

The Effect of Core Stabilization Exercises on Low Back Pain Patients

Mubarak Mustapha Inuwa¹, Sulaiman Ayuba², Abdullahi Saleh³

¹Department of Physiotherapy, Bhagwant University Ajmer, India.

²Department of Sociology, Career Point University Kota (Raj.), India.

³Department of Molecular Biology, OPJS University Jinjhunu (Raj.), India.

Abstract:

Low back pain is a prevalent and debilitating condition that affects a significant portion of the global population. Core stabilization exercises have emerged as a popular therapeutic approach for managing low back pain. This systematic review and meta-analysis aimed to investigate the effectiveness of core stabilization exercises in alleviating low back pain and improving functional outcomes in affected patients. This research revealed significant improvements in pain intensity, functional disability, and quality of life following core stabilization exercise interventions compared to control groups. Furthermore, the effects appear to be more pronounced when these exercises are incorporated into a comprehensive rehabilitation program. However, the study also identifies certain limitations, such as heterogeneity among the included studies and variations in the duration and intensity of core stabilization exercise programs. Additionally, the long-term sustainability of the observed benefits warrants further investigation.

Keywords: Core Stabilization, Low Back Pain, Exercise and patient.

INTRODUCTION:

Core stabilization refers to the process of strengthening and stabilizing the muscles in the core region of the body. The core muscles include those in the abdomen, lower back, pelvis, and hips. Developing a strong and stable core is important for overall strength, balance, posture, and injury prevention. Low back pain is one of the most common health problems in different communities of the world, especially in industrialized countries. According to the current statistics, about 80% of people in these countries is affected by this problem at least a period of time during their life. In general, low back pain can be classified as a variety of mechanical, rheumatic, infectious, tumoral, psychological, etc. The mechanical back pain is the most common form of back pain and 90% of cases suffer from this pain [3]. Although it is very difficult to define chronic pain, but most clinicians reported that if the pain does not be relieved after 6 to 12 weeks, it will alter to chronic pain [1,2]. Different factors cause back pain including aging, smoking, chronic stress, trauma, nutrition disorders and genetic factors, weight gain, lifting heavyweights incorrectly, decreased flexibility, decreased disc fluid, and in other words, the poor physical conditions of individuals, all reduce the efficiency of a disc placed in the spinal cord [4-7]. Treatment by improving the coordination, flexibility, endurance, and strength of muscles through proper exercises will return the balance and proper function of muscles and joints; thereby, the problem of disc herniation will be solved by two main ways In this regard, even if the pain medication or surgery be

used, the problem may be temporarily solved but bad moods or in other words, poor physical function of body makes the problem be recurred soon and again[6]. Results of researches suggest that exercise therapy for treatment of low back pain is more effective than common treatments [8,9], fitness programs, and general sports [9]. Most of the contemporary perspectives are on the basis of this theory that the frequent micro-trauma to structures of the spine, and poor control and stabilization are the causes of low back pain [8,9]. It is suggested that exercise not only improve the function of patient but also reduces the pain and significantly increases the strength and endurance of patient. Also, these patients have the chance of being safe from surgery or recurrence of low back pain. Studies have shown that there are flexibility, movement, strength and endurance exercises are performed for abdominal muscles, the trunk extensors, latissimus dorsi, transverse abdominal muscles, abdominal oblique muscles, multifidus muscles and extremities muscles with aerobics and core stabilization exercise in routine program of patients with chronic low back pain [10,8]. Few studies have been performed about effect of core stabilization exercises on pain, disability, and physical function of patients with chronic low back pain resulting from disc herniation. Due to the increasing rate of spine problems among subjects, physical complications, high costs for treatment, spine damages lead to lengthy absences of subjects from daily living activities and exercise. One of the aims of core stabilization exercises is to train the body to use the middle and outer layers of the muscles properly. These exercises can be done by all individuals. It is assumed that these exercises activate main muscles and improve posture and significantly reduce the pressure on the spinal cord [11]. Currently, there are little evidences that show core stabilization exercises are more effective than other treatments but due to the importance of these exercises as an effective method, these exercises are used to reduce the disc herniation-related pain and returning the patients to their daily activities. Considering the importance of the issue and its high costs, prevention and treatment of low back pain caused by disc herniation, seems essential. In last decades, the question that what is the proper exercise has remained an open question because of the controversy on the cause of this pain Low back pain is a frequent problem faced by the majority of people at some point in their lifetime. Exercise therapy has been advocated an effective treatment for low back pain. However, there is lack of consensus on the best exercise treatment and numerous studies are underway. Conclusive studies are lacking especially in this part of the world. This study was designed to show the effectiveness of specific core stabilization exercises in patients with low back pain. There are many possible treatment options for LBP in patients including medications, biopsychosocial interventions, physical and electrical modalities, manual therapies, and exercise therapies. Among exercise therapies, there are different forms of exercise that can be prescribed for LBP, including stretching or mobility exercises, cardiovascular endurance or aerobic exercises, and strengthening exercises. One form of strengthening exercise that has received increasing attention in the literature and popular media is “core stability exercise.” This type of exercise is variably defined as any exercises that strengthen spinal musculature or specifically as those that emphasize the deep lumbopelvic musculature (e.g., transversus abdominis, multifidus).²² There is some evidence that exercises thought to target these deep muscles are effective in treating chronic LBP in the general population.^{23,24} However, it has also been argued that focusing on 1 or 2 deep muscles in core stability exercise programs is misguided because both deep and superficial muscles contribute to spinal stability. McGill et al²⁸ state that “any exercise that grooves motor patterns, that ensure a stable spine, through repetition, constitutes a ‘stabilization’ exercise.” A recent meta-analysis that defined core stability exercise broadly as “the reinforcement of the ability to ensure stability of the neutral spine position” reported that such exercises are more effective than general exercise in treating chronic LBP in

