



# LITERATURE REVIEW ON EFFECTIVENESS OF ROLE OF CORE STRENGTHENING EXERCISES TO IMPROVE BALANCE & POSTURE CONTROL IN THE CHRONIC STROKE PATIENTS

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## Abstract :

**Aim:** To investigate the effectiveness of role of core strengthening exercise to improve balance and posture control in chronic stroke patients.

**Methodology:** A comprehensive search on pub Med, Google scholar, using keywords like stroke patients, balance training, postural control, core strengthening.

**Selection Criteria:** selection criteria includes the articles focusing on core strengthening exercises in balance and posture control in chronic stroke patients.

**Results:** out of 10 articles they are stating that the core strengthening exercises along with conventional therapy improves the balance and posture, trunk stability, velocity, gait & quality of life in chronic stroke patients

**Conclusion:** This literature review analyzed effect of core strengthening along with conventional therapy to correct the balance and posture control in chronic stroke patients, The wide range of review is used to demonstrate that core strengthening along with conventional therapy can be the best choice for correcting the balance and posture control in chronic stroke patients.

**Keywords:** core strengthening, balance, postural control, stroke

## INTRODUCTION:

A stroke is the rapidly developing loss of brain function due to a disturbance in the blood supply to the brain. This can be due to ischemia caused by blockage or due to a hemorrhage. After a stroke, motor, sensory, perceptual, or cognitive deficits may occur, and these impairments can have various impacts on individual functioning through generation of disabilities and affect rehabilitation potential. Stroke survivors have difficulty in balance and postural

control for standing upright because they are impaired by asymmetric posture, abnormal body imbalance, and deficit of weight transfer. Asymmetric movement also decreases ability to stand upright, disorients the body midline and space, and hinders appropriate alignment between vertebrae, trunk rotation, selective movement between trunk and extremities, anterior-posterior tilt of the pelvis during weight transfer, protective reaction, and equilibrium reaction. Previous studies have demonstrated the particular importance of trunk control in stable walking and decreasing falling risk in stroke patients.<sup>1</sup> Stroke causes blood supply problems that occur after the brain has completed normal growth and development. This disease becomes the cause of considerable morbidity and mortality worldwide. In general, stroke patients experience weakening of muscles on the affected side. In particular, the weakening of trunk muscles moves the center of gravity backward, thereby causing thoracic bending. As this disturbs proper postural control by reducing the activation of abdominal muscles, it can become the primary cause of reduced balance and gait abilities.<sup>2</sup> Impairments in balance can be a consequence of changes in the sensory and integrative aspects of motor control. More than 80% of subjects who suffered a first-time stroke have balance disability in sub-acute phase. Trunk impairment, restriction in balance, and impairment in postural control in patients with stroke are correlated with increasing risk of falls and impairment in mobility. This creates disability and dependency in their activities of daily living.<sup>3</sup> Core strengthening has been rediscovered in rehabilitation. The term has come to connote lumbar stabilization and other therapeutic exercise regimens. In essence, it describes the muscular control required around the lumbar spine for maintenance of functional stability. The “core” has been described as a box, with the abdominals in the front, paraspinal and gluteal muscles in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom. Particular attention has been paid to the core because it serves as a muscular corset that works as a unit to stabilize the body and spine, with and without limb movement. In short, the core serves as the center of the functional kinetic chain. In the world of alternative medicine, the core has been referred to as the “powerhouse”, the foundation or engine of all limb movement. With regard to impaired trunk control and poor balance, previous studies have advocated efficient neuromuscular control for trunk stability and accurate trunk muscle recruitment patterns for control of spinal load in relation to a given task and posture,<sup>(1)</sup>

## OBJECTIVE:

The objectives of this study is to find the effectiveness of core strengthening exercise to improve balance and postural control in chronic stroke patients.

