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UNDERSTANDING THE EFFECTS OF SPACEFLIGHT ON HEAD-TRUNK COORDINATION DURING WALKING AND OBSTACLE AVOIDANCE

Abstract

Introduction: Prolonged exposure to spaceflight conditions results in a battery of physiological changes, some of which contribute to sensorimotor and neurovestibular deficits. Upon return to Earth, functional performance changes are tested using the Functional Task Test (FTT), which includes an obstacle course to observe post-flight balance and postural stability, specifically during turning. The goal of this study was to quantify changes in movement strategies during turning events by observing the latency between head-and-trunk coordinated movements. It was hypothesized that subjects experiencing neurovestibular adaptations would exhibit head-to-trunk locking ('en bloc' movement) during turning, exhibited by a decrease in latency between head and trunk movement. **Methods:** FTT data samples were collected from ISS missions. Samples were analyzed three times pre-exposure, immediately post-exposure (1 day post) and 2-to-3 times during recovery from the microgravity environment. Two 3D inertial measurements units (XSens MTx) were attached to subjects, one on the head and one on the upper back. This study focused primarily on the yaw movements about the subject's center of rotation. Time differences (latency) between head and trunk movement were averaged across a slalom obstacle portion, consisting of three turns (approximately three 90 turns). **Results:** Preliminary analysis of the data shows a trend toward decreasing head-to-trunk movement latency during post-flight ambulation in slalom turning after reintroduction to Earth gravity in ISS astronauts. **Discussion:** It is clear that changes in movement strategies are adopted during exposure to the microgravity environment and upon reintroduction to a gravity environment. Most ISS subjects exhibit symptoms of neurovestibular changes ('en bloc head and trunk movement) which may impact their ability to perform post-flight functional tasks.