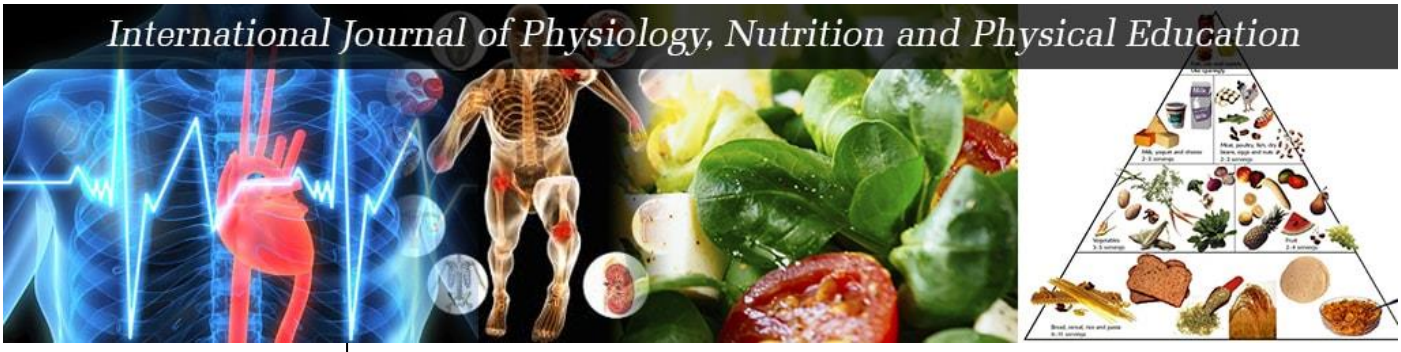

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To compare the effect of core stability exercise versus posterior pelvic tilt exercises on chronic low back pain

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Abstract
Background: Major concern facing individual with chronic mechanical LBP is limited function ability and pain. There are many therapeutic approach used to restore motion and maintain the posture and regain the functional range.
Aim: To compare the effect of core stability exercise versus posterior pelvic tilt exercises on chronic low back pain.
Method: 30 patients who fulfilled the criteria were selected and divided into two groups of 15 each. Group A core stability exercises and Group B posterior pelvic tilt exercise. Intervention given for 4 weeks and pre and post scoring done by NPRS and RMDS.
Result: Paired t test and independent t test were used to analyze data for statistical significant among groups. Result shows a statistically significant difference in both groups and group A is more significant than group B.
Conclusion: This study concluded that core stability exercises are more effective on chronic mechanical LBP.

Keywords: Low back pain, lordosis, functional limitation, core stability exercises, posterior pelvic tilt exercises, NPRS, Roland Morris disability questionnaire

Introduction
Low back pain (LBP) is the most common musculoskeletal condition affecting the adult population. Chronic LBP (CLBP) is a chronic pain syndrome in the lower back region, lasting for at least 12 weeks. CLBP represents the leading cause of disability worldwide and is a major welfare and economic problem [1].
Almost one third of the patients who have pain as the chief complaint. Majority of them had chronic pains. Females report pain much more commonly than males and surprisingly young and middle-aged report chronic pain more than elderly [2].
Chronic low back pain affects up to 23% of the population worldwide, with an estimated 24% to 80% of patients having a recurrence at one year [3]. 75-84% of the general population suffer from low back pain and among them, it is estimated that 5-10% of the people experience LBP resulting in severe morbidity, increased health care costs, sick leaves and individual suffering [4]. LBP is one of the most common painful situations rising from muscular indolence. Equally circulated among gender 45% of men and 58% in women who suffering from LBP [5]. Low back pain is usually nonspecific or mechanical. Mechanical low back pain refers to back pain that arises intrinsically from the spine, intervertebral disks, or surrounding soft tissues. This includes lumbosacral muscle strain, disk herniation, lumbar spondylosis, spondylolisthesis, spondylolysis, vertebral compression fractures, and acute or chronic traumatic injury. Most patients who experience activity-limiting low back pain go on to have recurrent episodes [3].
Several factors have been associated with the development of LBP are [6],

- Pelvic Tilt
- Abdominal Muscle Length and Strength
- Back Extensor Muscle Endurance
- Back Extensor Muscle Flexibility
- Iliopsoas Muscle Length
- Hamstrings Muscle Length

- Leg Length Discrepancy
- Iliotibial Band Tightness
- Foot Pronation
- Triceps Surae Muscle Flexibility
- Hip Abductor and Adductor Muscle Flexibility and Strength

Based on the anatomic relationship between the pelvis and the lumbar spine, it has been speculated that changes in the pelvic inclination affect the size of the lumbar lordosis and cause LBP. Although Roncaratiand McMullen found that there was an increased anterior pelvic tilt in patients with LBP [6].

