

AEROBIC CAPACITY FOLLOWING LONG DURATION INTERNATIONAL SPACE STATION (ISS) MISSIONS: PRELIMINARY RESULTS

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Introduction: Maximum oxygen uptake (VO_2max) is reduced immediately following space flights lasting <15 d, but has not been measured following long-duration missions. The purpose of this study is to measure VO_2max and maximum work rate (WRmax) data from astronauts following ISS flights (91 to 188 d). **Methods:** Five astronauts [3 M, 2 F: 47 ± 6 yr, 174 ± 6 cm, 71.9 ± 10.9 kg (mean \pm SD)] have participated in the study. Subjects performed upright cycle exercise tests to symptom-limited maximum. An initial test was done ~ 270 d before flight to establish work rates for subsequent tests. Subsequent tests, conducted ~ 45 d before flight and repeated on the first or second day (R+1/2) and at ~ 10 d (R+10) following landing, consisted of 3×5 min stages designed to elicit 25%, 50%, and 75% of preflight VO_2max , followed by $25 \text{ W}\cdot\text{min}^{-1}$ increases. VO_2 , WR, and heart rate (HR) were measured using the ISS Portable Pulmonary Function System [Damec, Odense, DK]. Descriptive statistics are reported. **Results:** On R+1/2 mean VO_2max decreased compared to preflight (Pre: 2.98 ± 0.99 , R+1/2: $2.63 \pm 0.56 \text{ L}\cdot\text{min}^{-1}$); 4 of 5 subjects demonstrated a loss of > 6%. WRmax also decreased on R+1/2 compared to preflight (Pre: 245 ± 69 , R+1/2: $210 \pm 45 \text{ W}$). On R+10, VO_2max was $2.86 \pm 0.62 \text{ L}\cdot\text{min}^{-1}$, with 2 subjects still demonstrating a loss of > 6% from preflight. WRmax on R+10 was $240 \pm 49 \text{ W}$. HRmax did not change from pre to post-flight. **Conclusions:** These preliminary results, from the first 5 of 12 planned subjects of an ongoing ISS study, suggest that the majority of astronauts will experience a decrease in VO_2max after long-duration space-flight. Interestingly, the two astronauts with the highest preflight VO_2max had the greatest loss on R+1/2, and the astronaut with the lowest preflight VO_2max increased by 13%. Thus, maintenance of VO_2max may be more difficult in astronauts who have a high aerobic capacity, perhaps requiring more intense in-flight exercise countermeasure prescriptions.