and to improve core muscle strength equally statistically but clinically there was a greater improvement in core muscle strength and pain reduction in Elastic Resistance Band (ERB) Exercise group as compared to Core Stabilization Exercise group. To assess the patients with NSLBP of both group elastic resistance band exercise and core stabilization exercise group, out comes measures are taken such as NPRS, PBF and MODQ and their data are compared between and with the group. The stretching of the tube is equal to the resistance provided by the tube. When resistance is applied it generates strength curve by the tube is equal to the human strength curve. This is because of the angle generated by the lever arm and elastic resistance. This cause increase in ROM during exercise, also may increase in resistance provided by tube to body. Which helps to use more muscle fibers and further to improve / gain muscle strength. And the present study is also focusing on the same, by using resistance band during exercise helps to gain more muscle strength.[34]

A study done by Peeyosha V. Nistsur, Tanvi S. Pathania and Trupti A. Bligi in the year 2014 that resistance band exercise is more helpful to gain the muscle strength, flexibility and functionality compare to the yoga in physiatrist student. The purpose behind the study is to find the exercise which will be helpful to clinician for treating low back pain.[22] It has been found that, through core stabilization exercise helps to improve functionality and also helps to reduce the pain in subjects with low back pain. The subject were been given same Exercise for certain period of time and then assessed and get improvement from back pain and the same is been reported in the finding given from the study done by Koumantakis and O'Sullivan.[35,36]

A study done by Jordan Opel in year 2007 proposed that core stabilization exercise are effective in treating the low back pain due to spinal instability and to gain functionality and also to get pain free movement in athletes. The purpose of the study was to get pain free movement and helps the clinicians to treat the patients through same.The present study Concluded that elastic resistance band exercise group is better than core stabilization exercise group with NSLBP. Although both the group A and B shows positive

result. The result showed from elastic resistance band exercise group and core stabilization exercise group shows helpful in getting pain free movement, helps to improve functionality, also to improve core muscle strength of patient with NSLBP.

Conclusion

Elastic Resistance Band Exercise is more effective than Core Stabilization Exercise in terms of Greater Muscle Strength, Functional Ability and Pain reduction in patients with non specific low back pain (NSLBP).

Summary

The study is to compare the effects of Core Stabilization exercise and Resistance Band exercises for improve Core Muscle Strength to reduce Non – specific low back pain. 30 patients were randomly divided into both groups. Both the groups will be advised for back care education. Group A receives Core Stabilization exercise and Group B receives Resistance Band exercises. Both Exercise is helpful to improve Muscle Strength, Functional ability and pain reduction in patients with non specific low back pain.