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COUNTER-MEASURES RESEARCH: PERIPHERAL SKIN COOLING AUGMENTS
CARDIOVASCULAR FUNCTIONING.

Abstract

Cardiovascular collapse can occur in the aerospace environment as a result of hypovolemic shock due to trauma or orthostatic collapse due to vasomotor dysfunction during gravitational challenges. Peripheral skin cooling (PSC) could be used as a counter-measure by manned crews during these emergent situations in order to ensure perfusion to the vital organ systems are maintained without the use of exogenous catecholamine administration. The Arctic Sun PSC system has been used in the clinical setting in order to reduce metabolic demand status post myocardial infarction and cerebral insult, however the acute effects PSC has on cardiovascular functioning has not been thoroughly tested. In this pilot project, we hypothesized that the Arctic Sun PSC would increase arterial blood pressure via peripheral vasoconstriction, while a decrease in heart rate would be seen due to blood volume centralization amongst a small group of healthy volunteers. Seven human subjects (3F/4M) were outfitted with bilateral thigh Arctic Sun PSC pads, with a circulating water temperature set at 4 Celsius for 10 minutes while laying supine. Systolic arterial pressure (SAP), diastolic arterial pressure (DAP) and heart rate (HR) were recorded for baseline and during PSC. For all subjects, SAP increased to 9.3. Amongst the small group of subjects, 10 minutes of PSC seemed to have an effect upon cardiovascular functioning. The increases in SAP and DAP with the concomitant decreases in HR during PSC to indicate that a centralization of blood volume does occur. Our original speculation was supported, at least in this small sample of subjects. The increases in SAP and DAP may prove to be a useful exogenous counter-measure against hemodynamic collapse, as well as hypovolemic shock encountered in remote environments. Additionally, PSC produced equal effects amongst men and women despite anthropometric differences. Further testing involving PSC during gravitational challenges will be required in order to further determine if it can effectively augment orthostatic stability. Furthermore, the acute effects of PSC on thermoregulation, microcirculation, and cognition need to be determined.