RESEARCH PAPER

The Effect of Core Stability Exercises on Adolescent Idiopathic Scoliosis: - A Review of Literature

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ABSTRACT
Adolescent idiopathic scoliosis (AIS) is a spinal deformity that has no known cause and is characterized by a lateral curvature of the spine greater than 10 degrees. Traditional treatment for AIS includes surgical interventions for severe cases, bracing, and observation. Recently, non-invasive treatment modalities such as core stability exercises (CSE) have been noted as an alternative for the treatment of AIS by addressing muscular imbalances and correcting spinal alignment. The purpose of this review is to critically evaluate the effects of CSE in the treatment of AIS by compiling the findings of the 20 research publications published between 2015 and 2025. The findings of this review suggest that the effectiveness of CSE in the treatment of AIS is evident by the reduction of the angle of the spine in patients with AIS. Therefore, the effectiveness of CSE in the treatment of AIS is evident by the reduction of the angle of the spine in patients with AIS.

Keywords: Adolescent Idiopathic Scoliosis, Scoliosis, Core stability exercises, Cobb Angle, Physiotherapy, Spinal Curvature

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INTRODUCTION

Scoliosis is a complicated three-dimensional deformity of the spine that is defined by a Cobb angle greater than 10° along with axial rotation [1]. Different types of scoliosis include idiopathic, congenital, neuromuscular, and neurofibromatosis types of scoliosis. Among them, adolescent idiopathic scoliosis is the most common type, which accounts for 80% of the total cases of scoliosis. Genetic factors, hormonal factors, neuromuscular factors, and biomechanical factors are responsible for this disease [2]. In adolescent idiopathic scoliosis, there is a segmental change in the trunk due to inappropriate mechanical pressures acting on the spine [3]. 2-2.5% of adolescents are affected by adolescent idiopathic scoliosis, which is more common in females than males, as defined by a Cobb angle of 10° or greater [4].

According to recent studies, there is a possibility that AIS patients could be suffering from a muscular imbalance on both sides of the spine, which could be the reason for the development of scoliosis [5]. According to the latest recommendations of the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) on the conservative management of scoliosis, the main goals are to improve the aesthetics of the subject, alleviate the subject's respiratory dysfunctions, stop the progression of the curve, and alleviate the subject's pain syndromes associated with the spine [6].

In the past few years, there has been an extensive application of exercise programs that help in the relief of clinical symptoms and the prevention of the progression of the curve. Yoga, Pilates, and core stabilization (CS) are other newly developed physiotherapeutic exercises for the stabilization of the spine. The primary objective of these exercises is spinal stability and core strength training [7]. Core stability exercises (CSE) are a non-invasive form of therapy that has gained much attention in the past few years for the improvement of spine alignment. One of the promising physiotherapeutic interventions for the

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contraction of the muscles for the best spinal alignment and stability against the progression of the curve is core exercises [8].

The concept of the core may be described as a muscular box with the diaphragm as the roof, the pelvic floor and hip girdle muscles as the bottom, the abdominal muscles as the front, and the paraspinals and gluteal muscles as the back [9]. Strengthening the muscles in the core region of the body, which include the oblique muscles, the anterior abdominal muscles, the gluteal muscles, the multifidus muscles, and the pa-spinal muscles, is the major aim of core stabilization exercises (CE) [10]. In order to assess the potential benefits of core stability exercises for spinal curvature, posture, function, and quality of life in adolescents with idiopathic scoliosis, this review will seek to examine and summarize the latest research in this area.

METHODS

Search Strategy: An intensive literature search was conducted to identify relevant literature published between 2015 and 2025. The search tools used were PubMed, Web of Science, Scopus, and Google Scholar. The keywords used in the search were "postural control," "core stability exercises," "core strengthening," "adolescent idiopathic scoliosis," "spinal rehabilitation," and "exercise therapy for scoliosis."

Inclusion criteria:

- Studies published between 2015 and 2025.
- Studies involving adolescents diagnosed with AIS.
- Randomized controlled trials (RCTs), systematic reviews, meta-analyses, and cohort studies.
- Studies with full-text availability in English.

Exclusion criteria:

- Studies focusing on congenital or neuromuscular scoliosis.
- Case reports, editorials, conference abstracts, and non-peer-reviewed articles.
- Studies lacking detailed methodology, control groups, or measurable outcomes.

