Abstract

Title: The effect of sustained military operational stress on military-related physical and cognitive performance

Goal: To examine the effects of a three-day stress protocol simulating the physical and cognitive demands of sustained military operational stress (SMOS) on military-oriented physical and cognitive performance.

Method: This study is of an empirical-theoretical nature. The research sample consisted of a total of 8 (experimental n = 4, control n = 4) healthy, physically fit soldiers with an average age of 20.9 ± 1.8 years, studying in the Military field at the Faculty of Physical Education and Sport, Charles University. Prior to the measurements, all participants completed the CD RISC questionnaire, which revealed that they possessed average to above-average psychological resilience. The participants underwent a three-day stress protocol aimed at simulating the physical and cognitive demands of SMOS that soldiers may experience during combat. The core of this protocol was a test battery (TMT) consisting of seven tests (reaction speed, shooting, vertical jump height, casualty evacuation, agility run with and without load, load carriage), which the participants performed three times in one day. The TMT tests served as continuous stressors for the participants and also as a measure to monitor their ongoing performance (PRE1, 2, 3 and POST1, 2, 3 - performance assessment on the 1st, 2nd, and 3rd day). The subjective perception of load was recorded throughout the measurement using the Borg Scale of Perceived Exertion scale. In contrast to the control group, the experimental group had to perform a 40-minute aerobic walking exercise with load on a treadmill ergometer every day between the TMT tests, while the control group rested passively.

Results: No significant declines in physical performance were observed within the PRE1 → POST3 period in any of the physical tests. There was an overall improvement of 5.3% in vertical jump performance. Shooting performance showed an overall improvement of 1.9%. Agility run without load showed a negligible overall improvement of 1.6%. In the agility run with load, an intra-day performance decline of up to 2.7% was observed during the second and third day of measurement, but the results within the PRE1 → POST3 period were nearly identical. The participants showed an overall improvement of 16.9% in casualty evacuation and a 4% overall improvement in load carriage. The cognitive test of reaction speed revealed an overall decline of 6.5% in performance within the PRE1 → POST3 period, with the experimental group showing a decline of 9.6% and the control group showing a decline of 3.5%. The experimental

group demonstrated overall better performance in reaction speed (up to 9.4%), shooting (up to 21.7%), casualty evacuation (up to 100%), load carriage (up to 21.4%), and agility run without load (up to 7%) and with load (up to 4.7%). The most balanced performances between the groups were observed in vertical jump height. The subjective perception of exertion increased intensively in all performance tests within the PRE1 → POST3 period, reaching up to 42.1% (agility run without load), with the experimental group showing higher overall values in differences within the PRE1 → POST3 period. However, due to the small research sample and high variability of performance among the participants, the differences between the groups cannot be considered as 100% conclusive.

Conclusions: Due to the small research sample, this study primarily has a pilot character, and its results serve as an empirical foundation for subsequent studies. The findings and outcomes can be summarized into five key points:

- The devised stress protocol was manageable for both groups without significant signs of fatigue affecting physical performance, indicating the potential for expanding the protocol to include additional sustained military operational stressors, such as sleep deprivation or caloric restriction.
- The cognitive performance is adversely affected by a three-day continuous military operational stress (SMOS) protocol, while the physical performance remains relatively stable or even shows signs of improvement.
- A three-day sustained military operational stress (SMOS) focusing on physical and cognitive demands had a negative impact on cognitive performance, while physical performance remained stable or showed signs of improvement.
- If the findings of this study can be generalized, it suggests that soldiers are capable of maintaining their physical performance over three physically and cognitively demanding consecutive days, provided they have sufficient sleep and caloric intake.
- An adapted SMOS stress protocol, designed to be logistically less demanding, was established and can be further utilized for research within the Czech Republic Army.

Key words: military, sustained stress, fatigue, physical performance, cognitive performance