EFFECT OF COMBINED ENDURANCE AND STRENGTH TRAINING ON MAXIMAL AND EXPLOSIVE STRENGTH DEVELOPMENT OF LEG EXTENDERS AND FLEXORS IN MIDDLE-AGED AND OLDER WOMEN

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Introduction: During combined strength and endurance training the physiological stimuli directed to skeletal muscle are divergent in nature, and these stimuli will determine the adaptation to exercise accordingly (Hickson 1980). Concurrent training may or may not have an interfering effect on the development of strength and endurance components. This probably depends on the mode, intensity, volume, frequency and duration of training and pretraining status of subjects (Sale et al. 1990, Häkkinen et al. 2003). This study compared the effects of strength training only, endurance training only, and combined training on maximal and explosive strength development as well as maximal aerobic capacity in middle-aged and older women.

Methods: Ninety-six healthy middle-aged and older women (40 to 65 years) were assigned to four groups; strength training only (S, n = 27), endurance training only (E, n = 26), combined strength and endurance training (SE, n = 25), and control groups (C, n = 18). Supervised S (2xweek-1), E (2xweek-1), and SE (2+2xweek-1) training lasted for 21 weeks. Maximal bilateral isometric force and one-repetition maximum of leg extensors (1RM) and unilateral maximum force of knee extensors and flexors were measured. Maximal power in concentric bilateral leg extension was tested with the 50% of 1RM load. Maximal aerobic capacity (VO2max) and power (Wmax) were measured in an incremental cycling test until exhaustion.

Results: Significant (p<0.001) and similar increases in magnitude in maximal isometric bilateral force (21.0%, 18.4%) and 1RM (9.8%, 12.1%) occurred in S and SE, respectively. E showed only minor increases (8.8%, p<0.05, 1.9%, p<0.05, 1.7%, ns, and 1.9%, ns.), and no increases occurred in C. Maximal power at 50%1RM increased (p<0.01) only in S and SE (9.9%, 12.5%, respectively). Similar increases in VO2max were recorded in both E and SE (15.7%, 16.9%, respectively) as well as in Wmax (16.6%, 17.5%), while S showed minor increases (5.3%, p<0.05, and 6.3%, p<0.05) with no changes in C.

Discussion: Significant increases in VO2max and Wmax or maximal strength and explosive power can be obtained by low frequency (2xwk-1) endurance or strength training in middle-aged and older women. Combined strength and endurance training (4xwk-1) does not seem to interfere with the development of aerobic performance, maximal strength of leg extensors and flexors or explosive power. The two training modalities can thus be combined without adverse effects, when low to moderate frequency physical training utilized. From the practical point of view, these findings may be of value how resistance exercise is prescribed and combined successfully with endurance training in middle-aged and older adults.

References

Keywords: Strength and Power