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

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## Introduction

- 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.**

**Ebike** (8C, ElliptiGO®)      **Elliptical** (EFX546, PRECOR)

## Methods

**31 High School Cross-Runners**

**Elliptical** (N = 7)
15±1yrs
60.0±7.0kg
1.74±0.09m

**Ebike** (N = 9)
16±1yrs
65.8±10.2kg
1.80±0.05m

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

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

**Pre-Training Testing** (Early season: August)
**Session 1** (in field)
3000m Time Trial
- 400m track

One week apart

**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 ($VO_2$) (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

One week apart

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

**Analyses**
- Paired t-tests and Cohen's d effect sizes were used to compare each variable before and after training for all groups
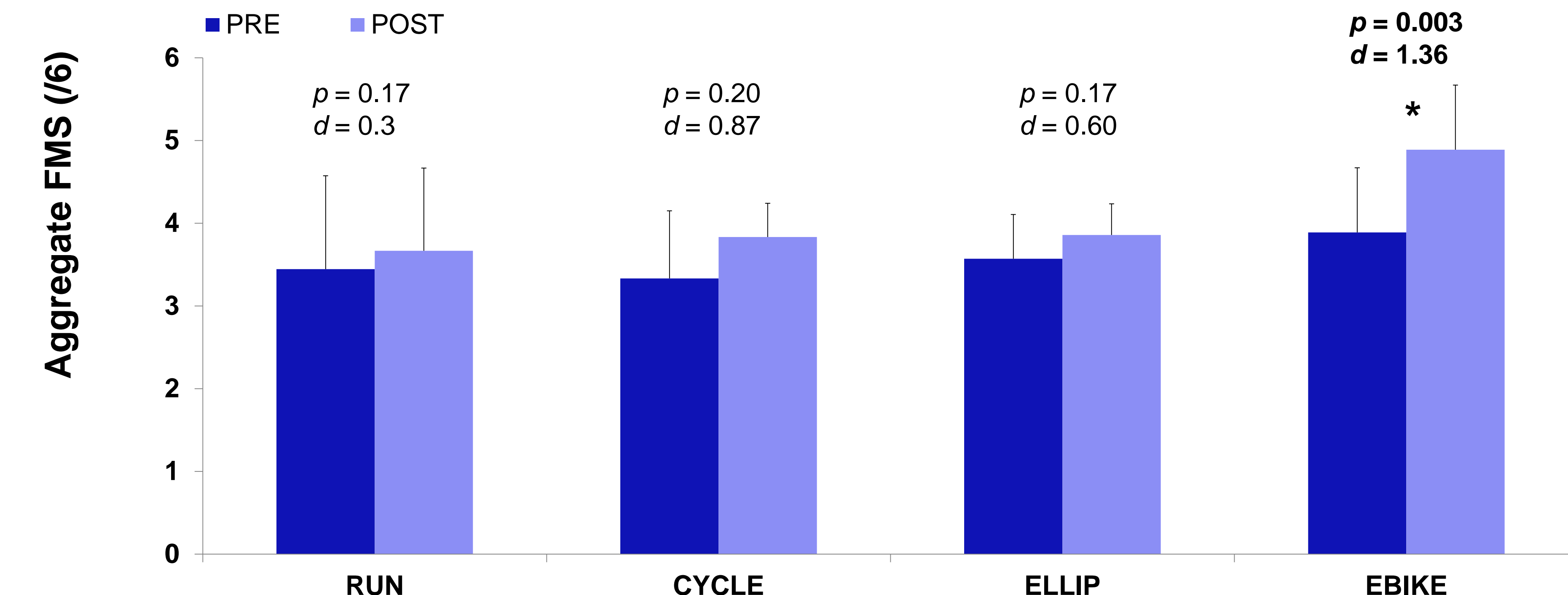
## Results



