

## **EVALUATION OF THE THERMAL PROFILE OF HUMAN FINGER PHALANGES AS A POTENTIAL SITE TO MONITOR BODY HEAT BALANCE**

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The goal of this research program is to maintain comfort and safety of astronauts/cosmonauts in thermal conditions that are difficult to monitor and control, such as nonuniform temperatures influences on the body surface during extravehicular activities. Prior research demonstrated that in sagittally divided nonuniform thermal conditions on the body surface, there were no significant differences in finger temperature between the two hands; both were responsive to a growing deficit in body heat (Koscheyev *et al.*, 2000a). Consistent relationships also were evident between the core and fourth finger temperatures under thermal applications to nonsymmetrical body surface areas, further indicating the potential effectiveness of the fingers for placing a monitoring/controlling device (Koscheyev *et al.*, 2000b). A series of studies was carried out in collaboration with the International Scientific Center "Arktika", Magadan, Russia to evaluate the specific site on the finger that would be most effective for placing a controller-sensor to initiate an automatic thermal feedback system in the space suit to maintain thermal homeostasis. Ninety seven male volunteers ages 19-23 participated in this research. The method of thermography (Raduga-MT4 thermovisual camera) was used to study the hand under temperature applications to the contralateral hand or each foot, respectively, to evaluate the thermal response on different fingers and the entire hand. Temperature changes on 20 sites of the hand were observed, including each phalanx, several points on the dorsal side of hands, and on the wrist area. The findings indicated that in spite of weak and distant thermal applications, a stable and uniform response to such thermal influences occurred on the entire fourth and fifth fingers, and on the distal and medial phalanges of the second and third fingers ( $p < 0.05$ ). The thumb was not highly responsive to such thermal applications. The large range of finger temperature changes on the skin of the fourth and fifth fingers compared with other areas of the hand under different thermal conditions on proximal and distal areas the body surface indicates that the fourth and fifth fingers have the potential to be highly effective in precisely monitoring thermal changes in the body, predicting changes in thermal status, and can be utilized to initiate preventive countermeasures for a growing heat deficit or heat accumulation.

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