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Height and In-Flight Low Back Pain Association Among Military Helicopter Pilots

Introduction: Low Back pain (LBP) is a well established entity among aircrew particularly among helicopter pilots, their prevalence ranges from 61 to about 80%. There are various studies on association of LBP with total flight hour (TFH) exposure and lack of association with height or body mass index (BMI); however there are limited studies on those excluded pilots with back injuries unrelated to flying.

Methods: Data was collected by means of a web-based survey distributed to 37 U.S. Navy helicopter squadrons, encompassing a total of 1028 active duty winged Naval Helicopter pilots. Of the 648 (63%) respondents, 83 pilots, or 12.9%, who reported non flying related back injuries and those without necessary data were excluded, yielding N=554. Case-control analysis was performed with logistic regression for height, BMI and TFH on significant LBP (defined as >30% of each flight) presence versus absence with Chi-square on the median split of each and ANOVA to include airframes.

Results: Among all the subjects, height was the positive predictor for significant LBP, with the strongest association among male pilots. On the contrary BMI, THF and airframe were not associated.

Conclusion: The predominant factor in LBP during flight are ergonomic stressors that adversely affect lumbar symmetry. Significant prevalence rates may persist in the absence of design enhancements that mitigate these stressors. Among all the parameters that were studied, height was found to be a significant predictor for in-flight LBP among US Navy Helicopter pilots. For every 1” increase in height values, the odds of experiencing significant LBP in flight was increased by 9.3% and with those equal/taller than median had twice the odds compared with those shorter.


Introduction: Night-vision goggles (NVG) in jet fighter aircraft are known to increase the risk of neck strain due to increased neck loading. The authors’ aim was to evaluate the effect on neck-muscle activity and subjective ratings of head-worn night-vision (NV) equipment in controlled simulated flights.

Methods: The study was conducted on five experienced fighter pilots who flew a standardized 2.5-h program in a dynamic flight simulator; one session with NVG and one with standard helmet mockup (control session). Each session commenced with a 1-h simulation at 1 Gz followed by a 1.5-h dynamic flight with repeated Gz profiles varying between 3 and 7 Gz and including aerial combat maneuvers (ACM) at 3-5 Gz. Surface electromyographic (EMG) data was simultaneously measured bilaterally from anterior neck, upper and lower posterior neck, and upper shoulder muscles. EMG activity was normalized as the percentage of pretest maximal voluntary contraction (%MVC). Head-worn equipment was rated subjectively immediately after flight.

Results: The authors noticed a trend toward greater overall neck muscle activity in NV flight during sustained ACM episodes, but with no such effects for temporary 3-7 Gz profiles. Postflight ratings for NV sessions emerged as “unsatisfactory” for helmet comfort/neck discomfort. However, this was not significant compared to the control session.
Conclusions: The authors have concluded that helmet mounted NV equipment caused greater neck muscle activity during sustained combat maneuvers, indicating increased muscle strain due to increased neck loading. In addition, postflight ratings indicated neck discomfort after NV sessions, although not clearly increased compared to flying with standard helmet mockup.


Background: Specimens from civilian aviation accident pilot fatalities in the USA are submitted to the Civil Aerospace Medical Institute (CAMI) for toxicological analyses. The authors feel that trends of fatal amateur-built aircraft accidents and toxicological findings in the associated pilot fatalities have not been examined.

Methods: Fatal amateur-built aircraft accidents that occurred during 1990-2009 were evaluated by retrieving information from the CAMI toxicology database. Probable cause/factor in the amateur-built aircraft mishaps were obtained from the National Transportation Safety Board’s (NTSB’s) aviation accident database.

Results: Of 6309 fatal aviation accidents from which CAMI received postmortem samples, 979 (16%) were related to amateur-built aircraft. The authors found a decreasing trend in non-amateur-built aircraft accidents, but an increasing trend in amateur-built aircraft accidents. In the 979 accidents, 392 pilots (40%) were positive for ethanol and/or drugs. Ethanol/drug use and medical condition were determined to be a cause/factor in 42 (11%) of the 385 ethanol/drug-positive amateur-built aircraft accidents investigated by the NTSB.

Discussion: The authors found that drugs found in the pilots were consistent with commonly used medications in the general population. They feel that contributory role of mechanical malfunction of home-built aircraft cannot be ruled out with or without ethanol and/or drugs.


Background: Head movements under G can result in vestibular stimulation that can lead to motion sickness (MS) symptoms. The authors in this study tested an MS adaptation protocol was tested for head movements under +Gz in a centrifuge.

Methods: Experienced pilots made 14 predetermined head movements in a sustained G flight simulator (at 3 +Gz) on 5 consecutive days and 17 d after training. Symptoms were measured after each head turn using a subjective 0-10 MS scale. The Simulator Sickness Questionnaire (SSQ) was also administered before and after each daily training session.

Results: After five daily training sessions, normalized mean MS scores were lower than on Day 1. Mean total, nausea, and disorientation SSQ scores were also lower. During retesting 17 d after training, nearly all scores indicated 90-100% retention of training benefits.

Discussion: The reduction of unpleasant effects associated with sustained G flight simulation using an adaptation training protocol may enhance the effectiveness of simulation.

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