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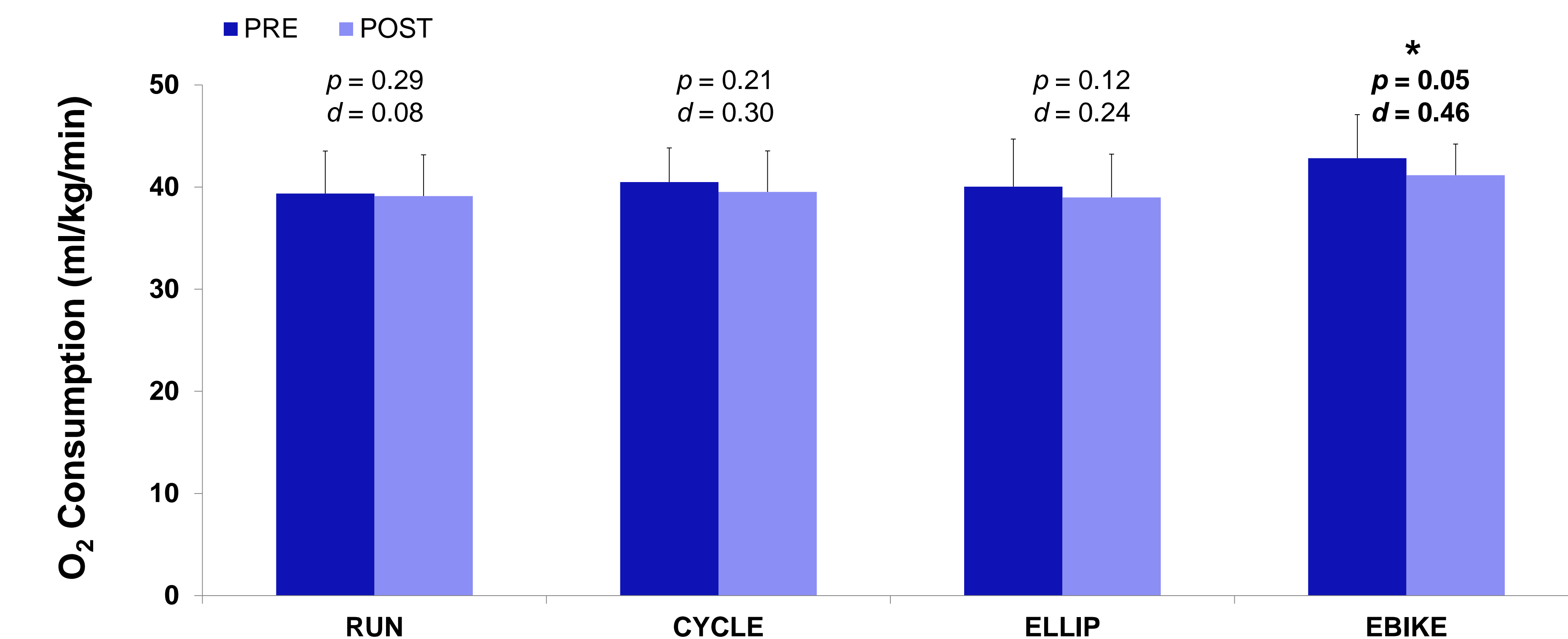


Fig 4. Average VO2 for during treadmill running at set speed PRE- and POST-training (mean±SD); *: $p < 0.05$.

## What Does it Mean?

1. EBIKE 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 EBIKE 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 EBIKE 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

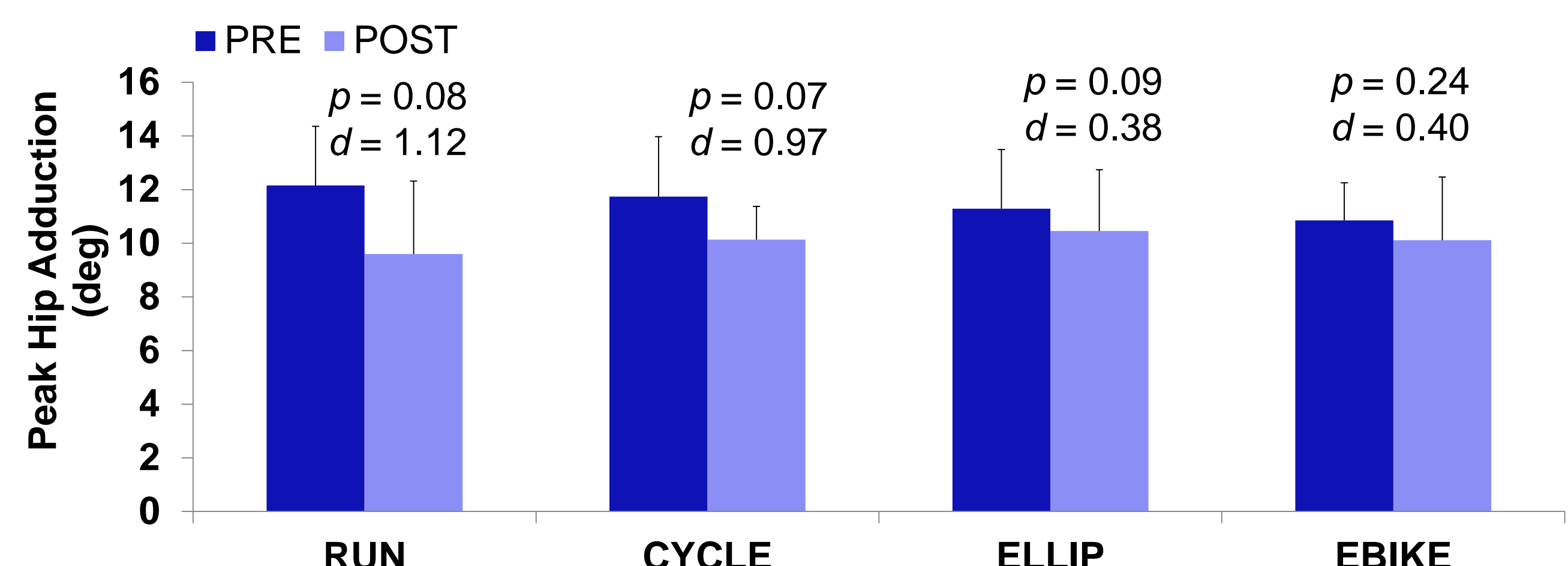1. Hotta, T., et al. J Strength Cond Res, 2015. 29(10): 2808-15.