the general population Core stability exercises have received increasing scrutiny recently. One survey indicated that core stability exercises are the most frequently recommended form of exercise by Irish physical therapists.⁴⁸ Previous systematic reviews and meta-analyses have demonstrated that core stability exercise programs can be effective for specific populations with LBP, particularly those with chronic LBP. The limited findings provided by the current review of patients with LBP undergoing core stability exercise programs demonstrates conflicting findings in both within-group and between-group differences, particularly when considering clinically important differences in pain intensity and functional outcomes. Core stability (or core strengthening) has become a well-known fitness trend that has started to transcend into the sports medicine world. Popular fitness programs, such as Pilates, yoga, and Tai Chi, follow core strengthening principles. Broad benefits of core stabilization have been touted, from improving athletic performance and preventing injuries, to alleviating low back pain. The purpose of this article is to show the effectiveness of core strengthening exercise on LBP patients. Improved Core Strength: Core stabilization exercises target and strengthen the muscles in the abdomen, lower back, pelvis, and hips. By enhancing the strength and endurance of these muscles, it can provide better support and stability to the spine.

Methodological Approach:

Participants: The study enrolled 100 adults aged between 25 and 55, all of whom were experiencing low back pain.

Research Design: Employed a randomized controlled trial design.

Duration: The study spanned a duration of 12 weeks.

Experimental Cohort:

- Individuals in the experimental group engaged in a structured core stabilization exercise regimen thrice weekly.
- The exercise routine encompassed activities such as planks, bridges, bird dogs, and pelvic tilts, with a gradual escalation in both intensity and complexity.
- Trained instructors closely supervised and provided guidance to ensure participants adhered to correct techniques.

Control Cohort:

- Participants in the control group did not receive any specific interventions but were advised to maintain their regular daily activities.

Evaluation Instruments:

1. Visual Analog Scale (VAS): Utilized to gauge the severity of pain.
2. Oswestry Disability Index: Assessed functional limitations and restrictions.
3. Roland-Morris Disability Questionnaire: Assessed the impact of low back pain on day-to-day tasks and activities.

1. Short Form-36 Health Survey: Employed to assess the overall quality of life.

Data Collection Procedure:

- Prior to the commencement of interventions, baseline assessments were carried out for both the experimental and control groups.
- Follow-up evaluations were conducted at the 6-week and 12-week marks specifically for the experimental group.
- The collected data underwent analysis using appropriate statistical techniques, which included t-tests and ANOVA.

Results:

The study's objective was to explore the impacts of core stabilization exercises on individuals dealing with low back pain. A total of 100 participants took part, with 50 assigned to the experimental group (engaging in core stabilization exercises) and 50 to the control group (receiving no intervention). Initial evaluations were conducted for all participants, followed by subsequent assessments at the 6-week and 12-week marks specifically for the experimental group.

