TO COMPARE THE EFFECT OF GLOBAL STABILITY TRAINING WITH SITFIT AND SWISSBALL IN IMPROVING THE CORE STABILITY AMONG THE PATIENTS WITH MECHANICAL LOW BACK PAIN

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CERTIFICATE

This is to certify that the dissertation entitled "**TO COMPARE THE EFFECT OF GLOBAL STABILITY TRAINING WITH SITFIT AND SWISSBALL IN IMPROVING THE CORE STABILITY AMONG THE PATIENTS WITH MECHANICAL LOW BACK PAIN"** is a bonafide work done by **ANIT AQULINA DAISY.M.J** bearing the **Register No: 271710083,** KMCH College of Physiotherapy, towards partial fulfilment of the requirements of the **Master of Physiotherapy (Advanced PT in Orthopaedics**) of The Tamil Nadu Dr. M.G.R. Medical university, Chennai - 32.

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ABSTRACT

ABSTRACT

Background: Low back pain is associated with deconditioning of spine and trunk due to lack of core strength and stability. And it remains the second most common symptom related problem among the population.

Objective: To study the effect of global stability training with Sitfit and Swiss ball in improving the patients with mechanical low back pain.

Methodology: Quasi-experimental research design with simple random sampling was used. Study setting was at KMCH college of physiotherapy, Coimbatore. Thirty patients were allocated in the study and 10 patients in each group. Group A received conventional physiotherapy whereas Group B received the global stability training with Sitfit and Group C received the global stability training with Swiss ball. Post-test measures were taken after 6 weeks of training. The training was supervised.

Outcome Measures: Pain was assessed using Numerical Pain Rating Scale, Core Endurance was assessed using Core Endurance Test and Functional Disability was assessed using Revised Owstery Low Back Disability Questionnaire.

Results: The data was analysed using Two-way ANOVA and paired‘t’ test at 5% level of significance. The post-test mean value showed improvement in all the three groups, greater improvements were observed in core endurance and values of pain and functional disability were decreased after training.

Conclusion: This study concluded that all three groups are good in increasing the core endurance and decrease in pain and functional disability but Core stability training with Sitfit showed greater improvement in the pain, core endurance and functional disability among the patients.

Keywords: Mechanical low back pain, core stability, Sitfit, Swiss ball, Revised Owstery Disability Index.

INTRODUCTION

1. INTRODUCTION

Low back pain is defined as the pain that occurs in an area with boundaries between the lowest rib and the crease of the buttocks. Low back pain is associated with deconditioning of spine and trunk due to lack of core strength and stability.

Mechanical low back pain is a cumulative process from chronic poor posture coupled with sedentary habits that put the back under severe mechanical stress. [9] And it remains the second most common symptom related problem among the population. Epidemiological studies show that 85-90% of the adult population experience low back pain at least once throughout an individual's lifespan. Among them 97% of cases the problem arises from the spinal structures such as bone, ligaments, discs, joint and nerves.

According to the earlier study, among the US population 85% of the people experience mechanical low back pain once in the lifetime and it is the common reason for seeing a physician.

In India, a study was conducted and concluded that the prevalence of mechanical low back pain is the most commonly occurring disease in the third decades of life. The recent literatures show that 30% of the adolescence experience low back pain worldwide. And in India, mainly the Young Adult are the more commonly affected population.

For patients with mechanical low back pain there are many therapeutic interventions. The complaints of the patients are usually self-limiting functional activities,90% of the patient's complaints disappear within few months through proper rest, analgesics and home exercise.

Physiotherapist usually give exercise therapy (or) in combination with the modalities, the new fashion of manipulative therapy is also being added up in the treatment protocol.

A recent focus in the physiotherapy management of patients with chronic low back pain was on the functional stability retraining by the principles of managing mechanical dysfunction. The principles (or) strategies are based on the local stabilisation, globalstabilisation and global mobilisation. Among which the global stabilizers (i.e.) core stability is mainly focused for the patients with mechanical low back pain.[8]

The core stability has become very important for efficient biomechanical function to maximize force generation and maximize joint loads in all types of activities.

Core stability is defined as the ability of the lumbopelvic hip complex to return to equilibrium following a perturbation without buckling of vertebral column.[4]

The core has been described as a box with the abdominals in the front, paraspinals and gluteal in the back, diaphragm as the roof and the hip girdle musculature are at the bottom and the hip abductors and rotators laterally. [5]All these muscles have direct (or) indirect attachments to the thoracolumbar fascia and the spinal column which connects the upper limb and the lower limb.[3]

A comprehensive strengthening (or) facilitation of these core muscles is done to prevent and rehabilitate various lumbar spine and musculoskeletal disorders.

In recent studies, several commercial products have been developed to enhance and improve the core endurance by providing core stabilisation exercise. The use of Swiss ball training for muscle development has been popular for several years. In this study two commercial products SITFIT and SWISSBALL are used for core stability exercise.

1.1 NEED FOR THE STUDY

In the earlier studies core stabilization exercise were performed and proved to be effective. The core stabilization was done with Swiss ball and without Swiss ball.A study was done on functional stability retraining for mechanical dysfunction and many principles and strategies were formulated and Sitfit was used in that study, but it was not done experimentally. And no studies were done only on global stability training. Hence the need for the study arises and the purpose of the study is to find the effect of global stability training on pain, core endurance and functional disability using Sitfit and Swiss ball and to compare which is more effective for training the core stabilizers.

REVIEW OF LITERATURE

2. REVIEW OF THE LITERATURE

2.1 REVIEWS ON PREVALENCE OF LOW BACK PAIN:

- **SUDHIR GANESAN et al (2017)**[12]conducted a cross sectional study on prevalence and risk factors for low back pain in young adults in India. As the result of the study 20-29 years were associated with Low Back Pain.
- **AL MAZORA MOHAMMAD et al (2012)**[13] described that low back pain affects people of all ages from children to the elderly and is a very frequent reason for medical consultations. The 2010 Global Burden of Disease Study estimated that low back pain is among the top 10 disease and injuries that account for the highest number of DALYs worldwide.The lifetime prevalence of non-specific(common) low back pain is estimated at 60% to 70% in industrialised countries.
- **JAMES et al (2008)**[14]reported that mechanical back pain is now more appropriately defined in terms of the spinal structures affected. Any structure within the spine including the vertebral bodies, intervertebral discs, zygapophyseal joints, sacroiliac joints,spinal ligaments,paraspinal muscles,dura,spinal cord and nerves may represent a potential pain generator for mechanical back pain. In the past, diagnoses such as non-specific back pain or lumbar strain were given to the majority of mechanical back pain cases.

2.2 REVIEWS ON NORDIC MUSCULOSKELETAL QUESTIONNAIRE:

- **JANNATBI ILI et al (2016)**[15] conducted a cross sectional study on 319 students the study subjects were interviewed using predesigned and pre-test Performa including Standardized Nordic Questionnaire. As the result of the study the most disabling MSDs affecting study subjects were upper back and lower back.
- **KUORINKA et al (1994)**[16] standardized Nordic Musculoskeletal Questionnaire for the analysis of musculoskeletal symptoms, the reliability of NMQ using a test-retest methodology 0 to 23% and validity 0 to 20%.

