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The Effects of Strength Training on Some Parameters of Aerobic and Anaerobic Endurance

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ABSTRACT

The studies exploring the influence of resistance training on endurance in men have produced inconsistent results. The aim of this study was to examine the influence of an Olympic weight lifting training programme on parameters of aerobic and anaerobic endurance in moderately physically active men. Eleven physical education students (age: 24.1 ± 1.8 yr, height: 1.77 ± 0.04 m, body mass: 76.1 ± 6.4 kg; X ± SD) underwent a 12-week, 3 times/wk training programme of Olympic weight lifting. Specific exercises to master the lifting technique, and basic exercises for maximal strength and power development were applied, with load intensity and volume defined in relation to individual maximal load (repetitio maximalis, RM). Parameters of both, aerobic and anaerobic endurance were estimated from gas exchange data measured during a single incremental treadmill test to exhaustion, which was performed before, and after completion of the 12-wk programme. After training, there was a small, but significant increase in body mass (75.8 ± 6.4 vs. 76.6 ± 6.4, $p<0.05$) and peak VO_2 (54.9 ± 5.4 vs. 56.4 ± 5.3 mL O_2/min/kg, $p<0.05$), with no significant change of the running speed at the anaerobic threshold (V_{AT}) and at exhaustion (V_{max}) (both $p>0.05$). However, there was a significant increase of anaerobic endurance, estimated from the distance run above V_{AT}, from V_{AT} to V_{max} (285 ± 98 m vs 212 ± 104 m, $p<0.01$). The results of this study indicate that changes in both, anaerobic and aerobic endurance due to a 12-wk period of strength training in untrained persons can be determined from a single incremental treadmill test to exhaustion. The possible causes of those training effects include several possible mechanisms, linked primarily to peripheral adaptation.

***Key words**: strength training, weight lifting, aerobic capacity, anaerobic capacity, endurance*

Introduction

The implementation of a specific training programme, applied in order to develop one motor ability, under certain circumstances may have an influence on other motor abilities. The magnitude of this influence, among other factors, depends on the fitness of the subject: the lower the fitness status, the greater is the possibility that other fitness components, not specifically targeted with the training, will also show an increase. With the increase of the overall fitness, the same training programme will have less and less influence on other components for which is not primarily applied, narrowing its influence on the primary fitness component[1]. Zaciorski[1] stresses that a specific conditioning programme may also have a negative transfer on other, not targeted fitness components. As an example, he quotes the relationship between the development of maximal strength and aerobic endurance, which often are inversely related. Viru[2] emphasizes the incompatibility of strength and aerobic endurance training, where strength training may hinder the development of aerobic endurance, and *vice versa*. Similarly, Weineck[3] reports that high volumes of endurance training may have negative influence on speed and strength. The studies on concurrent strength and aerobic endurance training have produced inconsistent results[4–7]. Kraemer et al.[8] report that concurrent training attenuates the adaptations at the skeletal muscle level compared to each mode of training when performed in isolation, which may cause a lack of development in either strength or endurance.

Strength training and aerobic conditioning each induce distinct structural and metabolic adaptations in the body, thus causing opposite training effects[9]. To elicit adaptive processes, a stimulus above a certain threshold is needed to activate protein synthesis in the muscle cells. The location of synthesis in the cell, and the type of

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