

## Review Article

# Benefits of core strengthening exercise in osteoarthritis knee patients: a narrative review

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## ABSTRACT

Osteoarthritis is a degenerative joint disease results from breakdown of cartilage that covers the ends of bones in joint. Breakdown causes bones to rub each other leading to pain, stiffness, swelling, loss of function in joint and can be accompanied by synovitis with or without joint fluid effusion. Muscle atrophy may develop if patient was inactive and did not perform exercises, which will affect functionality and stability of joint including activities of daily life. The aim of the study was to evaluate current literature and provide comprehensive overview of benefits of core muscle strengthening exercise in managing OA. The objective of this study was to discuss effectiveness of core muscle strengthening exercise in reducing pain, improving physical function, and enhancing quality of life in individuals with osteoarthritis knee. A systematic search was conducted to identify all relevant studies related to core muscle strengthening, database such as Pubmed, Cochrane library, Scopus had been used. Studies demonstrating clinical importance of core strengthening in treatment of osteoarthritis knee are limited. By performing randomized controlled trials with a big sample size, new researchers should produce more unique findings.

**Keywords:** Adult population, Functional mobility, Balance, Core strength training, Knee joint pain, Osteoarthritis knee

## INTRODUCTION

Knee osteoarthritis (OA), also known as degenerative joint disease, is typically the result of wear and tear and progressive loss of articular cartilage. It is most common in the elderly. OA reduces quality of life, increases risk of morbidity and mortality, and causes pain and disability. The knee is frequently affected, and its pathophysiology is complex. It is more prevalent as people get older; >70% of patients age 65 have it. More often than not, it affects women than men. As age and obesity are two major risk factors. Chondrocyte activity and cartilage health are fundamentally influenced by biomechanical stress. The mechanical characteristics of articular cartilage and other joint tissues can be impacted by abnormal stresses, which can also change metabolic processes. To compensate for

weak hip muscles and/or a lack of pelvic control during daily tasks, particularly those involving single-leg stance, such as single-limb support during locomotion, trunk movements change the moments of force acting on the knee.<sup>1</sup>

Due to damage to the articular cartilage, OA, a degenerative joint disease with a complex origin, causes loss of normal joint function.<sup>2</sup> Osteoarthritis of the knee is characterized by pain, joint stiffness, especially after extended movement, fades upon resting. Crepitus can occur while sleeping or waking up, and they might be accompanied by synovial inflammation, joint fluid effusion, or both. Muscle atrophy may develop if the patient simply performs in passive motion and refuses to exercise, which will decrease the joint's stability and

functionality. Additional side effects that can interfere with daily activities range from sitting-related pain to the most severe aspect, such as difficulty in walking.<sup>3</sup>

### **Anatomy of core muscle**

All motions in the body start from the core muscles, which are typically thought of as the muscles that surround the area of the body where the center of gravity is located. The entire movement and equilibrium of the human body are supported by the core muscles. Recently, the core has been recognized as the lumbopelvic hip complex.<sup>4</sup> The kinetic chain's ability to function depends on the lumbopelvic hip complex, also referred to as the core. It has long been standard practice to train the core, also known as the lumbopelvic hip complex in science, in an effort to improve performance and the biomechanics of the lower extremities.

Lumbopelvic hip complex, which stabilizes the spine, pelvis, and hips during functional movements, consists of more than 29 muscle pairs. The transverse and anterior rectus abdominis, multifidus, gluteus maximus, hamstrings, lateral gluteus medius, quadratus lumborum, and medial adductor magnus, longus, brevis, and pectineus particularly make up the core in the kinetic chain, the core is recognized as an essential link.<sup>4-7</sup> A key contributor to patellar femoral discomfort is femoral internal rotation and adduction, both of which are controlled by the lumbopelvic hip complex.<sup>8</sup>

It has been shown that the core strengthening exercise is useful in enhancing balance and reducing injuries from falling. Ageing results in a loss of stability and balance, thus a core strengthening program helps to increase independence in daily activities as well as balance and quality of life.<sup>9</sup>

### **Core stability exercise**

A program for strengthening and stretching the core region between the pelvis and vertebrae is known as core stability exercise. This exercise is also crucial for giving localized strength and balance, which maximizes activities and makes them more efficient. There are five different forms of core stability exercises: (1) seated abdominal contraction, (2) seated oblique twist, (3) legs raise, (4) bridge exercise, and (5) lying spinal rotation. Exercises for core stability that can build muscle strength can ultimately enhance postural balance.<sup>10,11</sup>

### **Efficacy of core strengthening exercise**

There hasn't been much study done on how core-strengthening programs affect clinical results. The lack of understanding on what makes up a core-strengthening exercise hinders research. Some opine functional education and sports-specific training, while others mention remedial neuromuscular retraining. As far as we are aware, there is no randomized controlled experiment

evaluating the effectiveness of core strengthening. The majority of studies consist of prospective, unreported case series.<sup>12-14</sup>

