INTRODUCTION: Studies have found that moving-base simulators of rotary-wing aircraft produce a more realistic G environment than fixed-base simulators. The present study compared health complaints and creamier factors in fixed-wing (FW) and rotary-wing (RW) simulator sickness, as measured by self-report, postural, and visual tests. A standardized scoring technique was developed which compares simulator exposures and a factor analysis revealed three distinct factor clusters corresponding to ocularmotor, visual-stereobulbar, and neurovegetative systems. METHODS: Four simulators were examined in the present experiment. Two "sister" moving-base simulators (2F114 and 2F 143) for the A-6A, and E-6A aircraft. The helicopter simulators employ CRI infinity optics and the other two were dome projection systems. The 2F114 was a fixed base. Approximately 100 aircrew were observed in each simulator.

RESULTS: Simulator sickness was found in all simulators when total scores were taken into account, with the highest incidence in the helicopter simulators. When the simulator sickness was scored according to the factor clusters, it was found that the CRT-based helicopter simulators had the highest reports of eyestrain and the fixed-base simulator had the highest reports of disorientation. Nausea was reported about equitably in all three of the motion-base simulators. CONCLUSION: Different symptom clusters which occur in specific simulators are sufficiently regular to suggest using this method of analysis to identify different equipment features that relate to simulator sickness.

NUTRITION AND ACCELERATION TOLERANCE: CURRENT UNDERSTANDING: G. E. Evans and J. P. Knack, Valparaiso University, Valparaiso, IN 46383 and Armstrong Laboratories, Brooks AFB, TX 78235-8000.

INTRODUCTION: Nutritional status and the influence of diet on individual ability to perform in the increased acceleration environment is an important aeromedical concern. Although a relative lack of information has been generated regarding the nutritional needs of the soldier, little data is available for the special case of the high performance pilot (HPP). METHODS: Approximately 50 subjects were randomized and received the current diet provided to the subjects with dietary intervention and conducted under operational conditions were reviewed. Interviews, computer data base searches, and matrixes of dietary aeromedical literature provided sources for this review. RESULTS: Various interventions offered the influence diet on the ability to be alert during flight. CONCLUSION: More research is needed to determine optimum composition and size and timing of pre-flight meals. Microgravity exposure.

INTRODUCTION: This study examined the effects of unloading on skeletal muscle structure. METHODS: Eight subjects walked on crutches for six weeks with a 10 cm elevated sole on the right shoe. This removed weight bearing by the lower limb, but the calf muscles were not unloaded. RESULTS: In soleus (S) and gastrocnemius (G) the CSA were decreased by 6% and 17% respectively. The results suggest that decreases in CSA were due to a reduction in muscle fiber size.

AEROBIC AND STRENGTH TRAINING EFFECTS DURING HINDLIMB SUSPENSION: J. B. Bomar, J. J. Lavitt, M. J. Plyley, N. H. McKee, K. Forsyth, and W. Rhodes, Departments of Physiology and Surgery, School of Physical and Health Education, University of Toronto, Toronto, Ontario, Canada, M5S 1A8.

INTRODUCTION. The hindlimb suspension model has been used to study the response of skeletal muscle to both a simulated "microgravity" environment. The purpose of this study was to determine the influence of strength training (electrical simulation) and aerobic exercise (treadmill running) on the response of the "fast" and "slow" muscles of the lower limb to hindlimb suspension. METHODS. Female Wistar rats (275g) were randomly assigned to suspension (S, n=30) and non-suspended (NS, n=30) groups. Both groups were subdivided into sedentary, aerobic and strength-trained groups. Training began 8 days after removal from a harness during the training sessions (3 days/week). Muscle contractile function and morphometry were assessed at the end of six weeks. RESULTS. In S, soleus peak twitch tension (P<.01), tetanic tension (Po, N/g) and mean cross-sectional areas (CSA, um^2) of type I and II fibers were reduced, respectively to 82, 78, 47 and 68% of NS values (p<.02). In S, plantaris fiber CSA was reduced to 82% (p<.01) of NS values (p<.01). Within S and NS groups respectively, sedentary values (mean±SD) for soleus Pt (2.4±0.7, 2.8±0.2 N/g), Po (10.8±3.0, 13±4±0.8 N/g), and plantaris Pt (1696±240, 1715±256, 1752±457 um^2) were not significantly changed by either strength or aerobic training. Compared to sedentary activity, strength training increased plantaris Pt by 23% in S and 29% in NS groups (p<.05). CONCLUSION. Aerobic and strength training intervention during prolonged hindlimb suspension may be ineffective in reducing the amount of muscle wasting due to simulated "microgravity" exposure.

