

POSTURAL EQUILIBRIUM TESTING OF AVIATORS: NORMATIVE SCORES AND ADAPTATION EFFECTS. K.A.Baylor^{*1}, B.J.McGrath^{*1}, S.M.Molstad², A.H.Rupert^{*1}, and F.E.Guedry^{*3}. ¹Naval Aerospace Medical Research Laboratory, Pensacola, FL; ²Northwestern State University, Natchitoches, LA; and ³University of West Florida, Pensacola, FL.

INTRODUCTION. An estimated 29% of aviators experience symptoms of Simulator Sickness (SS) following simulator training. Highly sensitive measures are required to assess the aftereffects of simulator training on balance and coordination, and the impact on performance and safety. The Neurocom Equitest System is a clinical device that examines the interaction of vestibular, visual and proprioceptive inputs on the balancing ability of subjects. The purposes of this study were to develop a normative aviator database as compared to clinical norms, and to determine learning effects from repeated test sessions. **METHODS.** Fifty-three male and 33 female aviators were tested on an initial day using an Equitest System. Repeat testing was completed on 19 males and 11 females on four additional days. **RESULTS.** Sensory Organization Test (SOT) equilibrium scores for the aviators were significantly higher than clinical norms. Equilibrium scores on the first trial were significantly lower than on the two subsequent trials. Differences between males and females existed in a correlation between equilibrium and strategy scores. A significant learning effect existed for equilibrium, with a plateau reached after 3 days. Motor Coordination Test latency scores for male aviators were significantly faster than for females. **CONCLUSIONS.** The high aviator scores demonstrate the importance of establishing population-specific norms for balance research. Gender differences among the aviators on latency scores support previous research establishing similar differences in reaction time. The learning effects from repeated SOT tests, which reduce the effectiveness of this device to assess SS aftereffects in pre- and post-simulator testing, may be minimized with random-order trials.

THE VESTIBULO-OCULAR REFLEX AND OPTOKINETIC NYSTAGMUS UNDER THE INFLUENCE OF CINNARIZINE. I. Doweck, A. Shupak, O. Spitzer, Y. Melamed and C.R. Gordon*. Motion Sickness and Human Performance Laboratory, Israeli Naval Hyperbaric Institute, Haifa, ISRAEL.

INTRODUCTION. Cinnarizine (Cn) is an antihistaminic agent with specific vestibular Ca++ channel blocking capacity, which has been found effective as an anti-motion sickness drug. We used the Vestibulo-ocular reflex (VOR) and the optokinetic nystagmus (OKN) to evaluate Cn's effects on the eye movement control mechanism. **METHODS.** The VOR parameters were evaluated using the Smooth Harmonic Acceleration Test (SHA) at 5 frequencies: 0.01-0.16 Hz. The OKN was also evaluated using a sinusoidal rotatory pattern at 3 frequencies: 0.01-0.04 Hz. The study was conducted on 16 healthy subjects aged 18-22. The effects of Cn 50 mg vs placebo were compared using a double-blind, randomized, crossover design 2 hours after drug administration. All 16 subjects underwent the SHA test, but only 12 completed the OKN test. **RESULTS.** Under the influence of Cn 50 mg, VOR gain at 0.04 Hz and phase lead at 0.16 Hz were significantly lower, while on the OKN test, phase lead values were higher at 0.01 Hz. **CONCLUSIONS.** Cn 50 mg partially affects both VOR and OKN parameters. The drug's influence on the OKN's phase parameter suggests that Cn affects the oculomotor pathways as well as the vestibular end organ.

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THE PSYCHOPHYSICAL FUNCTION FOR PERCEIVED GRAVITATIONAL-INERTIAL FORCE DOES NOT DEPEND ON THE ORIENTATION OF THE OTOLITH ORGANS. M. Cohen*, R. Welch*, and C. DeRoshia*. NASA-Ames Research Center, Moffett Field, CA 94035.

INTRODUCTION. It has generally been believed that the perceived intensity of a gravitational-inertial force depends on both the magnitude and orientation of the force with respect to the otolith organs, as does the elevator illusion. In this study, we examine the perceived intensity of Gz force and the elevator illusion as a function of the applied force and the orientation of S's head. **METHODS.** Each of eleven male Ss was seated upright in a swinging chair mounted in the Ames 20-G Human Centrifuge while he set a visual target to his apparent horizon and judged the perceived intensity of Gz forces by cross-modal matches on a hand dynamometer. Plateau Gz levels were 1.00, 1.25, 1.50, 2.00, 2.25, and 2.50; a 30-second ramp to plateau was used in all cases, and the duration of exposure at each plateau was 120 seconds. All measures were obtained both with S's head erect and pitched forward 30 degrees. **RESULTS.** Although the elevator illusion changed with head orientation [F(6,60)= 7.56; p<0.001], the perceived intensity of Gz was essentially the same for both orientations of the head [F(6,60)= 0.61; p>.50]. **CONCLUSIONS.** The results of this experiment suggest that the perceived intensity of gravitational-inertial force does not depend on otolith mechanisms in the same way as does the elevator illusion and that somesthetic, tactile, and other proprioceptive inputs are important for the psychophysical function.