2.3 REVIEWS ON MIL INDEX:

- **ANTONIO CUESTA-VARGAS et al (2014)**[7] conducted a study on the development of a valid and reliable "Mechanical and inflammatory Low back pain Index" for assessment of nonspecific low back pain. The 7-item tool assists practitioners in determining where symptoms are predominately mechanical or inflammatory. Participants completed the MIL and Roland Morris Questionnaire, SF-12 &Backache Index and physical assessment test. The study concluded that MIL is a valid and reliable clinical tool for patients with NSLBP that discriminates between Mechanical and Inflammatory LBP.

2.4 REVIEWS ON NPRS:

- **GILLIAN. A. HAWKER et al (2011)**[20] conducted a study on the validity and reliability of Numerical Pain Rating Scale. They said that numerical pain rating scale is a valid and reliable scale to measure pain intensity and they also mention that strength of this measure over pain VAS are the ability to administered both verbally and in writing as well as its simplicity of scoring.
- **AMELIA WILLIAMSON et al (2004)**[22] conducted a study on the review of three commonly used pain rating scales from this study they concluded that numeric pain rating scale has good sensitivity and generate data that can be statistically analysed for adult purposes and it has good validity and reliability compared to other pain rating scales.
- **JENSON MP et al (2001)**[24] conducted a study on numerical pain rating scale on which patients rate their current pain intensity from 0 (no pain) to 10 (worst possible pain) had become a widely used instrument for pain screening. Although it was not developed or validated as a screening test.It is a short, easy to administer and had been validated as a measure of pain intensity in population with known pain.

2.5 REVIEWS ON CORE ENDURANCE TEST:

- **ANDY WALDHELM et al (2012)[4]** conducted a study on 15 college aged males who had not suffered any orthopaedic injury in the past year. Core strength measurements, core endurance test, flexibility test,proprioception,functional measurements were performed to find overall intra rater reliability for all core stability related measurements. As the result of the day the core endurance test were found to be highly reliable test.
- **SHERI.P. SILFIES et al (2016)[6]** conducted a cross-sectional study to assess core stability to determine concurrent validity of two novel clinical core stability assessments (TST and UHBE). As a conclusion of the study the data support the utility of UHBE as a clinical measure of Core stability.

2.6 REVIEWS ON REVISED OWSTERY LOW BACK PAIN DISABILITY QUESTIONNAIRE:

- **JULIE M FRITZ et al (2001)[19]** conducted a study on sixty-seven patients with acute work-related low back pain referred and participated, Modified Owstery low back pain disability questionnaire and the Quebec Back Pain disability scale were administered initially and after 4 weeks of physical therapy. Among them modified OSW showed higher levels of test retest reliability and responsive compared to QUE.

2.7 REVIEWS ON CONVENTIONAL BACK EXERCISE:

- **VENKATA NAGA PRAHALADA KARNATI et al (2015)[9]** conducted a study on forty patients with mechanical low back pain and they were randomly divided into control group 20 patients received conventional back exercise and SWD and experimental group 20 patients received core stability exercise in additional with SWD and conventional back exercise for 3 days a week for 6 weeks .After 6 weeks of treatment the stabilization group scored significantly higher than that of conventional group.
- **DAVID BAXTER G et al (2003)[21]** found that exercise has a positive effect on low back pain patients and strengthening is a common component of exercise programs.

- **VAN TULDER et al (2000)[23]** published a Cochrane review of literature which assessing the effects of exercise therapy for low back pain in pain intensity, functional status, overall improvement and return to work. He concluded that exercise therapy was effective in decreasing pain and improving functional in patients with chronic low back pain.

2.8 REVIEWS ON STABILITY EXERCISE WITH SITFIT:

- **COMERFORD M J et al (2000)[8]** conducted a study on functional stability retraining for managing mechanical dysfunction. In this study, they proposed the principles and strategies for managing mechanical stability dysfunction. Activation of local stability system is to increase muscle stiffness, but global muscle retraining is required to correct multisegmental (or) myofascial dysfunction. Individual strategies for integrating local and global recruitment retraining back into normal function are suggested with SITFIT.

2.9 REVIEWS ON STABILITY EXERCISE WITH SWISS BALL:

- **NIKETA G PATEL et al (2014)[3]** conducted a study on 30 subjects with chronic low back pain and they were divided into two groups, Group A of 15 subjects treated with core stability exercise with swiss ball, lumbar traction 10 minutes, IFT 10 minutes and Group B of 15 subjects treated with core stability exercise without swiss ball, lumbar traction 10 minutes, IFT 10 minutes once a day for two weeks. Pre and Post VAS score and RMQ score were taken. As the result of the study there was statistically significant difference in both the groups but there were no statistically significant between both groups.
- **PATHAK PATLI et al (2015)[18]** conducted a study on 30 subjects with low back pain and they were divided into two groups, Group A 15 subjects with back extension exercise and Group B 15 subjects with swiss ball exercise. They were treated for three days a week for five weeks. Pre and Post measures were taken with Visual Analogue Scale, Roland Morris Questionnaire and Bering Sorenson Endurance Test. As the result of the study there was no significant difference between the two approaches so either the techniques can be used for the management of low back pain.

- **HASIM AHMED et al (2016)[17]** did a comparative study of trunk stabilization exercise using gym ball and conventional back care exercise. Thirty male subjects with chronic low back pain were randomly divided in to two groups; Group A received Trunk stabilisation exercise with gym ball and group B received conventional back exercise. The study demonstrated that Group A had significant improvement in abdominal muscle endurance and reduction in pain when compared to Group B.
- **SURESH BABU REDDY et al (2015)[2]** conducted a study to find the efficacy of core stabilization program and conventional exercises in the management of patients with chronic mechanical low back pain. Through Purposive sampling 40 patients were selected and randomly divided into two groups. After six weeks of treatment session group which received core stabilization program showed significant difference.

AIM & OBJECTIVES

3. AIMS AND OBJECTIVES

3.1AIM OF THE STUDY

- To compare the effect of Global stability training with SITFIT and SWISSBALL in improving the core stability among the patients with Mechanical low back pain.

3.2OBJECTIVE OF THE STUDY

- To find out the effect of global stability training with SITFIT on pain, core endurance, functional disability on core stability among the patients with mechanical low back pain.
- To find out the effect of Global stability training with SWISS BALL on pain, core endurance, functional disability on core stability among the patients with mechanical low back pain.
- To compare the effect of global stability training with SITFIT and SWISS BALL on pain, core endurance, functional disability on core stability among the patients with mechanical low back pain.

METHODOLOGY

4.MATERIALS AND METHODOLOGY

4.1 STUDY DESIGN

- A Quasi Experimental Study.

4.2 STUDY POPULATION

- Mechanical low back patients only.

4.3 SAMPLING METHOD

- Simple Random Sampling.

4.4 SAMPLING SIZE

- 30 Mechanical Low back pain patients were selected and randomly divided into three groups
- GROUP A: Control group 10 patients treated with conventional back care exercise.
- GROUP B: Experimental group 10 patients treated with Global Stability training using SITFIT.
- GROUP C: Experimental group 10 patients treated with Global stability training using SWISS BALL.

4.5 STUDY SETTING

- KMCH College of Physiotherapy-Coimbatore.

4.6 STUDY DURATION

- one year

4.7 TREATMENT DURATION

- Three days a week for six weeks.

