MYOFIBRE ADAPTATIONS AND STRENGTH AND POWER DEVELOPMENT AFTER STRENGTH AND/OR ENDURANCE TRAINING IN 40 TO 65-YR-OLD WOMEN

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Introduction: Volume, intensity, frequency and mode of training, initial training status of subjects, and the way in which the strength and endurance training is integrated have been proposed to interact while training for strength and endurance are performed concurrently (Sale et al. 1990). The purpose of this study was to examine myofibre adaptations and changes in neuromuscular performance following 6 months of strength and/or endurance training in 40 to 65-yr-old women.

Methods: Ninety nine women [mean (±SD) age 52±7 yr] completed a periodized total body training programme (2 exercises for leg extensors) of strength (S), endurance (cycling exercise) (E), concurrent S and E training (SE) or served as controls (C) over a 6-month period with 2 (S and E) or 2+2 (SE) workouts a week. Maximal voluntary isometric force and maximal concentric power were measured with leg press exercise. Muscle fibre composition and muscle fibre size of vastus lateralis muscle were assessed based on the ATPase activity at pH 4.37, 4.55 and 10.3 using the Tema Image-Analysis System (Scan Beam, Denmark).

Results: Maximal strength showed similar significant increases in both S (18.4%, p < 0.001) and SE (21.0%, p < 0.001), while only a minor increase occurred in E (8.8%, p < 0.05) with no increase in C (6.9%, ns.). Maximal power increased in both S (9.9%, p < 0.01) and SE (12.5%, p < 0.001), while E and C showed no increases. All training groups decreased (p < 0.05) their type IIB myofibre content and type IIA percentage increased (p < 0.05) in S. Muscle fibre size remained unaltered in S and SE for each fibre subtype, whereas the size of type I and IIA showed a significant increase (p < 0.05) in E and C, respectively. A significant correlation was found only in the S group between the changes in type IIA content and the changes in maximal strength (r = 0.61, p <0.05).

Discussion: The present study examined myofibre adaptations to S, E and SE in 40 to 65-yr-old women. The similar increases in neuromuscular performance in both S and SE showed that the present low volume/frequency concurrent training in aged women led to no interference effect. All training groups followed the expected muscle fibre subtype transformation observed as decreased type IIB but no changes in type I percentage. Interestingly, training-induced changes in myofibre sizes remained rather minor in all trained groups. However, in S the mean increases in size of three fibre types were as large as 10%, 4% and 24% but were characterized by large interindividual variation, while SE showed much less interindividual variation in myofibre size adaptations. In order to elucidate myofibre hypertrophy in older women longer training studies and more biopsy time points may be required. Type IIA myofibres seem to adapt differently after S compared to SE and these fibres seem to be more related to strength gains when performing S alone.

References

Keywords: Muscle Cells, Strength Training, Endurance Training