Proceedrngs of 3rd International Conference
on Environmental Ergonomics
8–12 August 1988 Helsinki. Finland
eds R Ilmarinen and A Påsche. P 67

KEYNOTE ADDRESS

THERMOREGULATORY MODELS: RECENT RESEARCH, CURRENT APPLICATIONS AND FUTURE DEVELOPMENT

Jurgen Werner
Institut fur Physiologie, Ruhr-Universitat Bochum

Address for reprints:
D 4630 Bochum 1, Universitätsstraße 150, MA 4/59,
Federal Republic of Germany

In view of the excellent and recent review on this topic given by Eugene Wissler in 1986, central points of which were to characterize representatives of physiological models currently available and to give an assessment of the difficulty of simulating human responses to exercise and environmental stress, this review tries to follow the guideline to trace common and complementary features of efforts in different fields of thermoregulatory modelling which after a common start in thermal physiology have diverged to a great extent and which run the risk of loosing contact to one another.

These three diverging branches are characterized by three different aims and purposes, namely

1. insight into functional physiological mechanisms and prediction of physiological phenomena,
2. oreediction of human performance for protection of industrial workers or military personnel,
3. prediction of the impact of accidents, deseases and clinical treatments.

Clearly, prediction is the common feature, but main topics in the physiological branch are to understand the regulatory concepts and the interaction with other systems of the body and to extrapolate to variables not experimentally attainable and to simulate non-performable experiments, whereas the second branch is producing models primarily in order to know the limits of performance, to calculate the efforts of harsh natural environment such as the desert, the Arctic, the atmosphere or the ocean. Special emphasis is laid on technically evoked environments: workers in mines, steel works and glas factories, as well as aircrew members and astronauts. The aim is on one hand higher utilization of manpower, on the other hand prevention of deseases and accidents. The third branch is faced with the consequences of deseases and accidents, either because they are at present inevitable or occur because of incomplete precautions. Important aspects are treatment of accidental hypo- or hyperthermia, furthermore diathermy and radiotherapy. Although these developments take place very independently from one another and their results are published in immensely diversified journals, common current and future efforts may be recognized, which improve the physiological quality of the models for purposes either of physiological research itself or of promotion of the field of application, namely:

1. to approach the models to real geometry and anatomy of the human body,
2. to simulate more adequately heat transport processes induced by the circulating blood,
3. to implement more sophisticated regulatory concepts,
4. to take into account interaction with other regulatory systems.

Examples for these features and efforts are given in this report. One central point will be an appeal to link together experiences, results and conclusions which are currently present in diversified fields. "Environmental Ergonomics" should be an adequate platform for this.

Our own work has been supported by Deutsche Forschungsgemeinschaft (SFB 114 + We 919/2-1).