Ithas been speculated that abdominal muscle weakness produces an anterior pelvic tilt and lumbar hyper lordosis, resulting in LBP. In addition, several studies have found decreased abdominal muscle strength in patients with LBP [6].

Chronic Low Back Pain with Movement Coordination Impairments Presence of 1 or more of the following [7]:

- Low back and/or low back–related lower extremity pain that worsens with sustainedend-range movements or positions
- Lumbar hypermobility with segmental motion assessment
- Mobility deficits of the thorax and lumbopelvic/hip regions
- Diminished trunk or pelvic-region muscle strength and endurance
- Movement coordination impairments while performing community/work-related recreational or occupational activities

Since exercise is the mainstay of treatment of low back pain prescribed by physical therapist, it is important to determine the type of exercise that is most specific and targeted in management of low back pain. The main objective of this study was to compare the effectiveness of specific stabilization exercises provided in patients with mechanical chronic mechanical low back pain [8].

Exercises for low back pain have evolved over the period of time with specific emphasis on the maintaining the spinal stability. These types of
core stabilization exercises are aimed at improving the neuromuscular control, endurance, strength of muscles central to maintaining dynamic spinal stability. Transversus abdominis, lumbar multifidi, and other paraspinal, abdominal, diaphragmatic, and pelvic musculature are targetedin core stabilization exercises [8].

Generally, anterior pelvic tilt is associated with excessive lumbar lordosis angle. For this reason, clinicians recommend various posterior pelvic tilt exercises be performed in the lying, sitting, or standing positions for LBP with excessive lordosis [9].

Prescribing individual resistance exercises for strengthening of the posterior pelvic tilt muscles of a LBP patient with excessive lordosis leads increase lumbar ROM and low back pain decreased [10].

The RDQ is a health status measure created to assess physical disability from LBP and it is one of the most used in research or clinical settings for monitoring patients. The questionnaire is simple to complete and easily understood by patients. Patients completing the RDQ have to mark statements which describe themselves that day. The RDQ score correlate well with the data obtained from other physical function score systems, such as the QBPDS and the ODI. The RDQ has good construct validity, internal consistency, responsiveness and reliability [11].

Numerical Pain Rating Scale (NPRS) is an ordinal and subjective scale which can be used for older or less literate, or for the one having sustained trauma. NPRS is quicker to score and therefore used in greater range of patients. Although having several advantages; capacity to detect the change is less [2].

Need of the Study

Chronic LBP represents the second leading
cause of disability worldwide being a major welfare and economic problem. Answering the question "what is the pain generator" among the several structures potentially involved in Chronic LBP is a key factor in the management of patients. Some studies suggests that there is association exists between the length of the abdominal muscles and the size of the lumbar lord osis so In this study an attempt is made to provide a brief clinical guide and find out the effect of core stability exercise versus posterior pelvic tilt exercises on chronic low back pain due to lack of comparative studies.

Review of Literature

1. Jella R *et al*. (2018) 75-84% of the general population suffer from low back pain and among them, it is estimated that 5-10% of the people experience LBP resulting in severe morbidity, increased health care costs, sick leaves and individual suffering. It is also one of the common reasons for a person to seek medical help.
2. Guna Sankar Ahdhi *et al*., (2018) Prevalence of low back pain and its relation to quality of life and disability among women in the rural area of Puducherry, India concluded that Prevalence of low back pain among women was comparatively more than other studies in India. Although moderate disability was more among those with low back pain, overall QOL was good.
3. Archana N. Deshpande (2018) Back pain was found to be the most common chronicpain condition, the prevalence being 24.84% among the patients with chronic pain. It included unilateraland bilateral pain, pain in the center of back/buttock pain/pain radiating to leg, or nonspecific back pain involving the whole of back.
4. Joshua SW *et al*., (2018) Mechanical low back pain refers to back pain that arises intrinsically from the spine, intervertebral disks, or surrounding soft tissues. This includes lumbosacral muscle strain, disk herniation, lumbar spondylosis, spondylolisthesis, spondylolysis, vertebral compression fractures, and acute or chronic traumatic injury [1]. Repetitive trauma and overuse are common causes of chronic mechanical low backpain, which is often secondary to workplace injury.
5. Edward A. Shipton (2018)I n chronic low back without serious pathology, recommended primary conservative physical treatment preferences include exercise,yoga, biofeedback, progressive relaxation, massage, manual therapy, and inter disciplinary rehabilitation.
6. Nadine EF *et al*., (2018) Recommended physical treatments, particularly for persistent low back pain (>12 weeks duration), includea graded activity or exercise programmed that targets improvements in function and prevention of worsening disability.
7. Muhammad WK *et al*., (2017) Core stabilization exercise is more effective than routine physical therapy exercise in terms of greater education in pain in chronic nonspecific low backpain.
8. Won-Gyu Yoo (2014) prescribing individual resistance

