Injuries often force runners to cross-train in an attempt to maintain fitness with less or no pain. It is however not well understood which cross-training modalities are most effective to maintain fitness while not exacerbating injury symptoms.

The purpose of this study was to compared running performance, running economy, hip adduction and, functional movements before and after training from three types of cross-training modalities in high school runners.

Introduction

Impact of different cross-training modes on economy and functional movement in high school runners

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Methods

31 High School Cross-Runners

- **Elliptical** (N = 7)
  - 15 ± 3 yrs
  - 60.0 ± 7.0 kg
  - 1.74 ± 0.09 m

- **Ebike** (N = 9)
  - 16 ± 1 yrs
  - 65.6 ± 10.2 kg
  - 1.80 ± 0.05 m

- **Cycle** (N = 6)
  - 15 ± 1 yrs
  - 55.2 ± 10.2 kg
  - 1.70 ± 0.06 m

- **Run Only** (N = 9)
  - 15 ± 1 yrs
  - 57.4 ± 6.9 kg
  - 1.71 ± 0.05 m

**Pre-Training Testing** (Early season: August)

**Session 1** (in field)
- 3000m Time Trial
  - 400m track

**Session 2** (in lab)
- FMS
  - Deep Squat (DS), Active Straight Leg Raise (ASLR) [1]

**Running Analysis**
- 80% of Time Trial speed on treadmill
- Hip Adduction – Motion capture (240Hz, Qualisys AB)
- Running economy (VO₂) (TrueOne 2400, ParvoMedics)

**4-Week Training**
- 2 sessions per week
- 20-30min sessions
- Same length of time per group
- 10-13 on Borg Scale RPE

**Post-Training Testing** (one week after training)

**Session 1** (in field)
- 3000m Time Trial
  - XC Course

**Session 2** (in lab)
- Same procedures

Results

**Fig 3** Average aggregate FMS score for deep squat and active straight leg raise for all groups PRE- and POST-training (mean±SD); *: p < 0.05.

**Fig 4** Average VO₂ for during treadmill running at set speed PRE- and POST-training (means±SD); *: p < 0.05.

- RUN: p = 0.017 d = 0.3
- CYCLE: p = 0.20 d = 0.87
- ELLIP: p = 0.17 d = 0.60
- EBICE: p = 0.003 d = 1.36

- RUN: p = 0.29 d = 0.08
- CYCLE: p = 0.21 d = 0.30
- ELLIP: p = 0.12 d = 0.24
- EBICE: p = 0.05 d = 0.46

**What Does it Mean?**

1. EBICE training may be the most effective cross-training modality to improve RE – Small effect size?
2. 3000m TT was improved for all groups with larger improvements for CYCLE and EBICE groups – Early season build-up?
3. Moderate-to-large effects suggest that running only and inclusion of cycling may help reduce hip adduction – Injury implications?
4. Large increase in FMS score (DS/ASLR) after EBICE training only suggests improved mobility – Implications to reduce injury risks [1]?
   - Prospective injury assessments and longer training periods to compare cross-modalities should be conducted.

References


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