SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

Author: Dr. Oliver Opatz
Center for Space Medicine Berlin (ZWMB), Germany, oliver.opatz@charite.de

Prof. Hanns-Christian Gunga
Charité - University Medicine Berlin, Germany, hanns-christian.gunga@charite.de
Dr. Alexander Christoph Stahn
Center for Space Medicine Berlin (ZWMB), Germany, alexander.stahn@charite.de

CAN SKIN TEMPERATURE BE A PREDICTOR FOR ORTHOSTATIC OR G-FORCE INDUCED LOSS OF CONSCIOUSNESS?

Abstract

Introduction: Doubling the gravitational forces in the centrifuge or aerial combat is an enormous challenge for human physiology, as is the one g environment after traveling space for a longer time. To predict the probability of a g-force induced loss of consciousness (GLOC) has been subject of numerous studies. Changes in perfusion (NIRS) and/or function of the brain (EEG, evoked potentials) have been the primary focus searching a predictor while centrifugal reallocation of blood volume is the primary cause for this blackout. We present a pilot study using fast measurements of peripheral temperatures to predict this peripheral pooling effect.

Methods: 20 healthy subjects were tested using a combined lower body negative pressur/tilt table. The produced push-pull effect has been used to select pilots suited to fly a forth generation jet fighter. The complete procedure was split in two phases before, one phase during and one phase after the induced push-pull effect. Recording skin temperatures proximal and distal of the upper and lower limbs allowed to quantify the effect of a peripheral perfusion change.

Results: 9 of the 20 subjects suffered an almost loss of consciousness (ALOC). Peripheral temperatures tended to be higher in subjects with an almost blackout. The strongest effect regarding the difference of the two groups was recorded at the upper arm ($p<0.05$).

Discussion: The probability of ALOC in this experiment could be predicted recording peripheral temperatures. Higher peripheral temperatures before the push-pull phase might be an indicator for peripheral vasodilation or a lowered sympathetic activation. However, to verify this effect, the experiment has to be repeated using more subjects and different hyper-g scenarios as the short as the long arm centrifuge and real aircraft manoeuvres.