



Finnish Defence Research Agency

# Cognitive Performance among Finnish Paratroopers during a 20-day Winter Military Field Training Course and the Following 10-day Recovery Period

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**Puolustusvoimat**

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# Motivation

- Paratrooper training and missions are characterized as involving activities that are highly stressful
- In order to survive, soldiers must be able to act rationally and consistently in mentally and physically stressful situations
- Soldiers cognitive functions refer to their ability to perform various mental activities, such as perception, information processing, memory, language, reasoning, problem solving and executing actions
- Various strenuous physical (e.g., activity, sleep deprivation), cognitive (e.g., time pressure) and environmental (e.g., weather, cold exposure) stressors may interfere cognitive performance
- We investigated how the stressors related to winter military field training course moderate cognitive performance during and after the exercise





# Field exercise

- Fifty-eight male soldiers participated to the training exercise. Soldier's average age was 19, 4 ( $\pm 0.8$ ) years, height 182 ( $\pm 6.0$ ) cm and weight 78, 5 ( $\pm 7.2$ ) kg
- The average temperature during the field exercise was -11, 3 °C and snow depth 107, 2 cm. The lowest temperature during the exercise was -31, 8 °C.





# Cognitive tests

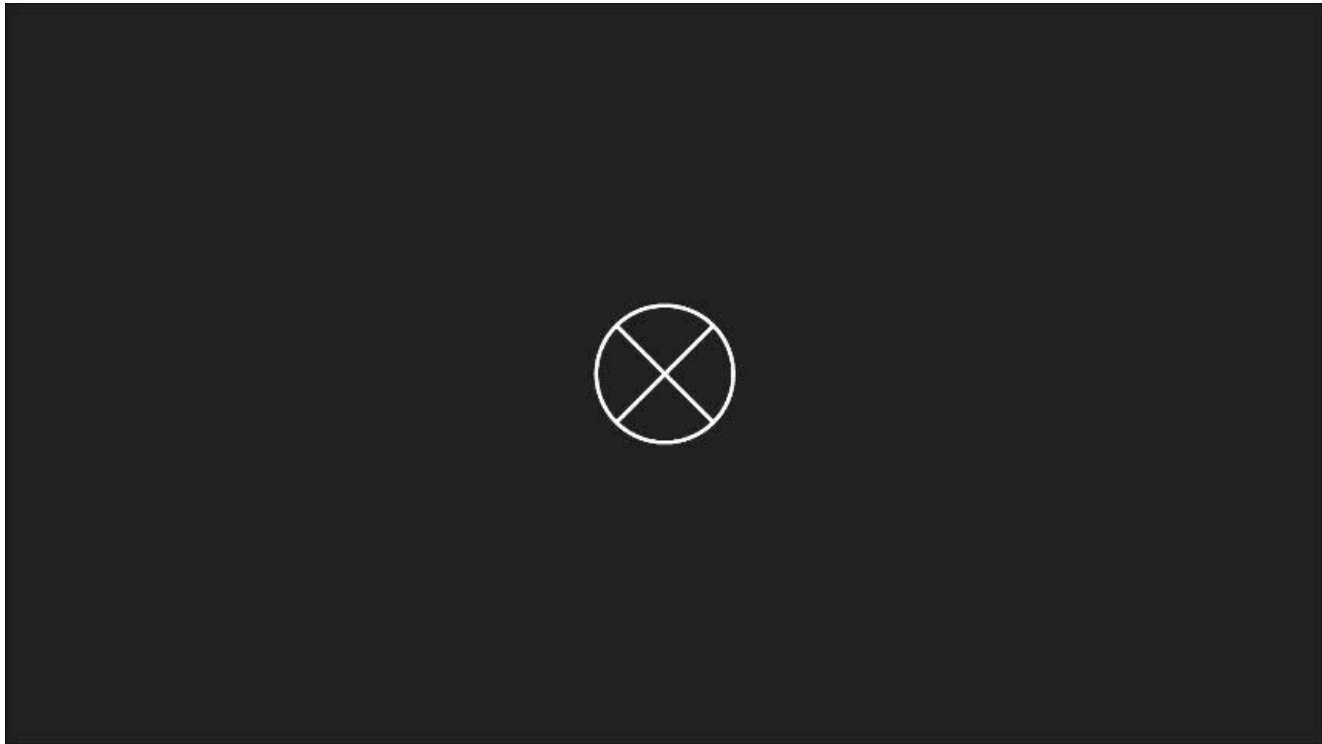
- PRE (baseline), MID (+7d), POST (+17d) and RECO (+27d) measurements
- Three cognitive tests:
  - The Sustained Attention to Response Task (SART) to assess executive function (execute/inhibit)
  - Baddeley's 3-minutes grammatical reasoning task (BRT) to assess verbal reasoning
  - Change Blindness test (CB) to assess visual perception





