EFFECTS OF STRENGTH, ENDURANCE AND CONCURRENT STRENGTH AND ENDURANCE TRAINING ON ANDROGEN RECEPTOR MRNA AND PROTEIN EXPRESSION IN ELDERLY MEN

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Introduction
It is well known that strength training increases greatly muscle strength and mass while endurance training do not. Concurrent training may have an interfering effect on the development of strength and endurance depending on the training program and pretraining status of subjects (Häkkinen et al. 2003). Testosterone is necessary for adaptations in muscle strength and size with long-term training. Cross-sectional studies have suggested that testosterone levels are reduced during aging and endurance training potentially deteriorating testosterone-dependent physiological processes (Hackney et al. 2005). Testosterone interacts with skeletal muscle via binding to androgen receptors (AR). We investigated whether the expression of AR differs between strength, endurance and combined training.

Methods
Healthy male subjects were randomized to strength (n=10, 61±5 yrs), endurance (n=9, 58±8 yrs) and combined (n=7, 64±3 yrs) training groups. Strength (S) and endurance (E) groups trained twice/week and combined (C) group trained 4 times/week: 2 for strength and 2 for endurance (bicycle ergometry). Muscle biopsies were taken from m.vastus lateralis and basal serum testosterone (T) concentration, VO2max, muscle strength (1RM and maximal isometric force of leg extensors) and VL thickness (by ultrasound) was measured before and after a 21-week training period. AR mRNA (by RT-PCR) and protein content (by Western blot analysis) were measured from the muscle samples. MHC isoform content was analysed electrophoretically.

Results
1RM increased 21 ±9% (p<.001), 25 ±10% (p<.01), and 8 ±10% (p<.05) in S, C and E, respectively. The changes were greater in S (p<.05) and C (p<.05) than in E. Significant increases occurred only in S and C in maximal isometric force. Increases of 14 61617;5% (p<.001), 14 61617;11% (p<.01) and 8 61617;12% occurred in muscle thickness in S, C and E, respectively. VO2max increased only in E (10 ±11%, p<.05) the change being greater than in S. MHCIIa content increased in S while MHCIIa content decreased and MHCI increased in E. No significant changes were observed in T and in AR mRNA and protein expression.

Discussion
As expected increases in muscle strength and thickness were greater in S and C than in E. Only E showed significant increases in VO2max. MHCIIa and I content changed in S and E as could be presumed due to the training method used. However, the data showed no interference of concurrent strength and endurance training in present previously untrained elderly men during the 21-week training period with the training protocols used. The present results indicate that 21 weeks of strength, endurance or combined training may not have systematic effect on AR mRNA and protein expression in skeletal muscle in elderly men and the present changes in muscle strength and mass could not be explained by changes in AR content of trained muscles.

References
Häkkinen K et al. (2003) Eur J Appl Physiol. 89:42-52

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