4.8 STUDY CRITERIA

4.8.1 INCLUSION CRITERIA

- Subjects with only mechanical low back pain
- Both men and women are eligible for the study
- Age group between 20 to 30 years
- Subjects who scores less than 2 in MIL index
- Subjects who falls between 20% to 40% (moderate) disability in the score of The Revised Owstery low back disability index
- Subjects who is willing for the study

4.8.2 EXCLUSION CRITERIA

- Any systemic diseases
- Persons with rheumatoid arthritis
- Recent fractures in the spine (or)in the lower limb
- Spinal infections
- Recently undergone surgeries(or) an inflammation
- Congenital deformity: Scoliosis
- Ankylosing spondylosis
- Radiating pain
- Cauda Equina Syndrome
- Current use of steroids or any drug for back pain

4.9 HYPOTHESES

4.9.1 NULL HYPOTHESES:

Ho1: There is no significant effect of conventional back exercise on pain, core endurance and functional disability among the patients with mechanical low back pain.

Ho2: There is no significant effect of Global Stability Training with SITFIT on pain, core endurance and functional disability among the patients with mechanical low back pain.

Ho3: There is no significant effect of Global stability Training with SWISS BALL on pain, core endurance and functional disability among the patients with mechanical low back pain.

Ho4: There is no significant difference on pain, core endurance and functional disability between conventional back exercise, SITFIT and SWISSBALL.

4.9.2 ALTERNATE HYPOTHESES

H1: There is significant effect of conventional back exercise on pain, core endurance and functional disability among the patients with mechanical low back pain.

H2: There is significant effect of Global Stability Training with SITFIT on pain, core endurance and functional disability among the patients with mechanical low back pain.

H3: There is significant effect of Global stability Training with SWISS BALL on pain, core endurance and functional disability among the patients with mechanical low back pain.

H4: There is significant difference on pain, core endurance and functional disability between conventional back exercise, SITFIT and SWISSBALL.

4.10 OUTCOME MEASURE:

- Pain
- Core endurance
- Functional disability

4.11TOOLS USED:

- Numerical pain rating scale
- Core Endurance Test
- The revised Owstery low back disability index

4.12 TREATMENT PROCEDURE:

The total number of 30 subjects who fulfilled the selection criteria were randomly divided into three groups.

GROUP A:

4.12.1 CONVENTIONAL BACK EXERCISE:

The patients in the control group were treated with conventional back exercise program for 3 days a week for 6 weeks.

EXERCISE: 1

SUPINE LYING-LEG LIFTS:

The patient was asked to lie on their glute and lift one leg first and hold it for five seconds and return to neutral position and asked to repeat the same for other leg. Later both the legs were made to lift simultaneously, holding them for five seconds and brought back to neutral position.

EXERCISE: 2

ABDOMINAL CRUNCHES IN CROOK LYING POSITION:

The patient was asked to lie on their glute with knees bend and the hands were behind the head and ask to lift the trunk upwards, rotate top either side to reach the knees and hold the position for five seconds and brought back to neutral position.

EXERCISE: 3

PRONE LYING -LEG LIFTS:

The patient was asked to lie on their abdomen and to lift one leg first and hold it for five seconds and brought to neutral position and repeat the same for the other leg. Later the patient was asked to lift both the legs and hold them for five seconds simultaneously and brought back to neutral position.

EXERCISE: 4

PRONE LYING -TRUNK LIFTS:

The patient was asked to lie on their abdomen by keeping the hands along the side of the body and to lift the trunk off the floor and hold the position for five seconds and brought them back to neutral position.

All these exercises were given for ten repetitions per session.

After 3 weeks of treatment session the holding time was progressed to 10 seconds for each repetition.

GROUP B:

4.12.2 STABILITY TRAINING WITH SITFIT:

Patient in the experimental group were treated with global stability exercise with the SITFIT in additional to the conventional back exercise program.

EXERCISE :1

LUMBO-PELVIC ROTATIONAL CONTROL:

The patient was asked to lie on glute and one leg was bent to the outer side by keeping the foot supported beside the straight leg, now the bended leg was lowered until there was no rotation of pelvis. This position was maintained for 10 seconds and brought back to neutral position. And ask to repeat the same for the other side.

EXERCISE: 2

CONTROL THROUGH RANGE:

The patient was asked to lie on side keeping the heels together. The patient was instructed to lift the uppermost knee by turning the hip out. This position was maintained for 10 seconds and brought back to neutral position. And ask to repeat the same for the other side.

EXERCISE: 3

CONTROL OF ROTATIONAL LOAD:

The patient was asked to lie on glute first one foot was lifted off the floor and then the other foot was also lifted off the floor and it was kept beside the first leg. And this position was maintained for 10 seconds and brought back to neutral position. And ask to repeat the same for other side.

EXERCISE: 4

LUMBO-PELVIC FLEXION CONTROL with SITFIT:

The patient was asked to lie on glute and the SITFIT was placed under the pelvis creating an unstable base one leg was bent outward until there was no rotation in the pelvis. And this position was maintained for 10 seconds and brought back to neutral position. And ask to repeat the same for other side.

EXERCISE: 5

CONTROL OF ROTATIONAL LOAD with SITFIT:

The patient was asked to lie on glute a SITFIT was placed under the pelvis one leg was lifted off the floor and the other leg was also lifted off the floor and kept beside the other leg. And this position was maintained for 10 seconds and brought back to normal position. And the patient was asked to repeat the same for opposite side.

All these exercises were given for ten repetitions per session.

GROUP C:

4.12.3 STABILITY TRAINING WITH SWISS BALL

Patient in the experimental group were treated with global stability exercise with the SWISS BALL in additional to the conventional back exercise program.

EXERCISE :1

STATIC CRUNCHES:

The patient was asked to lie on glute on swiss ball and instructed to place the hands behind the head and lift the trunk to reach the knees and instructed to hold this position for 10 seconds and ask to come back to normal position.

EXERCISE :2

SIDE PLANK:

The patient was asked to lie on side on swiss ball and instructed to place the elbow on the top of the swiss ball and place the other hand lightly on the ball to balance and the hip was rested on the swiss ball initially. Then the hip was raised and instructed to hold this position for 10 seconds and brought back to normal position and the same was repeated for opposite side.

EXERCISE :3

PLANK:

The patient was asked to lie on belly with the elbow placed on the swiss ball the knees were placed on the ground initially. After maintaining the balance, the knees were raised off the floor and instructed to hold it for 10 seconds and brought back to normal position.

EXERCISE :4

PLANK WITH LEG LIFTS:

The patient was asked to lie on the belly with the forearms placed on the swiss ball and the legs were on the floor, the position was maintained and now the patient was instructed to slowly raise the leg off the floor and hold it for 10 seconds and brought to normal position and the same was repeated for opposite side.

EXERCISE: 5

QUADRIPOD:

The patient was asked to lie on the belly on swiss ball and instructed to lift one leg and contralateral arm and hold it for 10 seconds and brought back to normal position and the same was repeated for opposite side.

All these exercises were given for ten repetitions per session for 6 weeks.

After 6 weeks of training program, the patients were reassessed on the pain rating using Numerical Pain Rating Scale, Core endurance rating using Core endurance test and disability rating using The Revised Owstery Low Back Pain Questionnaire.

4.13 PHOTO PRESENTATION

4.13.1 GROUP A

Fig 1 ABDOMINAL CRUNCHES

Fig 2 SUPINE LYING LEG LIFTS

Fig 3 PRONE LYING LEG LIFTS

4.13.2 GROUP B

Fig 4 LUMBO-PELVIC ROTATIONAL CONTROL

Fig 5 LUMBO-PELVIC FLEXION CONTROL WITH SITFIT

Fig 6 CONTROL OF ROTATIONAL LOAD WITH SITFIT

4.13.2 GROUP C

Fig 7 PLANK

Fig 8 PLANK WITH LEG LIFTS

Fig 9 SIDE PLANK

Fig 10 QUADRIPOD WITH CONTRLATERAL ARM AND LEG LIFTS

4.14 STATISTICAL ANALYSIS

Pre-test and post-test values of the study was collected and assessed for variation in improvement and their results were analysed using paired 't' test and Two-way ANOVA.