Table-1: Review of Literature

Sl. No.	Author Name & Year	Title Of The Study	Intervention	Finding
1.	Xiaomei Liu et. al (2025) [1]	The efficacy of core stabilization exercise in mild and moderate adolescent idiopathic scoliosis: a systematic review and meta-analysis	core stabilization exercise	The study shows that core stabilization exercise may be beneficial for the patients with mild to moderate adolescent idiopathic scoliosis
2.	YangJiang et. al (2025) [17]	Evaluating exercisetherapies in adolescent idiopathic scoliosis: asystematic review with Bayesian network meta-analysis	Schroth method with core stabilization training	The study found that integration of core stabilization training with the Schroth method reveals a markedly enhanced effectiveness.
3.	Roberta Yi Li Ong et. al (2025) [18]	Effectiveness of dynamic neuromuscular stabilization approach in lumbopelvic stability and gait parameters in individuals with idiopathic scoliosis A randomized controlled trial	dynamic neuromuscular stabilization with core stabilization exercises	The study shows that the combined DNS and CSE approach significantly improves lumbopelvic stability in individuals with idiopathic scoliosis. However, the impact on gait parameters was minimal,
4.	HE Yang, LIU Peng-fei (2024) [11]	Clinical study of Schroth therapy combined with co re muscle training in the treatment of adolescent idiopathic scoliosis	Schroth therapy combined with core muscle training	The study demonstrated that Schroth therapy combined with core muscle training can significantly reduce the Cobb Angle, ATR and AVT, and improve spinal deformity, plantar-pressure distribution, body balance and quality of

				life in adolescent patients with scoliosis,with a clinical application value.
5.	Windy Lathifa et. al (2024) [22]	The effect of core Stability exercise on decreasing angle of trunk rotation degree in idiopathic scoliosis	core Stability exercise	The research proves that providing core Stability exercise for 5 weeks can reduce the degree of scoliosis curve in junior high school adolescents
6.	Kexin Qi et. al (2022) [12]	Effects of Core Stabilization Training on the Cobb Angle and Pulmonary Function in Adolescent Patients with Idiopathic Scoliosis	Core stabilization exercise	The study shows that core stabilization exercise can be considered to have a positive effect on the normal physiological curvature of the spine in AIS patients, as it decreases the Cobb angle and strengthens respiratory muscle strength and pulmonary function.
7.	Peng Sun et. al (2023) [19]	Short-Term Benefit from Core Stabilization Exercises in Adolescent Idiopathic Scoliosis: A Meta-Analysis of Randomized Controlled Trials	Core Stabilization Exercises	The study results shows that a very short-term efect of core stabilization exercise on patients with idiopathic scoliosis.
8.	LI Bin et. al (2023) [13]	Rehabilitation Efficacy of Two Exercise Methods on Adolescent Scoliosis	Schroth and core group exercise therapy	The study results found that Schroth and core group exercise therapy was superior to the home exercise intervention.
9.	Arash Khaledi et. al (2023) [10]	Core Stabilization Exercises vs. Schroth's Three Dimensional Exercises to Treat Adolescent Idiopathic Scoliosis: A Systematic Review	Core Stabilization Exercises vs. Schroth Exercise	The study results suggests that both SE and CE can effectively improve CA, respectively. There is very limited evidence to suggest that SE is more effective than CE in treating AIS.