### **Effect of core stability exercise in osteoarthritis knee**

It is well known that the muscles that stabilize the knee and lose strength are also affected by osteoarthritis. By stimulating the vital muscles of the lumbopelvic-hip complex and the periarticular muscles of the knee, core stability training can increase the coordination and stability of the trunk, pelvis, hips, and knees.<sup>15</sup> The ability to protect joints from pathological loads has been demonstrated for appropriate training regimens that target regaining muscle strength.<sup>16,17</sup> Exercises for core stability will increase the activity of the dynamic muscles, and the occurrence of coordinated and simultaneous contractions of these muscles will provide rigidity to support the trunk. This will lower intradiscal pressure and lessen the workload on the lumbar and lower extremity muscles, reducing the risk of injury to the surrounding tissues and reducing abnormal lumbar muscle tension.<sup>18-20</sup>

To produce an optimal movement with the transfer of body weight and stepping while walking, one needs to have core stability, which is the capacity to manage the position and motion of the trunk to the pelvis. Spinal rotation is accomplished by engaging the core muscles.<sup>21-23</sup> The ability to support or move the extremities is developed by greater levels of activation of the extremities or limbs as a result of enhanced core stability activation patterns, which will support maintaining proper posture while moving and serve as the foundation for all arm and leg motions.<sup>24</sup> Osteoarthritis causes pain, physical dysfunction, and muscle weakness in a vicious cycle. When muscle weakness and pain are connected, it causes physical dysfunction and slows the spread of disease. Exercises for the core muscles are essential for managing knee osteoarthritis.

### **Purpose of the study**

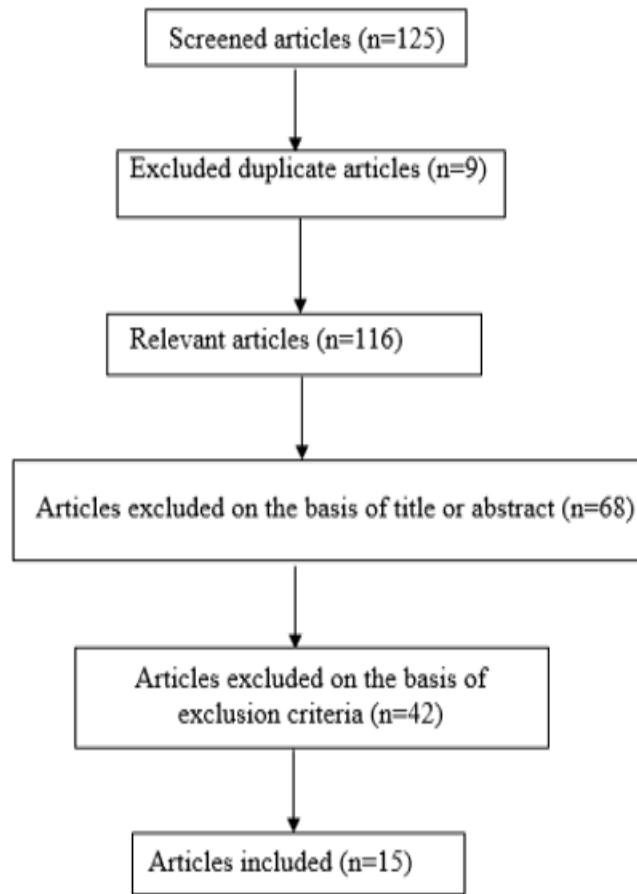
The aim of the review's goal was to learn more about the advantages of core strength training for the senior population's functional mobility and balance to prevent recurrent falls.

## **METHODS**

The data base searched were Pubmed, Google scholar, and Research Gate. Terms used during search were core stability exercises, osteoarthritis, knee pain and following algorithm. To analyze the research on core muscle strengthening programs and assess their value for improving functional mobility and balance in the adult population. Total 14 articles which were relevant in were found through search in Pubmed, Google scholar and Research Gate in which there was 2 comparative study, 4 experimental study, 3 literature review, 3 pilot study, and 2 randomized controlled trial studies were included. Adult

population, the impact of given core strength training examined and published from 2000 to present, studies published in English, and recent research were the

inclusion criteria. research conducted on adults, research published before 2000, and studies on athletes all met the exclusion criteria.



**Figure 1: Flow chart of screening of articles for review.**

**RESULTS**

Total 16 articles were taken and studied.

The review study was tabulated about author, year of publication, title of the study, study design and conclusion of the study are described below in the Table 1.<sup>16-28</sup>

**Table 1: List of articles including author, year of publication, title, type of study design and conclusion.**

Author	Year of publication	Title	Study design	Conclusion
Suri P et al <sup>16</sup>	2009	Trunk muscle attributes are associated with balance and mobility in older adults: a pilot study	Pilot study	Trunk endurance and strength can be safely measured in mobility limited older adults and are associated with both balance and mobility performance. Trunk endurance and strength are physiologic attribute worthy of targeting in rehabilitative care of mobility limited older adults
Choi Su- Hee et al <sup>17</sup>	2012	The effects of trunk stabilization exercise using swiss ball and core stabilization exercise on balance and gait in elderly women	Experimental Study	These finding indicate that trunk stabilization exercise using swiss ball could improve balance and gait in elderly women

Continued.

