Muscle function and morphology adaptations to differentiated training models

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Summary:
This master thesis represents a part of an international multigroup project, with the overall aim of identifying and investigating cellular regulatory mechanisms underlying the adaptations to differentiated exercise modalities. More specifically, the thesis work has been focused towards muscle functional and morphological adaptations to different exercise modalities.

This thesis contains two manuscripts with the following purposes, methods, results and conclusions:

**Manuscript 1** – Muscle morphological and strength adaptations to endurance versus resistance training.
**Purpose:** The purpose of this manuscript was to compare and correlate several morphological adaptations to 10 weeks of endurance (END, n=7) versus resistance training (RT, n=7).
**Methods:** Biopsies were harvested from m. vastus lateralis (VL) and analyzed for fiber cross-sectional area (CSA). MRI scans was performed to determine anatomical CSA of the thigh. Ultra sonic measurements were used to determine the fascicle angle (FA) of VL. Also various functional parameters such as maximal oxygen uptake, isometric and isokinetic strength were measured.
**Results:** RT increased fiber CSA (+19%, p<0.05), anatomical CSA of knee extensors (+9%, p=0.001) and VL FA (+23%, p<0.01) after 10 weeks of training. No changes were observed for ET. Maximal oxygen uptake increased in END (+10%, p<0.001), but not RT. Both isometric (+19%, p<0.001) and isokinetic strength (+23%, p<0.05) increased in RT, but not END.
**Conclusions:** No morphological or strength changes were observed for END. RT showed significant changes in and interdependence of fiber CSA, anatomical CSA, fascicle angle and strength.

**Manuscript 2** – Changes in fiber type distribution and desmin protein expression after longterm resistance versus endurance training are not interrelated.
**Purpose:** The purpose of this manuscript was to investigate possible relationship between the cytoskeletal protein desmin and the fiber type distribution following 10 weeks of endurance (END) versus resistance training (RT).
**Methods:** Biopsies were harvested from m. vastus lateralis (VL) and analyzed histochemically for fiber type distribution and fiber cross-sectional area (CSA). Western blotting of desmin and actin protein expression was performed. Also various functional parameters such as maximal oxygen uptake, repetition maximum (RM), isometric and isokinetic strength were measured.
**Results:** Overall group changes were observed in fiber type distribution; significant Type Ila increase (from 29% to 35%, p=0.017) and a tendency towards type IIX decrease (from 24% to 18%, p=0.079). No overall or group specific changes were observed for either desmin or actin protein expression. No correlations between fiber type area distribution and desmin expression was observed.
**Conclusions:** 10 weeks of endurance or resistance training elicits group specific changes in muscle morphology, but does not increase desmin protein expression. A relationship between fiber type area distribution and desmin expression remains speculative.