Psychological Aspects Of Stress In The Antarctic

by

Iain A. McCormick

A thesis
presented to Victoria University of Wellington
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
in
Psychology

1983

ACKNOWLEDGEMENTS

The author wishes to thank Professor A.J.W. Taylor, and Dr F.H. Walkey for supervision, Dr K.G. White, Mr J. Gamby, and Mr J. Williams for their assistance, Diane Morris for proof reading and support, the State Services Commission for leave on pay to undertake the field work, the New Zealand Mental Health Foundation for a supporting grant, Murray Hahn and Richard Siegert for encouragement and Hal the IBM 4341 for obedience.

ABSTRACT

The International Biomedical Expedition to the Antarctic (IBEA) was a five nation, interdisciplinary endeavour designed to assess human responses during a long polar traverse. The present study was a part of the IBEA and was designed to predict and assess the perceived stress and psychological coping ability of the expedition members. It begins with a review of previous Antarctic studies which revealed that Antarctic personnel were above average in intelligence, stable, controlled and achievement orientated. Their performance was most accurately predicted by biographic variables, followed by psychometric questionnaires and clinical ratings. An interactive theoretical model of stress and coping was adopted in which stress was defined as the substantial imbalance between the perceived demand and an individual's capacity to fulfill the demand. Coping was defined as the process in which this imbalance was minimized. A withdrawal of treatments design was used to identify stress, and comparisons were made between the 12 man, experimental group and a multivariate non-randomized control group in New Zealand. Stress was measured with the Hopkins Symptom Checklist, the Stress Arousal Checklist, the "Mental Paper Folding" Test, and the Series Completion Test. The results showed no significant differences between the groups on any measure. Coping style was assessed using the Repression Sensitization Scale and the Adaptability Questionnaire and the results suggested that many subjects repressed and therefore did not report stress responses. The results of the prediction of Antarctic performance from a range of measures used in the present study were in agreement with previous findings of earlier researchers. The study also made use of participant observation methods from which a descriptive account was prepared. Future research is required in two main areas, the evaluation of Antarctic coping techniques and the preparation of actuarial tables to improve the prediction of performance.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

PREFACE

The International Biomedical Expedition to the Antarctic (IBEA) was designed to assess human response to the Antarctic environment. The expedition was organised through the Human Biology and Medicine Working Group of the Scientific Committee for Antarctic Research (SCAR) and its logistic support was provided primarily by Expedition Polaires Francaise (EPF) and by the Australian Antarctic Division. In addition scientific and logistic support was provided by Argentina, Japan, New Zealand and the United Kingdom.

The design of the project enabled physiological, psychophysiological, psychological and medical examinations to be conducted continually throughout an Antarctic summer period. Although many physiologists, physicans and psychologists have worked independently and sporadically in the Antarctic over the last thirty years, the IBEA was the first expedition in polar history in which these different disciplines worked in the one project.

Over 25 scientists were involved at different stages of the research, but the field participants comprised three physiologists and one technician from the United Kingdom, three physicians from France, one physiologist, one physician and one documentary film producer from Australia, one biochemist from Argentina and one psychologist from New Zealand (see Appendix C). All of the field subjects were involved in a comprehensive set of experiments in which, for reasons of logistics and economy, they played the role of either experimenter and/or subject. A second psychologist was involved at the beginning and end of the expedition and undertook interviews, group discussions and part of the overall test administration.

The IBEA was organised in three phases:

1. Phase I - involved thirty one days of psychological and physiological testing and experimentation in the Commonwealth Institute of Health in Sydney, Australia
2. Phase II - a seventy two day traverse of the windswept and isolated polar plateau of French Terre Adelie Land in which subjects lived under primitive environmental conditions and travelled on open motorised toboggans
3. Phase III - involved a thirteen day period of post Antarctic testing - back in Sydney.