Author	Year of publication	Title	Study design	Conclusion
<b>Granacher et al<sup>18</sup></b>	2013	The importance of trunk muscle strength for balance, functional performance, and fall prevention in seniors: a systematic review	Literature review	Core strength training and/or PET can be used as an adjunct or even alternative to traditional balance and/or resistance training programs for old adults
<b>Markovic et al<sup>19</sup></b>	2015	Effects of feedback-based balance and core resistance training verses pilates training on balance and muscle function in older women: a randomized controlled trial	Randomized control trial	Feedback-based balance and core resistance training proved to be more effective in improving single- and dual- task balance ability, trunk muscle strength, leg power, and body composition of healthy older women than the traditional pilates training
<b>Dabholkar et al<sup>20</sup></b>	2016	Correlation of the core stability measures with the hip strength and functional activity level in knee osteoarthritis	Co-relation experimental study	There is a significant co-relation of core stability with function activity level in knee osteoarthritis knee
<b>Chevidik-unnan MF et al<sup>21</sup></b>	2016	Effectiveness of core muscle strengthening for improving pain and dynamic balance among female patients with patellofemoral pain syndrome	Experimental study	Adding core-muscle strengthening program to the conventional physical therapy management improves pain and dynamic balance in female patients with patellofemoral pain syndrome
<b>Hoglund et al<sup>22</sup></b>	2018	A 6-week hip muscle strengthening and lumbopelvic-hip core stabilization program to improve pain, function, and quality of life in persons with patellofemoral osteoarthritis: a feasibility pilot study	Pilot study	PFJ OA patients underwent ten twice-a-week hip strengthening and core stabilization exercise sessions. The participants reported the improvement of pain, symptoms, daily living function, sports activity, and quality of life all improved within six weeks
<b>Higuchi H Matsumoto et al<sup>23</sup></b>	2018	Sitting trunk exercise for older adult to improve balance and mobility: pilot study	Pilot study	Among community dwelling older adults, trunk exercises in the sitting position might be effective in improving trunk muscle, balance and mobility.
<b>Garima et al<sup>24</sup></b>	2018	Effect of core stability exercises using swiss ball on balance performance and quality of life in elderly	Comparative study	Core stability exercises using swiss ball are more effective than floor exercises in elderly for improving balance performance
<b>Daniel Hernandez et al<sup>25</sup></b>	2019	Efficacy of core in patients with osteoarthritis knee: a randomized control trial	Randomized control trial	Combination of core muscle activation exercises and conventional treatment was more effective in short-term pain reduction in patients with knee OA
<b>Agris L et al<sup>26</sup></b>	2019	A systemic review: a comparison of traditional with motor learning core stability training approaches regarding the effect on lower and upper extremity use, balance and	Literature review	Currently available literature does not present a wealth of information about the best strategy for core stability training in seniors

Continued.

Author	Year of publication	Title	Study design	Conclusion
		functional performance in older adults		
<b>Khisty A et al<sup>27</sup></b>	2019	Effect of core stability exercises in patients with unilateral osteoarthritis of knee	Experimental study	There was a statistically significant difference in knee injury, and osteoarthritis outcome score (KOOS) and VAS post the intervention (p<0.05)
<b>Muham-mad D et al<sup>28</sup></b>	2020	Effectiveness of core stability exercise for knee joint osteoarthritis: a review	Literature review	According to the literature review, it has been shown that core stability exercise is potential in the management of knee osteoarthritis

## DISCUSSION

In the elderly population, the current review shows a relationship between core strength training, functional mobility, and balance ability. The data backs up Hodges and Richardson's theory from 1996, which states that the transverse abdominis contracts before any limb movement. Prior to leg movement, the core muscles are also in responsible for producing a range of trunk movement in several planes of motion. The evidence suggests that the kinetic link that transmits is the core muscles.<sup>25</sup>

Because of their enormous moment arms and complex mechanisms that extend from the thorax to the pelvis, regional muscles (rectus abdominis, external obliques, and some sections of the erector spinae) are perfect for producing traction and moving the trunk. These muscles are known as the primary movers in the flexion, extension, and rotation of the trunk or hip. Stability of the core linked to local muscles during whole-body movement.<sup>26,27</sup> Local muscles, including the transverse abdominis, multifidus, pelvic floor, diaphragm, and internal obliques, are in charge of generating enough force to keep the segments of the spine stable. During functional activities, the coordinated muscular recruitment of the global muscles and the local muscles maintains the integrity of the core spine.<sup>28</sup>

## CONCLUSION

According to the review of literature it suggests that core strengthening exercises have been shown to have potential in the treatment of osteoarthritis in the knee. Exercises for core strengthening have been shown in numerous trials to be beneficial in reducing pain while improving functional activities including gait in knee osteoarthritis patients'. It is essential to highlight that, while these advances show potential feasible intervention for improvement in knee osteoarthritis management, more study is required to thoroughly assess their long-term efficacy, safety, and cost effectiveness.

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