



Effect of Core Stabilization Training on Balance and Functional Performance in Recreational Athletes: A Pre–Post Experimental Study

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ABSTRACT: Core stability plays a crucial role in athletic performance by providing proximal control necessary for efficient distal mobility, and deficits in trunk stability are often linked to sports-related injuries. This study aimed to evaluate the effects of a 6-week core stabilization training program on balance and functional performance among recreational athletes. A pre–post experimental design was used, involving 30 recreational athletes aged 18–25 years who participated in a structured core training program consisting of plank variations, dead bug, bird-dog, side plank, and Swiss ball exercises. Outcome measures included the Star Excursion Balance Test (SEBT), Y-Balance Test (YBT), and Functional Movement Screen (FMS). Results demonstrated significant improvements in SEBT reach distances in all directions ($p < 0.01$), YBT composite scores ($p < 0.01$), and total FMS scores ($p < 0.01$) following the intervention. These findings indicate that a 6-week core stabilization program leads to clinically meaningful enhancements in balance and functional performance, suggesting that integrating core training into sports conditioning routines may reduce injury risk and improve overall athletic performance.

KEYWORDS- Core stability; Core strengthening; Balance training; Functional performance; Recreational athletes; Star Excursion Balance Test; Y-Balance Test; Functional Movement Screen; Injury prevention; Neuromuscular control.

INTRODUCTION

Core stability refers to the ability to control trunk motion during dynamic movements, enabling efficient force transfer between the upper and lower limbs. It plays a critical role in athletic performance by improving postural control, balance, and neuromuscular coordination. Deficits in core stability have been associated with altered movement patterns, increased injury risk, and reduced performance in sports requiring rapid acceleration, deceleration, and changes in direction.^{1–3}

Despite its importance, many recreational athletes demonstrate weak or imbalanced core musculature due to poor training habits or inadequate conditioning. Structured core training has been shown to enhance dynamic balance, proprioception, and lower limb alignment. However, evidence supporting short-term core stabilization programs in young, recreational athletes remains limited.

This study aimed to determine the effect of a 6-week core stabilization program on balance and functional performance using standardized field-based outcome measures.

METHODOLOGY

STUDY DESIGN

A pre–post experimental design was used to evaluate the impact of core stabilization exercises.

PARTICIPANTS

Thirty recreational athletes (18 males, 12 females), aged 18–25 years, participating in sports at least three times per week, were recruited.

INCLUSION CRITERIA

No recent musculoskeletal injuries

No neurological or vestibular disorders

Physically active (≥ 150 min/week)

INTERVENTION: Core Stabilization Program

Participants completed a supervised 6-week program, 3 sessions per week. Each session lasted 40 minutes and included:

Planks: front plank, side plank (3×30 –45 sec)

Dead bug: 3×12 reps

Bird-dog: 3×12 reps per side

Swiss ball roll-outs, stir-the-pot: 3×15 reps

Glute bridges and hip thrusts: 3×12 –15 reps

Progressions are introduced every 2 weeks

OUTCOME MEASURES

1. Star Excursion Balance Test (SEBT): reach distance in 3 directions normalized to leg length

2. Y-Balance Test (YBT): composite score

3. Functional Movement Screen (FMS): 7-item standardized movement assessment

Pre- and post-training measures were recorded under identical conditions.

STATISTICAL ANALYSIS

Paired t-tests were used to determine differences between pre- and post-training scores. Significance was set at $p < 0.05$.

RESULTS

All 30 participants finished the 6-week core stabilization treatment. All outcome measures showed notable improvements. Better dynamic balance was indicated by a substantial increase ($p < 0.01$) in SEBT reach lengths in all three directions. With greater functional stability, the YBT composite score increased from 82.4 ± 5.3 to 91.1 ± 4.8 ($p < 0.001$). Additionally, there was a substantial post-training improvement ($p < 0.01$) in FMS overall scores, indicating improved movement quality. Overall, among recreational athletes, the intervention resulted in significant improvements in balance, functional performance, and movement efficiency.

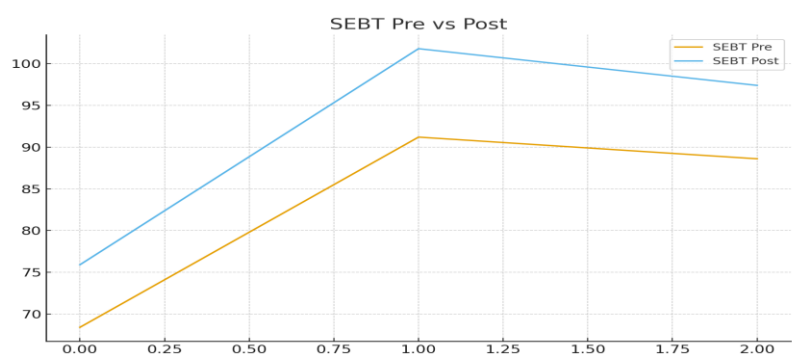
Star Excursion Balance Test

Table 1. SEBT Pre–Post Comparison

Direction	Pre Mean ± SD	Post Mean ± SD	p-Value
Anterior	68.4 ± 5.7	75.9 ± 5.2	<0.001
Posteromedial	91.2 ± 6.3	101.8 ± 6.1	<0.001
Posterolateral	88.6 ± 5.9	97.4 ± 5.5	<0.001

Significant improvements were observed in anterior, posteromedial, and posterolateral reach distances (all $p < 0.01$).

