



The Effects of a Core Strengthening Program on Improving Running Performance in High School Runners: A Critically Appraised Topic

Kimberly B. Malmberg, Stephanie H. Clines, PhD, ATC
Sacred Heart University, Fairfield, CT

CLINICAL SCENARIO

- The core musculature includes muscles of the trunk and pelvis that are responsible for maintaining the stability of the spine and pelvis and are critical for the transfer of energy from the torso to the extremities during physical activity.¹ When core musculature is weak relative to the strength of the extremities, decreased force production and inefficient movement patterns result.²⁻³
- Most muscle action in running mechanics occurs in the sagittal plane, contributing to the body's forward propulsion. Motion that is outside of that movement decreases running efficiency. Strengthening the core maintains the body in an upright position and anchors the pelvis in a neutral position. A neutral position of the pelvis allows for a strong base, by eliminating undesired movements of the trunk during running.^{4,5} Therefore, the relationship between core stability and movement pattern efficiency will theoretically influence running performance.

FOCUSED CLINICAL QUESTION

Is there evidence to suggest that implementation of a core strengthening program improves athletic performance in high school runners?

SUMMARY OF SEARCH, "BEST EVIDENCE" APPRAISED, AND KEY FINDINGS

- Literature was searched in September of 2019 for studies of Level 2 evidence or higher that investigated the effect of a core strengthening program on performance in high school athletes.
- Running performance was defined as race time during an athletic completion. Improved performance was defined as the decrease in the time it takes participants to run their race.
- The literature search yielded 15 possible studies for inclusion.
- Three studies⁶⁻⁸ met the inclusion criteria and were critically appraised using the PEDro scale.
- All three studies⁶⁻⁸ identified an improvement in runner performance when implementing a core strengthening program compared to the control group.

The training programs consisted of abdominal bracing, prone bridge, supine bridge, side bridge, single leg bridge, abdominal roll out and a pike,^{6,8} and physioball exercises.⁷

- Improvement in running control was also identified.⁸

SEARCH STRATEGY

Terms Used to Guide Search Strategy

- Population: *high school runners*
- Intervention: *core strengthening program*
- Comparison: *normal training*
- Outcome: *improved performance*

Sources of Evidence Searched

- EBSCOhost
- PubMed
- SportDiscus,
- Hand search through existing literature

Inclusion Criteria

- Publication Date: 2009-present
- Language: English only
- Study designs of level 2 evidence or higher
- Studies that investigated the effect of core strengthening programs on running performance
- Studies examining high school runners

Exclusion Criteria

- Studies investigating recreational runners or older populations
- Studies investigating other strengthening programs.

RESULTS OF SEARCH

Table 1. Summary of Study Designs of Articles Reviewed.

Author	Study Design	Level of Evidence*	PEDro Score
Clark et al., ⁶	Randomized Control Trial	2	8/11
Sandrey et al. ⁷	Cross Over	2	7/11
Romero-Franco et al., ⁸	Cross Over	2	8/11

*Level of evidence assessed using the Oxford Centre for Evidence-Based Medicine 2011 criteria.

CLINICAL BOTTOM LINE

There is consistent moderate to high-quality evidence to support the implementation of a core strengthening program in improving athletic performance in high school cross country and track and field athletes.

Strength of Recommendation: The Strength of Recommendation of Taxonomy (SORT) recommends a grade of B for the findings of this appraisal.

IMPLICATIONS FOR PRACTICE, EDUCATION, AND FUTURE RESEARCH

- Consistent with the findings in other athletic populations,⁹ the incorporation of core strengthening programs in runners also improved performance as demonstrated by improved race times among participants.
- All studies⁶⁻⁸ identified improvements in running performance after completing a core strengthening program even though the core strengthening programs implemented were not standardized among the appraised articles. This finding suggests that overall incorporation of a core strengthening program, regardless of exercise type, provides benefit to high school runners. These programs can easily be incorporated by team coaches, athletic trainers, or strength coaches into the runner's training regimen.
- Future research should explore the various core strengthening programs to determine if there is a difference in core stability measures and performance to aid in the design of an optimal core strengthening program for runners.

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