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META-ANALYSES OF THE EFFECT OF HIGH-INTENSITY INTERVAL TRAINING ON PERFORMANCE-RELATED MEASURES IN ELITE ATHLETES

Wiesinger, H.P., Hopkins, W.G., Haller, N., Blumkaitis, J., Strepp, T., Kilzer, F., Schmuttermair, A., Stöggl, T.

University of Salzburg

INTRODUCTION:

High-intensity interval training (HIT) enhances sprint and endurance performance, but its effect on elite athletes, who are already highly trained, could be limited by a ceiling effect. We have therefore meta-analysed the effects of HIT on such athletes.

METHODS:

We followed the PRISMA guidelines. Studies were performed on endurance (mean VO₂max: males 60 ml·min⁻¹·kg⁻¹, females 55 ml·min⁻¹·kg⁻¹) or other elite athletes. HIT consisted of 5 sessions and 1 session/wk at intensities 90% of HRmax or VO₂max for intervals of 4 min or with all-out intervals of 90 s. Percent changes with HIT vs usual control training were derived via log-transformation from random-effects meta-regression with adjustment for one or more fixed-effect modifiers (sex, type of athlete, type of test, type of HIT, phase of training, training duration, whether HIT replaced some usual training, and relevant pre-test mean values). Separate analyses were performed for the following performance-related measures: sprint speed/power, repeated-sprint ability (RSA), time-trial speed/power, peak speed/power, threshold speed/power, VO₂max, and work economy. Heterogeneity, representing unexplained real differences between settings, was estimated from random effects for study- and sample-estimate identity. Level of evidence for effect magnitudes was evaluated via effect uncertainty and a smallest important change of 1%.

RESULTS:

All performance-related measures except economy showed at least good evidence for enhancement in some subgroups and some settings, with effects ranging from 2.1% for 5-s sprints in male other athletes to 12.6% for threshold speed/power in female endurance athletes. Moderating effects of sex and type of athlete were inconclusive. Very good evidence was found for greater effects of HIT vs control on longer sprint and time trial. There was at least good evidence for reduced effects of more anaerobic types of HIT on VO₂max and threshold speed/power, but its effects on other measures were inconclusive. Effects of other modifiers on the other measures, where they could be estimated, were also inconclusive. Heterogeneity of the effects of HIT ranged from small to moderate (SDs 1.1 to 2.3%) but was generally unclear.

CONCLUSION:

On average, HIT works for endurance and other elite athletes across various performance demands, including short sprints, repeated sprints, and time trials, which relate closely to competition performance. The positive effects of HIT would hold for most sports, even if our already conservative estimate of the smallest important of 1% was doubled. However, when heterogeneity is taken into account, HIT could be ineffective for some measures in some settings. Additional research is required to address the uncertainty in the effects of HIT with female non-endurance athletes on some measures, the effect of HIT on economy, and the modifying effects of the duration of training, the phase of training, and type of HIT with most measures.

Contact:

hans-peter.wiesinger@plus.ac.at

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