Effects of high-resistance wheel running on hallmarks of endurance and resistance training adaptations in mice

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Exercise effectively promotes and preserves cardiorespiratory, neuromuscular, metabolic, and cognitive functions throughout life. The molecular mechanisms underlying the beneficial adaptations to exercise training are, however, still poorly understood. To improve the mechanistic study of specific exercise training adaptations, standardized, physiological, and well-characterized training interventions are required. Therefore, we performed a comprehensive interrogation of systemic changes and muscle-specific cellular and molecular adaptations to voluntary low-resistance wheel running (Run) and progressive high-resistance wheel running (RR) in young male mice. Following 10 weeks of training, both groups showed similar improvements in body composition and peak oxygen uptake (VO; 2peak;), as well as elevated mitochondrial proteins and capillarization markers in the M. plantaris. Run mice clearly outperformed RR mice in a forced treadmill running capacity test, while RR mice displayed increased grip strength as well as superior mass gains in the M. soleus, associated with distinct proteomic changes specifying the two paradigms. Thus, even though both training modalities induce overlapping adaptations, Run interventions preferably improve submaximal running performance, while progressive RR is a valid model to study training-induced gains in grip strength and plantar flexor hypertrophy.
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