

pre-market validation. This paper compares the convergence and consistency of readings between different makes of pulse oximeters under normobaric hypoxia conditions. **METHODS:** Four healthy volunteers (26-52 years, 2 male and 2 female), all experienced with practical hypoxia awareness training, were exposed to 5 min normoxia (FiO<sub>2</sub>=0.21) followed by 5 min normobaric hypoxia (FiO<sub>2</sub>=0.10, approx. 19,000ft.), recovering on 3 min hyperoxia (FiO<sub>2</sub>=0.38). Three different pulse oximeters (benchmark oximeter: 'A'; and two test oximeters: 'B' and 'C') were attached to adjacent fingers, and SpO<sub>2</sub> data (1/s) was acquired from them simultaneously. Subjects' data collection was repeated several times after a >30min normoxia break. The participants repeated this experiment over a 4 weeks period, aiming to minimize the influence of environmental and physiological variables. Over 120 datasets were captured and exported to a spreadsheet. Integrated values of bias between A-B and A-C were calculated. **RESULTS:** Integrated average difference SpO<sub>2</sub> readings between A and B and A and C calculated  $\pm 1.4\%$  and  $\pm 2.9\%$ , with variance  $\pm 2.4\%$  and  $\pm 5.4\%$  correspondingly ( $p < 0.05$ ). **CONCLUSION:** Despite its limitations, the convenience and non-invasiveness of pulse oximeter technology remains a valid and acceptable method to monitor SpO<sub>2</sub> trends during practical hypoxia training. Since different manufacturers use their proprietary averaging algorithms and validation lookup tables, SpO<sub>2</sub> readings from different oximeters may not be identical at any given time of hypoxemia, although this difference is minimal after 90 s. Regardless of the manufacturer, at the range of SpO<sub>2</sub> > 70%, readings converge within SpO<sub>2</sub>  $\pm 3\%$  (absolute value). Data for SpO<sub>2</sub> < 70% were not available for comparison and future research is required.

#### Learning Objectives:

1. Review state of the art of pulse oximeter technology and its limitations.

### [228] SIX NECK PAIN MITIGATING SOLUTIONS TO BE IMPLEMENTED IN RCAF GRIFFON HELICOPTER AIRCREW

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**MOTIVATION:** Neck pain prevalence rate was 75% in 2014 amongst Royal Canadian Air Force (RCAF) Griffon Helicopter aircrew. Defence Research and Development Canada (DRDC) and Canadian Forces Environmental Medicine Establishment proposed and assessed ten solutions, which led to credible scientific advice for the RCAF. After briefing the assessment results to the Griffon Squadrons Commander, it was decided that the following six solutions would be implemented: Helmet Fit, Education, Exercise, Task Sharing, Low Demand Postures, and Seat Ergonomics. This abstract provides a solution overview and the significance of this implementation decision. **SOLUTIONS OVERVIEW:** Helmet Fit: Royal Netherlands Air Force study indicated a significant reduction in neck pain using a novel Helmet Fit protocol. The RCAF plans to implement a similar protocol. Exercise: Neck-specific exercises have been reported to reduce neck pain. Although the Canadian exercise study is in progress, the RCAF plans to mandate general fitness for all aircrew. Education: Weak evidence has suggested education is effective for various neck disorders. Nevertheless, RCAF neck pain mitigation curricula are being developed. Task Sharing: the flying pilot (FP) and non-flying pilot (NFP) can share centre console tasks within the Griffon cockpit. Simulation results produced a 71% reduction and a 34% increase in NFP and FP muscle fatigue, respectively, yielding a 37% overall team muscle fatigue reduction. Low Demand Postures: several postural sequences have been identified that minimise neck loads while performing aircrew tasks (e.g., Flight Engineer neck torque was reduced by 64% during equipment handling). Seat Ergonomics: National Research Council of Canada studies have shown an overall vibration reduction with novel passive cushions. The RCAF will investigate the feasibility of replacing seat cushions. **SIGNIFICANCE:** The six mitigating solutions hope to lower neck pain prevalence. Methods, based on research surveys and an objective pain metric, need to be developed to monitor solution effectiveness in operations. Transitioning

neck pain mitigating solution advice into operations is becoming a success story for the RCAF and DRDC.

#### Learning Objectives:

1. To understand that there are very high aircrew neck pain prevalence rates.
2. To understand that there is no 'silver bullet' to solve the neck pain problem, but there are several solutions that can mitigate the problem.
3. To understand the challenges related to implementing research results into operations.

### [229] MAGNETIC E-RESONANT THERAPY ALLEVIATES COMBAT RELATED POSTTRAUMATIC STRESS DISORDER

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**INTRODUCTION:** After decades of war, Posttraumatic Stress Disorder (PTSD) has become pervasive in veterans. The RAND and National Centers for PTSD, estimates the prevalence of PTSD in 2.6 million U.S. service members who have served in Iraq or Afghanistan wars since 2001 range from 13-20%. Among the psychosocial treatments of PTSD are exposure therapy, cognitive therapy, eye movement desensitization and reprocessing, and group therapy. The combinations of cognitive behavioral therapy and pharmacotherapies for PTSD are often used with limited success and are associated with significant medication side effects. Transcranial magnetic stimulation of the brain is an FDA approved neuromodulation technology to treat patients with depression and may become an emerging adjuvant treatment modality for PTSD as well. Recent clinical trials produced promising results in the treatment of PTSD by this new modality. We have conducted a human subject study at Tinker AFB to investigate the effect of transcranial Magnetic e-Resonance Therapy (MeRT) on veterans suffering with PTSD from combat experience. **METHOD:** Eight subjects (projected 25) were enrolled and completed MeRT treatment after obtaining Air Force Institution Research Board approved consent. The MeRT treatment is guided by baseline EEG and is composed of five 30 min sessions weekly for 4 weeks. Subjects were randomly assigned to receive active (Group I) or Sham (Group II) treatment for the first two weeks with transition to an open label study so that all subjects received a total of 4 weeks of active MeRT. The PTSD Checklist Military Version (PCL-M) score and Cognitive and Physical Functioning Questionnaire (CPFQ) were used to measure clinical response at interval follow ups. **RESULTS:** 1). There were no serious side effects observed related to MeRT treatments. The most common side effect was a self-limiting headache due to the transcranial magnetic stimulation. 2). After four weeks of active treatment, compared to baseline, on average MeRT reduced the PCL-M score from 66 to 37, and from 79 to 50 in both groups respectively. 3). CPFQ scores also showed improvement in areas of motivation, alertness, energy level, focus, recall, ability to find words and mental acuity. **CONCLUSION:** Our preliminary results suggest that transcranial MeRT is a promising adjuvant treatment modality to help veterans suffering from PTSD.

#### Learning Objectives:

1. To introduce and understand that transcranial MeRT may provide an alternate method to help veterans suffering from PTSD.

### [230] JUST CULTURE AND PEER SUPPORT FOR PILOT MENTAL HEALTH: AN EVIDENCE BASED APPROACH

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**MOTIVATION:** Several airlines have peer support programs to help pilots suffering from mental health complaints. Ideally, mental health problems are dealt with in a Just Culture environment. Peer support programs differ between airlines, and there is a lack of knowledge on the most optimal design and how they can be implemented in a Just Culture. We combined findings from aviation accidents and incidents with current scientific knowledge to provide data-based recommendations for optimal peer support and a Just Culture approach to mental health issues. **OVERVIEW:** We analyzed commercial aviation accidents and incidents