The psychological study was organised principally in France by Dr J. Rivolier, and in New Zealand by Professor A.J.W. Taylor. It included the administration of the standard TAT, Rorshach, WAIS, MMPI and Health and Motivational Questionnaires during Phase I followed by a large number of measures which were used at specific intervals during all three phases of the expedition. These additional measures included: the Adaptability Questionnaire, the End of Sydney Stay Questionnaire, the Field Questionnaire, and the Relational Grid. A second psychological component was organised by the author, Professor A.J.W. Taylor, Dr F.H. Walkey and Dr K.G. White, for the purposes of the research project which is the subject of this thesis. This included the use of

- the Hopkins Symptom Checklist (HSCL) (Derogatis, Lipman, Rickels, Uhlenhuth & Covi, 1974)
- the Stress Arousal Checklist (SACL) (MacKay, Cox, Burrows & Lazzerini, 1978)
- the Mental Paperfolding Test (MPF), and the Series Completion Test (SC) (White, Taylor & McCormick, 1983)
- the Video Interpersonal Distance Measure (IPD) (Walkey & Gilmour, 1978),
- the Recent Life Changes Questionnaire (RLC) (adapted from Holmes & Rahe, 1967) and
- the Repression Sensitization Scale (RSS) (Byrne, 1961).

The HSCL, SACL, MPF and SC were administered on a regular basis throughout the expedition, while the other measures were used only at the beginning of Phase 1. An integrated account of the results from the various experiments of each discipline will be published in book form, while the results now being presented were those obtained by the present author specifically for the research described in this thesis.

To make the functional distinction between the two psychologists in the overall project Professor Taylor who was involved in Phase I and III, is referred to as either the examining psychologist or the principal thesis supervisor. For his part, the author was involved in all three phases of the study and as well as being a participant in all IBEA experiments. He was responsible for administering all measures, for organising discussion groups during Phase 2, and for administering the majority of measures used in this PhD study during Phases I and III.

The present thesis is organised in 12 chapters: the first three review areas relevant to the present study, the next four present evaluations of the major tests used in the study, and the final chapters present data from the expedition itself. The chapters move sequentially from the more objective to the more subjective evaluations of behaviour and from group to individual investigations. Over 550 subjects were involved in the present study and their behaviour was assessed using clinical, experimental, psychometric, and statistical methods.

To consider the content of the chapters in more detail:

- Chapter I reviews previous studies of psychological responses in the Antarctic,
- Chapter II reviews the topics of stress and coping research,
- Chapter III describes and evaluates the experimental design for the study of stress,
- Chapter IV gives a psychometric evaluation of the Hopkins Symptom Checklist
- Chapter V presents an evaluation of the Stress Arousal Checklist,
- Chapter VI evaluates the Mental Paper Folding Test and the Series Completion Test,
- Chapter VII evaluates the Adaptability Questionnaire as a measure of Antarctic performance,
- Chapter VIII compares the results, on the various measures of stress, between the IBEA subjects and a matched control group of researchers in New Zealand,
- Chapter IX correlates the initial coping style and defense mechanisms of the IBEA members with the subsequent stress and adaption levels later in the expedition,

- Chapter X examines the utility of biographic, clinical and psychometric variables as predictors of performance on the expedition
- Chapter XI presents a participant observation study of the expedition,
- Chapter XII presents an overview and sets out the conclusions of the thesis.

CHAPTER I - A CRITICAL REVIEW OF PSYCHOLOGICAL STUDIES IN THE ANTARCTIC

From the time of the early Antarctic explorers in the first part of this century, the public has been fascinated by the thoughts, feelings, and behaviour of humans who have lived in the "white wilderness" of Antarctica.

However only recently has this interest stimulated psychological research and few consistent conceptual or theoretical themes have developed. Many of the studies in this review are multifaceted and have therefore been considered under several different headings. In this chapter there is a brief introduction to the difficulties of undertaking Antarctic field studies, followed by a section on the prediction of Antarctic performance, and another on the adaptation of personnel to Antarctic conditions. This ordering has been adopted because many researchers initially were involved in selection of personnel and in the prediction of their performance. Only subsequently did they study the adaptation of personnel under Antarctic conditions. It should be noted that many of the following prediction studies were in fact postdictive and retrospective but they have potential for prediction that is still untapped.

The predictive studies are divided into six subsections:

- the development of individual criterion performance measures,
- prediction of performance from biographic data,
- prediction from clinical evaluations,

- prediction from psychometric testing
- additional studies
- an overview of the predictive studies.

This final subsection integrates and coordinates the previous fragmentary findings.

