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7 Physiological strain caused by work clothing at muscular work in dry and humid heat

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In 213 climatic chamber experiments four young, healthy, acclimatized men performed light (260 W) and moderate (335 W) work on a treadmill and were exposed successively to combinations of ambient temperature and air humidity varying within the range of 15°C to 55°C and 10 to 98% relative humidity with a constant air speed of 0.3 m/s. The effect of two sets of work clothing with an I_{cl} of 0.7 and 1.0 clo on heart rate, sweat loss and body temperatures were studied. Each subject performed a control series of experiments at a given work rate wearing only shorts with an insulation value of 0.1 do. The combinations of the work, clothing, and the thermal parameters were selected in such a way that the subjects were able to tolerate the conditions for as long as 4 hours. Compared with the nearly nude, 0.1 clo. condition, the 0.7 clo clothing caused practically no physiological effects in the men in neutral room temperature, and only slight physiological strain occurred in a warm climate in dry air with a light work rate, but the strain increased as the vapour pressure and work rate increased The effects of 1.0 clo clothing were also relatively small in an elevated room temperature in dry air, but clothing caused considerable super-elevation of all the physiological responses as a result of increasing vapour pressure already in a moderate warm environment with a light work rate. Further elevation was seen in humid heat, especially with a moderate work rate. The heat strain due to clothing did not increase linearly with the insulation in clo-unit; instead the increase was exponential.

The results indicate that it is not possible to consider clothing independently of other heat stress factors. The physiological effects of a specific set of clothing are always dependent on the combinations of the thermal parameters and the activity level.

8 Cardiac output of children during submaximal exercise under different ambient temperatures