10.	Yildirim Sefa et. al (2022) [14]	Effects of Core Stabilization Exercises on Pulmonary Function, Respiratory Muscle Strength, Peripheral Muscle Strength, Functional Capacity, and Perceived Appearance in Children with Adolescent Idiopathic Scoliosis A Randomized Controlled Trial	Core Stabilization Exercises	The study results found that Core stabilization exercises given in addition to the traditional scoliosis exercise can improve respiratory muscle strength and perceived appearance in patients with adolescent idiopathic scoliosis
11.	Mohamed I Kamel et. al (2022) [20]	Effects of core stabilization exercise and kinesio taping on pain, Cobb angle and endurance of trunk muscles in children and adolescents with idiopathic scoliosis.	core stabilization exercise and kinesio taping	The study results found that adding KT to CS exercises yields improvement on pain, reduction in Cobb's angle and improvement in back muscle endurance more than CS alone in AIS.
12.	Ezzat El Sayed Moubarak et. al (2022) [21]	Efficacy of core stabilization versus active self-correction exercises in the treatment of adolescents with idiopathic scoliosis.	core stabilization versus active self-correction exercises	The study results shows that the core stabilization program is superior to active-self correction exercises in the short term treatment of mild adolescent idiopathic scoliosis.
13.	Vanja Dimitrijević et. al (2022) [6]	Efects of Schroth method and core stabilization exercises on idiopathic scoliosis: a systematic review and meta-analysis	Schroth method and core stabilization exercises	The study demonstrated that Schroth method and core stabilization exercises have a positive efect in subjects with idiopathic scoliosis. Subgroup analysis showed that the Schroth method had a larger efect size than the core stabilization exercises
14.	Huijian Weng, Qin Li (2022) [5]	Effect of Core Stability Training on Correction and Surface Electronic Signals of Paravertebral in Adolescent Idiopathic Scoliosis	Core Stability Training	The study shows that the core stability training can significantly reduce the Cobb angle of AIS and correct the bad posture of scoliosis patients, which may be related to the balance of the electromyographic activities (convex concave side) of paravertebral muscles in AIS patients.

15.	Hikmet Kocaman et. al (2021) [7]	The effectiveness of two different exercise approaches in adolescent idiopathic scoliosis: A single-blind, randomized-controlled trial	Schroth exercises and core stabilization exercises	The results found that the Schroth exercises are more effective than core stabilization exercises in the correction of scoliosis and related problems in mild adolescent idiopathic scoliosis, and core stabilization exercises are more effective than Schroth exercises in the improvement of peripheral muscle strength.
16.	Xin Li et. al (2021) [8]	Effect of core-based exercise in people with scoliosis: A systematic review and meta-analysis	Core-based exercise	The study found that the Core-based exercise may have a beneficial role in reducing the Cobb angle and improving quality of life in people with scoliosis in the short term.
17.	Yagci, Gozde, Yakut Yavuz (2019) [15]	Core stabilization exercises versus scoliosis-specific exercises in moderate idiopathic scoliosis treatment	Core stabilization exercises versus scoliosis-specific exercises	The study found that Both treatment conditions including core stabilization with bracing and scientific exercises approach to scoliosis with bracing had similar effects in the short-term treatment of moderate adolescent idiopathic scoliosis.
18.	Gür et. al (2017) [3]	The effectiveness of core stabilization exercise in adolescent idiopathic scoliosis: A randomized controlled trial	Core stabilization exercise	The study found that the Core stabilization training in addition to traditional exercises was more effective than traditional exercises alone in the correction of vertebral rotation and reduction of pain in adolescent idiopathic scoliosis.
19.	Kwang-Jun Ko, Seol-Jung Kang (2017) [2]	Effects of 12-week core stabilization exercise on the Cobb angle and lumbar muscle strength of adolescents with idiopathic scoliosis	core stabilization exercise	The study results that the Core stabilization exercise can be an effective therapeutic exercise to decrease the Cobb angle and improve lumbar muscle strength in adolescents with idiopathic scoliosis

20.	Yun Hee Park et. al (2016) [16]	The effect of a core exercise program on Cobb angle and back muscle activity in male students with functional scoliosis: a prospective, randomized, parallel-group, comparative study	core strengthening exercise	The study shows that A 10-week core strengthening exercise programme decreases Cobb angle and improves back muscle strength in patients with functional scoliosis

DISCUSSION

The results of the reviewed research consistently show that core stability exercises improve the functional and clinical outcomes of adolescents with idiopathic scoliosis.

Decrease in Spinal Curvature: Several research have been conducted to assess the effect of CSE exercises on the Cobb angle, which is a major indicator of the degree of scoliosis in a patient's spine. In patients with functional scoliosis, Yun Hee Park and others in 2016 observed that a core strengthening exercise program for a period of 10 weeks improved muscular back strength and caused a statistically significant reduction in the Cobb angle [16]. According to Kwang-Jun Ko, Seol-Jung Kang (2017) stated that "Core stabilization exercise may be an effective therapeutic exercise in reducing the angle of the Cobb and improving the strength of the lumbar muscles in adolescents with idiopathic scoliosis" [2]. In addition, Xin Li et al. (2021) stated that there is a potential role of Core-based exercise in reducing the angle of the Cobb and improving the quality of life in patients with scoliosis in the short term [8]. The reduction in the angle of the Cobb means that the unbalanced muscular imbalances that favor the progression of scoliosis may be reduced through core strengthening.