The adaptation of personnel to Antarctic conditions is divided into eight subsections:

- stressors encountered during Antarctic service,
- the characteristics of the Antarctic volunteer,
- differences amoung occupational groups of volunteers,
- motivation for Antarctic service,
- personality stability during polar duty,
- emotional changes during wintering-over,
- psychophysiological changes in Antarctica,
- group functionning.

The studies are further separated into their countries of origin.

The Difficulties of Antarctic Research

Psychological research in Antarctica has ranged from descriptions of human adaptation and coping through to controlled studies of specific aspects of human functionning. Systematic research dates from the dramatic increase in Antarctic activities at the time of the International Geophysical Year (IGY) of 1957-1958. The research has been conducted either by individuals (e.g. Taylor, 1969b), or by small groups of investigators (Gunderson and colleagues; see Gunderson 1974).

The investigators were sometimes connected with military organisations that provided logistic support for scientists in Antarctica.

Most of the psychological research has been conducted by investigators from the United States, New Zealand and Australia with a smaller contribution from France, Japan and the U.S.S.R.

All of the researchers have experienced problems in conducting their studies. For example logistic problems have often limited the size and scope of research with few investigators actually being able to observe and measure responses at Antarctic Bases let alone under field conditions. When investigators did journey to the ice they encountered the inevitable problems of transportation and equipment failure. They also had to contend with discontinuous data when subjects were brought home early after failure to adapt, or when subjects withdrew their cooperation before studies were complete. Difficulties were sometimes openly stated as resistance to psychological studies (Fuchs, 1963) and sometimes as disruptive effects on station morale (Siple, 1959) that on occasion led to studies being discontinued (Nardini, Herrmann & Rasmussen, 1962).

Researchers also encountered methodological difficulties that affected the design and execution of their work. They were unable to allocate subjects randomly to experimental and control groups because they were all working in operational field stations rather than in experimental laboratories. Even the selection of subjects was necessarily influenced by extraneous factors that were not necessarily conducive to good research e.g. selection was often based on availability and not on sampling procedures. They had few opportunities to gather any sound baseline data before their groups went south, and also they experienced difficulties in following up subjects after they returned. Yet despite these difficulties there is now a twenty five year history of psychological research in Antarctica.

The Prediction of Antarctic Performance

In general, psychologists have made predictions of Antarctic performance based on clinical, biographical, and psychometric data that were acquired from subjects before they departed from their home countries.

The Development of Criterion Performance Measures

The criterion measures were usually derived from peer group and supervisor ratings and constituted the standard of comparison or criteria against which predictions of behaviour were made.

United States Studies. The early studies undertaken by Gunderson and colleagues (see Gunderson & Nelson, 1966b) examined the reliability of criterion measures and showed significant agreement between peers' and supervisors' ratings. Significant correlations were also found between different supervisors, both within and between successive time periods. There were also significant positive correlations between evaluations of work performance, social adjustment, and overall adjustment, although the latter global judgements achieved better reliability than the more specific judgements.

Trait ratings of station members and rankings of desirability for future Antarctic service were developed and used by the U.S. expeditions of 1960-1962. In this period both peer and supervisor ratings were made in seven small Antarctic stations. Reliability correlations for both types of ratings were a moderate .63 (Gunderson & Nelson, 1966b).

The next phase of Gunderson's research involved a factor analysis of ten trait ratings selected for their high reliability. The analysis was conducted on ratings made by two supervisors for all U.S. personnel serving at the time. The traits were: 1) likeability 2) emotional control 3) acceptance of authority 4) industriousness 5) achievement motivation 6) motivation towards the group 6) attitude towards the project 7) happiness 8) alertness 9) job satisfaction and 10) self confidence. The ranking, peer nomination for "best friend" or "easy to get along with" was also included in the analysis. The study involved both civilian scientific staff as well as naval support personnel. Two factors accounted for 82% of the variance. One was a general factor and the other a bipolar factor with social and emotional attributes loading in one direction and task-oriented attributes loading in the other. Each of the three clusters was represented by a pair of items i.e. 1) emotional control and acceptance 2) industriousness and achievement motivation, and 3) likeability (from supervisor) and friendship-compatability (from peer). The correlation between the scores, derived from the three factors, and the criterion scores obtained by combining peer and supervisor ratings was .89. This phase of the study was limited as it appears that the same subjects were used to produce the factors as well as to derive the criterion correlations.