Paired 't' test:(Within group)

To measure the difference between the pre-test and post-test values.

$$t = \frac{\bar{d}\sqrt{n}}{SD}$$

SD=

$$\sqrt{\frac{\sum(d-\bar{d})^2}{n-1}}$$

$\bar{d}$ =calculated mean difference between pre-test & post-test values

d = difference between pre-test and post-test values

n = sample size

SD = Standard Deviation.

Two-wayANOVA (BETWEEN GROUPS)

Source of variation	**SS (Sum of Squares)**	**I(DEGREES OF FREEDOM)**	**MS (MEAN SUMOF SQUARES)**	**Variance (F-Ratio)**
Between Samples	SSC	C-1	MSC=SSC/C-1	MSC/MSE
Between Rows	SSR	r-1	MSR=SSR/r-1	MSR/MSE
Residual of Error	SSE	(c-1)(r-1)	MSE=SSE/(r-1) (c-1)	

MSC = Mean Sum of Squares between Column

MSR = Mean Sum of Squares with in Column

DATA PRESENTATION

5.DATA PRESENTATION

5.1 TABULAR PRESENTATION

5.1.1 TABULAR PRESENTATION FOR PAIRED 't' TEST BETWEEN PRETEST AND POSTTEST:

5.1.1.1 Paired't'test analysis for Pre-test and Post-test values of NPRS

Outcome measure		Mean value		Calculated 't'value	Table 't'value	Level of significance
		Pre-test	Post-test			
NPRS	GROUP A	6	4.7	5.95	2.262	P<0.05 significant
	GROUP B	6	3.3	12.73		
	GROUP C	5.7	3.6	11.03		

5.1.1.2 Paired't'test analysis for Pre-test and Post-test values of CORE ENDURANCE TEST

Outcome measure		Mean value		Calculated 't'value	Table 't'value	Level of significance
		Pre-test	Post-test			
CORE ENDURANCE TEST	GROUP A	31	46.5	9.85	2.262	P<0.05 significant
	GROUP B	40	58	11.75		
	GROUP C	35	51.5	11.07		

5.1.1.3 Paired't'test analysis for Pre-test and Post-test values of REVISED OSW

Outcome measure		Mean value		Calculated 't'value	Table 't'value	Level of significance
		Pre-test	Post-test			
REVISED OSW	GROUPA	31.9	22.5	8.07	2.262	P<0.05 significant
	GROUP B	31.5	18.2	18.19		
	GROUP C	31.6	18.2	12.09		

5.1.2TABULAR PRESENTATION OF TWO-WAY ANOVA BETWEEN GROUPS:

5.1.2.1 Two-way ANOVA for post-test values of NPRS

Source of variation	SS (Sum of Squares)	I(DEGREES OF FREEDOM)	MS (MEAN SUMOF SQUARES)	Variance (F-Ratio)
Between Samples	SSC = 10.87	2	MSC = 5.43	7.14
Between Rows	SSR = 4.8	9	MSR = 0.53	
Residual of Error	SSE = 13.8	18	MSE = 0.76	0.69

5.1.2.2 Two-way ANOVA for post-test values of CORE ENDURANCE TEST

Source of variation	**SS (Sum of Squares)**	**I(DEGREES OF FREEDOM)**	**MS (MEAN SUM OF SQUARES)**	**Variance (F-Ratio)**
Between Samples	SSC = 665	2	MSC= 332.5	3.58
Between Rows	SSR = 1046.66	9	MSR= 116.29	
Residual of Error	SSE = 1668.34	18	MSE= 92.68	1.25

5.1.2.3 Two-way ANOVA for post-test values of REVISED OSW

Source of variation	**SS (Sum of Squares)**	**I(DEGREES OF FREEDOM)**	**MS (MEAN SUM OF SQUARES)**	**Variance (F-Ratio)**
Between Samples	SSC = 123.27	2	MSC= 61.63	1.35
Between Rows	SSR = 224.97	9	MSR = 24.99	
Residual of Error	SSE = 816.73	18	MSE= 45.37	0.55

5.2 RESULTS

The difference within groups were analysed by means of Paired ‘t’ test and the difference between the groups by means of Two-way ANOVA.

PAIRED ‘t’ TEST:

NUMERICAL PAIN RATING SCALE:

GROUP A:

When the pre-test and post-test values of NUMERICAL PAIN RATING SCALE for Group A were analysed by Paired ‘t’ test the calculated ‘t’ value is 5.95.For 9 degrees of freedom (df 9)at 5% level of significance the table ‘t’ value is 2.262.As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of NUMERICAL PAIN RATING SCALE for Group A.

GROUP B:

When the pre-test and post-test values of NUMERICAL PAIN RATING SCALE for Group B were analysed by Paired ‘t’ test the calculated ‘t’ value is 12.73.For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2. 262. As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of NUMERICAL PAIN RATING SCALE for Group B.

GROUP C:

When the pre-test and post-test values of NUMERICAL PAIN RATING SCALE for Group C were analysed by Paired ‘t’ test the calculated ‘t’ test value is 11.03. For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2.262.As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of NUMERICAL PAIN RATING SCALE for Group C.

CORE ENDURANCE TEST:

GROUP A:

When the pre-test and post-test values of CORE ENDURANCE TEST for Group A were analysed by Paired ‘t’ test the calculated ‘t’ value is 9.85.For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2. 262. As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of CORE ENDURANCE TEST for Group A.

GROUP B:

When the pre-test and post-test values of CORE ENDURANCE TEST for Group B were analysed by Paired ‘t’ test the calculated ‘t’ value is 11.77. For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2.262.As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of CORE ENDURANCE TEST for Group B.

GROUP C:

When the pre-test and post-test values of CORE ENDURANCE TEST for Group C were analysed by Paired ‘t’ test the calculated ‘t’ value is 11.07.For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2. 262. As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of core endurance test for Group C.

REVISED OWSTERY DISABILTY INDEX:

GROUP A:

When the pre-test and post-test values of REVISED OWSTERY DISABILITY INDEX for Group A were analysed by Paired ‘t’ test the calculated ‘t’ value is 8.07. For 9 degrees of freedom (df 9) at 5% level of significance the table ‘t’ value is 2. 262.As the calculated ‘t’ value is greater than table ‘t’ value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of REVISED OWSTERY DISABILITY INDEX for Group A.

GROUP B:

When the pre-test and post-test values of REVISED OWSTERY DISABILITY SCALE for Group B were analysed by Paired 't' test the calculated 't' value is 18.19. For 9 degrees of freedom (df 9) at 5% level of significance the table 't' value is 2. 262. As the calculated 't' value is greater than table 't' value, the null hypothesis **i**s rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of REVISED OWSTERY DISABILITY INDEX for Group B.

GROUP C:

When the pre-test and post-test values of REVISED OWSTERY DISABILITY SCALE for Group C were analysed by Paired 't' test the calculated 't' value is 12.09. For 9 degrees of freedom (df 9) at 5% level of significance the table 't' value is 2.262.As the calculated 't' value is greater than table 't' value, the null hypothesis is rejected. Hence it is proved that there is significant difference between Pre-test and Post-test values of REVISED OWSTERY DISABILITY QUESTIONNAIRE for Group C.

