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EFFECTS OF SIMULATED HEARING LOSS ON SPEECH PERCEPTION IN NOISE. A. H. McCardie and G. B. Thomas. Naval Acrospace Medical Research Laboratory, Pensacola, FL 32508-5700.

INTRODUCTION. Hearing standards for aviators often permit relatively large pure-tone losses at the higher audiometric frequencies. This study investigated the effects of simulated hearing loss at 2 kHz and 4 kHz on speech perception in cockpit noise. METHODS. Four lists of the Tri-Word Modified Rhyme Test (TMRT), two lists at a +4 dB signal-to-noise (S/N) ratio and two lists at a 0 dB S/N ratio, were administered to 26 student naval aviators. Before testing, standard air-conduction, pure-tone audiograms were administered to each subject. During one list at each S/N ratio, the speech signal was narrow-band attenuated to simulate a 25 dB hearing loss at 2 kHz and a 50-60 dB hearing loss at 4 kHz. The other two lists were presented without attenuation. RESULTS. The results indicated that performance differences due to S/N ratio were significant, $p < .00001$, and that performance differences due to attenuation were significant, $p < .00001$. No interaction effects were noted. Interestingly, there was a tendency for those subjects with the poorer audiograms to be affected less by the simulated loss of hearing. This suggests the possible development of a compensatory perceptual/cognitive mechanism in those subjects. CONCLUSION. Subjects' normal-hearing performance on the TMRT is significantly better than their performance while experiencing simulated hearing loss equivalent to 25 dB at 2 kHz and 50-60 dB at 4 kHz. Subjects with poorer pure-tone thresholds may develop compensatory perceptual/cognitive mechanisms to partially offset their hearing loss.

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DEVELOPMENT OF A NEW COMMUNICATION SYSTEM INTENDED FOR NOISY ENVIRONMENTS. H.Pongratz*, D.-M. Rose*, W. Blank, H.Welsch*, German Air Force Institute of Aerospace Medicine, Division IV -Ergonomics-, Flugplatz, D-8072 Manching

INTRODUCTION. A new 2-way communication system integrated into an ear plug with a piezoelectric accelerometer to pick up the human voice as the direct vibration through bone and tissue in the auditory canal, and an ultra-small electromagnetic speaker for transmission of incoming speech-signals, was investigated for the fitness of communication in loud ambient aircraft noise. METHODS. Monosyllabic word intelligibility tests were carried out via intercom with 24 candidates (12 of them wearing the ear plug in only one ear and 12 wearing it in both) who were concurrently exposed to white noise of 104 dB with and without an extra ear muff. Additionally this system was used in place of the normal hearing protection helmets for ground crews during routine fighter pre-flight-checks. The subjective impressions were validated with a questionnaire. RESULTS. Without additional ear-muffs the rate of error was 70%. With ear-muffs the error-rate decreased by more than 70% to 19.9%. There was no difference whether the ear plug was worn in one or both ears. During the pre-flight checks the comprehensibility of speech was good for both the ground and the cockpit crew. DISCUSSION. The great safety and comfort advantages of this new system are: A) ground crews are able to work unemcumbered, B) the heat and restriction of a helmet are eliminated, C) the visual field is broader and D) breathing noises in microphones that interfere with communication are eliminated. A future option would be the integration of this system into a whole body climated suit for fighter pilots.

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SHORT LATENCY VESTIBULAR EVOKED POTENTIALS. G. Knox*, J. Isaacs, D. Woodard*, L. Johnson. University of Florida Health Science Center, Jacksonville, Florida 32209.

Auditory responses including the well-characterized auditory brainstem response have been used extensively in clinical investigations. Evoked responses have not been adequately developed to investigate the vestibular system. The purpose of this study is to describe a new method for the evaluation of short-latency vestibular evoked potentials in human subjects. Standard ABR equipment is employed using a customized solid-state modification of the triggering mechanism. Signal averaging is used to record responses to multiple accelerations. Normal and vestibular deficient subjects are tested. Results indicate the presence of a short latency wave which is absent in vestibular deficient subjects. The literature is reviewed and illustrative cases are presented. We feel that vestibular evoked potentials are a promising new modality in investigating vestibular physiology and motion sickness.

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EVALUATION OF A VOICE-RECOGNITION SYSTEM FOR THE AUTOMATION OF THE VORPET TEST. E.A. Molina*. Naval Aerospace Medical Research Laboratory, Pensacola, FL 32508-5700.