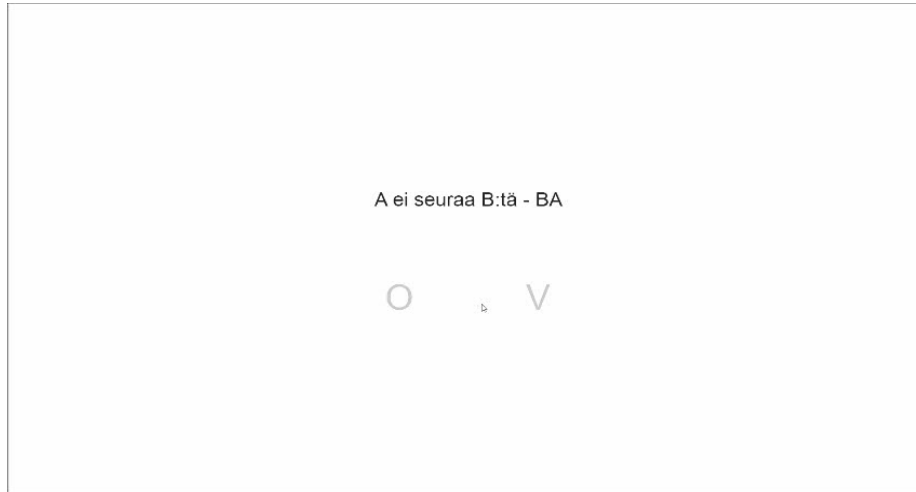
# SART

Subjects were asked to press response button as quickly as possible whenever other than number 3 was presented in the screen (i.e. one of the numbers 1,2,4,5,6,7,8,9; GO stimulus) and refrain from pressing the button in the existence of number 3 (NoGO stimulus)

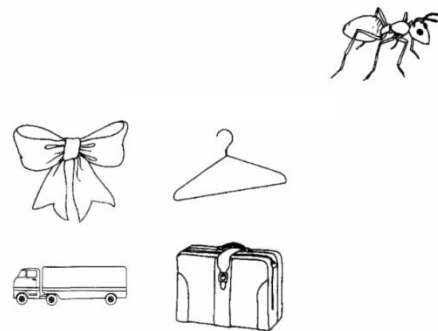
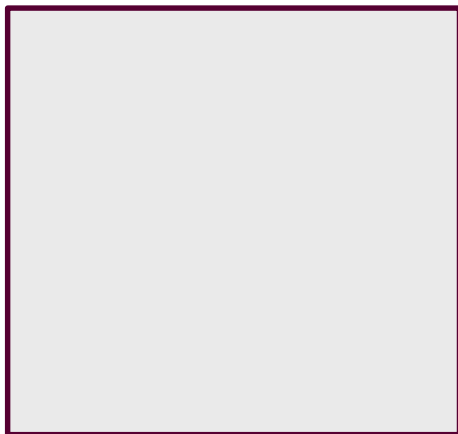




# BRT and CB tasks



In BRT participant's task was to answer correctly as many questions as possible regarding statements about the order of letters A and B in the fixed 3-minute period



In CB participant's task was to point, both the replaced and the replacing object in the set of two consecutive image collages