## METHODOLOGY:

### inclusion Criteria:

Patients having minimal muscle strength>3  
Both males and females with age group 40 to 60 years old  
Able to understand and execute simple instructions  
Medically stable patients  
chronic stroke patients  
patients who agrees for the treatment procedure

### exclusion Criteria :

Lower limb structural deformity&fractures  
Cardiac pacemakers or other implanted electronic system  
Epilepsy patients  
Any other brain insults  
Patients with age less than 40 and above 60 years old

### source of data:

Google scholar  
Pubmed  
Science direct

### result:

Out of 10 articles they are stating that the core strengthening exercises along with conventional therapy improves balance posture, trunk stability, velocity, gait and quality of life in chronic stroke patients

### conclusion:

This literature review analyzed the effect of core strengthening along with conventional therapy to correct the balance and posture control in chronic stroke patients, the wide range of review is used to demonstrate that core strengthening along with conventional therapy can be the best choice for correcting the posture and balance in chronic stroke patients

**REVIEW OF LITERATURE:**

SN.O.	AUTHOR	YEAR&JOURNAL	TITLE	TYPE OF STUDY	RESULTS	CONCLUSION
1.	Seong-Hun Yu et al <sup>4</sup>	2013 Journal of Exercise Rehabilitation	The effects of core stability strength exercise on muscle activity and trunk impairment scale in stroke patients	Randomized control trail	The results of this study show that the core stability-enhancing exercise is effective in improving muscle activity of the lower trunk, which is affected by hemiplegia.	The activity and stability of the core muscles were measured using surface electromyography and the trunk impairment scale. The mean TIS score and muscle activity of the lower trunk increased in the experiment group significantly after performing the core stability-enhancing exercise.
2.	Eun-Jung Chung et all. <sup>1</sup>	2013 Journal of physiotherapy science	The Effects of Core Stabilization Exercise on Dynamic Balance and Gait Function in Stroke Patients	Randomized control trail	Following intervention, the core exercise group showed a significant change in TUG, velocity, and cadence. The only significant difference observed between the	The results of this study suggest the feasibility and suitability of core stabilization exercise for stroke patients.

					core group and control group was in velocity.	
3.	Kyung Yoon Kim et all. <sup>(2)</sup>	2015 Health care and nursing	Effects of Core Stability Training on Postural Control Ability and Respiratory Function in Chronic Stroke Patients	Randoimzed control trail	The results of this study showed that the core stability training may be appropriate for improving the trunk stability and respiratory function in chronic stroke patients.	This study confirmed that an eight-week core stability training program was more effective than a general exercise therapy program in improving the postural control ability and respiratory function of chronic stroke patients. Therefore, the results of this study are likely to become essential information showing the effectiveness of core stability training for the rehabilitation of chronic stroke patients in clinical practice.
4.	Rosa Cabanas-Valdés et all <sup>(3)</sup>	2016 Clinical Rehabilitation	The effect of additional core stability exercises on improving dynamic sitting balance and trunk control for subacute stroke patients	Randomized controlled tr	The experimental group showed statistically significant differences for all of the total scale scores except for the sitting section of the Brunel	Core stability exercises in addition to conventional therapy improves trunk control, dynamic sitting balance, standing balance, gait and activities of daily living in subacute

					<p>Balance Assessment. The mean difference between groups in Trunk Impairment Scale total score was points, and its subscale dynamic sitting balance was The Berg Balance Scale was points, and the Barthel Index was points. Collectively, these results were in favour of the experimental group.</p>	<p>post-stroke patients.</p>
5.	Eun Jae Ko, MD et al <sup>5</sup>	2016 Annals of Rehabilitation Medicine	The Additive Effects of Core Muscle Strengthening and Trunk NMES on Trunk Balance in Stroke Patients	Randomized controlled trial.	All 3 groups showed improvements in K-BBS, PASS, TIS, and K-MBI after therapeutic interventions, with some differences. The combination group showed more improvements in K-BBS and the dynamic sitting balance	The results indicated an additive effect of CMS and tNMES on the recovery of trunk balance in patients with acute or subacute stroke who have poor sitting balance. Simultaneous application of CMS and tNMES should be considered when designing a rehabilitation program to improve trunk

					of TIS, as compared to the CMS group; and more improvement in K-BBS, as compared to the tNMES group.	balance in stroke patients.
6.	Koshiro Haruyama et al <sup>6</sup>	2017 Neurorehabilitation and Neural Repair	Effect of Core Stability Training on Trunk Function, Standing Balance, and Mobility in Stroke Patients	Randomized Controlled Trial	A treatment effect was found for the experimental group on the dynamic balance subscale and total score of the TIS (P = .002 and P < .001, respectively), pelvic tilt active range of motion (P < .001), Brief-BESTest (P < .001), TUG (P = .008), and FAC (P = .022).	Core stability training has beneficial effects on trunk function, standing balance, and mobility in stroke patients. Our findings might provide support for introducing core stability training in stroke rehabilitation.
7.	Rosa Cabanas-Valdés et al <sup>7</sup>	2017 Clinical Rehabilitation	Long-term follow-up of a randomized controlled trial on additional core stability exercises training for improving dynamic sitting balance and trunk control in stroke patients	Randomized controlled trial.	A total of 68 subjects out of 79 completed the three-month follow-up period. The mean difference (SD) between groups was 0.78 (1.51) points (p = 0.003) for	Core stability exercises plus conventional physiotherapy have a positive long-term effect on improving dynamic sitting and standing balance and gait in post-stroke patients.

