GROUND REACTION FORCES DURING RUNNING ON ACTIVE AND PASSIVE TREADMILLS IN SIMULATED ZERO-CGRAVITY. J. L. Davis, P. R. Canavan.* Center for Locomotion Studies, Penn State University, University Park, PA 16802.

INTRODUCTION. Running on a passive treadmill has been suggested as a possible countermeasure. The aims of the present study were first, to conduct a detailed investigation into the dynamics of a zero-gravity locomotion simulator, and second, to investigate which factors affected the forces acting on the legs during tethered zero-gravity treadmill exercise in simulated hypergravity. METHODS: Twelve subjects were recruited for the study and compared running at 90% of their own steady-state speed using a modified zero-gravity treadmill simulator and testing was conducted in the grav-0.18 g conditions. Descriptive statistics were performed between different g-conditions. RESULTS: The results showed that running on active and passive treadmills in the simulator produced similar maximum ground reaction force (maxGRF). It was also found that these maximum forces were significantly lower than those obtained during overground trials, even when the speeds of locomotion in the simulator were 66% greater than those in LG. With regard to the force applied to the footstrike, it was found that the maximum rate of change of force (maxDFDT) was similar for overground running and exercise in simulated 0g, providing the "weightless" subjects were running in a tethered environment. The results suggest that the vertical ground-reaction force during running is not as effective at simulating the ground-reaction forces produced during active mammalian locomotion at present there are no data available concerning the usefulness of IMP during concentric and eccentric exercise. IMP showed that IMP measurement provides a better index of muscle contraction force than EMG for developing exercise hardware and protocols for astronauts exposed to long-duration flight. (Supported by NASA)

SENSORY ILLUSIONS REPORTED WHILE USING NIGHT VISION DEVICES IN SOUTHWEST ASIA. D. T. FITZPATRICK* U.S. Army Safety Center, FT. RUCKER, AL 36362.

INTRODUCTION. Degraded visual cues associated with the use of night vision devices (NVDs) combined with the adverse environmental conditions of Southwest (SW) Asia often produced unexpected visual effects and illusions. This study identified the variety of sensory illusions experienced by U.S. Army aviators in SW Asia while using NVDs. METHODS. An open-ended questionnaire was distributed to aviation units while deployed. Aircrews were asked to report any episodes of distortion, sensory problems, or illusions noted while flying with NVDs. RESULTS. Sensory illusions included those associated with the sensory events occurred during good weather, over open desert terrain, during low levels of illumination, in all phases of flight. Degraded visual cues accounted for over half of all reports, with loss of visual horizon and degraded resolution most frequently mentioned. Over one-third reported a negative outcome ranging from fatigue or distraction to equipment concerns. CONCLUSIONS. Sensory illusions associated with night vision devices are critical for safe night flight. These findings can be used to better prepare aviators to fly at night in a desert environment.
INTRODUCTION. A rigid EVA enclosure with full length anthropomorphic arms and a mechanical restraint system offers several theoretical advantages over current EVA systems. To assess human factors aspects of such an enclosure, a mockup was constructed for neutral buoyancy testing. Upper body strength, an important contributor to performance, was measured in subjects in the mockup and compared to that in a simulated EVA foot restraint. METHODS. Using an underwater load cell in a standardized position for force measurement, exertion profiles consisting of 16 conditions were assessed in 11 male subjects. Variables examined were environment (enclosure vs. foot restraint), restraint with the opposite hand (yes or no), direction of exertion (forward or backward), and hand used (left or right). RESULTS. ANOVA revealed a global enhancement of strength for exertions performed in the enclosure (p<.001). Use of the opposite hand for restraint enhanced strength (p<.001). Hand used for a given exertion did not influence strength. Significant first order interactions (p<.005) were noted between environment and direction, environment and opposite hand use, and direction and opposite hand use. CONCLUSION. A rigid enclosure offers a strength advantage over a standard EVA foot restraint. Overall strength in the enclosure without opposite hand use was greater than overall strength in the foot restraint with opposite hand use. Thus, the enclosure allows a greater force exertion while sparing the opposite hand from fatigue induced by grasping.

MOTION SICKNESS IS ASSOCIATED WITH A GENETIC POLYMORPHISM OF THE ALPHA-2 ADRENERGIC RECEPTOR. The human brain contains two types of alpha-2 adrenergic receptor, the alpha-2A and alpha-2C receptors. While the alpha-2C receptor is expressed in the human brain, the alpha-2A receptor is not. However, a recent study has shown that individuals who are carriers of the alpha-2C receptor have a higher risk of developing motion sickness. This suggests that there may be a genetic component to motion sickness susceptibility.

RESULTS. Genotyping of the alpha-2A receptor gene was performed on a group of volunteers who were exposed to motion sickness. The results showed that individuals who were heterozygous for the alpha-2A receptor gene had a significantly higher risk of developing motion sickness compared to those who were homozygous for the alpha-2C receptor gene. This suggests that there may be a genetic component to motion sickness susceptibility.

CONCLUSION. The results of this study suggest that there may be a genetic component to motion sickness susceptibility. Further research is needed to confirm these findings and to identify other genetic factors that may contribute to motion sickness susceptibility.

AN EMPIRICAL EVALUATION OF THE RESONANCE HYPOTHESIS OF MOTION SICKNESS. C. R. Wilpizek, L. D. Lowry and C. L. Jefferson Medical College, Philadelphia, PA

INTRODUCTION. Lysaght proposed that motion sickness develops in man and animals when rhythmic changes in body displacement centering around 12/sec synchronize brain waves occurring in the alpha-theta range (10.17-0.25 Hz for beta rhythm). The resonance hypothesis is based on some selected factors associated with MS but is inconsistent with other evidence. METHODS. Squirrel monkeys, cynomolgus monkeys and cats were exposed to continuous linear vertical and linear horizontal displacement on a motorized vertical horizontal rotation. Results of the study showed that Squirrel monkeys developed MS more readily than cats. CONCLUSION. The results of this study support the resonance hypothesis of MS as it is currently formulated.