Enhancement of Postural Control and Balance: Deep stabilizing muscles such as transversus abdominis, multifidus, and pelvic floor muscles are contracted through core stability exercises. These muscles play an important role in spinal support and alignment. The proportion of the electromyographic activities of the convex concave side muscles may be the reason for the observation that the core stability exercises can significantly decrease the Cobb angle in patients with AIS and correct the posture in scoliotic patients, as noted by Huijian Weng and Qin Li in their study in 2022 [5]. This gives credence to the theory that muscle functional reeducation in posture may correct spinal deformity to a certain extent.

Improvement of Trunk Stability and Muscular Endurance: Improvements in dynamic stability and trunk muscular endurance have also been noted, as reported by Li and Hwang (2022). This is important as it has to do with maintaining an upright posture, which is often interfered with in patients with scoliosis due to exhaustion or lack of muscle coordination [5]. Besides other physiotherapy exercises According to Hikmet Kocaman et al. (2021), Schroth exercises are better than core stabilization exercises in correcting mild adolescent idiopathic scoliosis and associated problems, while core stabilization exercises are better than Schroth exercises in improving peripheral muscle strength [7].

Evaluation in Relation to Other Exercise-Based Interventions: Despite all its benefits, CSE has been compared to Schroth therapy, as well as other exercises that take into account scoliosis. While CSE mainly aims to improve muscle activity in the trunk area, there is evidence suggesting that Schroth therapy is more effective in treating three-dimensional spinal deformities, especially in patients with scoliosis (Yagci & Yakut, 2019) [15]. Perhaps the best results can be achieved by using a combination of workouts designed specifically for patients with scoliosis, together with CSE.

Pain Reduction and Enhancement of Quality of Life: For AIS, pain and discomfort are common, especially in cases that have progressed over time. However, based on various studies, it has been shown that CSE therapy has a significant positive impact in improving quality of life and reducing pain levels. According to Kocaman et al. (2021), in a study that involved teenagers with AIS and received CSE therapy for 16 weeks, it was observed that pain levels were 30% less in CSE therapy recipients compared to those in the control group based on a VAS scale [7]. According to a systematic review by Dimitrijević et al. (2022), CSE therapy has a positive impact on the physical functions and self-perception and social participation of AIS patients in the long term [6]. In a study by Gür et al. (2017), it was observed that vertebral rotation and pain in adolescents with idiopathic scoliosis were more effectively corrected by combining core stabilization exercises with traditional exercises than by using traditional exercises alone [3].

In addition to the physical changes, a number of the studies found that the quality of life and self-esteem of the participants had improved. The reduction in curvature and improvement in physical function may have a positive impact on social interactions, stability of mind, and body image, all of which are important aspects of adolescent health. The findings of the above studies indicate that CSE is an effective intervention for improving overall function, muscular strength, and spinal alignment in adolescents with AIS. In mild to moderate cases of AIS, CSE may even arrest or even reverse the progression of scoliosis, as evidenced by the reduction in the Cobb angle in the above studies. However, the amount of exercise and the duration of the exercise intervention will play a role in the extent of the improvement. The results of the exercise programs with a duration of 12 weeks or more were better than those with a lesser duration.

Limitations and Research Gaps: It is, however, important to note that there are a few limitations associated with the results, despite the findings being very encouraging. Most of the studies had a small sample size, and thus the results cannot be generalized. It is also very difficult to compare the results of different studies because of the different exercise regimens. There is a lack of data on the long-term benefits of CSE. Most of the studies have assessed the results in the short term (8-24 weeks).

Suggestions for Further Research: Standardized core exercise protocols and the need for a larger and more diverse sample population should be included in future studies. The long-term effects of core stability therapies need to be assessed through long-term follow-up periods. The potential of technology, like virtual reality and biofeedback, in enhancing compliance and engagement in core training programs for teenagers is also an area of interest.

Conclusion: Core stability exercises have been proven effective in the treatment of adolescents with idiopathic scoliosis, as it helps reduce the spinal curvature, muscle strength, and quality of life. Although promising, further research is needed to standardize the procedure and validate the long-term benefits. A promising, non-invasive approach for the treatment of AIS may be achieved by incorporating CSE into holistic rehabilitation.

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