PLANTARFLEXION TORQUE IS IMPROVED BY WHEEL RUNNING IN MICE WITH DUCHENNE MUSCULAR DYSTROPHY

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Background and Purpose
Duchenne Muscular Dystrophy (DMD) is a recessive X-linked disorder caused by the absence of dystrophin protein. It is characterized by a progressive decrease of muscle function due to repeated destruction and inadequate regeneration of muscle fibers. Muscle weakness and fatigue lead to loss of ambulation in DMD patients. It is uncertain how much physical activity DMD patients can safely participate in. The purpose of this study was to identify whether voluntary wheel running in mdx mice may slow loss of muscle function.

Subjects
20 male mdx mice (10 sedentary controls, 10 runners), 4 weeks of age.

Methods and Materials
After twelve weeks of either rest or voluntary wheel running, mice were anesthetized to obtain in vivo measurements of muscle contractile function. Posterior muscles were stimulated via the sciatic nerve. The following torque measurements were made using a dynamometer: maximal isometric torque, torque at 12 frequencies, torque over a range of velocities, active and passive torques at 9 joint angles, and isometric torque during a fatigue protocol. Differences between sedentary and runner mice were determined using t-tests.

Analyses/ Results
Mdx mice given free access to a wheel ran 1.6-5.2 km per day over 12 weeks. Runners produced 10.7% more maximal isometric plantarflexor torque compared to sedentary mice. Runners also showed more fatigue resistance when only losing 47±2% of their initial torque after the fatiguing protocol; non-runners lost 58±3%. Plantarflexor torque in both groups recovered within 5 minutes.

Discussion, Conclusion and Implications
For mdx mice, voluntary running increased plantarflexor isometric torque production and fatigue resistance. Importantly, no outcome indicated decreased muscle function as a result of wheel running. Further research may indicate that moderate physical activity is not detrimental and may even be beneficial for function of muscle in DMD patients. Preservation of muscle function would ultimately prolong a DMD patient’s unassisted ambulation and improve his quality of life.

Keywords: Dystrophin, Exercise, Fatigue, Plantarflexors, Skeletal muscle