Acute perturbations to IL-8 and neutrophil expression of LFA-1 and Mac-1 are not associated with declines in executive function

Background

Lymphocyte associated antigen-1 (LFA-1/CD11a) and macrophase-1 antigen (Mac-1/CD11b) are cell adhesion molecules that mediate endothelial capture and intravascular crawling of leukocytes during inflammation. Chronically high levels of LFA-1 and Mac-1 expression on neutrophils, along with elevated concentrations of the neutrophil chemokine interleukin-8 (IL-8), have previously been associated with executive dysfunction in elderly individuals (1,2,4). However, whether acute perturbations to cellular or systemic mediators of neutrophil recruitment influence cognitive function is unclear. Purpose: To examine the relationships between changes in IL-8, LFA-1, Mac-1 and measures of executive function among young healthy individuals during a period of acute physical and psychological stress.

Methods

Participants

- Sixteen males (Age 23.1±3.5, height 184.4±9.3cm, Body mass 80.9±11.9kg, Height 174.4±4.9cm).
- Sustained Military Operation (SUSOP) Physical and Psychological Stress.

Lecture based training

- Participants underwent 10 hours of lecture-based training consisting of mission briefs and combat specific activities.

Military specific physical tasks

- Participants completed a series of physically demanding activities throughout the entire 24-hour period consisting of pull-ups, vertical jumps, 50-meter carry, time-task assessment questions, and weighted ruck marches (Table 1).

Sleep and calorie restriction

- No sleep was permitted throughout the 24-hour time period.
- A standard snack was provided before the blood draw at 0 Hours (0H) and again at hour 20. A standard meal ready to eat (MRE) was provided at hour 8.

Cognition and Psychological Stress Assessments

- Executive function and psychological stress was assessed at 0H and 24 hours (24H) using Automated Neuropsychological Assessment Metric (ANAM) software.
- Throughput scores (TP), a measure of cognitive efficiency, were assessed for Mathematical Processing (MP), Matching to Sample (M2S), and Code Substitution Delayed (CSD) tasks.

Results

Frequency (p<0.001) and severity (p<0.001) of psychological stress symptoms increased significantly from 0H to 24H.
- IL-8 significantly increased from 0H to 24H (p<0.007) (Figure 2).
- Neutrophil LFA-1 expression significantly decreased from 0H to 24H (p<0.004) (Figure 5).
- Significant decreases in MS8 (p=0.001) and CSD TP scores (p<0.009), as well as GNG percent correct (p<0.001) were observed from 0H to 24H.
- No significant changes were seen in neutrophil Mac-1 expression (p>0.56).
- No significant associations between changes in IL-8, LFA-1, or Mac-1 and in measures of executive function were found.

Conclusion

Acute perturbations in serum IL-8 along with changes in degree of neutrophil integrin expression of LFA-1 and Mac-1 do not appear to be associated with impairments in executive function and increases in psychological stress seen during a SUSOP.

Acknowledgments

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References