# Data-analysis

- Data for cognitive performance parameters (i.e., number of SART commission errors, number of SART omission errors, SART reaction time for GO stimuli, BRT test score and response rate and CB test score), each in turn, was analysed by the General Linear Model (GLM) Repeated Measures procedure in SPSS statistical program with Measurement (PRE, MID POST, RECO) as within-subjects
- Contrasts (e.g., POST vs. PRE, RECO vs. POST measurement) were analysed to assess differences in cognitive performance after recovery and before and immediately after the field training





# Results

SART omission error rate, SART reaction time and BRT response rate was highest and BRT and CB scores lowest in POST measurement (i.e., right after the field exercise)

SART omission error and BTR response rate decreased, and BRT and CB score increased from POST to RECO measurement

	PRE (0)	MID (+7days)	POST (+17days)	RECO (+27days)
Test result				
SART omission error (%)	1,2 <sup>#</sup>	0,6 <sup>###</sup>	4,0 <sup>**</sup>	0,6 <sup>###</sup>
SART reaction time (ms)	332 <sup>###</sup>	386 <sup>***</sup>	423 <sup>***</sup>	398 <sup>***</sup>
BRT score	35,0 <sup>#</sup>	35,8 <sup>###</sup>	30,1 <sup>*</sup>	38,9 <sup>##</sup>
BRT response rate (ms)	4612 <sup>#</sup>	4537 <sup>###</sup>	5564 <sup>**</sup>	4323 <sup>##</sup>
CB score	27,6	29,0 <sup>###</sup>	25,8	31,0 <sup>###</sup>

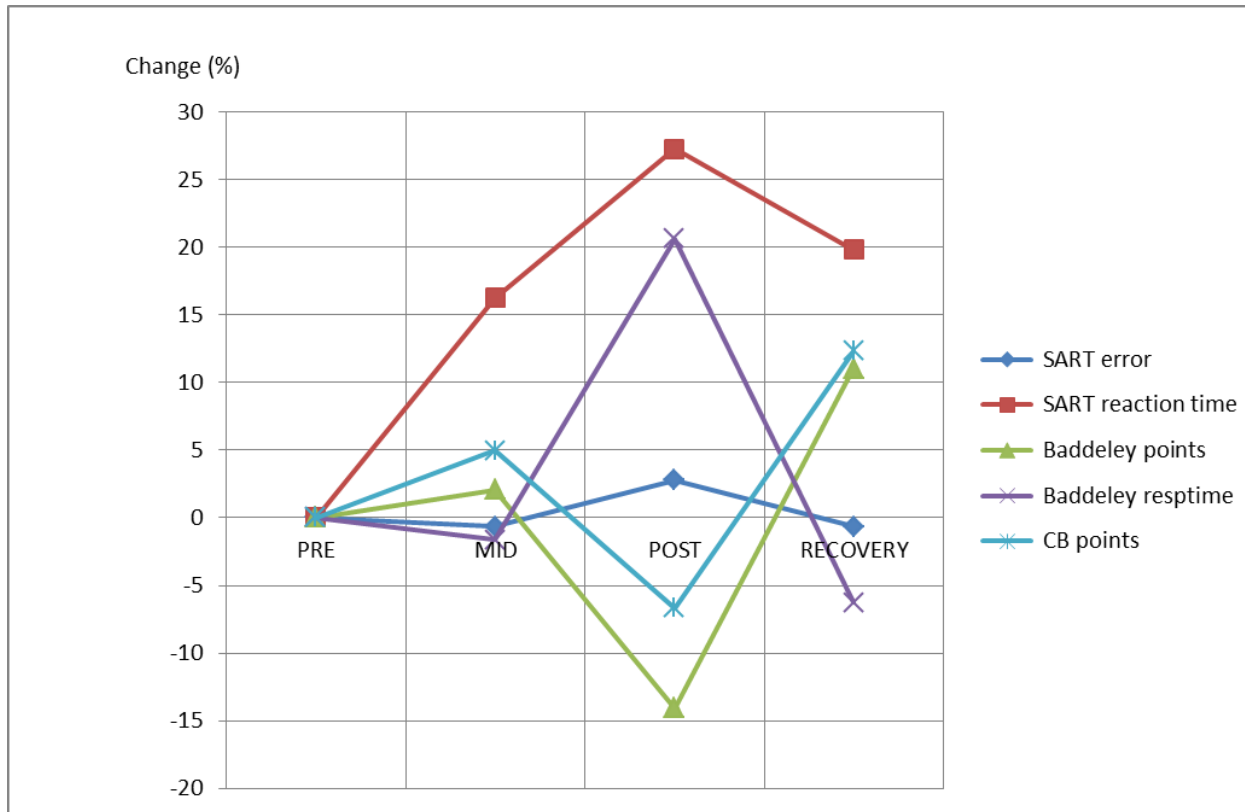
\* = compared to PRE measurement \* = p < 0.05, \*\* = p < 0.01, \*\*\* = p < 0.001;  
# = compared to POST measurement # = p < 0.05, ## = p < 0.01, ### < 0.001.







