Session 3 Thermal Environment
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S-301 Relationship between Scrotal Temperature and Floor Surface Temperature at a Sedentary Posture over the ONDOL Floor

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ABSTRACT

The purpose of this study is to investigate the changes in the scrotal temperatures of the subjects, who were made to assume a sedentary posture over a heated floor. Experiment I was designed for a low metabolism state, with the subjects reading a book while in a sedentary posture for 50 min. The floor surface temperature (t_f) was controlled by varying the temperature of the water (t_w) flowing into the floor coil from 15°C to 50°C, at 5°C intervals. The final scrotal surface temperatures were 32.27°C, 32.62°C, 33.51°C, 33.34°C, 34.14°C, 34.28°C, 34.34°C, and 35.04°C at t_w 15°C (t_f 17.0°C), 20°C (t_f 20.8°C), 25°C (t_f 24.1°C), 30°C (t_f 27.8°C), 35°C (t_f 31.7°C), 40°C (t_f 35.9°C), 45°C (t_f 38.6°C), and 50°C (t_f 42.2°C), respectively. Experiment II was designed for a high metabolism state, with the subjects playing a card game while in a sedentary posture for 180 min. The temperature of the water (t_w) flowing into the floor coil was controlled from 30°C to 40°C, at 5°C intervals. The final scrotal temperatures were 33.43°C, 34.78°C, and 35.61°C, respectively. The scrotal temperature was affected by the floor surface temperature and by the rate of metabolism of the subject in a sedentary posture. As derived from regression analysis, the recommended surface temperature of a heated floor to achieve spermatogenesis is within 23°C-33°C.

Key words: clothing environments; heat and cold stress; body temperature regulation; comfort sensation

S-302 Evaluation of Thermal Environment in Outdoor Space in Consideration of Human Comfort

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ABSTRACT

It has been becoming important to estimate the thermal comfort in outdoor space due to the severe thermal environment in urban area as represented by heat island phenomena in recent years. The comfort indices such as SET* and PMV have been widely used in order to evaluate the thermal environment in indoor space. However, it is necessary to take the influence of solar radiation into those indices in order to evaluate it in outdoor space. In the present study, a thermal comfort index for outdoor environment was newly proposed. The field experiments were conducted in the open grass field and asphalt in summer, autumn and winter seasons. The total fourteen subjects were made to stay in a standing posture face to face to the sun, and the several weather factors such as air temperature, relative humidity, solar radiation and wind speed and the physiology factors such as skin temperatures, blood flow rate, heart rate and amount of perspiration were measured at the same time. The measurement started after 15 minutes had passed since it begun to install the sensors, and it kept for 30 minutes. Subjects were made to vote thermal sensation and comfortable sensation not only every 5minutes but also in their feeling changing. Based on the heat balance in human body, the thermal load of human body is calculated from the mean skin temperature and the surrounding environmental factors such as air temperature, solar radiation and wind speed. In result, it turned out the thermal load reached about $\pm 200\ W/m^2$ according to the season. A correlation between the measured thermal sensation of all subjects and the evaluated thermal load was recognized enough. The thermal sensation in outdoor space could be evaluated by the thermal load as a thermal comfort index regardless of the season.

Key words: thermal environment, outdoor space, human comfort