TWO WAY ANOVA

NUMERICAL PAIN RATING SCALE:

When the post-test values of NUMERICAL PAIN RATING SCALE for Group A, B & C were analysed by Two-way ANOVA calculated 'F' value is 7.14. For 2 and 27 degrees of freedom at 5% level of significance the table 'F' value is 3.35. As the calculated 'F' value is greater than table 'F' value, the null hypothesis is rejected. Hence it is proved that there is significant difference in Post-test values of NUMERICAL PAIN RATING SCALE between Group A, Group B and Group C.

CORE ENDURANCE TEST:

When the post-test values of CORE ENDURANCE TEST for Group A, B & C were analysed by Two-way ANOVA calculated 'F' value is 3.58. For 2 and 27 degrees of freedom 5% level of significance the table 'F' value is 3.35. As the calculated 'F' value is greater than table 'F' value, the null hypothesis is rejected. Hence it is proved that there is significant difference in Post-test values of CORE ENDURANCE TEST between Group A, Group B and Group C

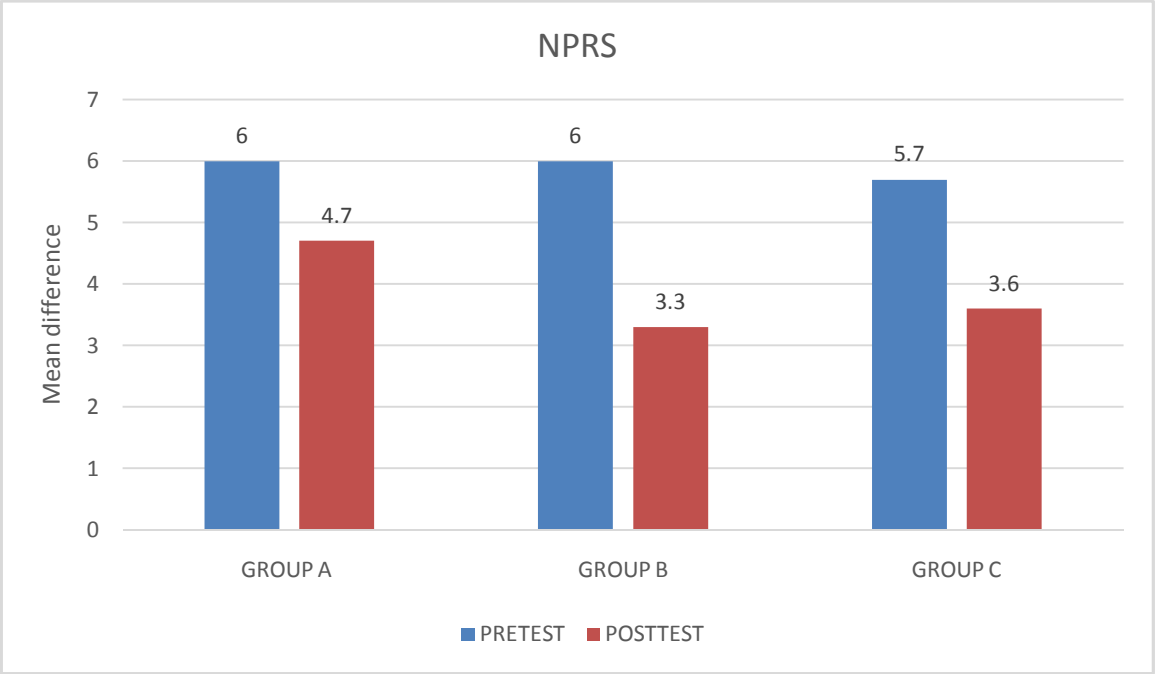
REVISED OWSTERY DISABILITY INDEX:

When the post-test values of REVISED OWSTERY DISABILITY INDEX for Group A, B & C were analysed by Two-way ANOVA calculated 'F' value is 1.35. For 2 and 27 degrees of freedom 5% level of significance the table 'F' value is3.35. As the calculated 'F' value is lesser than table 'F' value, the null hypothesis is accepted. Hence it is proved that there is no significant difference in Post-test values of MODIFIED OWSTERY DISABILTY INDEX between Group A, Group B and Group C. Thus, the homogeneity between the groups is maintained.