# Results





# Conclusions

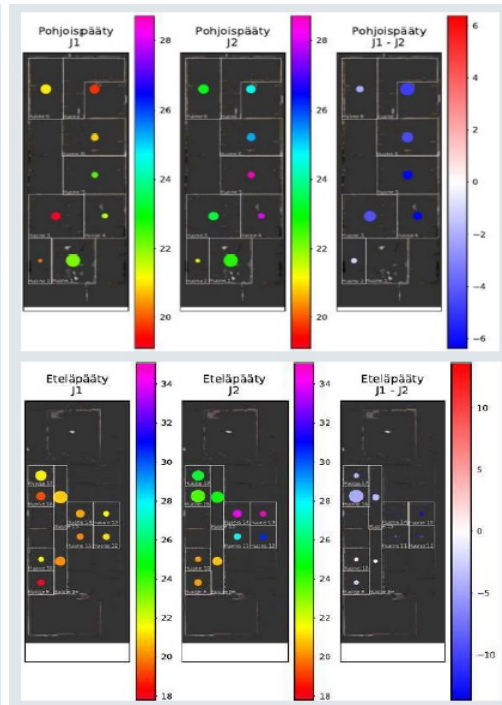
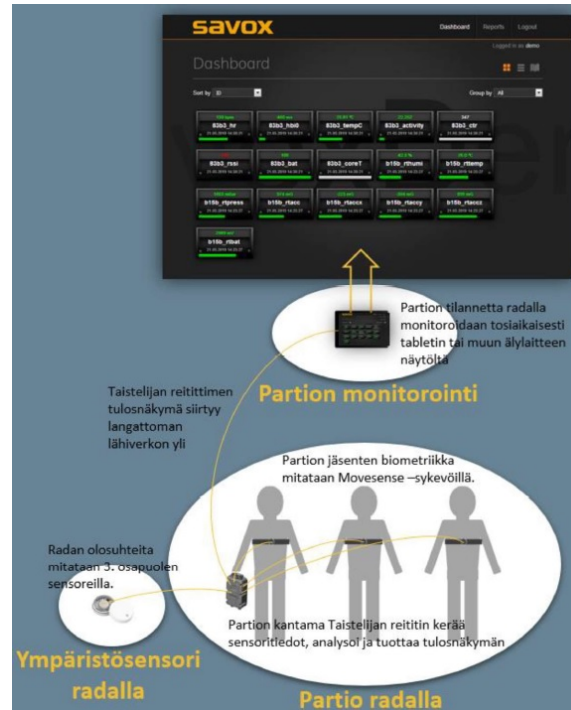
- We examined the effects of winter military field training course on cognitive performance among Finnish soldiers
- As expected cognitive performance declined during the field exercise
- The results supported previous studies that have reported effects of prolonged exercises on cognitive performance and underline the necessity of understanding, preparing and supporting cognitive performance in operations in addition to physical and environmental factors
- Further studies could elaborate more the effects of different stressors (e.g., the role of cold temperature), the individual thresholds and differences related to stress and performance as well as larger variety of soldier relevant cognitive tasks





# Future plans

## Demonstrator system



## Vagus nerve stimulator





Thank you for your attention,

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