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Ambulatory Monitoring of Performance and Health in the Military using Field Labs

Operations in Iraq, Afghanistan and Bosnia reveal that soldiers are exposed to extreme, complex and sustained operations, crossing the limits of human capabilities. During these operations the operational readiness or status of the soldier is estimated by the commander based on subjective observations of the physical and mental capabilities of the soldier. This commander evaluation can be biased by personal experiences and commanders own physical and mental status.

Wrong judgement can have negative consequences for the soldier, which might lead to dangerous and harmful situations. To predict the operational readiness and to guard the safety and health of soldiers, it is important to objectively recognize symptoms of fatigue and exhaustion. Up till now, no methods were available for the Dutch Army

to monitor physiological and cognitive status of soldiers during military operations.

PURPOSE

Monitoring the physical and cognitive performance of soldiers during an Air Mobile Brigade training course.

METHODS

A field lab was developed to assess soldiers physiological and cognitive functioning during a 7-week training course. During 3 weeks physiological parameters like heart rate, skin- and core temperature, respiration rate and activity were measured 24hours a day during 3 days for 3 weeks. Cognitive performance (logical reasoning, working memory and vigilance) was measured 5 times a week using the N- Back task, Tower of Hanoi and the VigTrack task. Short questionnaires assessed the amount and quality of sleep, level of exertion, need for recovery and subjective alertness.

RESULTS

The physiological measurements indicate Heart Rate Reserve percentages up to 80%. Core temperatures sometimes reached values up to 39 degrees (averaged per hour). Cognitive performance was seriously affected in the second week. Reaction time decreased (N-Back, VigTrack) while initiation time (Tower of Hanoi) and errors increased.

CONCLUSIONS

Soldiers were not able to maintain optimal physical and cognitive functioning during the training course. Intermittent low impact weeks appeared to be sufficient to restore cognitive functioning.

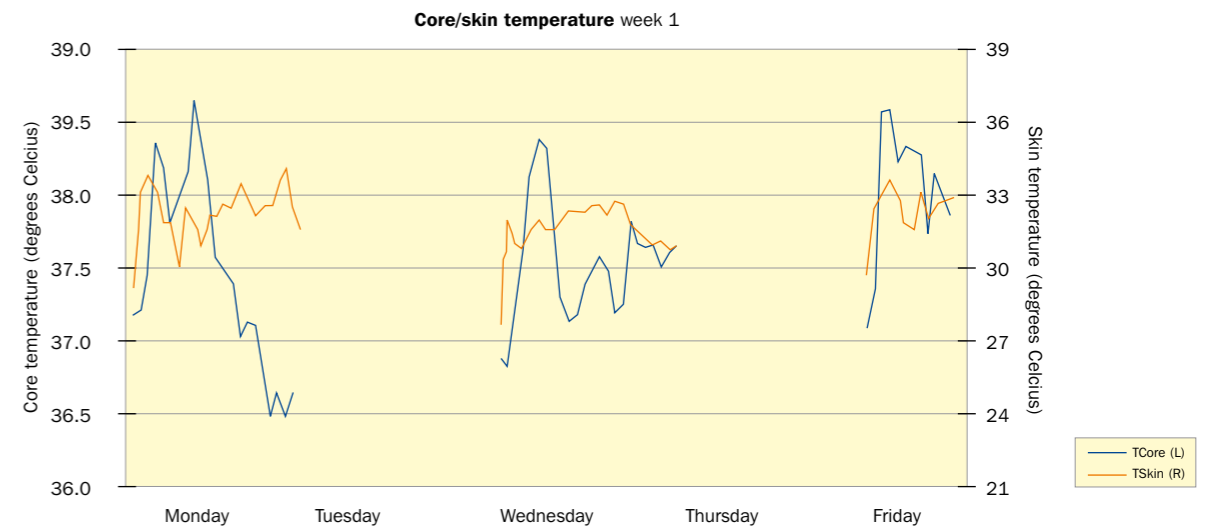


Figure 1: Combined core and skin temperature of the participants during week 1

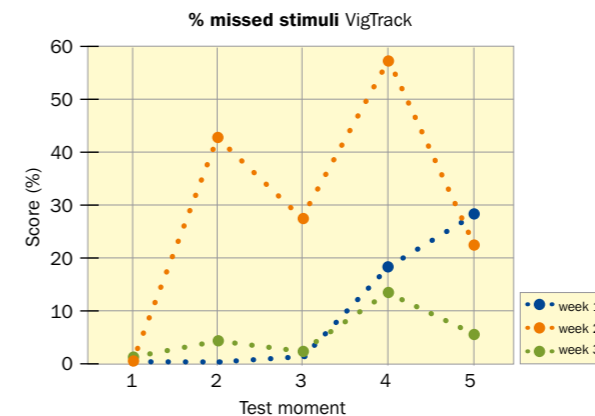


Figure 2: Percentage of missed stimuli of the participants during the VigTrack

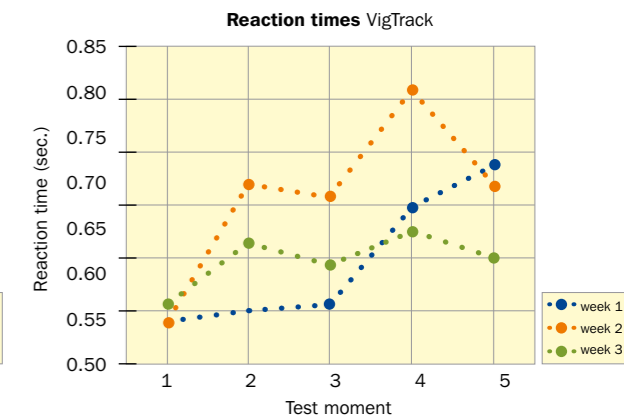


Figure 3: Reaction times of the participants during the VigTrack