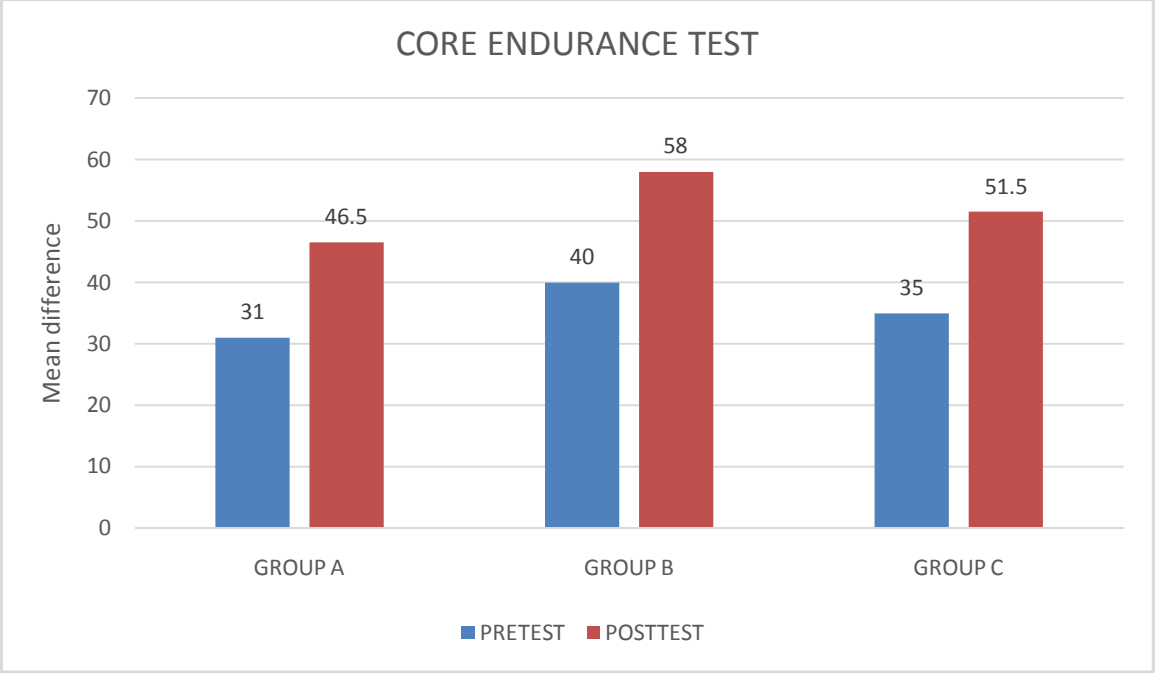
5.3 GRAPHICAL PRESENTATION

5.3.1 PAIRED ‘t’ TEST– PRETEST VS POSTTEST

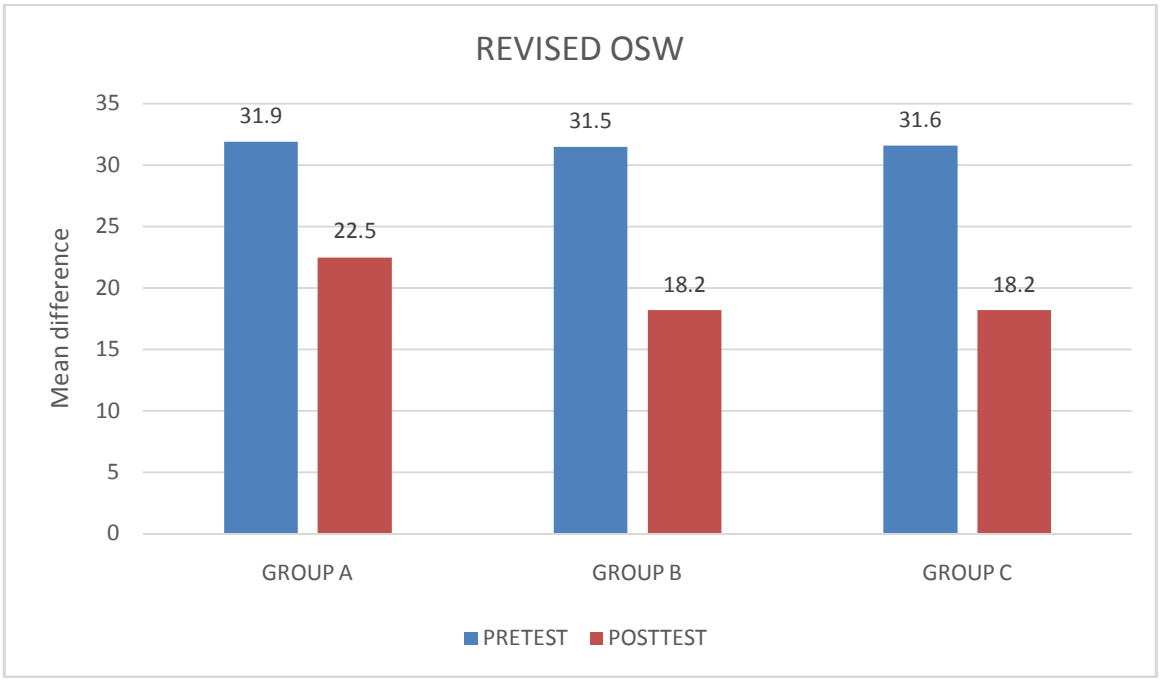
5.3.1.1 PAIRED ‘t’ TEST– PRETEST VS POSTTEST for NPRS