The next phase determined the relationship between these three clusters and criterion scores for different stations and for different types of personnel. Correlations between different stations ranged from .76 to .83. For the different types of personnel the correlations were: military r=.90 and civilian r=.87. Despite the limitations the study does suggest that the greatest amount of criterion variance can be accounted for by the three trait clusters: emotional stability, task motivation, and social compatability.

Gunderson and Nelson (1966) then proceeded to evaluate the reliability and validity of the three criterion clusters. They gathered fresh peer and supervisor nominations from eight small Antarctic stations over a two year period. The resulting inter-rater reliabilities for peers ranged from .65 to .83, and for supervisors the range was from .56 to .76. A multimethod multitrait analysis was then used to evaluate validity. The convergent validity coefficents ranged from .45 to .64, and produced evidence that different methods can measure the same trait with a significant degree of agreement. Discriminant validity, by contrast, requires that different and clearly uncorrelated traits measured by either the same or different methods should not correlate significantly. In this more stringent test the ratings did not hold up well, with correlations ranging from .64 to .12.

Gunderson and Ryman replicated the 1966 study in 1971 with data gathered over a four year period and obtained more satisfactory results. Their analysis showed that test-retest reliability correlations over a six to seven month winter period ranged from .49 to .79. Spearman-Brown split half correlations of the three constituted clusters of ratings were: emotion .71, task .81, and social .80. The convergent validity correlations ranged from .47 to .67 and were generally higher than discriminant correlations which ranged from .32 to .54.

These results suggest that emotional stability, task motivation, and social compatibility were potentially useful dimensions on which to judge Antarctic performance.

A second group of American researchers, Weybrew, Molish and Youniss (1961) used monthly health reports, supervisor ratings, an attitude self report measure and a group behaviour questionnaire to obtain performance ratings of Antarctic duty. Their analysis produced four criterion dimensions that were similar to those derived by Gunderson and Ryman. The dimensions were 1) overall adjustment 2) enjoyment of recreation 3) freedom from psychosomatic symptoms 4) sociability. Factor one included items of task competence , factors two and four appeared to be related to Gunderson and Ryman's social compatability factor, and factor three resembled the emotional control factor.

Australian Studies. Owens (1966) obtained a similar factor structure to the Americans when he developed independent supervisor ratings of Australian personnel. The factors 1) task competence 2) interpersonal competence and 3) intrapersonal competence in coping with external pressure were found. Owens (1966) also identified a further factor that related specifically to a willingness to participate in field work.

<u>New Zealand Studies</u>. Taylor (1978) encounted resistance from supervisors when using rating scales similar to those developed by Gunderson and Nelson (1966). Supervisors prefered to use verbal descriptions rather than be confined by ratings, and because of this no comparable New Zealand criterion measures were developed.

<u>South African Studies</u>. Vermeulen (1975) used peer ratings to develop criterion measures in four South African expeditions. Using an oblique rotation of principle components, three factors were identified: interpersonal competence, intrapersonal competence and task motivation.

<u>Conclusion</u>. Investigators working independently of each other have isolated highly similar behavioural clusters that appear to be important features of Antarctic adaptation. These are:

1. emotional stability
2. task competence
3. interpersonal compatability.

Yet despite the consistency of these findings the reliability and validity of the simple rating scales were not entirely satisfactory. The rating scales suffered from a number of potential problems relating to their construction and use e.g. halo and leniency effects that reduced their value. It is now posible to use more sophisticated types of Behaviourally Anchored Rating Scales (BARS) (Jacobs, Kafry & Zedeck, 1980) for that purpose, and there is a further suggestion from Saal, Downey and Lahey (1980) that multivariate methods should be used to evaluate and improve the characteristics of rating scales.

Prediction of Performance from Biographic Data

A number of studies have utilised biographical data as a predictor of Antarctic performance. The advantages, in general, are that life history data are easy to obtain, their reliability can be checked, and they have good face validity. Data used have included military experience, social activities and hobbies, family and educational background, and vocational history.

United States Studies. Weybrew, Molish and Youniss (1961) administered questionnaires before departure to American personnel on International Geophysical Year (IGY). They found that age (less than 25 years) was correlated with low frequency of psychosomatic symptoms and therefore good adjustment. Persons from the southern U.S. did better than their northern counterparts, while single people did better than married. It was also found that those with a university education were more negative in their attitude toward the project than those with high school education.

