



ANATOMY OF A GROUP IN ANTARCTICA

THESIS

ON THE PHYSIOLOGICAL ADAPTATION AND  
HEALTH OF AN EXPEDITION IN ANTARCTICA,  
WITH COMMENT ON BEHAVIOURAL ADAPTATION

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## SUMMARY

Antarctica is the harshest and most isolated continent, and members of the Australian National Antarctic Research Expeditions (ANARE), who come from densely populated temperate and tropical regions, form an ideal population in which to study human adaptability. In this age of space exploration and the current evaluation of man's impact on the world and of the world on himself, medical research on small groups in Antarctica is appropriate as human adaptation is the central problem in environmental epidemiology.

The study which is described in this thesis consists of a number of interrelated observations on physiology, thermal comfort, cold exposure, activity, health and behaviour of a nine-man expedition at Davis, Antarctica, in 1963, and a health survey of the Australian Expeditions 1947-1972. Medical practice and research in Antarctica are reviewed, and a description of the environment, cold exposure experienced, expedition organisation and programme is given. This is important not only for an understanding of the present study but also enables comparisons to be made with expeditions of other nations.

The men were exposed to the meteorological climate for 20 per cent of their time. However, adaptation was influenced by behavioural response as the exposure climate was found to be

12-28°C above the meteorological climate and independent of it. At all dry-bulb temperatures between 5.6°C and 27.2°C all men were comfortable, but the preferred indoor temperature was 14.2°C. The results are compared with those for tropical and temperate regions. The absence of thermal discomfort and the low value of the preferred temperature are shown to be due to adjustments in clothing, clothing being shown to play a larger part in determining the thermal sensation than the indoor air temperature.

The amount of clothing worn outdoors did not increase as winter approached, yet the men maintained a higher level of thermal comfort. A comparison of the thermal comfort and the clothing worn, both indoors and outdoors, in periods before and after midwinter strongly suggests that acclimatization to cold had occurred.

Throughout the whole year there was a high degree of activity which was reflected in an absence of seasonal weight changes. The human adaptation is related to changes in the physiological variables although the biological significance of a number of these changes is not clear. Observations of men on field traverses showed a complex interaction between activity, calorie intake and energy expenditure, with dehydration being considered the most important factor that influenced the substantial weight losses that occurred.

The group adjusted readily to the climate, isolation, work, stress and each other. This is emphasized by the low incidence of mental illness. Comment on the behavioural adaptation is made. Although physiological adaptation in the form of

acclimatization to cold is suggested by the Davis study, it is concluded that overall adaptation of the group is more influenced by behavioural than by physiological factors.

The ability of the men to function effectively is shown by the low incidence of illness, for the maintenance of health implies adaptation to man's environment. An analysis of the health, including mortality and medical evacuations, of 60 Australian Expeditions shows the Davis group to be a typical expedition. Factors influencing health are discussed.

It is believed that this thesis contributes to the knowledge of man in polar regions and human adaptability in Antarctica in the areas of local acclimatization, thermal comfort, health, morbidity, medical practice and behaviour, all of which are basic to a complete understanding of Antarctic environmental epidemiology.