SKIN TEMPERATURES AND THERMAL JUDGMENTS IN SEDENTARY SUBJECTS EXPOSED TO EITHER HEATED FLOOR OR HEATED CEILING.

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INTRODUCTION

When investigating local thermal discomfort (reviews in 1, 2) attention has rarely be paid to local skin temperatures (3). We studied these local temperatures under two distinct but globally equivalent indoor climate patterns, namely heated floor (HF) as heated ceiling (HC). Both produced an overall thermal state of the environment corresponding to thermal balance fit to 0.6 clo-clothed sedentary (M = 1.2 met) subjects : 24.5°C operative temperature. Both conditions were non uniform due to vertical radiant temperature asymmetry which is an important criterion for admitted comfort limits (4). They differed in respect to the localisation of the source of radiant asymmetry : either below (HF) or above (HC) the subject. The aims of the investigation were : to collect simultaneously data on body (skin) temperatures and data on subjective thermal feelings (dependent variables) ; to examine the initial adjustments and the temporal evolution of the various (dependent) variables ; to compare the results in both climate patterns.

METHOD

Two non-uniform indoor conditions (heated floor : HF at 34°C, or heated ceiling HC at 45°C) were imposed in a climatic chamber to 2 groups of 10 lightly clothed male subjects (Ss), performing a computer task. When floor and ceiling temperatures (T) were increased beyond the comfort limits, compensation of air (Ta) and of the other wall (Tw) temperatures enabled the operative T (To) to be kept constant at 24.5°C. Ten local skin temperatures (Tsl) and various thermal judgments were collected throughout the 200-min experimental test, which included an initial 30-min stay at uniform To = 24.5°C.

RESULTS

When non uniformity was generated, Ta and Tw were slightly decreased in both conditions and most of the Tsl as well as judgments of thermal sensations also decreased, although To was theoritically unchanged.

Results obtained after two hours of exposure showed that under HF, foot T increased steadily and leg T decreased less. Under HC, forehead, chest and shoulder T decreased less whereas lower back and inferior limb T showed a greater decrease. Mean skin temperature changes were -0.65°C and -1.10°C under HF and HC respectively.

In terms of thermal judgments, feet and floor were recognized as being warm under HF but corresponding local dissatisfaction was not expressed. In contrast to this, the shoulder, arm, back, hand as well as wall and air temperatures were estimated as being less and less warm (or cooler), inducing overall dissatisfaction (up to 6 Ss out of 10). Under HC, most parts of the body and of the room were judged as slightly cool, with no real change throughout the exposure : constant overall dissatisfaction was found in 4 Ss out of 10, in association with local dissatisfaction in foot, shoulder and hand.

CONCLUSION

It is concluded that the perception of the non-uniform indoor climate in our conditions was mainly influenced by those environmental components (here, floor and air) which exerted strongest influence on the thermal sensors ; the ceiling was uninfluencial. Although operative T was supposed

to be kept constant, the skin T changes demonstrated that local and overall heat exchanges were different, depending on the heating source and on the thermal state of the remaining components.

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