

## HEAT BALANCE DURING SELF-PACED WALKING AT $-12^{\circ}\text{C}$

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Exercise is an important behavioural instrument to adjust thermally to different environments. A study was undertaken, in which subjects in a given and constant environment were asked to change walking speed to attain thermal neutrality.

Eight volunteers (men, 21-29 years) participated in the study. Each subject performed double identical experiments. The experiments took place in a climatic chamber at  $-12^{\circ}\text{C}$ , air velocity around 0.5 m/s. Subjects were clothed in a three-layer cold protective clothing. The insulation value of the clothing ensemble was measured on a standing thermal manikin ( $I_{\text{tot}} = 2.15 \text{ clo}$ ,  $I_{\text{cl}} = 1.65 \text{ clo}$ ). Subjects walked on a treadmill in 120 min. The thermal index for cold environments IREQ was used to calculate an ambient temperature. Thermal equilibrium of the subject during an exercise intensity of 3 met would be achieved at an air temperature of  $-9^{\circ}\text{C}$ . The ambient temperature was set at  $-12^{\circ}\text{C}$  to create a situation where the subject would feel cool. During the experiments, subjects were told to adjust their walking speed (and consequently their metabolic rates) on 3 occasions (30, 50, 70 min) to achieve thermal neutrality. Subjective ratings were made on perceived body, hand and foot temperatures, exertion and comfort.

There was no difference of measured or calculated values between the two experiments. Mean skin temperature of the last half hour of the experiment was  $31.5$  and  $31.1^{\circ}\text{C}$  (first and second experiment). Rectal temperature was  $37.6^{\circ}\text{C}$  in both experiments. Evaporative heat loss ( $E_{\text{sk}}$ ) was 10.2 and 8.4  $\text{W/m}^2$ .  $I_{\text{cl,r}}$  was 1.44 and 1.33 clo. Subjective ratings on perceived body temperature was neutral to slightly cold.  $T_{\text{sk}}$  followed the comfort criteria prediction of Fanger.  $E_{\text{sk}}$  was considerably lower than predicted by the same criteria.

There was little variability in thermal physiological and subjective responses in the studied group of subjects. The acceptance for thermal comfort was neutral to slightly cold. Evaporative heat loss in the comfort criteria of Fanger is too high when compared with our data. Results suggest that the sensation of thermal neutrality in the cold is well correlated with skin temperature, whereas sweat evaporation only has marginal influence.