THE FUNCTIONAL TASK TEST: RESULTS FROM THE ONE-YEAR MISSION

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Exposure to the microgravity conditions of spaceflight causes astronauts to experience alterations in multiple physiological systems including sensorimotor disturbances, cardiovascular deconditioning, and loss of muscle mass and strength. Some or all of these changes might affect the ability of crewmembers to perform critical mission tasks immediately after landing on a planetary surface. The goal of our recently completed Functional Task Test (FTT) study was to determine the effects of spaceflight on functional tests that are representative of high priority exploration mission tasks and to identify the key underlying physiological factors that contribute to decrements in performance. The FTT is comprised of seven functional tests and a corresponding set of interdisciplinary physiological measures specifically targeting the sensorimotor, cardiovascular and muscular changes associated with exposure to spaceflight. Both Shuttle and International Space Station (ISS) astronauts were tested before and after spaceflight. Additionally, we conducted a supporting study in which subjects performed the FTT protocol before and after 70 days of 6° head-down bed rest, an analog for spaceflight. Two groups of bed rest subjects were studied: one group who performed aerobic and resistive exercise during bed rest using protocols similar to astronauts and one group who served as non-exercise controls. The bed rest analog allowed us to isolate the impact of body unloading without other spaceflight environmental factors on both functional tasks and on the underlying physiological factors that lead to decrements in performance, and then to compare those results with the results obtained in our spaceflight study.

As an extension to the FTT study we collected data from one ISS crewmember who experienced 340 days in space using the same FTT protocol used previously to test spaceflight and bed rest subjects. Data were collected three times preflight and 1.7, 7.5 and 36.5 days after landing. The FTT one-year results will be presented at the meeting, and a comparison will be made with data previously obtained using the same protocol on astronauts tested before and after 6 months in space.

Future work will focus on collecting data from additional subjects from one-year flights to gain a better assessment of extreme long-duration exposure to spaceflight on both functional measure of performance and physiological metrics.