

# **Role of strength training in endurance runners during preparatory, maximal versus explosive, and reduced strength training periods.**

Ritva S. Taipale<sup>1</sup>, David Gitonga<sup>1</sup>, Simon Walker<sup>1</sup>, Ari Nummela<sup>2</sup>, Ville Vesterinen<sup>2</sup>,  
Jussi Mikkola<sup>2</sup>, Keijo Häkkinen<sup>1</sup>

<sup>1</sup>Department of Biology of Physical Activity, University of Jyväskylä, Jyväskylä, Finland;

<sup>2</sup>KIHU-Research Institute for Olympic Sports, Jyväskylä, Finland.

Strength (STR) and endurance (END) training produce divergent adaptations and are often performed concurrently. An interference effect (1) between STR and END training is often related to high intensity/volume and long duration of training, but it is possible for concurrent training to lead to increased STR and END performances even in endurance athletes (2). A reduction in training stimulus leads to a reversal in adaptations as demonstrated by decreased activation and STR of detrained muscles (3).

Twenty-eight male recreational END runners (mean±SD, age 35.4±6.8yrs, height 180±5.3cm, body mass 79.3±7.5kg) were divided into three STR training groups: maximal (M=11), explosive (E=10) and circuit training (C=7). Within these groups, subjects completed 6 weeks of common preparatory STR training (PRE) and then a specific 8-week STR training intervention (STI) followed by 14 weeks of intentionally reduced strength training and increased endurance training (RST). STR training (including at least two exercises for leg extensors) occurred on average 1.3±.02, 1.5±.03 and 0.5±.03 times per week in each training period, respectively, while END training volume (running km) increased progressively throughout the study. Concentric leg press strength (1RM), jumping power (CMJ), muscle activation (EMG of VL + VM) and END performance (vVO<sub>2</sub>, VO<sub>2MAX</sub>, running economy (RE)) were measured prior to PRE (-6), at 0, 4 and 8 weeks of STI and after RST (+14).

During PRE and STI, 1RM improved significantly in all groups peaking at 4 (7.7, 3.2 and 6.4% in M, E and C from -6, respectively), while significant gains in CMJ peaked at 8. Gains in 1RM were accompanied by increased EMG of VL+VM in M and E (p=0.027 and 0.002) but not in C. VO<sub>2max</sub> increased only in M from -6 to 8 (4.3%), vVO<sub>2</sub> improved significantly in all groups from -6 to 8 and RE in E improved significantly by 2.4%. Following RST, progressive decreases were observed in 1RM, CMJ and EMG which were significant in 1RM and EMG of M (p=0.002 and 0.038). However, significant increases in vVO<sub>2</sub> of M and E (4.7 and 2.4%), RE of M (7.7%) as well as some gains (n.s.) in VO<sub>2max</sub> continued in M and E.

Both M and E STR training performed concurrently with high volume END training led to increases in 1RM, CMJ and EMG but strength development plateaued indicating some interference over a prolonged period. Nevertheless, these neuromuscular improvements were accompanied by progressive gains in VO<sub>2max</sub>, vVO<sub>2</sub> and RE. RST resulted in decreases in 1RM, CMJ and EMG; however, vVO<sub>2</sub> and RE continued to improve in M and E. Adaptations to ST were maintained to some extent, since 1RM, CMJ and EMG did not fall below starting values. Thus, improved neuromuscular performance and increased preparedness for an increase in running volume due to STR enabled subjects to improve END performance.

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