exercises for strengthening of the posterior pelvic tilt muscles of a LBP patient with excessive lordosis leads to limited lumbar ROM increased and low back pain decreased.

9. Anthony D *et al*., (2012) Clinicians should consider utilizing trunk coordination, strengthening, and endurance exercises to reduce low back pain and disability in patients with subacute and chronic low back pain with movement coordination impairments.
10. Phan *et al*. (2012), Assessment of Pruritus Intensity: Prospective Study on Validity and Reliability of the Visual Analogue Scale, Numerical Rating Scale and Verbal Rating Scale in 471 Patients with Chronic Pruritus, concluded that high reliability and concurrent validity was found for VAS, NRS and VRS. On re-test, higher correlation and less missing values were observed. A training session before starting a clinical trial is recommended.
11. Raymond W.J.G Ostelo *et al*. (2003), 24-item Roland-Morris Disability Questionnaire was preferred out of six functional status questionnaires for post-lumbar disc surgery concluded that the use of the RDQ-24 for this specific post-surgery population is suggested. The optimal cut-off point of the RDQ-24 that minimizes the overall classification error was found to be 3.5 with a sensitivity of 94.6% and a specificity of 88.2%.
12. Ng, Joseph K. F. *et al*. (2001), Range of Motion and Lordosis of the Lumbar Spine: Reliability of Measurement and Normative Values concluded that, Inclinometer and lumbar rotameter measurements with the use of a pelvic restraint device are reliable for measuring lumbar spine range of motion. Use of the inclinometer technique to record lumbar lordosis also is a reliable measure.

Materials and Method

Study Design: Comparative Study

Study Setting: Various physiotherapy clinics of Ahmadabad city

Sampling Technique: ConvenientSampling

Study Population: Patients with Chronic low back pain

Study Sample: 30 patients

Study duration: 6 months

Inclusion Criteria [13]

- Chronic(>3 months)Patients with mechanical low back pain
- Both male and female.
- Age group between 25-65 years [9].

Exclusion Criteria [13]

- History of hospital admission in the past six months.
- People who are taking analgesic
- Subject who have neurological back pain.

Material Used In Study

- Pencil
- Pen
- Plinth
- Chair
- Measure tape
- Weighing machine
- Stadiometer
- Foam surface

Procedure

This study used a comparative study design to compare the effect of Core Stability exercises versus posterior pelvic tilt exercises on chronic low back pain**.** Total 30 patients were taken from various physiotherapy clinics of Ahmedabad city by convenient sampling. All the patients were explained about procedure involved in the study before the enrolment in the study. Institutionally approved written consent was obtained from the patients before the study who fulfilled both the criteria.

On the first visit a complete physical assessment was done and patients randomly divided into 2 groups.

Group A Core Stability exercises (n=15)

Group B Posterior Pelvic Tilt exercises (n=15)

To evaluate LBP and functional assessment before and after intervention, outcome measures used in the study were Numerical Pain Rating Scale and Roland Morris Disability Questionnaire Scale.

Basic Demographics: Name, age, gender, occupation, address.

Basic Anthropometry: Height was measured by wall Stadiometer Weight measured by the digital bathroom scale BMI calculated by the formula weight (kgs)/height^2 (meters)^2.

