IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

Author: Ms. Elisabeth Dichaira
The University of Louisville, United States, elisabeth.dichaira@louisville.edu

Prof.Dr. John Caruso
The University of Louisville, United States, john.caruso@louisville.edu
Ms. Priya Jones
The University of Louisville, United States, priya.jones@louisville.edu
Mr. Kylan Gill
The University of Louisville, United States, kylan.gill@louisville.edu
Mr. Neel Patel
The University of Louisville, United States, neel.patel.2@louisville.edu
Mr. Mike Jett
The University of Louisville, United States, mike.jett@louisville.edu
Mr. Ben Skutnik
The University of Louisville, United States, benjamin.skutnik@louisville.edu

MANUAL DEXTERITY WHILE WEARING GLOVES DESIGNED TO IMPROVE HEAT TRANSFER

Abstract

Thermoregulation is upset in microgravity, which elicits numerous physiological problems. Microgravity impairs convection and evaporation that causes internal body heat accrual. At rest, body temperatures in microgravity are elevated, and evoke even higher increases during in-flight exercise, as compared to similar activity done on Earth. However, palm cooling improves thermal, physiological and ergogenic outcomes through greater conductive heat loss. The hand's palm covers anastomoses, which are blood vessels that hasten heat loss upon cold object contact to elicit conduction. Gloves were fabricated to enable intermittent palm cooling, which ultimately removes more heat than continuous cooling. In-flight glove use permitting intermittent cooling may enhance heat removal both at rest and during exercise. Yet maintenance of manual dexterity as gloves are worn is crucial to in-flight tasks. Purpose: Examine manual dexterity as palm cooling gloves are worn, to assess their utility for in-flight use. Methodology: To date, ten men and seven women made three laboratory visits for a new investigation and, in a randomized sequence, did manual dexterity tests under one of the following conditions 1): no gloves, 2): gloves worn in a fashion to enable intermittent (10.6o C) palm cooling, 3): gloves worn in a fashion that did not allow palm cooling (no cooling). Manual dexterity tests entailed 1): peg insertion into peg board holes, and 2): nuts and bolts threaded together through a board with various sized holes. With each test timed, data analysis entailed 2 (gender) x 3 (condition) ANOVAs with repeated measures for condition. Alpha = 0.05 and Scheffe's post-hoc identified the source of the differences. Results: Peg board test results (mean +/- sem) included the following significant condition effect: no gloves 25.03 +/- 1.7 sec. ¡ palm cooling 27.83 +/- 1.3 sec., no cooling 26.51 +/- 1.8 sec. Thread test results (mean +/- sem) were non-significant; times per condition were as follows: no gloves 243.03 +/- 10.0 sec., palm cooling 257.83 +/- 9.1 sec., no cooling 252.3 +/- 11.1 sec. These data are new, novel and have not appeared in prior conferences or publications. Conclusions: Preliminary results imply gloves worn in the palm cooling condition may impede manual dexterity. Areas of Discussion: Regarding potential in-flight use, thermoregulatory benefits from the palm cooling gloves should be weighed against manual dexterity limitations. Individual users may

wish to consider their in-flight operational task demands, specific to manual dexterity, when palm cooling glove usage is being considered.