

ABSTRACT

THESIS: Efficacy of the NASA SPRINT exercise protocol for preserving soleus myocellular characteristics during 6 months aboard the International Space Station

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Objectives: The purpose of this study was to determine the efficacy of the NASA SPRINT exercise protocol on preserving muscle fiber size and fiber type distribution in the soleus after 180 days of spaceflight. **Methods:** Biopsies from the soleus were obtained from 6 crewmembers (48.3±7.3 yr). Muscle samples were assessed for fiber size using a video camera connected to a computer. For fiber type determination, single muscle fibers were analyzed using SDS-PAGE. **Results:** MHC I fibers size decreased after spaceflight (-21±16%, P<0.05). MHC I atrophy was greater in subjects 2, 5, and 6 (-27, -30, and -43; respectively) while 1 subject experienced no atrophy. In addition, MHC I/IIa fibers experienced atrophy (-46%, P<0.05) There was no change in MHC IIa and MHC IIa/IIx fiber size. There was a reduction in the number of MHC I fibers (-17%, P<0.05). There was no change in MHC I/IIa, IIa, IIa/IIx, IIx, and I/IIa/IIx distribution. **Conclusions:** Similar to previous investigations, the SPRINT exercise protocol was only able to partially protect the soleus during long duration spaceflight. Compared to a previous 6-month expedition aboard the ISS, the higher intensity exercise performed in the current study reduced the degree of atrophy, however fiber type shifts were similar. Non-traditional countermeasures in conjunction with the SPRINT protocol may have to be implemented to fully protect the soleus.