

## PERCEPTION OF PERIPHERAL COOLING

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Perception of thermal stimuli is important for cognitive interpretation and behavioral action. Relations between peripheral skin temperatures and the associated perception provide useful information for assessment of climatic conditions. Mathematical models of human thermal responses often provide a distribution of temperatures across the skin surface. Accordingly, predictions may not only give results in terms of thermal stress or physiological strain, but also in terms of for example comfort sensation, acceptance, or pain sensation. The aim of the paper is to review data from several studies of cold exposure in order to examine relations between thermal and pain sensation and cooling of the extremities. *Material and methods:* Three studies of hand cooling (34 subjects) and one study of feet cooling (8 subjects) were analyzed. They comprised 60 or 90 minutes of exposure to constant cold conditions at temperatures of -25, -12, 0, 4, 7, 10 and 15°C. Skin temperatures were measured every minute with thermistors at several different sites of hands, fingers, feet and toes. Thermal and pain sensations were rated by subjects every 10 minutes. *Results:* In average, peripheral temperatures dropped to lower values when ambient temperature became lower. For each climatic condition the individual variation was considerable. Average ratings of thermal sensation and pain showed strong correlation with peripheral temperatures. Correlation was stronger and variation was smaller the more peripheral the temperature was located. In general, skin temperatures were about 5°C lower at fingertip or toe for the same value of thermal sensation or pain. *Conclusions:* It seems that cooling of hand and feet are quite well perceived and quantitative relations can be found between skin temperatures and thermal and pain sensation. Relations are stronger for fingers and feet indicating that these parts are the determinants of the reaction. Thermal sensation displays a more linear drop with colder skin. Pain sensation follows a power function with larger increments at lower skin temperatures. Onset of pain appears to take place at finger/toe temperatures around 15°C. Setting limit values for hand or feet skin temperature must recognize the fact the fingers and toes may be more than 5°C colder for the same conditions.

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