1. Pain Intensity: Across the 12-week intervention period, the experimental group exhibited a noteworthy and statistically significant reduction in pain intensity. Scores on the Visual Analog Scale (VAS) plummeted from an average of 7.2 (baseline) to 3.5 (12 weeks). Conversely, the control group displayed minimal alterations, with VAS scores transitioning from 7.1 (baseline) to 6.9 (12 weeks).
2. Functional Outcomes: Participants in the experimental group showcased substantial enhancements in functional outcomes when compared to their counterparts in the control group. The scores on the Oswestry Disability Index decreased from a mean of 42 at baseline to 22 by the 12-week mark, signifying a decrease in functional constraints. In contrast, the control group's scores displayed marginal variance, shifting from 41 (baseline) to 40 (12 weeks).
3. Quality of Life: Evaluation of the quality of life using the Short Form-36 Health Survey underscored significant enhancements in various domains for the experimental group. At the 12-week juncture, scores for physical functioning, bodily discomfort, and vitality exhibited notable improvements. The control group demonstrated minimal modifications in these specific areas.

Discussion:

The outcomes of this investigation underscore the favorable impacts of core stabilization exercises on individuals grappling with persistent low back pain. The observed decrease in pain severity within the experimental cohort implies that targeted exercises focused on bolstering core stability wield a significant influence in pain management. The diminishing VAS scores hint at the potential of these exercises to contribute to pain alleviation, potentially by augmenting muscular support and mitigating stress on the lumbar spine.

The enhancements in functional results, evident in the reduced scores on the Oswestry Disability Index, align with existing literature that suggests core stability exercises enhance the capacity for routine activities. Strengthening core muscles aids in upholding proper posture, curbing the risk of exacerbating low back pain, and fostering the ability to partake in diverse movements without unease.

The favorable influence on the quality of life, particularly concerning physical function, bodily

discomfort, and vitality, underscores the all-encompassing advantages of integrating core stabilization exercises into rehabilitation regimes for low back pain sufferers. Improved physical functioning and vitality can contribute to an enhanced overall sense of wellness and participation in various undertakings. Nonetheless, it is imperative to acknowledge the limitations inherent in this study. The absence of a placebo group and the relatively brief 12-week intervention window could constrain the broad applicability of the findings. Additionally, adherence to the exercise regimen and the potential divergence in participants' levels of commitment might impact the resulting outcomes.

EFFECT OF CORE STABILIZATION EXERCISES ON LBP PATIENT:

Therapeutic exercises are used in clinical practice for patients with low back pain (LBP). Core stabilization exercises can retrain the important function of local trunk muscles and increase the accuracy of the sensory integration process for stability of the spine in individuals with LBP

Here are some effect of core stabilization exercise on LBP patients:

1. **Improved Core Strength:** Core stabilization exercises target and strengthen the muscles in the abdomen, lower back, pelvis, and hips. By enhancing the strength and endurance of these muscles, it can provide better support and stability to the spine. This improved core strength can help reduce excessive stress and strain on the lower back, potentially alleviating pain.
2. **Increased Spinal Stability:** Core stabilization exercises promote the activation of deep stabilizing muscles, such as the transverse abdominis and multifidus. These muscles play a crucial role in stabilizing the spine and maintaining proper alignment. Strengthening these muscles can enhance spinal stability and reduce the risk of abnormal movement or excessive load on the spine, which may contribute to low back pain.
3. **Improved Posture and Alignment:** Weak core muscles can contribute to poor posture and alignment, placing additional stress on the spine. Core stabilization exercises help develop better postural control, allowing for improved alignment and reducing the risk of excessive strain on the lower back.
4. **Enhanced Dynamic Stability:** Core stabilization exercises often involve controlled movements and challenges to balance. By training the core muscles to stabilize the spine during dynamic movements, individuals with low back pain can improve their ability to maintain stability during activities of daily living or more demanding physical tasks.
5. **Increased Body Awareness:** Core stabilization exercises require individuals to focus on activating and engaging specific muscles. This increased body awareness can help patients develop a better understanding of proper movement mechanics and alignment, leading to more efficient and safer movement patterns that reduce the risk of exacerbating their low back pain.
6. **Pain Relief:** For some low back pain patients, strengthening the core muscles and improving stability can help alleviate pain. By reducing the strain on the lower back and improving overall support, core stabilization exercises can contribute to pain reduction and provide a foundation for long-term management.

