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Research article, Young investigator

Adaptive Changes of Myosin Isoforms in Response to Long-Term Strength and Power Training in Middle-Aged MenRaivo Puhke¹, Sirkka Aunola² , Pirjo Ailanto³, Karin Alev¹, Mika Venojärvi^{2,4}, Heikki Rusko^{5,6}, Teet Seene¹[Author Information](#)[Publish Date](#)[How to Cite](#)[Email link to this article](#)

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The purpose of the study was to examine the adaptive changes in myosin heavy chain (MHC) and light chain (MLC) isoforms in human vastus lateralis muscle caused by long-term strength and power training (54 weeks, approximately 3 times a week) in untrained middle-aged men (16 in the training and 6 in the control group). Muscular MHC and MLC isoforms were determined by means of SDS-PAGE gel electrophoresis. During the training period, maximal anaerobic cycling power increased by 64 W ($p < 0.001$) and the maximal jumping height by 1.5 cm ($p < 0.05$) in the training group, but no significant changes were found in the control group. However, the group by time effect was not significant. In the training group, the increase of the maximal jumping height correlated with the number of strength and power training sessions ($r = 0.56$; $p < 0.05$). The change of the proportion of MHC IIa isoform from $52.6 \pm 12.2\%$ to $59.4 \pm 11.6\%$ did not reach statistical significance ($p = 0.070$ for group by time; within training group $p = 0.061$) and neither did the change of the proportion of MHC IIx isoform from $18.1 \pm 11.4\%$ to $11.1 \pm 9.1\%$ ($p = 0.104$ for group by time; within training group $p = 0.032$). The degree of change of MHC IIx isoform correlated with the amount of earlier recreational sports activity ($r = 0.61$; $p < 0.05$). In the training group, the changes of MLC1s isoform correlated negatively with the changes of MLC1f isoform ($r = -0.79$; $p < 0.05$) as well as with the changes in maximal anaerobic cycling power ($r = -0.81$; $p < 0.05$), and positively with those of MHC I

isoform ($r = 0.81$; $p < 0.05$). In conclusion, the long-term strength and power training ~3 times a week seemed to have only slight effects on fast MHC isoforms in the vastus lateralis muscle of untrained middle-aged men; the proportion of MHC IIa tended to increase and that of MHC Iix tended to decrease. No changes in MLC isoform profile could be shown.

Key words: Anaerobic muscular power, contractile proteins, myosin heavy chain isoforms, myosin light chain isoforms, training, transformation

Key Points

- A long-term strength and power training program seemed to decrease the proportion of MHC Iix isoform in previously untrained middle-aged men.
- The degree of change of MHC Iix isoform correlated with the amount of earlier recreational sports activity.
- The changes of MLC isoforms were associated with the transition of MHC isoforms. Whether this means improved speed and coordination of muscle contraction remains to be investigated in the future.

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