

## **AN EXPERIMENTAL MODEL FOR EXAMINING CHANGES IN SKIN TEMPERATURE IN THE HANDS AND FEET OF YOUNG AND ELDERLY SUBJECTS IN RESPONSE TO LOCAL COOLING**

*L.K. Rasmussen and J.B. Mercer\*, Institute of Exercise and Sports Sciences, University of Copenhagen, Denmark, and \*Department of Medical Physiology, Faculty of Medicine, University of Tromsø, Tromsø.*

An important component in the regulation of body temperature is skin blood flow, especially in peripheral sites such as hands and feet. Any impairment of vasomotor control in these skin areas can, in addition to causing tissue damage, compromise thermoregulation and may, under certain circumstances, be detrimental for health. While patho-physiological related changes in the control of skin blood circulation (usually reduced blood flow) are often clearly discernible, natural age related changes in the healthy elderly are less well documented and opinions vary concerning the degree and pattern of these changes. The object of this study was to design a reliable, repeatable and, non-invasive experimental method for examining how peripheral circulation in the extremities (hands and feet) is affected by a short period of local cold exposure and which can be easily applied to both young and elderly subjects. The experiments, which took place in a climatic chamber under thermoneutral ambient conditions ( $T_c$  26-28°C), were carried out in 12 young male (mean age 25 years) and 8 elderly female and 4 elderly male (mean age 77 years) healthy volunteer subjects. During the experiments, the lightly clothed subject sat in a comfortable stool while resting either their hands or their feet (palm/sole down) on a thin grid made of nylon netting. Following a 30 minute control period to establish base line values (a generally vasodilated state with particular emphasis on the presence of thermal symmetry between the left and right sides of the body) the right hand or the left foot was immersed for a period of 2 minutes in 10°C water (a thin plastic bag was worn during the immersion period to avoid skin wetting). Throughout the experiments measurements of surface temperatures (infra-red thermal imagery and thermocouples) and skin blood flow (laser Doppler flowmetry) were made at multiple skin sites. Blood pressure and heart rate were also measured. Calculations were made of the time taken for skin temperatures in the 'cold' hand or foot to regain 80% of the cold induced drop in temperature (recovery time). None of the subjects found the experiments to be discomforting. The main findings were:- 1) Under thermoneutral ambient conditions skin temperatures on the hands and feet were lower in the elderly than in the young subjects. 2) Under thermoneutral ambient conditions skin temperatures on the feet were always lower than on the hands in both the young and elderly subjects. 3) Recovery time after cooling was always longer in the elderly subjects, both for hands and for the feet. 4) In both young and elderly subjects recovery time was always shorter for the hands than for the feet. The results clearly indicate that the peripheral responses to local cooling differ in the hands and feet and, in addition are altered with increasing age. The sensitivity of the method indicates that it may be a suitable model for the early detection of blood flow disturbances associated with peripheral arterial disease.

james.mercer@fagmed.uit.no