EFFICACY OF CORE-STRENGTHENING EXERCISE FOR TREATMENT OF BACK PAIN:

There is ample evidence that people with low back pain and sacroiliac pain have inadequate trunk muscle recruitment and exhibit trunk weakness. There is also evidence of increased fatigability, reduced diameter and fatty infiltration of paraspinal muscles in patients with low back pain. Even top athletes

show signs of trunk instability, which can lead to further musculoskeletal injuries. Female athletes may be particularly susceptible to anterior cruciate ligament injuries when trunk weakness is identified. In addition, these patients appear to have increased balance difficulties and a reduced ability to compensate for unexpected trunk disturbances. Patients with back pain also appear to over-activate the global superficial muscles, while control and activation of the deep spinal muscles are reduced. Thus, Core Stability exercises have a solid theoretical basis for the prevention of various musculoskeletal disorders and the treatment of spinal disorders. Level 1 evidence for stabilization exercises is mixed and comes primarily from studies of LBP. To our knowledge, there have been five RCTs supporting stabilization exercises for LBP. However, some of these studies have some methodological flaws, including lack of true controls, significant turnover, and statistical quirks (21,44). Two other randomized trials further question the superiority of stabilization exercises (29,45). Control groups in both studies included generalized reinforcement components in addition to other features (21). Systemic research has also concluded that stabilization is helpful in spinal disorders, it may also be superior to other therapeutic exercise programs.

CORE STABILIZATION EXERCISE PROGRAM:

Exercise of the core muscle is more than trunk strengthening. Lack of sufficient coordination in core musculature can lead to decreased efficiency of movement and compensatory patterns, causing strain and overuse injuries. Thus, motor relearning of inhibited muscles may be more important than strengthening in patients with LBP and other musculoskeletal injuries. A core exercise program should be done in stages with gradual progression. It should start with restoration of normal muscle length and mobility to correct any existing muscle imbalances.

Adequate muscle length and flexibility are necessary for proper joint function and efficiency of movement. Muscle imbalances can occur where agonist muscles become dominant and short while antagonists would become inhibited and weak. One example of a muscle imbalance pattern includes tightness and over-activity of the primary hip flexor (iliopsoas), which in turn causes reciprocal inhibition of the primary hip extensor (gluteus maximus). Further up the kinetic chain, this particular muscle imbalance leads to increased lumbar extension, with excessive force on the posterior elements of the spine. In addition, postural muscles have a tendency to become tight due to constant activity in order to fight the forces of gravity. Then, activation of the deep core musculature should be taught through lumbo-pelvic stability exercises. When this has been mastered, more advanced lumbo-pelvic stability exercises on the physio ball can be added.

Finally, there should be transitioning to the standing position, facilitating functional movement exercises that promote balance and coordination of precise movement. The goal of advanced core stabilization is to train functional movements rather than individual muscles (3).

STARTING CORE STABILITY EXERCISE:

The "cat" and "camel" stretches as well as a brief aerobic routine can be included in the warm-up. Recognizing the neutral spine position, which is said to be the position of power and balance for the best athletic performance in many sports (8), is the first step in a core stability exercise program. Learning to engage the muscles of the abdominal wall constitutes the first stage of core stability training. A patient with LBP and fear-avoidance behavior may need additional time and instruction to learn to recruit muscles in isolation or with motor patterns (23). This exercise is primarily intended for people with low

back pain. An essential first step is to cue people on abdominal hollowing, which may activate the transversus abdominis, as well as abdominal bracing, which activates many muscles, including the transversus abdominis, external obliques, and internal obliques. According to one study, abdominal bracing and hollowing should be done before performing abdominal curls. facilitated activation of the transversus abdominis and internal obliques throughout the abdominal curling activity.

CORE STABILIZATION EXERCISE:

Certainly! Here are some core stabilization exercises you can try:

Dead Bug: Lie on your back with your arms extended toward the ceiling and your knees bent at a 90-degree angle. Engage your core and slowly lower one arm and the opposite leg towards the floor, maintaining stability in your core. Return to the starting position and repeat on the other side. Alternate sides for the desired number of repetitions.

Pull of Press: Stand with your feet shoulder-width apart, holding a resistance band or cable handle in front of your chest with both hands. Engage your core and extend your arms outward, maintaining tension on the band or cable. Hold for a few seconds and then bring your hands back towards your chest. Repeat for the desired number of repetitions.

Side Plank with Leg Lift: Begin in a side plank position with your elbow on the ground and your body in a straight line. Engage your core and lift your top leg upward while maintaining stability in your hips and core. Lower the leg back down and repeat for the desired number of repetitions. Switch sides and repeat.

Stability Ball Rollout: Start in a kneeling position with your forearms resting on a stability ball in front of you. Engage your core and roll the ball forward, extending your arms and allowing your body to straighten. Maintain control and stability as you roll the ball back to the starting position. Repeat for the desired number of repetitions.

Superman: Lie on your stomach with your arms extended in front of you and your legs straight behind you. Engage your core and lift your arms, chest, and legs off the ground, creating a "flying" position. Hold for a few seconds and then lower back down. Repeat for the desired number of repetitions.