SKELETAL MUSCLE RESPONSES TO UNLOADING IN HUMANS: G. Dudley, P. Tesch, B. Hether, G. Adema & P. Buchanan*, NASA & Biomedical Corp, Kennedy Space Center, FL 32899, Karolinska Institute, S-10401, Stockholm, Sweden.

INTRODUCTION. This study examined the effects of unloading on skeletal muscle structure. METHODS: Eight subjects walked on crutches for six weeks with a 10 cm elevated sole on the right shoe. This removed weight bearing by the lower limb, but the calf muscles were not unloaded.RESULTS: In soleus (S) and gastrocnemius (G) the CSA were decreased by 6% and 17% respectively. The results suggest that decreases in CSA were due to a reduction in muscle fiber size.

COMPARISON OF SIMULATOR SICKNESS SYMPTOMATOLOGY IN TWO FIXED-WING AND TWO ROTARY-WING SIMULATORS, Michael G. Ljunglin, PhD*, Naval Air Systems Command; Robert S. Kennedy, PhD**, Bionetics Corp, Kennedy Space Center, FL 32899, Karolinska Institute, S-10401, Stockholm, Sweden.

INTRODUCTION: Studies have found that moving-base simulators of rotary-wing aircraft produce a more realistic G environment than fixed-base simulators. The present study compared health complaints and creamier factors in fixed-wing (FW) and rotary-wing (RW) simulator sickness, as measured by self-report, postural, and visual tests. A standardized scoring technique was developed which compares simulator exposures and a factor analysis revealed three distinct factor clusters corresponding to ocularmotor, visual-stereobulbar, and neurovegetative systems. METHODS: Four simulators were examined in the present experiment. Two "sister" moving-base simulators (2F114 and 2F 143) for the A-6A, and E-6A aircraft. The helicopter simulators employ CRI infinity optics and the other two were dome projection systems. The 2F114 was a fixed base. Approximately 100 aircrew were observed in each simulator.

RESULTS: Simulator sickness was found in all simulators when total scores were taken into account, with the highest incidence in the helicopter simulators. When the simulator sickness was scored according to the factor clusters, it was found that the CRT-based helicopter simulators had the highest reports of eyestrain and the fixed-base simulator had the highest reports of disorientation. Nausea was reported about equitably in all three of the motion-base simulators. CONCLUSION: Different symptom clusters which occur in specific simulators are sufficiently regular to suggest using this method of analysis to identify different equipment features that relate to simulator sickness.


INTRODUCTION. This new anti-G system permitting the optional selection of positive pressure breathing for G (PBG). The PBG has recently undergone operational test and evaluation (OT&E) in the F-15 and E-16. PBG assisted by a counter-pressure vest. The PBG has been shown to provide positive pressure breathing during G and to increase the endurance attainable by subject when time is short, and the effect of longer-term operation conditions were reviewed. Interviews, computer data base searches, and matrixes of dietary aeromedical literature provided sources for this review. RESULTS: Various interventions offered the influence diet on the ability to be alert during flight. CONCLUSION: More research is needed to determine optimum composition and size and timing of pre-flight meals. Microgravity exposure.

CONCLUSIONS: The results suggest that decreases in CSA were due to a reduction in muscle fiber size.

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SKELETAL MUSCLE RESPONSES TO UNLOADING IN HUMANS: G. Dudley, P. Tesch, B. Hether, G. Adema & P. Buchanan*, NASA & Biomedical Corp, Kennedy Space Center, FL 32899, Karolinska Institute, S-10401, Stockholm, Sweden.

INTRODUCTION. This study examined the effects of unloading on skeletal muscle structure. METHODS: Eight subjects walked on crutches for six weeks with a 10 cm elevated sole on the right shoe. This removed weight bearing by the lower limb, but the calf muscles were not unloaded. RESULTS: In soleus (S) and gastrocnemius (G) the CSA were decreased by 6% and 17% respectively. The results suggest that decreases in CSA were due to a reduction in muscle fiber size.

CONCLUSIONS: The results suggest that decreases in CSA were due to a reduction in muscle fiber size.