

## **Physical Activity and Work Load during an International 6-Month Military Operation: Development of Military Simulation Test**

**INTRODUCTION:** Operational military duties have been characterized as prolonged low intensity physical activity intermittent by shorter bouts of higher intensity activities. Military tasks are often performed with extra loads and wearing protective equipment such as body armor, both increasing the energy expenditure of such activities. In addition to physical strain, negative energy balance, sustained readiness and sleep deprivation, high ambient temperature, altitude and environmental toxins may all separately or in combination disturb homeostasis of the body and thus, increase stress of soldiers. Consequently, these stressors may lead to degraded performance and increased risk for task or mission failure. Ultimately, prolonged stress may weaken immune function and mental health, leading to various diseases or disorders such as hypertension, atherosclerosis, metabolic syndrome or post-traumatic stress disorder.

**PURPOSE (Part 1)** To investigate the changes in human performance, physical activity and body composition during a 6-month crisis management operation in the Middle East.

**PURPOSE (Part 2)** To study the anaerobic performance of soldiers and evaluate the interrelationships between Military Simulation Test (MST) performance, body composition and physical fitness variables.

**METHODS:** 98 soldiers, who were deployed for 6 to 12 months in crisis management operation in the Middle East, took voluntarily part in the study. Soldiers participated in a series of measurements three times during their rotation. Measurements included physiological variables such as heart rate, blood biomarkers, body composition and components of physical fitness. The focus of the second part of the present study was on the initial measurement phase.

**RESULTS 1)** The quantity of physical activity, relative HR values and biomarkers used in the present study demonstrated that due to the operatively calm nature of the working environment the soldiers did not express signs of physical overload during the follow-up period. In fact, the total volume and intensity of physical activity was low and did not exceed population-wide recommendations.

**RESULTS 2)** The Spearman correlation analysis showed that the strongest individual predictor of MST performance was explosive force production of the lower extremities, especially countermovement jump performed in combat load (CMJ2). Furthermore, stepwise regression analysis showed that four variables, CMJ2, 3000 m run, skeletal muscle mass and push-ups in 1 min were significantly associated with MST time. Together, these variables explained 66 % of the variance in MST time.

**CONCLUSION 1)** The present soldiers were not exposed to prolonged physical activity during their crisis management operation. As such, the demanded level of physical performance (e.g. functional reserve) cannot be maintained during operations lasting several months just by performing the given work assignments. However, soldiers are required to maintain a high level of readiness for suddenly changing security situations. The present study highlights the importance of the maintenance of physical performance by both independent and guided exercises during deployment.

**CONCLUSION 2)** The present study demonstrated that the strongest correlational variables, inversely associated with MST performance, were the variables measuring muscular power of the lower extremities. Thus, the desirable characteristics of a soldier involved with combat situations are high level of muscular power in the lower extremities and endurance capacity as well as large muscle mass in relation to fat mass and external load carried during assignments. Furthermore, workouts focusing on development of lower body strength and power are encouraged to be implemented to training programs designed for soldiers engaging anaerobic combat situations.