Smith (1961) in an early U.S. descriptive study found no clear relationship between age, marital status, polar experience, education and Antarctic performance. Gunderson and Nelson (1965) reported their results in this area in three parts. In the first part, based on data from navy staff at small Antarctic stations (15 to 40 persons) during the IGY, they found that age and rank (salary level) were highly correlated with peer evaluations of performance. Years of experience, marital status (married), low frequency of religious worship, and a high frequency of reading were also positively associated with performance.

In a second part they examined the findings from questionnaires administered to naval staff in a large Antarctic station (McMurdo). In this setting they found that age, rank, years of experience, and marital status (married) were correlated positively with supervisors' ratings. In the third part the authors combined the data and produced two composite indices of 1) nonvocational interests i.e. hobbies, reading, etc. and 2) delinquency - truancy. High scores on the former and low scores on the latter correlated with good supervisor evaluation.

Gunderson and Nelson then gathered similar data over a five year period in fifteen small Antarctic stations. This time they found age correlated linearly and positively with the criterion scores, but only in the sample that was taken during the first two years of the study. Results from a second sample comprising members of the final three years indicated a non-linear relationship with the middle group (age 24 - 30) actually scoring lowest on the performance criterion. Similarly they found that rank and naval experience were correlated with the criterion but not in a simple linear relationship, e.g. the middle experience group (4 to 10 years) was again lowest on the performance criterion. They also found that the nonvocational interest index (based on club membership, sports participation and hobbies) and the delinquency - truancy index were both correlated with the criterion.

In a later and more detailed study Nelson, Gunderson and Ryman (1969) divided their subjects into three occupational groups, viz 1) naval construction workers 2) naval technical and administrative staff and 3) civilian scientists. They used five performance criteria in their evaluation 1) emotional stability 2) task motivation 3) social compatibility 4) leadership ability and 5) overall performance. The results indicated that the number of hobby interests tended to predict the emotional stability of the combined groups, but added little to prediction on the remaining criterion variables. On the other hand, a composite personal history index derived from 21 background variables was a moderately good predictor of task motivation and leadership. Findings were also produced for the different occupational groups and for both scientists and technical staff hobby interests and personal history variables were useful predictors for all criteria but in the case of naval construction personnel they were not.

Australian Studies. Owens (1975) gathered criterion data using five point supervisor ratings of both field and overall station performance. Age, marital status, educational attainment, stability of family upbringing, ordinal family position, station position and previous Antarctic experience were used as predictor variables. Age was found to be unrelated to overall performance except for subjects engaged in field tasks, presumably because field work required the physical stamina of younger subjects. Being unmarried was positively related both to overall performance and particularly to performance on field tasks. Educational attainment and station position were unrelated to performance. Subjects with positive previous experience were rated higher on criterion measures of current performance than were those with no previous experience. Middle children in the family tended to do less well, compared to children in other ordinal positions. On the basis of these partial findings Owens suggested that moderator variables might underlie some of the biographical variables.

Conclusion. From the review of the studies it is clear that no one biographic variable could be used with confidence to predict Antarctic performance. Instead different weighted combinations of variables could be useful in predicting the performance of specific groups under particular environmental conditions.

The Prediction of Antarctic Performance from Clinical Tests and Ratings

Psychologists and psychiatrists have been called upon by various national Antarctic research institutions both to assist in the identification of emotional difficulties that would indicate poor Antarctic adjustment and to predict potential adjustment levels for normal volunteers. Their work in screening was a matter of particular importance for the selection of wintering over staff because unsuitable personnel could not be evacuated once the winter had set in.

United States Studies. Weybrew, Molish and Youniss (1961) in an early study used psychiatrists' interview findings and psychologists' Rorschach assessments of IGY personnel as performance predictors. After discussing their findings, the two professional groups made a total of nine clinical ratings for each subject. This procedure led to significant correlations at the one percent level between predictions of Potential Effectiveness for Deepfreeze, Ability to Communicate, Absences of Expression of Overt Hostility, and Ability to Cope with Aggression and the criterion scores.

