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The effect of weight-lifting exercise related to muscle fiber composition and muscle cross-sectional area in humans.

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Abstract

Isometric and dynamic strength and endurance of knee extensors were tested in 18 young males. The relative composition of slow (ST) and fast twitch (FT) fibers in the vastus lateralis muscle was registered from needle biopsies. Thigh muscle volume was evaluated from ultrasonic measurements. Six subjects served as controls, six trained with 50%, and six with 80% dynamic strength three times per week for 7 weeks with 20 and 12 repetitions per session, respectively. The training load was adjusted to the increases in strength observed during training. Dynamic strength increased by 42.3% in the 80% group (p less than 0.01). In the control group and 50% group no significant increases were observed. Dynamic endurance: Controls showed no change. There was an over-all increase in the 50% group, while the 80% group only increased dynamic endurance for heavier loads. Isometric strength and endurance and fiber composition did not change in any group. In the 50% group the area of FT-realtive to ST-fibers increased 12.4% (p greater than 0.05). Dynamic strength relative to muscle cross section increased by 30% in the 80% group (p less than 0.01) positively correlated to relative content of FT fibers. The present results confirm the specificity of training and indicate that a high content of FT fibers is a prerequisite for a successful strength training.

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