6 Thermal comfort: A review of recent research

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Thermal comfort is defined as that state of mind that expresses satisfaction with the environment. From the classical studies of comfort and the environment by Houghton and Yaglou, the recognition of relationships between physiology and subjective response by Winslow, Herrington and Gagge and on to the present, research continues to strive to heighten the understanding and quantification of parameters affecting our satisfaction with the environment. While the steady state comfort response to uniform thermal environments is not completely understood, it can be reliably predicted and recent efforts have been directed toward non-uniform thermal environments. Asymmetric radiation, spatial temperature variation, and drafts are examples of non-uniformities that can cause physiological strain on the individual and discomfort in an otherwise neutral environment. Progress has been made in defining the relationship between subjective responses and these non-uniformities and work is continuing. Other work has explored the human response to physiological non-uniformities produced by clothing. Asymmetric clothing insulation may make the wearer less sensitive to charges in mean skin temperature. Physical fitness also affects thermal sensitivity but further studies are needed in this area. In a related matter it has been shown that though women often experience less discomfort in warm environments than men, when the subjective data is plotted against skin wettedness the sex differences disappear, implying the discomfort difference is due to differences in the physiological (sweating) response rather than sensory differences. The sweating response has been shown to depend on fitness and conditioning. Recently, it has been deomonstrated that skin moisture can be monitored by various types of miniature humidity sensors. This is enabling skin wettedness measurements to be made under a wider variety of clothing and activities and the correlation with warm discomfort to be better defined. Interestingly this work indicates that people are very good at sensing skin moisture as their perceived skin wettedness between dry and soaking wet has a high correlation to measured skin wettedness. How skin moisture is actually sensed is stili unknown, however. Additionally. skin wettedness above about 30% increases the friction between skin and clothing. contributing further to the discomfort of warm situations. Clothing research and new materials are leading to a better quantification of clothing parameters that affect comfort. In addition, it is being shown that furnishings and ambiance can influence the thermal judgements of occupants. Recent studies of subjective response have confirmed the usefulness of the operative temperature concept to characterize and control complex environments.