INTRODUCTION. The Vestibulo-Ocular-Reflex Performance Evaluation Test (VORPET), developed at the Naval Aerospace Medical Research Laboratory, gives a measure of left- and right-directed gaze-shift threshold time. This task can be used to assess the type of head/eye coordination relevant to the aviator who routinely makes large shifts in gaze while scaning cockpit instruments and the outside environment. Automation of the VORPET requires the use of a voice-recognition system to collect and score the subject's voice responses. We compared the accuracy of the Votan voice-recognition system to that of the present method that uses a test administrator to listen and record subject's responses when administering the VORPET. METHODS. Thirty-six subjects were administered the VORPET under three different conditions: (a) direct viewing of the stimulus digits presented on the CRT, involving no head movement, (b) VORPET administration using a test operator for subject's voice recognition and manual data entry, and (c) VORPET administration using the automatic voice-recognition system for subject's voice acquisition and recognition. Two, three, and four digits were used as visual stimuli for each method. RESULTS. Analysis of variance of test results indicates significant differences between the thresholds obtained when methods (b) and (c) were used to administer the VORPET. CONCLUSIONS. The Votan automated voice-recognition system cannot be used to automate the VORPET. Present speed and accuracy of automated voice-recognition systems still need additional technological advancement or improvement in order to replace the present "human-based voice-recognition system."

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ACHILLES TENDON REFLEX (ATR) IN RESPONSE TO SHORT EXPOSURES OF MICROGRAVITY AND HYPERGRAVITY. **M. Fujii* and @M. Jaweed. Space Biomedical Research Institute, @Biomedical Operations and Research Branch, NASA Johnson Space Center, Houston, Texas 77058.**

INTRODUCTION: Previous studies indicate that latency and amplitude of the ATR are reduced after exposure to microgravity for 28 days. The objective of this study was to quantitatively measure the latency of ATR during brief (20 second) exposure to microgravity in KC-135 parabolic flights. METHODS: The ATR was elicited in ten men during parabolic flight, with the ankle held neutrally, plantarflexed, and dorsiflexed. During flight, the ATR was elicited during the 0-g and 1.8-g phases. Postflight testing was performed flying back to the airfield. Latencies to onset of the ATR were calculated and analyses of variance were performed to determine the effect of gravity and ankle position on latency. RESULTS: The mean latencies for 0-g, 1.8-g, and postflight with the ankle in the neutral position were 32.7 +/- .5 ms, and 33.1 +/- .7 ms.respectively, which were not significantly different. There was a trend towards prolongation of latencies postflight. The mean latency for those who were motion sick was 32.1 +/-.1 ms compared to 34.0 +/-.3 ms for those who were not sick. CONCLUSIONS: These studies indicate that neither the level of gravity nor ankle position significantly affected the latency of the ATR.

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PREDICTION OF SPACE SICKNESS IN ASTRONAUTS FROM PREFLIGHT FLUID, ELECTROLYTE, AND CARDIOVASCULAR VARIABLES AND WEIGHTLESS ENVIRONMENTAL TRAINING FACILITY (WETF) TRAINING. **K. Simanonok*, E. Mosely, and J. Charles*. Space Biomedical Research Institute, NASA Johnson Space Center, Houston, Texas 77058.**

Nine preflight variables related to fluid, electrolyte, and cardiovascular status from 64 first-time Shuttle crewmembers were differentially weighted by discriminant analysis to predict the incidence and severity of each crewmember's space sickness as rated by NASA flight surgeons. The nine variables are serum uric acid, red cell count, environmental temperature at the launch site, serum phosphate, urine osmolality, serum thyroxine, sitting systolic blood pressure, calculated blood volume, and serum chloride. Using two methods of cross-validation on the original sample (jackknife and a stratified random subsample), these variables enable the prediction of space sickness incidence (NONE or SICK) with 80 percent sickess and space severity (NONE, MILD, MODERATE, or SEVERE) with 59 percent success by one method of cross-validation and 67 percent by another method. Addition of a tenth variable, hours spent in the Weightless Environment Training Facility (WETF), did not improve the prediction of space sickness incidence but did improve the prediction of space sickness severity to 66 percent success by first method of cross-validation of the original sample and to 71 percent by the second method. Results to date suggest the presence of predisposing physiologic factors to space sickness that implicate a fluid shift etiology. The data also suggest that prior exposure to fluid shift during WETF training may produce some circulatory preadaptation to fluid shifts in weightlessness that results in a reduction of space sickness severity.