STUDY PROTOCOL

Title

Effects of a 12-Week Isometric Core Training Program on Trunk Endurance and 50-m Freestyle Performance in Adolescent Amputee Swimmers: A Randomized Controlled Trial

Protocol Date

18 May 2026

Sponsor / Institution

Istanbul Gelisim University, Faculty of Sports Sciences, Istanbul, Türkiye

Ethics Approval

Istanbul Gelisim University Ethics Committee
Decision Number: 2024-03-73
Approval Date: 29 February 2024

1. Background and Rationale

Competitive swimming performance depends on propulsion, streamline posture, trunk stabilization, and efficient force transfer through the kinetic chain. In swimmers with limb amputations, asymmetric biomechanics increase the importance of trunk stabilization and neuromuscular control. Core training may improve postural stability, trunk endurance, and swimming performance in Para-swimmers. However, randomized controlled evidence regarding supervised isometric core training in adolescent amputee swimmers remains limited.

This study aims to investigate the effects of a 12-week individualized isometric core training program on trunk muscular endurance and 50-m freestyle performance in adolescent amputee swimmers.

2. Objectives

Primary Objective

To determine whether a 12-week supervised isometric core training program improves 50-m freestyle swimming performance compared with standard swimming training alone.

Secondary Objectives

- To evaluate changes in trunk muscular endurance.
- To assess changes in:

- 20-s sit-up performance
- 20-s reverse sit-up performance
- supine bent-knee leg hold duration
- prone trunk-extension hold duration

3. Study Design

This study is a two-arm, parallel-group, randomized controlled trial with a pre-test/post-test design.

Participants will be randomly assigned in a 1:1 ratio to:

- Experimental Group (EG)
- Control Group (CG)

The intervention duration will be 12 weeks.

Outcome assessors will be blinded to group allocation.

4. Study Setting

The study will be conducted at:

- Ankara Olympic Preparation Centre (TOHM), Türkiye

Swimming training and testing procedures will be performed in the same facility.

5. Participants

Inclusion Criteria

Participants must:

- be aged between 14 and 20 years,
- have upper- or lower-limb amputation,
- actively participate in competitive Para-swimming,
- have participated in at least two national Para-swimming championships,
- provide written informed consent.

Exclusion Criteria

Participants will be excluded if they:

- have acute musculoskeletal injury,
- have cardiovascular contraindications to exercise,

- discontinue regular swimming training,
- refuse participation.

6. Randomization and Allocation Concealment

Participants will be randomized using a computer-generated randomization sequence prepared by an independent investigator.

Allocation concealment will be performed using sequentially numbered opaque sealed envelopes.

Outcome assessors will remain blinded throughout the study.

Due to the nature of the intervention, participants and coaches cannot be blinded.

7. Interventions

Experimental Group (EG)

Participants in the EG will complete:

- standard swimming training,
- additional supervised isometric core training.

Swimming Training

- 6 sessions/week
- approximately 90 minutes/session
- 12 weeks duration

Isometric Core Training

- 3 sessions/week
- 40 minutes/session
- performed before swimming sessions

Exercises include:

- front plank
- side plank
- trunk-extension hold
- bridge exercises
- Pallof press
- bird-dog

- dead-bug variations

Exercises will be individualized according to amputation level.

Progression:

- hold durations increased every 2 weeks,
- elastic resistance added after week 6.

Control Group (CG)

Participants will perform only standard swimming training.

No additional dryland training will be provided.

8. Outcome Measures

Primary Outcome

50-m Freestyle Performance

- Unit: seconds
- Assessment tool: FINA-approved electronic timing system
- Time points:
    - baseline
    - week 12

Secondary Outcomes

20-s Sit-Up Test

- Unit: repetitions
- Time points:
    - baseline
    - week 12

20-s Reverse Sit-Up Test

- Unit: repetitions
- Time points:
    - baseline
    - week 12

Supine Bent-Knee Leg Hold

- Unit: seconds
- Time points:
    - baseline
    - week 12

Prone Trunk-Extension Hold

- Unit: seconds
- Time points:
    - baseline
    - week 12

9. Safety Monitoring

Participants will be monitored throughout all sessions by certified coaches and researchers.

Potential risks include:

- muscle soreness,
- fatigue,
- exercise discomfort,
- temporary musculoskeletal strain.

Any adverse event will be documented and reported.

Participants experiencing injury or medical contraindications will discontinue participation.

10. Ethical Considerations

The study was approved by the Istanbul Gelisim University Ethics Committee.

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The study will be conducted in accordance with the Declaration of Helsinki.

Written informed consent will be obtained from all participants and parents/guardians for minors.

11. Statistical Considerations

Statistical analyses will be performed using SPSS software.

Normality will be assessed using the Shapiro–Wilk test.

Depending on distribution:

- paired t-tests,
- Wilcoxon signed-rank tests,
- independent-samples t-tests,
- Mann–Whitney U tests

will be used.

Statistical significance will be accepted at:
$\alpha = 0.05$

Effect sizes will also be calculated.

12. Data Management and Confidentiality

Participant information will remain confidential.

All data will be coded and securely stored.

Only study investigators will have access to identifiable information.