

Low-load resistance training with blood flow occlusion as a countermeasure to disuse atrophy

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Decreases in strength and neuromuscular function are observed following prolonged disuse. Exercise countermeasures to prevent muscle dysfunction during disuse typically involve high intensity resistance training. **Purpose:** To evaluate the effectiveness of low-load resistance training with a blood flow occlusion to mitigate muscle loss and dysfunction during 30 days of unilateral lower limb suspension (ULLS).

Methods: Sixteen subjects (9M, 7F; 18-49 yr) underwent 30 days of ULLS. Measurements of voluntary and evoked forces and muscle cross-sectional area (CSA) of the knee extensors were collected before and after ULLS. During ULLS, 8 subjects (5M, 3F) participated in a low-load (20% of an isometric maximum voluntary contraction (MVC)) resistance training program with a blood flow occlusion (1.3 times systolic blood pressure) on the knee extensors three times per week. **Results:** After 30 days of ULLS, the subjects who performed the blood flow restricted resistance training experienced a 1.3% loss of quadriceps femoris CSA and a 1.5% decrease in one repetition maximum (1-RM) strength while the subjects who did not exercise lost 8% CSA and 21% strength. The loss of CSA and 1-RM strength was significantly different between the groups ($p=0.04$ and $p=0.02$, respectively). The number of repetitions completed during a dynamic knee extension muscular endurance task at a workload of 40% MVC improved 31% in the subjects who performed blood flow restricted exercise, but decreased 24% in those who did not exercise ($p=0.01$). No changes during ULLS, or between the groups were found for twitch and doublet force, central activation, rates of force development and rates of relaxation ($p>0.05$). **Conclusion:** Low-load blood flow restricted resistance training of the knee extensors can maintain muscle strength and size during 30 days of ULLS and results in improved muscular endurance.