FUNCTIONAL TASK TEST: 3) SKELETAL MUSCLE PERFORMANCE ADAPTATIONS TO SPACE FLIGHT

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INTRODUCTION: The functional task test is a multi-disciplinary study investigating how space-flight induced changes to physiological systems impacts functional task performance. Impairment of neuromuscular function would be expected to negatively affect functional performance of crewmembers following exposure to microgravity. This presentation reports the results for muscle performance testing in crewmembers. Functional task performance will be presented in the abstract "Functional Task Test 1: sensory motor adaptations associated with postflight alternations in astronaut functional task performance."

METHODS: Muscle performance measures were obtained in crewmembers before and after short-duration space flight aboard the Space Shuttle and long-duration International Space Station (ISS) missions. The battery of muscle performance tests included leg press and bench press measures of isometric force, isotonic power and total work. Knee extension was used for the measurement of central activation and maximal isometric force. Upper and lower body force steadiness control were measured on the bench press and knee extension machine, respectively. Tests were implemented 60 and 30 days before launch, on landing day (Shuttle crew only), and 6, 10 and 30 days after landing. Seven Space Shuttle crew and four ISS crew have completed the muscle performance testing to date.

RESULTS: Preliminary results for Space Shuttle crew reveal significant reductions in the leg press performance metrics of maximal isometric force, power and total work on R+0 ($p<0.05$). Bench press total work was also significantly impaired, although maximal isometric force and power were not significantly affected. No changes were noted for measurements of central activation or force steadiness. Results for ISS crew were not analyzed due to the current small sample size.

DISCUSSION: Significant reductions in lower body muscle performance metrics were observed in returning Shuttle crew and these adaptations are likely contributors to impaired functional tasks that are ambulatory in nature (See abstract Functional Task Test: 1). Interestingly, no significant changes in central activation capacity were detected. Therefore, impairments in muscle function in response to short-duration space flight are likely myocellular rather than neuromotor in nature.