5.3.1.2 PAIRED ‘t’ TEST– PRETEST VS POSTTEST for CORE ENDURANCE:

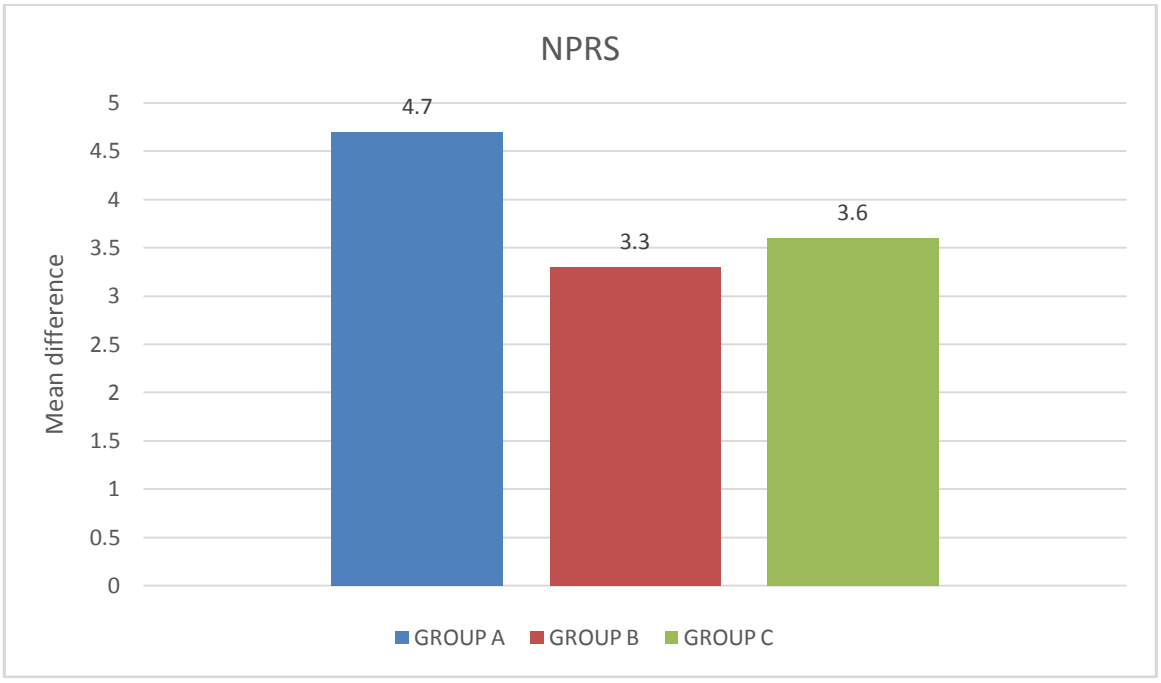


5.3.1.2 PAIRED ‘t’ TEST– PRETEST VS POSTTEST for REVISED OSW

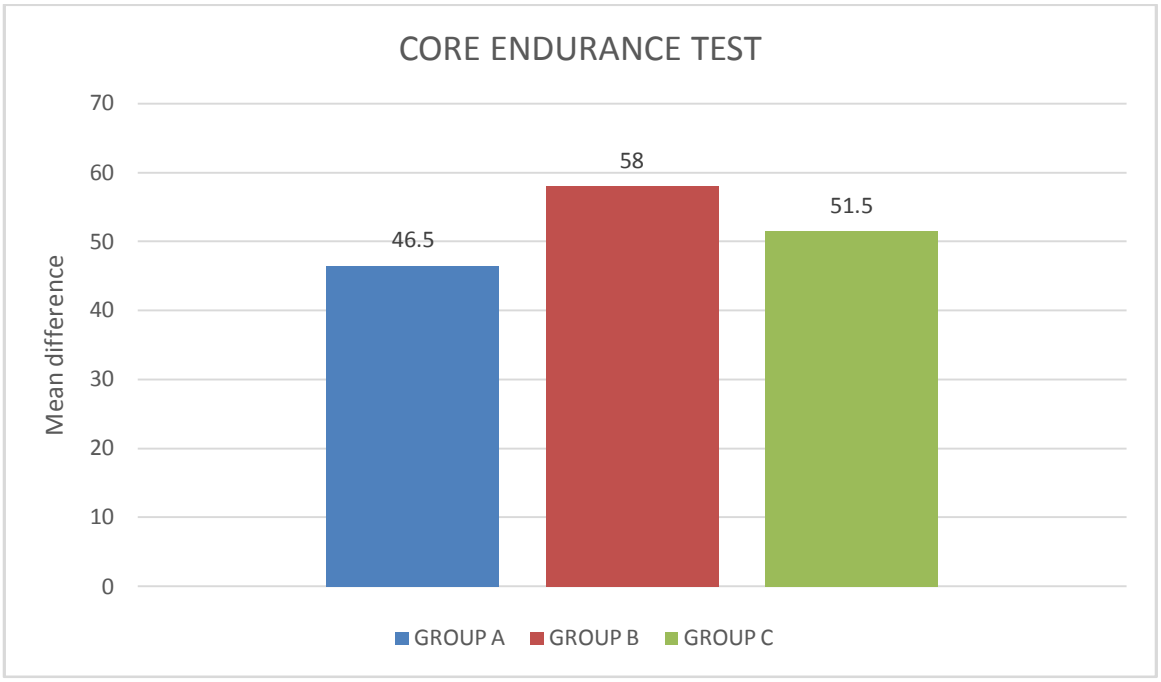


5.3.2 TWO WAY ANOVA-POST TEST VALUES

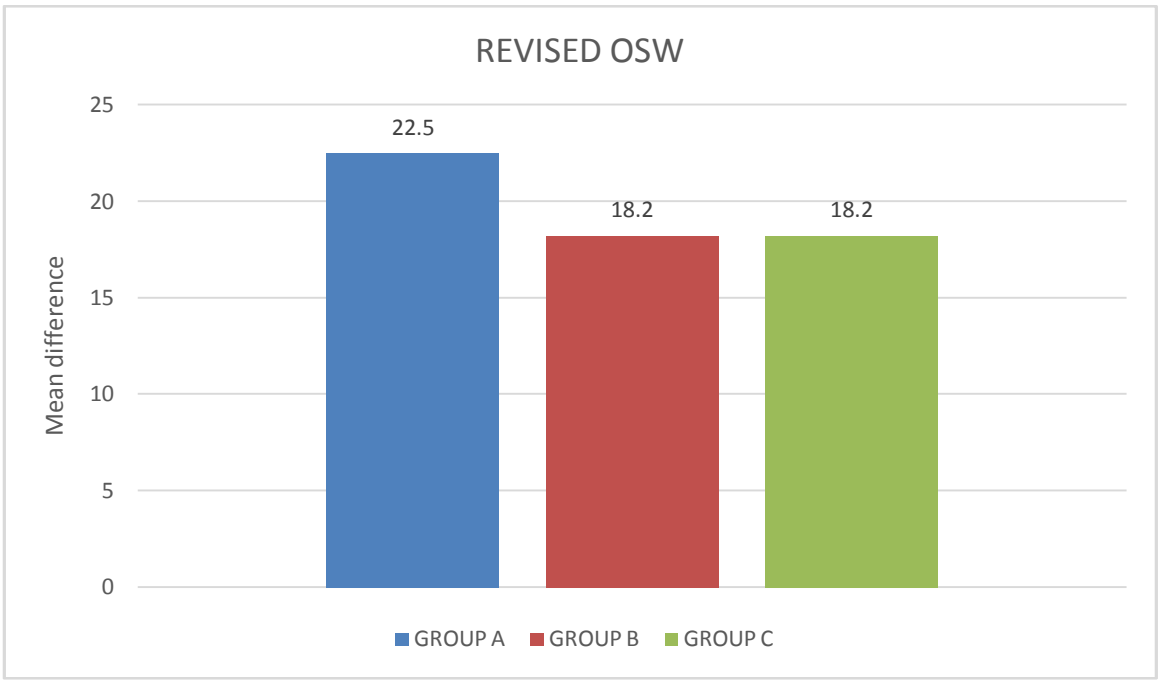
5.3.2.1 TWO WAY ANOVA-POST TEST VALUES for NPRS



5.3.2.2 TWO WAY ANOVA-POST TEST VALUES FOR CORE ENDURANCE TEST



5.3.2.3 TWO WAY ANOVA-POST TEST VALUES FOR REVISED OSW



DISCUSSION

6.DISCUSSION

Mechanical low back pain is the second most common symptom related problem among the population.Almost 30% of the adolescence experience the low back pain worldwide and the young adults are the more commonly affected population in India.

In the study of SUDHIR GANESAN et al stated that prevalence and risk factors for low back pain in India are among young adults between the age group of 20-29 years.

COMERFORD et al stated that individual strategies for integrating local and global recruitment of muscles were done for managing mechanical stability dysfunction.

NIKETA G PATEL et al conducted a study to find out the effect between core stability with and without SWISSBALL.

In this study,thirty subjects with mechanical low back pain who met the inclusion criteria were selected and assigned into three groups. Group A were given conventional back exercise, Group B were given global stability training with Sitfit and Group C were given global stability training with Swiss ball.

Although there were many exercises given for the low back patients; core stability training with swiss ball were encouraged in clinical practice for past years.No specific training for Global stability were recruited and given for the patients using the product Sitfit and swiss ball.

The study found significant difference in intensity of pain measured by Numerical Pain Rating Scale and increase in core endurance measured by Core Endurance Test (UHBE) further decrease in functional disability is measured by Revised Owstery Low Back Pain Disability Questionnaire.

Recorded values were analysed and interpret using paired ‘t’ test and two-way ANOVA. Paired‘t’ test was used to interpret the results within the group before and after the intervention and two-way ANOVA was used to interpret the results between the groups. When pre-test values and post-test values within the groups were analysed using paired ‘t’ test there is significant

difference in all three groups and when both groups were analysed by two-way ANOVA, the post-test value of Numerical Pain Rating Scale and Core endurance showed statistically significant difference, but the post-test values of The Revised Owstery Low Back Disability Index showed statistically not significant. When the mean values are compared, there is improvement within groups but comparatively there is differences between groups only for pain and core endurance and no significant differences between groups for functional disability of mechanical low back patients due to Global stability Training using Sitfit and Swiss ball.

The result of this study demonstrated that effectiveness of global stability training with Sitfit and Swiss ball were effective in reducing pain and increase in muscle endurance when compare to conventional therapy. But there was no significant difference in functional disability between the groups and it can be concluded that global stability training with Sitfit and Swiss ball is equally effective for improving the core stability of mechanical low back patients.

SUMMARY AND CONCLUSION

7.SUMMARY AND CONCLUSION

SUMMARY

The study evaluated the effect of global stability training with SITFIT and SWISS BALL on pain, core endurance and functional disability in mechanical low back patients.

30 subjects who met the selection criteria were randomly assigned to three groups – Group A, Group B and Group C. Group A were given Conventional back exercise and Group B were given Global stability training with SITFIT and Group C were given Global stability training with SWISS BALL.

The pre-test and post-test data were collected for Numerical Pain Rating Scale (Numerical Pain Rating Scale), Core endurance Test (UHBE) and Revised Owstery Disability Questionnaire. The difference between the three Groups were analysed using Two-way ANOVA and the difference within the groups were analysed using paired 't' test.

CONCLUSION

The study showed a significant improvement in all the three groups. So, this study concluded that Global stability training with SITFIT and SWISS BALL are effective to reduce pain, functional disability and to improve core endurance among patients with mechanical low back pain.

LIMITATION AND SUGGESTION

8.LIMITATIONS AND SUGGESTIONS

LIMITATIONS

- Small sample size was taken.
- The duration of the study was only 6 weeks.
- The study was limited with specific age group 20 to 40 years.
- Only Mechanical low back pain patients were taken in the study.

SUGGESTIONS

- Study can be done on larger sample.
- Similar studies can be done on longer duration.
- The future studies samples can also be selected from other age groups.
- Various outcome measures can be included.
- Gender based study can also be done.
- Future studies can be carried in disc prolapse, radiating pain and Inflammatory low back pain.

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9.REFERENCES

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APPENDIX

10.APPENDICES

APPENDIX -I

INFORMED CONSENT FORM

I …… Voluntarily consent to participate in the research study, **"TO COMPARE THE EFFECT OF GLOBAL STABILITY TRAINING WITH SITFIT AND SWISSBALL IN IMPROVING THE CORE STABILITY AMONG THE PATIENTS WITH MECHANICAL LOW BACK PAIN".**The researcher has explained me the treatment approach in brief, risk of participation and has answered the question related to the research to my satisfaction.