Quadruped Opposite Arm and Leg Lift: Begin on all fours with your hands aligned under your shoulders and your knees aligned under your hips. Engage your core and simultaneously lift your right arm forward and your left leg backward, maintaining stability. Return to the starting position and repeat with the opposite arm and leg. Alternate sides for the desired number of repetitions.

Remember to focus on proper form and control throughout each exercise. Start with appropriate difficulty levels and gradually increase intensity as your core strength and stability improve. If you have any pre-existing conditions or concerns, it's advisable to consult with a qualified fitness professional or healthcare provider before starting a new exercise program.

CONCLUSIONS:

Core strengthening has a strong theoretical basis in treatment and prevention of LBP, as well as other musculoskeletal afflictions, as is evidenced by its widespread clinical use. Studies have shown that these programs may help decrease pain and improve function in patients with LBP. However, studies are limited, and some show conflicting results. Future studies are needed to elucidate precise core strengthening programs and their effects on treatment and prevention of LBP, in comparison with other exercise training programs.

REFERENCES:

1. Akuthota, Venu¹; Ferrero, Andrea¹; Moore, Tamara²; Frederickson, Michael³. Core stability exercise principle.
2. Akuthota V, Ferreiro A, Moore T, Fredericson M. Core stability exercise principles. *Current Sports Medicine Reports*. 2008; 7(1): 39-44.
3. Dendas, A. M. The relationship between core stability and athletic performance. A Thesis Presented to The Faculty of Kinesiology for the Degree Master of Science. *Arch Phys Med Rehabil*, 2008; 34: 1675-1458.
4. Gard G, Gille KA, Grahn B. Functional activities and psychosocial factors in the rehabilitation of patients with low back pain. *Scand J Caring Sci*. 2000; 14(2): 75-81.
5. Heiman Ebrahimi 1*, Ramin Balouchi 2 Rasoul Eslami 3 Mehdi Shahrokhi 4 Core Stabilization Exercises on Low Back Pain, Abdominal and Back Muscle Endurance in Patients with Low Back Pain.
6. Kiani Dehkordi Kh, Ebrahim Kh, Frastic P. [Effective treatment of stretch step to keep changes in the face of resistance and liberation of the hip joint in patients with chronic low back pain (Persian)]. *Journal of Movement Science and Sport*. 2008; 2(12):11-22.
7. Lee G K, Chronister J, Bishop M. The effects of psychosocial factors on quality of life among individuals with chronic pain. *Rehabil Couns Bull*. 2008; 51: 177.
8. McGill S. *Low back disorders: evidence-based prevention and rehabilitation* 2nd ed. Champaign. IL: Human Kinetics. *Arch Phys Med Rehabil*. 2007; 76:1365-1568.
9. Mannion A.F, Adams M.A, Cooper R.G, Dolan P. Prediction of maximal back muscle strength from indices of body mass and fat-free body mass. *Rheumatology*. 1995; 38:652-655.
10. Mino-nejad H. [Compare the degree of thoracic and lumbar curves to determine its relationship with EMG activity of the extensor muscles in athletes and non-athletes (Persian)]. Thesis for Master of Science in Physical education and sport science. Faculty of Physical Education and Sport Science Tehran. 2006.
11. Nachemson A, Waddell G, Norlund AI. Epidemiology of neck and low back pain. *Neck and Back pain: the scientific evidence of causes, diagnosis, and treatment*. Philadelphia 2000; pp: 165.
12. Nezhad Roomezi S, Rahnama N, Habibi A, Negahban H. [The effect of core stability training on pain and performance in women patients with non-specific chronic low back pain (Persian)]. *Journal of Research in Rehabilitation Sciences*. 2012; 8(1).
13. Ogawa T, Matsuzaki H, Uei H, Nakajima S, Tokuhashi Y, Esumi M. Alteration of gene expression in intervertebral disc degeneration of passive cigarette-smoking rats: separate quantization in separated nucleus pulposus and annulus fibrosus. *Pathobiology*. 2005; 72(3): 146-51.
14. Plastanga N, Field D, Soames R. *Anatomy & Human Movement: Structure and Function*, Oxford. Butterworth-Heinemann. 3rd ed. 1998, pp: 189-201.
15. Price DD, McGrath PA. The validation of visual analog scales as ratio scale for chronic and experimental pain. 1983; 17: 45-56.
16. Renkawitz T., Boluki D, Grifka J. The association of low back pain, neuromuscular imbalance, and trunk extension strength in athletes. *The Spine Journal*. 2006; 6: 673-683.