Nardini, Herrmann and Rasmussen (1962) commented that clinical evaluations were effective in screening out grossly disturbed subjects, because in the five years beginning with IGY only six out of 1,000 persons were admitted to the sick list for psychiatric reasons. Despite this success in screening, the authors comment that clinical evaluation was of less value than other types of assessment in the prediction of Antarctic performance.

Gunderson and Nelson (1964) evaluated the reliability of clinical judgements of nine specific adjustment areas and on overall adjustment made from five point rating scales. Psychiatrists interviewed subjects then psychologists administered the Rorschach test. The correlations between these two forms of clinical assessment ranged from .38 to .82 with the average correlation being .60. Psychiatrists and psychologists also ranked 11 personality traits and defense mechanisms in order of favourability for adjustment at a small Antarctic station. The rank order correlation was .88 and the list from least favourable was: paranoid, psychopathic, dissociative, phobic, somatization, withdrawal, masochism, schizoid, obsessive-compulsive, rationalization, and repression.

In a second study Gunderson (1965) examined the reliability of clinical ratings from psychiatrists and psychologists and found that generally these coefficients were low. The reliability was lowest when the two professions used different assessment methods as well as when they tried to rate specific traits, but higher when they made more global ratings. For example, in an anaylsis of the comparative ratings of psychologist/psychiatrist pairs on over 700 navy and civilian applicants for Antarctic duty only 15 of 35 pairs achieved reliability coefficients above .50 for the overall effectiveness rating. Their agreement on specific traits averaged a low .30. Gunderson was unable to ascertain the factors that might have influenced the reliability of teams, except that those with more recent professional experience achieved greater agreement. In retrospect the low reliability of ratings was to be expected because the task was relatively unstructured and the clinicians had little idea both of the relative weightings to give various items and of the methods by which they might be combined effectively (see Meehl, 1954). The predictions were also made by clinicians with little knowledge or personal experience of Antarctic life, and with no feedback on the accuracy of their previous predictions (Gunderson, 1966).

Despite the low reliability,Gunderson and Kapfer (1966) went on to evaluate the validity of clinical ratings against peer and supervisor's criterion ratings of Antarctic performance. Psychologists who used the Rorschach test failed to produce significant correlations with any of the criterion measures, except one, even at the generous .10 level. Psychiatrists using interviews produced seven significant correlations with peer ratings.

Doll, Gunderson and Ryman (1969) separated their findings for the various occupational groups and found that clinical evaluations predicted leadership of naval personnel but not among civilians. However the ratings did predict the emotional stability and social compatibility for scientists.

Conclusion. Not suprisingly the Rorschach test alone had little utility in predicting Antarctic performance, because this measure was designed to assess unconscious influences on psychopathology and not occupational adjustment. Flexible interviews, while still not having high predictive validity, appear to have been a more useful procedure. The utility could be improved if the results of prediction studies were systematically fed back to raters. In addition raters in many of the studies appear to have been Naval personnel whose possible lack of familiarity with civilian roles might have limited their predictions.

Prediction from Psychometric Testing

United States Studies. Weybrew, Molish and Youniss (1961) used three tests to predict Antarctic performance. The first was the Shipley Hartford Scale IQ measure that had been used to assess cerebral dysfunction; the second,a Sports Inventory multiple choice test, in which 32 of the 50 items gave a measure of involvement in organised sport; the third, the Neurotic Symptom Checklist in which 16 of the 20 items gave a measure of symptomatology. Results indicated that the psychometric measures had some predictive validity. High scores on the Shipley Hartford verbal and abstraction subscales correlated .42 and .31 respectively with the overall adjustment criterion. The Sports Inventory correlated .46 with the sociability criterion and the Neurotic Symptom Checklist correlated .32 with the emotional adjustment criterion.

Smith and Jones (1962) used the Pensacola Z Scale (Jones, 1957) but found no significant correlations with supervisor ratings of performance. They did however find some significant relationships when correlating subsets of particular items of this test to the criterion. Questionnaires completed by referees nominated by Antarctic subjects were also correlated with supervisor ratings.