					total score on the Spanish-Version of Trunk Impairment Scale 2.0, 2.52 (6.46) points ( $p = 0.009$ ) for Function in Sitting Test, dynamic standing balance was 3.30 (9.21) points ( $p = 0.009$ ) on the Berg Balance Scale, gait was 0.82 (1.88) points ( $p = 0.002$ ) by Brunel Balance Assessment (stepping), and 1.11 (2.94) points ( $p = 0.044$ ) by Tinetti Test (gait), all in favour of core stability exercises.	
8.	Rafał Szafraniec et al <sup>8</sup>	2018 Acta of Bioengineering and Biomechanics	Acute effects of core stability exercises on balance control	Randomized controlled trial.	We observed a decrease in VAR and VEL in the ML plane at T30 m and T24 h, compared to T0. The COP entropy significantly increased in	A single bout of core stability exercises improved the control of the mediolateral body balance. This effect was evident within 30 minutes after exercise, and remained for at least 24 hours. In

					the ML plane at T24 h, compared to T0.	addition, 24 hours after exercise we observed an increased automaticity in the strategy to maintain a stable upright stance.
9.	Wajeeha Mahmood et al <sup>9</sup>	2022 BMC Sports Science, Medicine and Rehabilitation	Effect of core stabilization exercises in addition to conventional therapy in improving trunk mobility, function, ambulation and quality of life in stroke patients	Randomized controlled trial	The differences between the control group and experimental group post-treatment were statistically significant for trunk impairment, functional ambulation, quality of life, and frontal plane trunk motion (p-value < 0.05) with higher mean values for core stabilization training. The frontal plane trunk mobility and rotation showed non-significant differences post-treatment (p-value > 0.05).	This study concluded that core stabilization training is better as compared to the conventional physical therapy treatment for improving trunk impairments, functional ambulation and quality of life among patients of stroke. The core stabilization training is also more effective in improving trunk mobility in sagittal plane. This study is registered in Iranian Registry of Clinical Trials IRCT20210614051578N1 and was approved by the local research ethics committee of Riphah International University.

10.	Rakesh Pilkar et al <sup>10</sup>	2022 Brain sciences	A Novel Core Strengthening Intervention for Improving Trunk Function, Balance and Mobility after Stroke	Randomized controlled trial	the changes in the outcomes assessing trunk function, balance and mobility after completing 12 sessions of the CSI program. The TIS either increased (+8 points for S1) or remained the same (S2 and S3) for the participants	the current investigation presents the feasibility of a novel delivery method for core strengthening to maximize rehabilitation outcomes in the chronic phase of stroke.
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**RESULTS:** out of 10 articles they are stating that the core strengthening exercises along with conventional therapy improves the balance and posture, trunk stability, velocity, gait and quality of life in chronic stroke patients

**CONCLUSION:** This literature review concluded the effect of core strengthening along with conventional therapy to correct the balance and posture control in chronic stroke patients. The wide range of review is used to demonstrate that core strengthening along with conventional therapy can be the best choice for correcting the balance and posture control in chronic stroke patients. Core stability exercises in addition to conventional therapy improves trunk control, dynamic sitting balance, standing balance, muscle activity of the trunk, gait, velocity and activities of daily living in post-stroke patients.

**DISCUSSION:** The reviewed evidence suggests that core strengthening exercises can significantly improve balance and posture control in chronic stroke patients. These exercises enhance trunk stability and muscle strength, leading to improved postural alignment and control. The positive effects observed in the reviewed studies were supported by improvements in balance assessment scores, reduced postural sway, increased weight-bearing symmetry, and enhanced functional mobility. The combined use of core strengthening exercises and balance-specific training appeared to yield the most favorable outcomes.

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