Outcome Measure

NPRS (Numerical pain rating scale) [14, 15]

- **Purpose:** The NPRS for pain is a unidimensional measure of pain intensity in adults, including those with chronic pain due to rheumatic diseases. Although various iterations exist, the most commonly used is the 11-item NPRS, which is described here.
- **Content:** The NPRS is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of their pain. The common format is a horizontal bar or line. Similar to the pain VAS, the NPRS is anchored by terms describing pain severity extremes.
- **Number of items:** The pain NPRS is a single 11-point numeric scale.
- **Response options/scale:** An 11-point numeric scale (NPRS 11) with 0 representing one pain extreme (e.g., “no pain”) and 10 representing the other pain extreme (e.g., “pain as bad as you can imagine” and “worst pain imaginable”).
- **Recall period for items:** Varies, but most commonly respondents are asked to report pain intensity “in the last 24 hours” or average pain intensity. The reliability of NPRS is 0.95 AND 0.96. Validity is 0.86 to 0.95.

RMDQ (Roland-Morris Disability Questionnaire) [16, 17]

- The RDQ is a health status measure designed to be completed by patients to assess physical disability due to low back pain. It was designed for use in research (e.g., as an outcome measure for clinical trials) but has also been found useful for monitoring patients in clinical practice. It was originally designed for use in primary

care in the United Kingdom but has been used in a variety of other settings.

- Patients completing the RDQ are asked to place a check mark beside a statement if it applies to them that day. This approach was chosen to make it suitable for observing short-term changes in back pain (e.g., the relatively rapid resolution of symptoms of most patients seen in primary care) or short-term changes in response to treatment. The RDQ score is calculated by adding up the number of items checked. Items are not weighted. The scores therefore range from 0 (no disability) to 24 (maximum disability). Although designed for administration on paper, the RDQ has also been satisfactorily administered on computer and by telephone.RM-Sw is a reliable and valid measure of functional ability in low back pain. Reliability is 0.42-0.91.

Trunk Flexion Range of Motion [18]

The spine may be measured from the C7 to s1 spinous process with the patient in the normal standing position. The patient is then asked to bend forward, and the spine is again measured. A '10-cm (4-inch) difference in tape measure length is considered normal. In this the examiner measuring movement in the lumbar spine as well as the thoracic spine most movement, approximately 7.5cm (3 inches), occurs between T12 and s1.

Intervention

The patients in group A Core Stability exercises received pelvic floor exercises, single leg stand on foam surface, hip bridge with SLR.

The patients in group B Posterior Pelvic Tilt exercises received cat camel pose, double leg abdominal lift, bird dog with arm leg raise.

Both the groups underwent the protocol of 10 repetitions 10 secs hold of each exercise once a day, 5days per week up to 4 weeks.

Result

- SPSS version 20.0 for windows was used for the statistical analysis. Microsoft Excel and the word were used to generate graphs and tables.

Statistical test

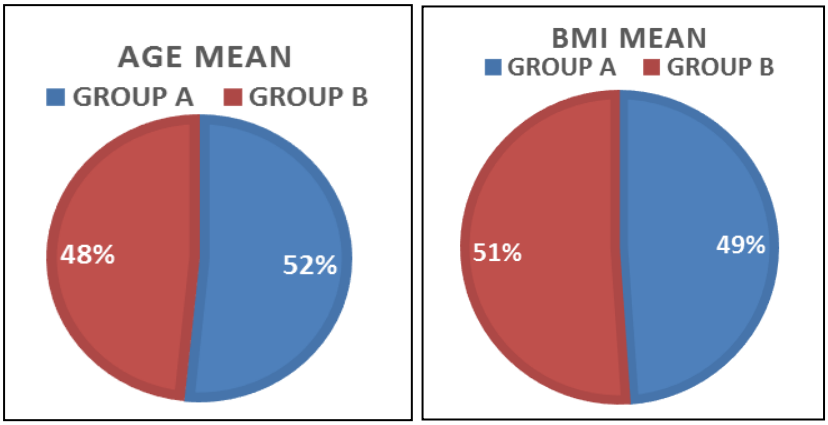
- The Paired t test for intra group analysis an Independent t test for inters group analysis because the outcome measure shows ordinal data.
- A p-value less than 0.05 were considered statistically significant.

The study involved 30 patients with mechanical CLBP. Results are presented for 30 patients (15 Patients in group A and 15 patients group B).

