Effects of different cooling principles on thermal sensation and physiological responses - DTU Orbit (12/03/2019)

**Effects of different cooling principles on thermal sensation and physiological responses**

Applying low exergy cooling concepts in the built environment allows reduction of use of high quality energy sources. Non-uniform thermal conditions, which may occur due to application of low ex systems, can result in discomfort. Two different cooling principles were studied: passive (through convection in terms of increased air velocities) and active cooling (through convection or radiation). Furthermore, two different ventilation techniques were included: mixing and displacement ventilation. Ten male subjects (age: 20-29) were exposed to six different cases: (1) PC-C-M: passive cooling through mixing ventilation, (2) AC-C-M: active cooling through convection by mixing ventilation, (3) AC-C-D: active cooling through convection by displacement ventilation, (4) AC-R-M-C: active cooling through radiation by the ceiling and mixing ventilation, (5) AC-R-M-F: active cooling through radiation by the floor and mixing ventilation, and (6) AC-R-D-F: active cooling through radiation by the floor and displacement ventilation. Though all cases were designed at PMV = 0, subjective data indicate significant differences between the cases. For the prediction of thermal sensation and thermal comfort under non-uniform conditions, the operative temperature only is not sufficient. Combined local factors play an important role in the comfort assessment. Furthermore, non-uniform environments, as case 6, can achieve a comparable or even a more comfortable assessment compared to uniform environments.

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