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Physiological and Molecular Adaptations to Concurrent Training in Combination with High Protein Availability

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Objective Attenuated muscle strength, hypertrophy and power adaptations with combined resistance and endurance ('concurrent') training may result from blunted cell signalling. Protein intake potentiates anabolic signalling pathways to facilitate adaptation. We hypothesized that 12 wk concurrent training with a high protein diet would elicit similar adaptations to a) strength, hypertrophy and power compared to resistance training alone, and b) aerobic capacity compared to endurance training.
Methods Thirty-two recreationally active males (age 25±5y; BMI 24±3kg•m^{-2}; mean±SD) performed 12 wk of either resistance (RES; *n*=10) or endurance (END; *n*=10) training (3x•w^{-1}), or concurrent training (CET; *n*=12; 6x•w^{-1}) with a high-protein (2g•kg^{-1}•d^{-1}) diet. Strength (1RM), aerobic capacity (VO_{2peak}) and anaerobic power (Wingate) were assessed PRE and POST. *Vastus lateralis* biopsies (immunoblotting) and thickness (ultrasound) were assessed PRE, after week 4 (WK4) and 8 (WK8), and POST. Changes were analyzed by two-way ANOVA with repeated measures.
Results Muscle thickness increased PRE to POST by 18% in CET, 14% in RES and 10% in END (P<0.001) and was greater in CET and RES compared to END (P<0.05). Leg press 1RM increased PRE to POST by 24% in CET and 33% in RES (P<0.01) but was not different between CET and RES. VO_{2peak} (L•min^{-1}) increased PRE to POST by 7% in CET and 12% in END (P<0.05) but was not different between CET and END. Wingate peak power (N•kg^{-1}) increased PRE to POST by 10% in RES (P<0.01) and was greater compared to CET and END (P<0.05). Total mTORC1 increased PRE to POST in CET (P<0.001) and was greater in CET compared to RES and END (P<0.01) and RES compared to END (P<0.05).
Conclusions Despite a high protein intake, concurrent training selectively attenuates developments to anaerobic power compared to resistance training. High protein availability may be effective for curtailing interferences to strength and hypertrophy with concurrent training.