FIELD ASSESSMENT OF SENSORIMOTOR FUNCTION FOLLOWING LONG-DURATION SPACEFLIGHT

INTRODUCTION: Field assessments of functional task performance following long duration spaceflight are critical to characterize the risk associated with sensorimotor adaptation. A portable test battery involving sit-to-stand, prone-to-stand, walk and turn with obstacle, and tandem walking has been implemented during pre- and postflight testing to provide Sensorimotor Standard Measures that could be implemented in remote test locations.
METHODS: To date, 19 astronauts (12 males, 7 females) participated in this study before and after 6–8-month expeditions to the International Space Station (198 ± 70 days, mean ±std). Ethics approvals were obtained, and all subjects provided informed consent. Tests were conducted preflight, within a few hours after landing, and then 1 day and 6–11 days later. Time to stability was the outcome measure for both standing tasks, time to completion and turn rate for the walk and turn task, and percent complete steps for the tandem walking (eyes open and closed). Statistical analyses included mixed effects (multi-level) generalized linear models.
RESULTS: Consistent with previous Field Tests, significant effects of spaceflight were observed during the initial testing including longer times to stabilize posture when standing, longer times to complete the short obstacle walk, and fewer correct steps during tandem walking. The recovery timeline varied with task complexity, generally taking longer when either the basis of support was limited (e.g., tandem walk) and/or visual cues were deprived (eyes closed).
DISCUSSION: These data suggest that additional sensorimotor-based countermeasures may be necessary to maintain functional performance during long-duration spaceflight. Maintaining core measures as new countermeasures are implemented during future missions will be instrumental in assessing their efficacy. This test battery will also serve as the basis for developing sensorimotor assessments during future space exploration.