



## Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 1<sup>st</sup> – 2<sup>nd</sup>, 2019  
Conference Proceedings

International Journal of Exercise Science, Volume 9, Issue 8



### Impact of Aerobic Fitness on Cognitive Performance During Simulated Military Operational Stress

Meaghan E. Beckner<sup>1</sup>, William R. Conkright<sup>1</sup>, Aaron M. Sinnott<sup>1</sup>, Alice D. LaGoy<sup>1</sup>, Felix Proessel<sup>1</sup>, Peter G. Roma<sup>2</sup>, Mathias Basner<sup>3</sup>, Mita Lovalekar<sup>1</sup>, Brian J. Martin<sup>1</sup>, Shawn D. Flanagan<sup>1</sup>, Anne Germain<sup>1</sup>, Fabio Ferrarelli<sup>1</sup>, Christopher Connaboy<sup>1</sup>, Bradley C. Nindl, FACSM<sup>1</sup>. <sup>1</sup>University of Pittsburgh, Pittsburgh, PA, <sup>2</sup>KBR/NASA Johnson Space Center, Houston, TX, <sup>3</sup>University of Pennsylvania, Philadelphia, PA

Low aerobic fitness, associated with cognitive impairment, may exacerbate the negative impact of military operational stress on vigilance and working memory compromising performance and safety.

**PURPOSE:** To determine the effects of aerobic fitness on cognitive function during simulated military operational stress (SMOS). **METHODS:** Fifty-three male Service Members (SMs) ( $26.2 \pm 5.3$  yrs,  $178.0 \pm 6.5$  cm,  $84.8 \pm 13.8$  kg,  $19.9 \pm 6.9$  %BF) completed a 5-day/night SMOS protocol consisting of daily physical and cognitive evaluations from 0900-2230. Assessments of psychomotor vigilance (PVT), working memory (2Back), and risk propensity (BART) were completed daily at 0900. 100% of caloric demands and 8 hours of sleep were provided on D1 (familiarization), D2 (baseline), and D5 (recovery). On D3-D4, SMs were allotted 50% of caloric needs and permitted to sleep from 0100-0300 and 0500-0700. SMs were split into aerobic fitness tertiles based on treadmill  $\text{VO}_{2\text{peak}}$  test completed on D1 (LOW:  $\leq 45.0$ ; MOD:  $> 45.0, \leq 51.54$ ; HIGH:  $> 51.54$  mL $\cdot$ kg $\cdot$ min $^{-1}$ ). Friedman tests and Bonferroni-corrected pairwise comparisons determined changes in 2Back, BART, and PVT reaction time (RT) and accuracy (ACC) across D2, D4, and D5 for each level of aerobic fitness. **RESULTS:** PVT RT slowed from D2 to D4 in LOW SMs ( $p = 0.003$ ), accompanied by a decrease in ACC ( $p = 0.001$ ). MOD SMs maintained PVT RT across SMOS ( $p = 0.069$ ), but ACC decreased D2 to D4 ( $p = 0.015$ ). HIGH SMs maintained PVT ACC across days ( $p = 0.062$ ) despite a slower RT from D2 to D4 ( $p = 0.011$ ). No difference was observed between D2 and D5 PVT RT or ACC across groups ( $p > 0.05$ ). 2Back ACC declined from D2 to D4 in MOD SMs ( $p = 0.003$ ). No other significant changes in 2Back were observed. BART ACC increased across SMOS at each level of fitness (LOW  $p = 0.045$ ; MOD  $p = 0.030$ ; HIGH  $p = 0.037$ ) despite no change in RT ( $ps > 0.05$ ). Risk propensity increased from D2 to D5 in both LOW and HIGH groups ( $ps < 0.017$ ), but did not reach statistical significance in MOD ( $p = 0.080$ ). **CONCLUSION:** SMs with low aerobic fitness were more susceptible to cognitive performance decrements under operational stress. Impaired vigilance and increased risk-taking can reduce operational readiness and effectiveness. Aerobic fitness is likely not only important for physical demands, but also cognitive demands associated with military operations.

Funded by the Department of Defense (Award # W81XWH-17-2-0070). The results and opinions herein are those of the authors and do not necessarily constitute endorsement of the Department of Defense.