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PD3-3 Evaluation of Two Types of Cooling Devices in a Warm Environment while Wearing Firefighting Protective Clothing

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The aim of the present study was to examine the effectiveness over time of two different types of cooling devices on physiological and subjective responses in reducing physiological load during exercise on an ergometer while wearing firefighting protective clothing (FPC) in a warm temperature environment [30ºC, 50%RH]. Eight graduate students remained initially in a Pre-test room for 10 min before entering the Test-room where they rested for another 10 min, followed by 30 min-exercise and a 10 min-recovery period. The exercise intensity was set at 55 % $\dot{V}O_{2max}$. Rectal temperature (*Tre*), mean skin temperature (*Tsk*), heart rate (*HR*), body weight, and clothing weight were monitored during the four test conditions; namely: control (CON), ice-pack (ICE) and Phase Change Material of 5ºC [PCM(5)] and 20ºC [PCM(20)]. The cooling devices were worn under the FPC. The result of the experiment showed a decrease in Tre for PCM (5) (38.1±0.2ºC) and PCM (20) (38.1±0.3ºC) which was more than that for CON (38.3±0.2ºC) and ICE (38.2±0.3ºC). *Tsk* was lower during PCM (20) (36.7±0.6ºC) than CON (37.4±0.1ºC), ICE (37.0±0.6ºC), and PCM (5) (36.9±0.2ºC) (p<0.01). *HR* was similar for ICE, PCM (5) and PCM (20). The surface cooling area of the ICE (1310 cm^2) was 73% of the PCM (5) and PCM (20) (1792 cm^2). Therefore, the increase in heat storage in the body can be suppressed. Furthermore, the heat adsorption capacity of the PCM (20) was higher than that of the other conditions in this experiment. These results suggest that PCM (20) is more effective than other cooling devices in reducing physiological load while wearing firefighting protective clothing.

PD3-4 Observation of the Thermal Conditions and Thermal Responses of Office Workers in "Cool Biz" Implemented Office in Summer in Japan

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This paper reports the results of measurement in "Cool Biz" thermal environments and workers' responses, including evaluation of thermal environments. The subjects were 83 male and female office workers at an office located in the middle of Tokyo.

Thermal conditions include ambient temperature, relative humidity, air velocity, and radiant temperature which were measured automatically every 5 minutes. Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) were also calculated. In the questionnaire, the thermal sensation vote, comfort vote and actual clothing worn were recorded. The preference of each worker and physical characteristics were also asked.

The thermal conditions in the office were relatively comfortable, although the ambient temperature was approximately 27.0 C. However, the workers perceived the thermal condition differently. Women's perception was rather neutral, whereas the men's perception was diverse. It was considered that this diversity came from the individual constitution. Referring to the same room, some subjects considered the room too hot but for some it was comfortable. The mean of the clo value was 0.53 clo, which showed that the workers wore very light summer clothes. No men wore jackets in the office and only 12 percent of them wore neckties. The mean value of PMV of each worker was 0.50 and PPD was 12.4%. For comfort in these kinds of "Cool Biz" offices, light clothing is required, and active use of fan and dehumidifier are also recommended.

PD3-5 The Effect of Size Factor and Material Property of Leather Shoes on Heat and Water Vapor Transfer relating to Shoes Microclimate

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In this study to improve the thermal comfort due to the microclimate in leather shoes, it was evaluated the effect of size factor and material property of leather shoes on heat and water vapor transfer in shoes. We studied the effect of fitting of foot measurement as one of the size factor. We compared three sizes, tight fitted: 1E, medium fitted: 2E, loose fitted: 3E. We also examined the effect of water vapor permeability as one of the material property of leather shoes which would affect water vapor transfer in shoes. We compared artificial leather with natural leather. Subject trial was carried out in an artificial climate chamber under the condition of 30℃, 65% RH and lower than 0.2m/s. The microclimate of shoe was measured at 5 points of the foot. The velocity was measured with 8 anemometers at the ankle part of leg which was surrounded opening of shoe.

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