Exercise Intensity Has No Effect on the Magnitude of Training-Induced Increases in Maximal Oxygen Uptake

Trisha D. Scribbans, Stephan P. Vecsey, Paul B. Hankinson, William S. Foster, Brendon J. Gurd.
Queen's University, Kingston, ON

Exercise training at a variety of intensities increases maximal oxygen uptake (VO_2max); the strongest predictor of cardiovascular and all-cause mortality. **PURPOSE:** The purpose of the present study was to perform a systematic review, meta-regression analysis and meta-analysis of available literature to determine if a dose-response relationship exists between exercise intensity and training-induced increases in VO_2max. **METHODS:** A search of the PubMed database was performed using the key terms 'VO_2max' and 'exercise training' or 'high intensity interval training' or 'endurance training' or 'sprint interval training'. Forty-three studies involving human participants (24±1yrs; 45.5±1.5 $mL \cdot kg^{-1} \cdot min^{-1}$) were included in the meta-regression with exercise training intensity, session dose, and total training volume used as covariates. These studies were also divided into 3 tertiles based on intensity (tertile 1: ~60-70%; 2: ~80-92.5%; 3: ~100-250%VO_2max), for comparison using 3 separate meta-analyses. **RESULTS:** The fixed and random effects meta-regression model examining training intensity, session dose, and total training volume was non-significant ($Q3 = 1.25$; $p=0.74$; $R^2 = 0.04$). There was no significant difference between tertiles in mean change in VO_2max post-training (tertile 1: +0.29±0.46 L/min, ES (effect size) =0.64; 2: +0.29±0.43 L/min, ES=0.64; 3: +0.33±0.37 L/min, ES=0.90), despite significant ($p<0.05$) reductions in session dose and total training volume as training intensity increased. **CONCLUSIONS:** These data suggest that exercise training intensity has no effect on the magnitude of training-induced increases in maximal oxygen uptake in healthy human participants, but similar adaptations can be achieved in low training doses at higher exercise intensities.

Supported by NSERC 402635-2011.