Zusammenfassung Hoppeler, 2008 (08-04)

HIT-Studie: Effekt eines 14-tägigen hochintensiven Ausdauertrainings auf funktionelle, muskuläre, hämatologische und kardiologische Veränderungen bei Ski Alpin Athletinnen

Abstract

This study examined cardiac and hematological mechanisms related to improvements of VO_2max (+6%) and peak power (+5.5%) after an 11-day high-intensity interval training (HIT) block. Six female and 13 male elite junior alpine skiers were matched and randomly assigned to either an interval (IT, n=13) or control training group (CT, n=8). IT performed 15 HIT-sessions (4×4min at 90-95% HR_{max}) during 11 days whereas CT continued normal mixed training including endurance and strength sessions. Using non-invasive CO-rebreathing, blood volume (BV), total hemoglobin mass (tHb_{mass}) and red cell volume (RCV) were assessed before (pre), two days (post2) and seven days (post7) after training. Pre and post7, stroke volume (SV_{peak}) and cardiac output at peak power output (Q_{peak}) were determined by inert gas rebreathing, whereas left ventricular muscle mass (LV_{mass}) was assessed by cardiac magnetic resonance imaging. Post7, only IT significantly increased BV, tHb_{mass} and RCV compared to post2 (+6.6%, 6.6%, 11.7%; $p<0.05$) and pre (+10.0%, 9.9%, 9.6 %; $p<0.01$), with no changes in CT. SV increased significantly in IT post7 (+9.3%; $p<0.01$), whereas CT showed non-significant changes. No changes were measured in LV_{mass} for either group. Pooling data from IT and CT, high correlations of VO_2max with tHb_{mass}, BV, SV_{peak} and Q_{peak} (r=0.92, 0.89, 0.85, 0.83) as well as of BV with SV_{peak} and Q_{peak} were evident (r=0.78, 0.75; all $p<0.01$). These data indicate that an 11-day HIT block induces substantial increases in tHb_{mass}, BV and Q_{peak}; thus, improved VO_2max after such a short training block can be explained by hematological and functional cardiac adaptations.