The influence of local effects on thermal sensation under non-uniform environmental conditions — Gender differences in thermophysiology, thermal comfort and productivity during convective and radiant cooling - DTU Orbit (03/12/2018)

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Applying high temperature cooling concepts, i.e. high temperature cooling \( T_{\text{supply}} \text{ is } 16–20°C \) HVAC systems, in the built environment allows the reduction in the use of (high quality) energy. However, application of high temperature cooling systems can result in whole body and local discomfort of the occupants. Non-uniform thermal conditions, which may occur due to application of high temperature cooling systems, can be responsible for discomfort. Contradictions in literature exist regarding the validity of the often used predicted mean vote (PMV) index for both genders, and the index is not intended for evaluating the discomfort due to non-uniform environmental conditions. In some cases, however, combinations of local and general discomfort factors, for example draught under warm conditions, may not be uncomfortable. The objective of this study was to investigate gender differences in thermophysiology, thermal comfort and productivity in response to thermal non-uniform environmental conditions. Twenty healthy subjects (10 males and 10 females, age 20–29 years) were exposed to two different experimental conditions: a convective cooling situation (CC) and a radiant cooling situation (RC). During the experiments physiological responses, thermal comfort and productivity were measured. The results show that under both experimental conditions the actual mean thermal sensation votes significantly differ from the PMV-index; the subjects are feeling colder than predicted. Furthermore, the females are more uncomfortable and dissatisfied compared to the males. For females, the local sensations and skin temperatures of the extremities have a significant influence on whole body thermal sensation and are therefore important to consider under non-uniform environmental conditions.

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