Response patterns in finger and central body skin temperatures under mild whole body cooling in an elderly and in a young male – a pre-study

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Response patterns in finger and central body skin temperatures under mild whole body cooling in an elderly and in a young male – a pre-study

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Introduction

- At thermoneutrality and in warmth the fingers usually exhibit the warmest skin of the whole human surface.
- In a cold person with closed AVAs (arteriovenous anastomoses) the fingers soon become the coldest part of the body.
- The “AVA organ” may provide for around one third of the total skin surface area for heat exchange.
- The temperatures over acral skin sites are seldom taken into account - the actual heat loss may be underestimated, especially, in studies employing mild whole-body cooling.

Aims and objectives

- To study the response pattern of finger skin temperature (rich in AVAs) to transient whole-body cooling as compared to skin temperatures in non-acral body sites (without AVAs) in elderly and in young.

Materials and methods

	old	young	
• age	78	31	years
• weight	73	70	kg
• height	174	171	cm
• clothing		shorts	

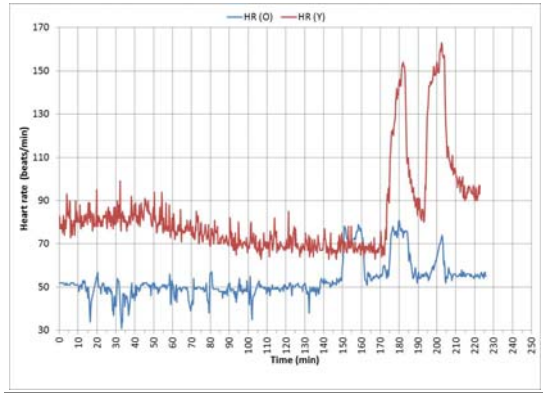
Old subject

Young subject

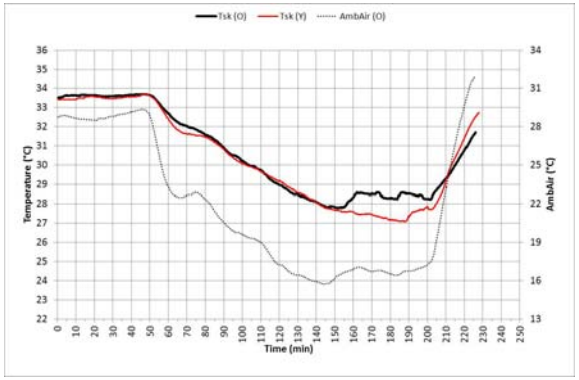
Materials and methods

- body core temperature, rectal (each 10 seconds)
- skin temperature at 8 body parts and fingertips (10 s)
- pulse (15 s)
- cold discomfort/thermal sensation (10 min)
- IR-imaging (10 min)
- instrumentation was carried out in the chamber at about 29 °C and took about 20-25 minutes
- ballistocardiographic measurements with pressure-sensitive films around the neck and ankle, and under the seat (Alametsä et al. 2014, 2015)

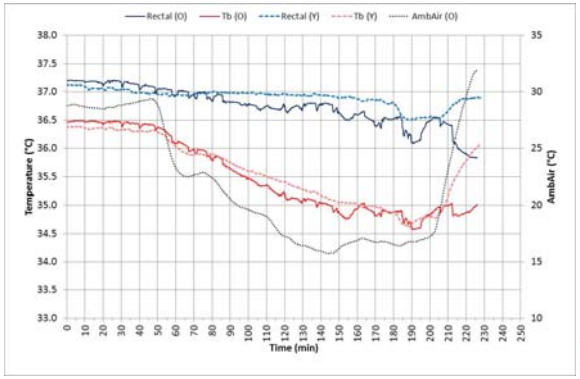
Results – heart rate change during exposure



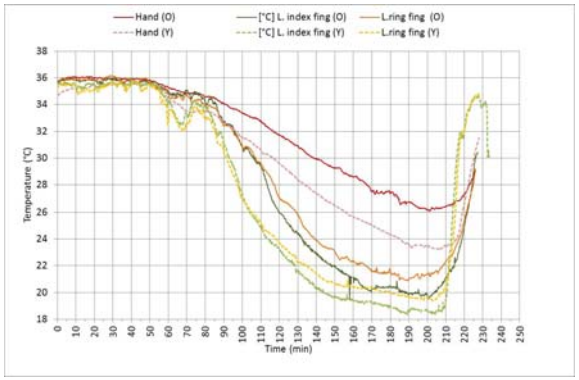
Results – mean skin temperatures



Results – body core (rectal) and mean body temperature



Results – left hand



Conclusions

- Classical mean skin temperature in the old and in the young person did not show differences.
- Body core temperature and, thus, body heat content in the old person reduced at a quicker rate than in the young person.
- Old subject reported less discomfort and cold sensation than the young one.
- The temperature in extremities (hands, feet -> AVAs areas) dropped quicker and lower in the young subject than in the old.

Conclusions

- Due to cold exposure, notable amplitude elevations were detected, both in systolic and diastolic seat BCG amplitudes being more heightened with the older person. Workload of the heart increased markedly with the older person.
- Blood pressure increased with both being modest with the younger person and more pronounced with the older person.
- Although ankle pulse amplitude started to recover with the younger one due to cycling and room temperature rise, recovery with the older person seemed to be more gradual. This was seen as non-returning ankle pulse amplitude and cold limbs in thermal images.

Conclusions

- These observations indicate clear age-related differences in the circulatory response to a mild whole-body thermal challenge. This circulatory response may be associated with normal aging process.
- These findings may help to develop 'smart clothes' applications to compensate ambient temperature changes concerning especially people having age-related differences in the circulatory response to thermal challenge.