Demographic Distribution of the patients with chronic mechanical low back pain

Demographic Data		Group A	Group B
Age	Mean	37.33	35
	SD	3.109	4.721
BMI	Mean	24.13	25.21
	SD	3.175	3.239

Interpretation: The above table shows the mean value and standard deviation of age and BMI in patients with chronic mechanical low back pain

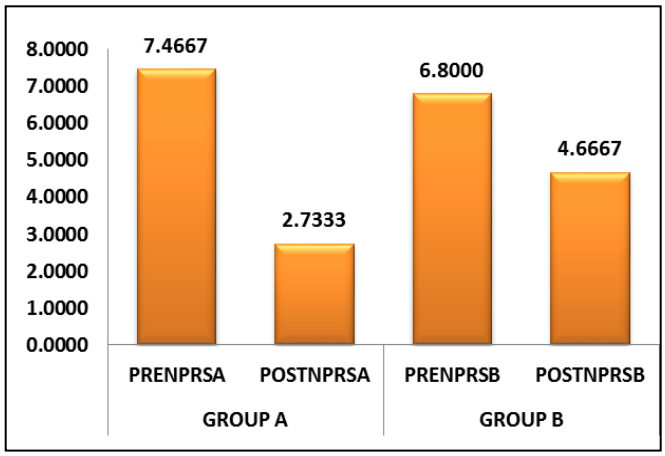


Mean of age and BMI in patients with chronic mechanical low back pain

Intra Group Comparison of Numerical Pain Rating Scale of Group A and B with Paired T-Test

Numerical Pain Rating Scale	Pre Mean ±SD	Post Mean ±SD	T Value	P Value
Group A	7.47 ±.915	2.73 ± 1.033	16.669	.000
Group B	6.80 ± 1.859	4.67 ± 1.718	16.00	.000

Interpretation: The above table shows the P value <0.05 which is statistically significant



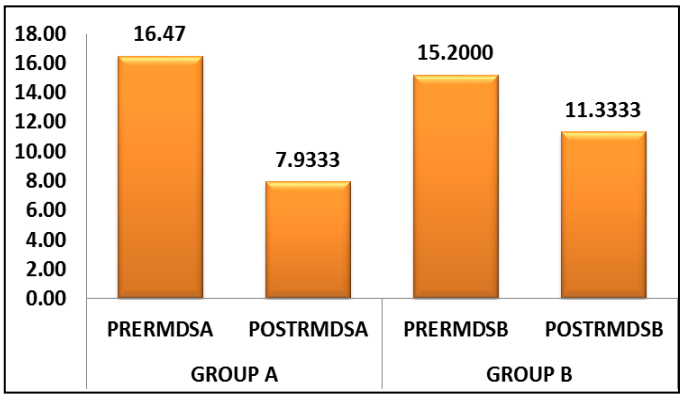
Intergroup Analysis of Numerical Pain Rating Scale of Group A and B

Interpretation: The above graph shows the mean value of pre and post NPRS that suggest improvement in the pain intensity after both the treatment.

Intra Group Comparison of Roland Morris Disability Questionnaire of Group A, and B with Paired T-Test

Roland Morris Disability Questionnaire	Pre Mean ±SD	Post Mean ±SD	T Value	P Value
Group A	16.47± 3.482	7.93± 2.840	7.341	.000
Group B	15.20± 3.448	11.33± 3.309	12.614	.000

Interpretation: The above table shows the P value <0.05 which is statistically significant



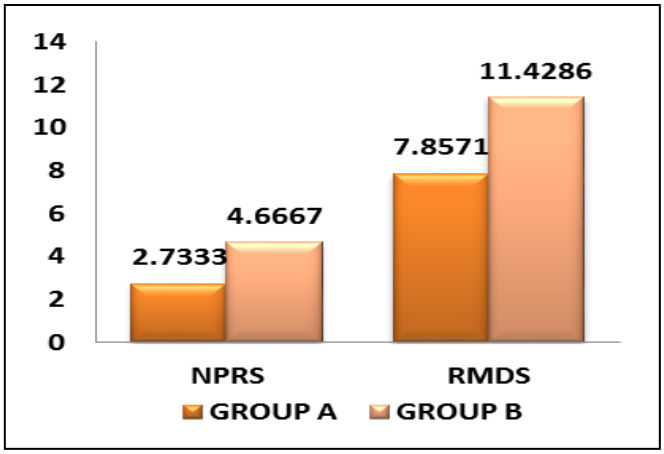
The Intra Group Analysis of Roland Morris Disability Questionnaire of Group A and B

Interpretation: The above graph shows the mean value of pre and post RMDS that suggest improvement in the functional ability after both the treatment.

