

Human Thermal Sensitivity: A Methodological Comparison

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Introduction

Thermal sensitivity is one of the main sensory modalities of the skin, providing thermoregulatory feedback to evoke appropriate autonomic and behavioural responses. Regional differences in thermal sensitivity exist due to the distribution and density of thermoreceptors. This has been observed using a magnitude estimation method, where an individual rates the intensity of a fixed temperature stimulus after application to the skin (Gerrett *et al.* 2014, 2015). However, as there are also regional differences in skin temperature (Tsk), it is unknown whether this influences the way we perceive stimuli of fixed temperatures. By comparing a relative and a fixed stimulus, this study assessed whether regional differences in thermal sensitivity still exist when the stimulus temperature is relative to Tsk.

Methods

Twenty healthy males, matched for body characteristics, were separated into two groups: one exposed to a fixed stimulus temperature (FIX n=10) and the other to a stimulus relative to Tsk (REL n=10). Participants completed two trials resting in thermo-neutral conditions (25°C, 40%RH) whilst a WARM or COLD thermal probe was applied to 33 body regions. Application temperatures were as follows: FIX = 40°C and 20°C and REL = Tsk+7°C (range 35.3-42.3°C) and Tsk-10°C (range 18.6-25.5°C) for WARM and COLD trials respectively. Participants used a perceptual scale to rate thermal sensation pre and post probe application.

Results

Regional variation in sensitivity to warm and cold was observed across the body within both FIX and REL groups. Overall there were no significant differences in either WARM or COLD sensitivity between the FIX and REL groups ($p>0.05$).

Conclusion

Regional differences in thermal sensitivity exist when applying both a fixed and relative stimulus temperature. It may therefore be concluded that when using a magnitude estimation method, Tsk variation in a thermo-neutral climate does not greatly influence sensitivity response to warm or cold stimuli.