An attitude questionnaire was first used in screening U.S. personnel in 1958 and subsequently it was revised and presented as the Opinion Survey (Shear & Gunderson, 1966). Later Doll, Gunderson and Ryman (1969) used this measure with 160 naval construction and administrative staff and 80 civilians. They found the Opinion Survey was of value in predicting the performance of construction and administrative staff performance but not of scientists. Seymour and Gunderson (1971) used the same measure with 389 Antarctic personnel between 1963-1968. For civilian scientists the most predictive items were rather heterogeneous but suggested the best preformers were introverted as well as having a strong dislike for obsessive neatness and cleanliness. Successful technical-administrative navy staff were found to be both fearful and critical of authority as well as intolerant of change. They were also intolerant of persons with different beliefs, and somewhat suspicious. Succesful navy construction workers were strong in their basic beliefs but tolerant of different viewpoints, perservering but not compulsive, trusting but not sympathetic or helpful, and conforming. Overall the performance of navy construction workers was the most accurately predicted of the groups and the social adjustment criterion was more accurately predicted than the task, social or overall criteria.

Doll, Gunderson and Ryman (1969) developed a series of personality scales from a composite of the Firo-B Inventory (Schultz, 1958) and thirteen scales that had been developed for Antarctic screening. When applied to an Antarctic cohort these scales most accurately predicted the social, emotional, and overall performance of administrative staff but predicted the leadership and overall performance of scientists. They were of little value for predicting the performance of naval construction workers.

Australian Studies. Owens (1975) used the Sixteen Personality Factor (16 PF) Questionnaire - Form A (Cattell, Saunders & Stice, 1957) the Interpersonal Checklist (ICL) (La Forge & Suczek, 1955), the Californian F Test (Adorno, Frenkel-Brunswick, Levison & Sanford, 1950) and the Pensacola Z Scale (Jones, 1957). Owens (1975) found a curvilinear relationship between the Factor B intelligence scale of the 16 PF test and the criterion of base staff performance i.e. good performance at base was related to mid-range cognitive ability, but a linear relationship for field staff. Low neuroticism and sound emotional judgement were associated with good performance for both grous. Owens made a special attempt to measure authoritarianism because he predicted that low levels on this trait would correlate with good performance. This was assessed using the 16 PF, low L (paranoid tendency), high Q2 (self sufficiency) and Q3 (self control), on Test F low authoritarianism, with high autonomy on Test Z and the ICL, high dominance and love, and low scores on octant FG (distrust) and NO (responsibility). When results did not comfirm the hypothesis Owens concluded that a considerable refinement of the criterion measures and an examination of the influence of moderator variables were indicated.

<u>New Zealand Studies.</u> Taylor (1978) used material from structured interviews and peer and supervisor comments retrospectively to pick twelve poor performance subjects from three winter-over parties at the New Zealand Scott Base. Then he compared initial 16 PF profiles of these poor performers with the rest of the respective groups. He found that the unsatisfactory Antarcticans were significantly more preoccupied with themselves (Factor M) and more radical (Factor Q2). Also the Schedule of Recent Experience (Holmes & Rahe, 1967; Gunderson & Rahe, 1974) was used to predict illness during Antarctic service. The measure was of little value as the subjects both reported few life changes prior to leaving home and had few illnesses during their winter service.

<u>British Studies.</u> The Likes and Dislikes Questionnaire (Kline, 1968) was administered by de Monchaux, Davis and Edholm (1979) to 77 British Antarctic Survey personnel. They then used a stepwise discriminant analysis to differentiate between the criterion performance of very satisfactory and very unsatisfactory groups as judged by their peers. They found that the unsatisfactory subjects were more socially mistrustful, more anxious about their emotions and about sensual enjoyment, more rebellious in their attitudes to authority, were more lacking in independence, and had higher scores on exhibitionism and social extroversion.

<u>Conclusion.</u> Psychometric testing has been of some benefit in the prediction of Antarctic performance but not enough work has yet been done to clearly indicate which tests are of value for which personnel under which conditions. Research in this area could be improved if the

utility of a few tests were systematically evaluated rather than the current haphazard approach.

Additional Studies

The predictive studies in this section have been grouped together because they do not easily fit into the preceding sections.

The French have also undertaken a comprehensive programme of Antarctic prediction studies using biographical and psychometric measures as well as clinical ratings. Descriptions of their procedures have been translated (Crocq, Rivolier & Caze, 1973; Rivolier, 1974) but their results have yet to appear in the English language journals.

