Effects of 30-, 60-, and 90-Day Bed Rest on Postural Control in Men and Women
Julie T. Esteves,1 Laura C. Taylor,2 Robert D. Vanya,2 S. Lance Dean,2 and Scott J. Wood3
1MEI Technologies, Inc. (Houston, TX, 2Wyle Integrated Science and Engineering Group Houston, TX, and
3Universities Space Research Association Houston, TX

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.