Participant signature :

Signature of witness :

Signature of researcher :

APPENDIX -II

ASSESSMENT PERFOMA

Name :

Age :

Gender :

Register no :

Date of admission :

Date of assessment :

Height :

Weight :

BMI :

Address :

Nordic Musculoskeletal Questionnaire :

MIL index :

Outcome measures :

Numerical Pain Rating Scale score :

Pre test	
Post test	

Core endurance:

Pre test	
Post test	

The revised Owstery low back disability questionnaire :

Pre test	
Post test	

SIGNATURE OF THE PHYSIOTHERAPIST :

APPENDIX – III

Nordic musculoskeletal questionnaire

Please answer by using the tick boxes ☑
– *one tick for each question*

Please note that this part of the questionnaire should be answered, even if you have never had trouble in any parts of your body.

Have you at any time during the **last 12 months** had **trouble (such as ache, pain, discomfort, numbness)** in:	Have you had **trouble** during the **last 7 days:**	During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. job, housework, hobbies) because of this trouble:
1 ***Neck*** No 1☐ Yes 2☐	2 ***Neck*** No 1☐ Yes 2☐	3 ***Neck*** No 1☐ Yes 2☐
4 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	5 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	6 ***Shoulders (both/either)*** No 1☐ Yes 2☐
7 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	8 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	9 ***Elbows (both/either)*** No 1☐ Yes 2☐
10 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	11 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	12 ***Wrists/hands (both/either)*** No 1☐ Yes 2☐
13 ***Upper back*** No 1☐ Yes 2☐	14 ***Upper back*** No 1☐ Yes 2☐	15 ***Upper back*** No 1☐ Yes 2☐
16 ***Lower back (small of the back)*** No 1☐ Yes 2☐	17 ***Lower back*** No 1☐ Yes 2☐	18 ***Lower back*** No 1☐ Yes 2☐
19 ***One or both hips/thighs/buttocks*** No 1☐ Yes 2☐	20 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐	21 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐
22 ***One or both knees*** No 1☐ Yes 2☐	23 ***Knees*** No 1☐ Yes 2☐	24 ***Knees*** No 1☐ Yes 2☐
25 ***One or both ankles/feet*** No 1☐ Yes 2☐	26 ***Ankles/feet*** No 1☐ Yes 2☐	27 ***Ankles/feet*** No 1☐ Yes 2☐

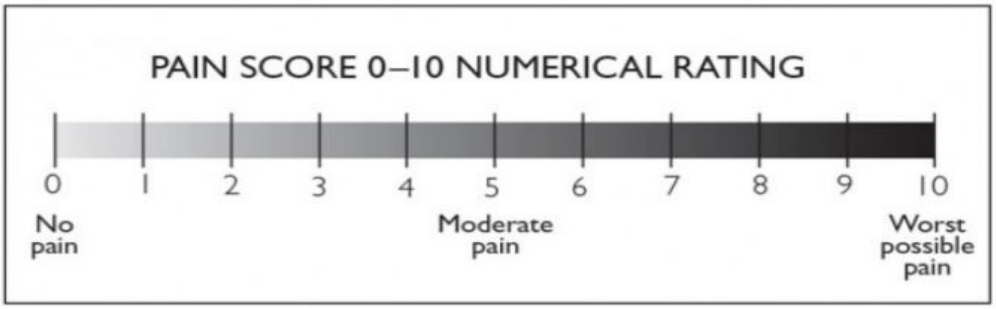
Figure 2 Musculoskeletal questionnaire

APPENDIX – IV

MIL INDEX

APPENDIX – V

Numerical Pain Rating Scale



APPENDIX – VI

Revised Oswestry Disability Index (ODI)

Name: Date:

This questionnaire is designed to enable us to understand how much your pain has affected your ability to manage everyday
activities. Please answer each Section by circling the ONE CHOICE that most applies to you. We realize that you may feel that
more than one statement may relate to you, but Please just circle the one choice which closely describes your problem right
now.

Section 1 – Pain Intensity

- I have no pain.
- The pain comes and goes and is very mild.
- The pain comes and goes and is moderate.
- The pain is moderate and does not vary much.
- The pain is severe but comes and goes.
- The pain is severe and does not vary much

Section 2 – Personal Care (washing, dressing, etc.)

- I would not have to change my way of washing or dressing in order to avoid pain.
- I do not normally change my way of washing or dressing even though it causes some pain.
- Washing and dressing increases the pain, but I manage not to change my way of doing it.
- Washing and dressing increases the pain, and I find it necessary to change my way of doing it.
- Because of the pain, I am unable to do some washing or dressing without help.
- Because of the pain, I am unable to do any washing and dressing without help.

Section 3 – Lifting

- I can lift heavy weights without extra pain.
- I can lift heavy weights but it gives extra pain.

- Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned (i.e. on a table).
- Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- I can lift only very light weights.
- I cannot lift any weight

Section 4 – Walking

- I have no pain walking.
- I have some pain walking, but I can still walk my required normal distances.
- Pain prevents me from walking long distances..
- Pain prevents me from walking intermediate distances.
- Pain prevents me from walking even short distances.
- Pain prevents me from walking at all.

Section 5 – Sitting

- Sitting does not cause me any pain.
- I can sit as long as I need provided I have my choice of sitting surfaces.
- Pain prevents me from sitting for more than 1 hour.
- Pain prevents me from sitting for more than ½ hour.
- Pain prevents me from sitting for more than 10 min
- Pain prevents me from sitting at all.

Section 6 – Standing

- I can stand as long as I want without pain.
- I have some pain while standing, but it does not increase with time.
- I cannot stand for more than one hour without increasing pain.
- I cannot stand for more than ½ hour without increasing pain.
- I cannot stand for more than 10 minutes without increasing pain.
- I avoid standing because it increases my pain right away.

Section 7 – Sleeping

- I have no pain in bed.
- I have pain in bed but it does not prevent me from sleeping well.
- Because of pain I only sleep ¾ of normal time.
- Because of pain I only sleep ½ of normal time.
- Because of pain I only sleep ¼ of normal time
- Pain prevents me from sleeping at all.

Section 8 – Social Life

- My social life is normal and cause me no extra pain.
- My social life is normal but increases the degree of pain.
- Pain has no significant effect on my social life apart from limitingmy more energetic interests, i.e. sports.
- Pain has restricted my social life and I do not go out as often.
- Pain has restricted social life to my home.
- I have no social life because of pain.

Section 9 – Traveling

- I get no pain while traveling.
- I get some pain while traveling but none of my usual forms of travel make it any worse.
- I get some pain while traveling, but it does not cause me to seek alternative forms of travel.
- I get extra pain from travel that causes me to seek alternative forms of travel.
- Pain restricts me from all forms of travel.
- Pain restricts me from all forms of travel, except that done lying down.

Section 10 – Employment / Homemaking

- My normal job/homemaking activities do not cause me pain.
- My normal job/homemaking activities cause me extra pain, but I can still perform all that is required of me.

- I can perform most of my job/homemaking duties, but pain prevents me from performing more physically stressful activities eg, lifting, vacuuming.
- Pain prevents me from doing anything but light duties.
- Pain prevents me from doing even light duties.
- Pain prevents me from performing any job or homemaking chore.