

Combined Strength and Endurance Training: perspectives for recreational endurance runners

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Chronic and acute neuromuscular, cardiorespiratory and hormonal responses and adaptations to combined strength and endurance training were examined in recreational endurance runners using longitudinal and cross-sectional study designs. In the longitudinal study, men and women were divided into specific strength training groups following a short preparatory period. Men: maximal (M), explosive (E), Men and women: mixed maximal and explosive (MM, MW) and circuit training control (CM, CW). Groups completed an 8-week strength training intervention after which M, E and CM completed 14 weeks of marathon training. Periodized maximal, explosive, and mixed strength training were more effective than circuit training in improving maximal and explosive strength as well as maximal muscle activation of the lower extremities despite increased running volume. Overall

endurance performance improved (peak running speed, S_{peak}) in all groups. After the 14-week marathon period, only M made further gains in S_{peak} and running economy (RE). The cross-sectional study showed that when mixed strength and endurance were combined into a single session, the order of loadings, (endurance followed by strength (ES) or strength followed by endurance (SE)), led to different acute responses and recovery patterns. At recovery of 24 and 48 h, suppressed testosterone concentrations were observed in SE men while a delayed decrease in explosive strength was observed in ES women. The present results suggest that periodized maximal, explosive, and mixed strength training combined with endurance training lead to improvements in neuromuscular running characteristics while the order of exercises should be considered for optimization of training and recovery.