Inter Group Analysis

Outcome Measure	Mean (POST)		standard deviation	P value
	Group A	Group B		
NPRS	2.7333	4.6667	.51763	.001
RMDS	7.8571	11.4286	1.20243	.006

Inter group analysis in table suggest that group A shown significant improvement than group B. There is more significant improvement in pain in patient with chronic mechanical LBP.



Inter Group Analysis

Discussion

The purpose of the study was to find out of the effectiveness of active mean of Intervention for the low back pain in patients with chronic mechanical LBP to improve in pain intensity, quality of life.

The important finding is a statistically significant improvement in the pain is more than functional ability in group A than group B. So, the null hypothesis is rejected which suggest that there is significant difference between core stability exercise versus posterior pelvic tilt exercises on chronic low back pain.

The findings were similar to Brumitt J The transverse abdominus and multi fidus muscles serve as the primary generators of intra-abdominal pressure: electro myographic activity has been demonstrated immediately before extremity movement. These findings have led many to adopt the idea that activation of these core stabilizers is a normal precursor to dynamic contractions of the extremity musculature. Promoting this perception was the finding that patients reporting LBP displayed decreased electro myographic activity in the transverse abdo minus and multi fidus muscles.[19]

Brian J suggest that core stability exercise was more effective than general exercise for decreasing pain and increasing back-specific functional status in patients with LBP. [20]

Vass E had suggested that inefficient muscular stabilization of the lumbar spine associated with low back pain. A motor control evaluation of transversus abdominis was t*he delayed onset of contraction of transversus abdominis indicates a deficit of motor control and is hypothesized to result in inefficient muscular stabilization of the spine* [21].

It may be worth noting that there are somewhat similar alternatives in which the patient draws in the abdomen in a manner similar to that of the pelvic tilt exercise but without tilting the pelvis or flattening the lumbar spine [22, 23]. However, abdominal hollowing does not seem to activate the abdominal muscles to the same degree as the pelvic tilt [24, 25].

Neutral spine is the foundation of good postural control, regardless of sport. But to be able to hold good neutral spine against body movement or loading, you have to know how to tilt and hold your pelvis [26].

Won-gyuyoo suggested that individual resistance exercises is necessary for the effective and fast strengthening ofthe pelvic posterior tilt muscles in case of LBP with excessive lordosis [10].

Previous study founded that the long-lever posterior-tilt plank significantly increases muscle activation compared to the traditional prone plank. The long-lever component tends to

contribute more to these differences than the posterior-tilt component [27].

Both groups of patients experienced similar amounts of reduction in pain and increases in function after core stability exercises and posterior pelvic tilt exercise but patient with group A core stability exercise had more reduction in pain and functional improvement. One of the long-held perceptions regarding the treatment of LBP is that the muscular boundaries of the lumbopelvic area provide a corset-like stability that leads to a stable spine. This thought arose from the functional anatomy of the core musculature, such that increased intra-abdominal pressure leads to stiffness of the stabilizing muscles [19].

Limitations

- Small sample size
- Shorter study duration

Conclusion

Patients of both groups had experienced similar amounts of reduction in pain and increases in function after core stability exercises and posterior pelvic tilt exercise but patient with group a core stability exercise had more reduction in pain and functional improvement. This study concluded that core stability exercises are more effective on chronic mechanical low back pain.

Summary

Low back pain (LBP) is the most common musculoskeletal condition affecting the adult population. Most patients who experience activity-limiting low back pain go on to have recurrent episodes. Chronic Low Back Pain with Movement Coordination Impairments of lumbo pelvic/hip regions. Exercises for low back pain have evolved over the period of time with specific emphasis on the maintaining the spinal stability but here in this study purpose is to compare the effect of core stability exercise versus posterior pelvic tilt exercises on chronic low back pain.30 patients who fulfilled the criteria were selected and divided into two groups of 15 each. Group A Core stability exercise and Group B posterior pelvic tilt exercise. Intervention given for 4 weeks and pre and post scoring done by NPRS and RMDS. Paired T Test and independent t Test were used to analyze data for statistical significant among groups. Result shows a statistically significant difference in both groups and group A is more significant than group B. This study concluded that core stability exercises are more effective in chronic LBP.

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