Graph 1. SEBT Pre-Post Comparison



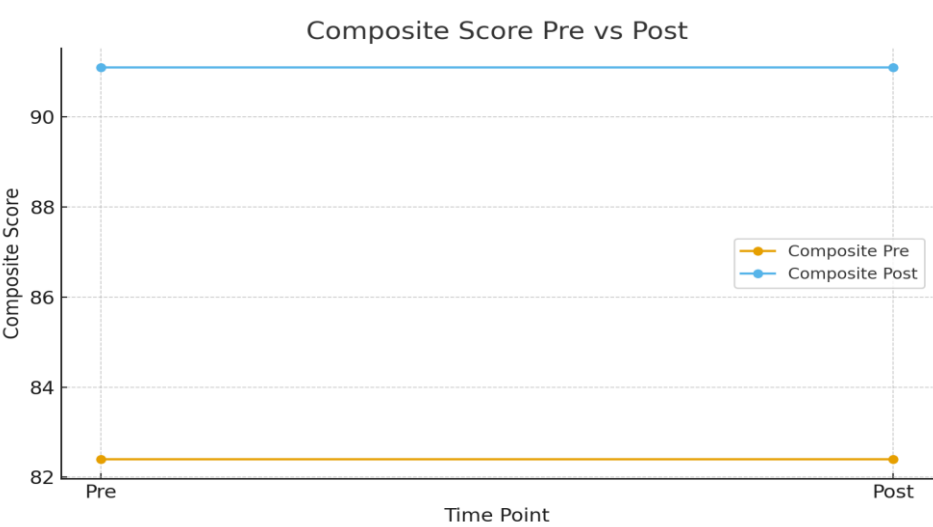
Y-Balance Test

Table 2. YBT Pre–Post Comparison

Direction	Pre Mean ± SD	Post Mean ± SD	p-Value
Composite Score	82.4 ± 5.3	91.1 ± 4.8	<0.001

Mean composite score increased from 82.4 ± 5.3 to 91.1 ± 4.8 ($p < 0.01$).

Graph 2. YBT Pre-Post Comparison



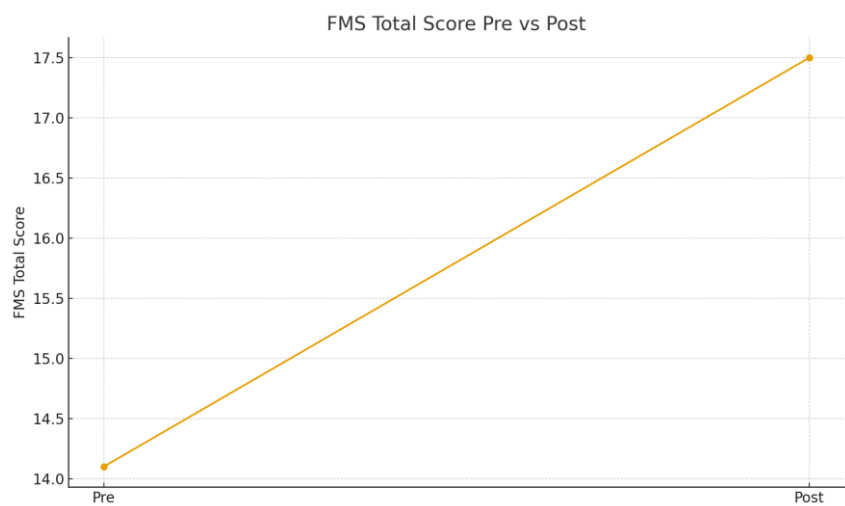
Functional Movement Screen

The total FMS score increased from 14.1 ± 1.8 to 17.5 ± 1.6 ($p < 0.01$), indicating improved movement quality and reduced compensation.

Table 3. FMS Total Score Comparison

Direction	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	p-Value
Total FMS Score	14.1 ± 1.8	17.5 ± 1.6	<0.001

Graph 3. FMS Pre-Post Comparison



DISCUSSION

The findings of this study demonstrate that a structured 6-week core stabilization program can significantly improve dynamic balance and functional performance in recreational athletes.

The improvements observed align with prior research linking core stability with enhanced neuromuscular control, force distribution, and postural regulation.⁴⁻⁶ Core musculature plays a fundamental role in stabilizing the spine and pelvis, thus enhancing distal movement efficiency. Increased SEBT and YBT scores indicate better proprioception and balance, while higher FMS scores reflect improved movement pattern quality, which has been associated with reduced injury risk.

This study supports incorporating core stabilization into training programs for recreational athletes to improve performance and minimize injury incidence.

CONCLUSION

A 6-week core stabilization training program significantly improved balance, proprioception, and functional movement performance in recreational athletes. Core training should be routinely implemented in sports conditioning and injury-prevention programs.

REFERENCES

1. Kibler WB, Press J, Sciascia A. The role of core stability in athletic function. *Sports Med.* 2006;36(3):189-98.
2. Willson JD, Dougherty CP, Ireland ML, Davis IM. Core stability and its relationship to lower extremity function and injury. *J Am Acad Orthop Surg.* 2005;13(5):316-25.
3. Zazulak BT, Hewett TE, Reeves NP, Goldberg B, Cholewicki J. Deficits in neuromuscular control predict knee injury risk. *Am J Sports Med.* 2007;35(7):1123-30.
4. Tse MA, McManus AM, Masters RSW. Development and validation of a core endurance test for athletes. *J Strength Cond Res.* 2005;19(4):857-65.
5. Nesser TW, et al. The relationship between core strength and performance in Division I athletes. *J Strength Cond Res.* 2008;22(1):175-81.
6. Stanton R, Reaburn PR, Humphries B. The effect of short-term Swiss ball training on core stability and running economy. *J Strength Cond Res.* 2004;18(3):522-8.