Area of Research:
Neuroscience

NASA Program:
Biomedical Research and Countermeasures

NASA Field Center:
Johnson Space Center, Houston, Texas 77058

Abstract:

The JSC Neurosciences Laboratories are engaged in a wide-ranging program of ground-based and space flight studies investigating the effects of unique space flight environmental variables, particularly microgravity, on the human nervous system. Results obtained from the Apollo, Skylab, Shuttle, Mir and ISS missions have focused our attention on studies that attempt to elucidate those neurosensory, sensorimotor, and related physiological mechanisms underlying space-adaptation syndrome (space motion-sickness, spatial disorientation, changes in neural motor function, vestibular driven cardiovascular function and perceptual illusions) and re-adaptation to Earth. Included are investigations of semicircular-canal and otolith-organ interaction processes, vestibulo-spinal reflex responses, visual-vestibular interaction processes, vestibular-autonomic interaction processes, eye-hand coordination, psycho-physiological responses, and postural and locomotion control processes.

Dr. Bloomberg's research focuses on the effects of spaceflight on sensorimotor function and adaptation. His work investigates the underlying mechanisms responsible for postflight locomotor dysfunction. This involves an extensive program of spaceflight and ground-based investigations. His work also involves the development of countermeasures to mitigate postflight sensorimotor disturbances. The goal of the current series of studies is to develop a sensorimotor training regimen that facilitates the recovery of locomotor function after long-duration spaceflight. The countermeasure being developed is based on the concept of variable practice. During this type of training, the subject gains experience producing the appropriate adaptive motor behavior under a variety of sensory conditions and response constraints. As a result of this training a subject learns to solve a class of motor problems, rather than a specific motor solution to one problem, i.e., the subject learns response generalizability or the ability to "learn to learn" under a variety of environmental constraints. The goal of this training is to accelerate recovery of postural and locomotor function during readaptation to gravitational environments following spaceflight. Dr. Bloomberg’s lab is also involved in the development of new testing paradigms to evaluate astronaut in-flight and postflight sensorimotor performance. These efforts include the development of unique multi-system testing during treadmill locomotion, evaluation of gaze instabilities through measurement of dynamic visual acuity and tests of functional locomotor performance. Dr. Bloomberg is willing to take on postdoctoral fellows interested in working in one or more of these areas and having backgrounds in motor control, sensorimotor function, biomechanics and kinesiology.