MOTION SICKNESS INVESTIGATION: THE CHOICE OF TREATMENT? I.A.Nichiponik, A.I.Grigoriev. Institute for Biomedical Problems, Moscow, USSR.

INTRODUCTION. In spite of successful treated motion sickness (MS) episodes during space flights, this problem remains actual until its pathogeny will be clear. **METHODS.** More than 100 various susceptible to laboratory induced MS male volunteers were examined by electro-physiological and radioimmuno assay methods for estimation of central nerve system (CNS) activity and blood concentration of pituitary-adrenal, thyroid, pancreatic, and vasoactive hormones. Some energy metabolism substrates (EMS) were determined in brain structures during MS simulating animal experiments. Various drugs have been used for MS treatment. **RESULTS.** MS induced reactions expressed stress-associated hormones blood excess followed CNS excitation, and blood EMS increase for its easy delivery to brain structures. All drugs while being effective in MS treatment, significantly decreased CNS activity, accompanied with reduced endocrine and metabolic changes. **CONCLUSION.** Our data evidence that any effective pharmacological MS treatment probably would result in physical and psychological activity depression which could complicate flight program success. Therefore, no-drug MS countermeasures, or drug-induced adaptive reactions increase would be preferred.

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USE OF INJECTABLE PROMETHAZINE TO DECREASE SYMPTOM SCORES OF SPACE MOTION SICKNESS. B.G.BECK, M.D.* A.E.NICOGOSSIAN, M.D.* MEDICAL OPERATIONS BRANCH, NASA-JSC, HOUSTON, TX 77058

Introduction. Space Motion Sickness (SMS) has been a problem affecting approximately 74% of first-time Shuttle flyers. Promethazine injections have been used for 29 cases of SMS to decrease the severity of their illness. Although reported to be effective in reducing symptoms in 27 of the 29 cases, there has been no proof of its efficacy. **Methods.** Retrospective analyses of Medical Debriefs examining the symptom scores for nausea, vomiting, decreased appetite, and stomach awareness were performed. Each symptom is rated on a mild=1, moderate=2, severe=3 system for each flight day. Crewmember scores from the first three flight days on an initial flight in which injectable promethazine had not been used were compared to scores in a later flight in which the promethazine was utilized. Scores were also compared in a similar group of crewmembers who did not use promethazine. **Results.** There was a decrease in median scores for all symptoms except nausea, however it was significant ($p=0.014$) only for the vomiting scores. This significant decrease was not seen in the control group. **Conclusions.** Injectable promethazine has been associated with a significant decrease in vomiting compared to earlier flights in which injectable promethazine was not used.

HEMODYNAMIC MEASUREMENTS DURING PARABOLIC FLIGHT A. Miyamoto*, S. Nagaoka, K. Suzuki, S. Kaneko, S. Watanabe*, S. Usui, J. Nakayama, T. Kojima. National Space Development Agency of Japan, Nagoya University, Toyohashi University of Technology, Toray Research Center.

INTRODUCTION. A parabolic flight is a useful method as a simulation of weightlessness to study cardiovascular deconditioning, even though the available time is very short.

METHODS. Cardiac output and blood pressure were continuously monitored during parabolic flights performed by a small rear-jet aircraft (MU 300). A male subject, 28 years old, took 9 to 11 parabolic flights a day for 6 days. Two accelerating patterns, 2.5-G and 1.3-G level, were used. Cardiac output was measured by impedance cardiography and blood pressure was measured by a finger pressure cuff method. The positions of the subject were sitting up straight and sitting reclined.

RESULTS. Heart rate increased by 25% at 2.3-G accelerating period and decreased by 10% during low G period in the sitting up position. Stroke volume decreased by 30% at 2.3-G entry and increased by 30% during low G period. These changes became less in the 1.3-G pattern and in the sitting reclined position too. Diastolic blood pressure decreased during low G period. The subject seemed adapted in the latter parabolas in the same day.

CONCLUSION. These results suggested that the hemodynamic changes in the parabolic flight would be modified by the pattern of acceleration and adaptation of the subject.