## Results



Fig 1. Peak hip adduction during treadmill running at set speed PRE- and POST-training (mean±SD); *: $p < 0.05$.
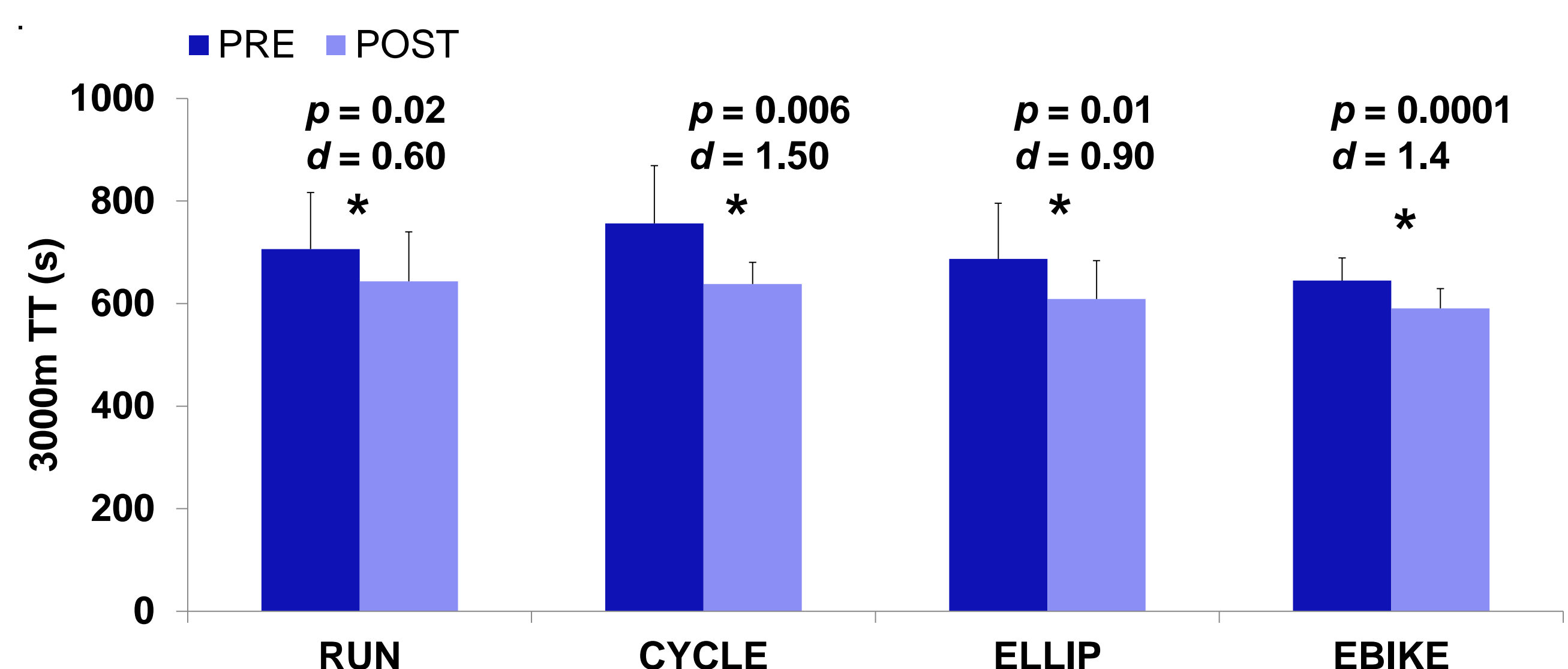


Fig 2. 3000m times (s) PRE- and POST-training (mean±SD); *: $p < 0.05$.

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