USE OF VIRTUAL REALITY FOR SPACE FLIGHT

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Virtual environments offer unique training opportunities, particularly for training astronauts and preadapting them to the novel sensory conditions of microgravity. Two unresolved human factors issues in virtual reality (VR) systems are: 1) potential "cybersickness", and 2) maladaptive sensorimotor performance following exposure to VR systems. Interestingly, these aftereffects are often quite similar to adaptive sensorimotor responses observed in astronauts during and/or following space flight. Active exploratory behavior in a new environment, with resulting feedback and the formation of new associations between sensory inputs and response outputs, promotes appropriate perception and motor control in the new environment. Thus, people adapt to consistent, sustained alterations of sensory input such as those produced by microgravity. Our research examining the effects of repeated exposures to a full field of view dome VR system showed that motion sickness and initial decrements in eye movement and postural control were greatly diminished following three exposures. These results suggest that repeated transitions between VR and the normal environment preflight might be a useful countermeasure for neurosensory and sensorimotor effects of space flight.

The range of VR applications is enormous, extending from ground-based VR training for extravehicular activities at NASA, to medical and educational uses. It seems reasonable to suggest that other space related uses of VR should be investigated. For example, 1) use of head-mounted VR on orbit to rehearse/practice upcoming operational activities, and 2) ground-based VR training for emergency egress procedures. We propose that by combining VR designed for operational activities preflight, along with an appropriate schedule to facilitate sensorimotor adaptation and improve spatial orientation would potentially accomplish two important goals for astronauts and cosmonauts, preflight sensorimotor adaption and enhanced operational training at the same time. Such efforts could support both improved health and performance on orbit and improved operational training in the most efficient manner.