

Effects of 30-, 60-, and 90-Day Bed Rest on Postural Control in Men and Women

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INTRODUCTION

Head-down-tilt bed rest (HDT) has been used as a safe ground-based analog to mimic and develop countermeasures for the physiological effects of spaceflight, including decrements in postural stability. The purpose of this investigation was to characterize the effects of 30-, 60-, and 90-day bed rest on postural control in men and women.

METHODS

Twenty-nine subjects (18M,11F) underwent 13 days of ambulatory acclimatization and were placed in 6° HDT for 30 ($n=12$), 60 ($n=8$), or 90 ($n=9$) days, followed by 14 days of ambulatory recovery. Computerized dynamic posturography (CDP) was used to assess changes in sensory and motor components of postural control, and recovery after HDT. Sensory Organization Tests (SOTs) objectively evaluate one's ability to effectively use or suppress visual, vestibular, and proprioceptive information for postural control. Stability during the SOTs was assessed using peak-to-peak sway and convergence toward stability limits to derive an equilibrium score. Motor Control Tests (MCTs) evaluate one's ability to recover from unexpected support surface perturbations, with performance determined by center-of-pressure path length. Whole-body kinematic data were collected to determine body-sway strategy used to maintain stability during each condition. Baselines were determined pre-HDT. Recovery was tracked post-HDT on days 0, 1, 2, and 4.

RESULTS

Immediately after HDT, subjects showed decreased performance on most SOTs, primarily on sway-referenced support conditions, typically returning to baseline levels within 4 days. MCT performance was not significantly affected. There were no significant gender or duration differences in performance. Kinematic data revealed a tendency to use ankle strategy to maintain an upright stance during most SOT conditions. Interestingly, six subjects (2M,4F) experienced orthostatic intolerance and were unable to complete day 0 testing.

CONCLUSION

HDT mimics some unloading mechanisms of spaceflight and elicits orthostatic issues present post-spaceflight (contributing to instability); however, it does not sufficiently address the vestibular dysfunction which occurs post-spaceflight.