

## **Abstract:**

### **Title:**

Ventilation - respiratory changes and diffusion of gases in the simulated snow avalanche.

### **Goals:**

The aim of this study was to investigate different ventilation-respiratory parameters with breathing into the simulated snow avalanche with and without any air pockets.

### **Method:**

An intervention randomized double blind crossover study was conducted on 12 male students of Military Department at the Faculty of Physical Education and Sports of Charles University. The study was realized in the Krkonoše Mountains in the period January 14 – 18th, 2013 at an altitude of 762 m above sea level. Each volunteer underwent two phases of the experiment in a random order: 1st phase “AP”- breathing into the snow with a 1 L air pocket, and 2nd phase “NP”- breathing into the snow with no air pocket. Physiological parameters, especially fractions of O<sub>2</sub> and CO<sub>2</sub> in the airways and work of breathing (*WoB*) expressed as Pressure-Time Product (*PTP*) were recorded continuously.

### **Results:**

The presence of the air pockets and size has an important role in the survival of buried avalanche victims. The finding of this study is that it is possible to breath in the avalanche snow even with no air pocket (0 L), but breathing under this condition is associated with significantly increased work of breathing. The limiting factor in no air pocket conditions was excessive increase in work of breathing that induces increase in metabolism accompanied by higher O<sub>2</sub> consumption and CO<sub>2</sub> production. The significant differences were initially observed for end-tidal values of the respiratory gases (*EtO<sub>2</sub>* and *EtCO<sub>2</sub>*) and peripheral oxygen saturation (*SpO<sub>2</sub>*) between AP and NP phases, whereas significant differences in inspiratory fractions occurred much later (*F<sub>I</sub>O<sub>2</sub>*), or never (*F<sub>I</sub>CO<sub>2</sub>*). The presence of even small air pocket reduces significantly the work of breathing.

### **Key words:**

snow avalanche, work of breathing, breath effort, survival, hypoxia, hypercapnia