

NASA's Functional Task Test: High intensity exercise improves the heart rate response to a stand test following 70 days of bedrest.

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Cardiovascular adaptations due to spaceflight are modeled with 6° head-down tilt bed rest (BR) and result in decreased orthostatic tolerance. We investigated if high-intensity resistive and aerobic exercise with and without testosterone supplementation would improve the heart rate (HR) response to a 3.5-min stand test and how quickly these changes recovered following BR.

During 70 days of BR male subjects performed no exercise (Control, n=10), high intensity supine resistive and aerobic exercise (Exercise, n=9), or supine exercise plus supplemental testosterone (Exercise+T, n=8; 100 mg i.m., weekly in 2-week on/off cycles). We measured HR for 2 min while subjects were prone and for 3 min after standing twice before and 0, 1, 6, and 11 days after BR. Mixed-effects linear regression models were used to evaluate group, time, and interaction effects.

Compared to pre-bed rest, prone HR was elevated on BR+0 and BR+1 in Control, but not Exercise or Exercise+T groups, and standing HR was greater in all 3 groups. The increase in prone and standing HR in Control subjects was greater than either Exercise or Exercise+T groups and all groups recovered by BR+6. The change in HR from prone to standing more than doubled on BR+0 in all groups, but was significantly less in the Exercise+T group compared to the Control, but not Exercise group.

Exercise reduces, but does not prevent the increase in HR observed in response to standing. The significantly lower HR response in the Exercise+T group requires further investigation to determine physiologic significance.

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