Doll and Gunderson (1970) in a somewhat different study attempted to isolate the importance of particular behavioural characteristics as perceived by civilian and naval groups. They obtained peer nominations in four categories; emotional control, task orientation, social compatability and leadership. The criterion measure was nominations for first choice of peer to winter over with in a small station. The results suggested that emotional stability and social compatability were more important for all groups than were leadership or task orientation. For civilian scientists social compatability was more important than emotional stability which was the reverse of the preference for naval personnel.

Arthur (1971) has summarized the findings about predictors for Antarctic service and found that biographical data contributed most overall but that attitude and social behaviour questionnaires also made a significant contribution. Clinical and peer ratings contributed least to the prediction. It was concluded that the analysis demonstrates the complexity of behaviour prediction and indicates the relevance of a high degree of specificity in the personnel information needed to predict the different criteria and different job roles (Table 1).

The article however fails to give detail about the studies from which the data were drawn.

TABLE 1

Overview of Antarctic Performance Predictors

Group and Criterion	Best Predictors
Navy Construction Workers.	
Emotion	Biographical and Attitude Questionnaires
Task	Attitude Questionnaires and Clinical Ratings
Social	Attitude Questionnaires
Leadership	Attitude Questionnaires and Clinical Ratings
Technical and Administrative Staff.	
Emotion	Biographical, Attitude and Social Behaviour Questionnaires, and peer ratings
Task	Biographical Questionnaires and Clinical Ratings
Social	Biographical and Attitude Questionnaires
Leadership	Social Behaviour Questionnaires and Clinical Ratings
Scientists	
Emotion	Social Behaviour and Biographical Questionnaires
Task	Social Behaviour and Biographical Questionnaires
Social	Social Behaviour and Biographical Questionnaires
Leadership	Social Behaviour and Biographical Questionnaires

Overview of Predictive Studies

The predictive studies reviewed indicate that there is considerable potential for the development of actuarial tables, however the prediction of performance for individuals who are already highly selected and motivated is always difficult. Further improvement in prediction studies will take place when more reliable and valid criteria measures have been developed.

Adaptation to Antarctic Conditions

The studies in this section of the review describe the stressors of Antarctic duty, the types of people who volunteer for it and details the changes they undergo during and after their service.

Stressors Encountered during Antarctic Service

Rohrer (1961) considered that three main stressors were a feature of work in Antarctica

1. physical harm from the environment e.g. the danger of fires or frostbite
2. social isolation, resulting in an erosion of social status and prestige
3. emotional harm from isolation e.g. psychological insecurity and anxiety.

Wilson (1965) included sexual deprivation as a stressor. Gunderson and Nelson (cited in Wilson, 1965) extended the list to include 1) the confined isolation 2) the continuous presence of the same associates 3) the emotional control necessary to maintain group cohesion 4) the boredom and monotony 5) the physical hardship of heavy work and 6) the lack of immediate status rewards.

Gunderson (1968) found that improvements in living conditions in U.S. bases up until this date made little difference to the frequency or intensity of stress symptoms. Taylor (1969b) also commented on the problem of monotony of the living environment, and Natani and Shurley (1974) found the problem to be most evident at South Pole station.

Rivolier (1974) examined climatic stressors and reported that the presence of high velocity winds correlated with increased psychological problems, but low temperatures and solar radiation did not.

Characteristics of Antarctic Volunteers

Gunderson and Mahan (1966) found some important differences between navy and civilian volunteers on United States stations. Navy personnel tended to be younger than civilians but had more occupational experience. More of both groups were single than those of their age group at home, and the navy volunteers had the highest divorce rate. Protestants were overrepresented in the military volunteers while Catholics were underrepresented among civilians. More of the civilian volunteers had no religious preference as compared to navy personnel or U.S. males generally. Navy volunteers were more frequently from rural backgrounds, civilian volunteers had higher educational achievement than their navy counterparts. As might be expected, navy volunteers were rated more highly on military performance evaluations than their non-volunteering counterparts. The volunteers had also received more rapid promotions than the usual navy personnel. The indications were that the Antarctic personnel were higher achievers than others.

Gunderson and Nelson (1966) used the Survey of Interpersonal Values and found that the means for the scales for conformity (Conformity) and helpfulness to others (Benevolence) were higher for Antarctic volunteers than for normative groups. Means for autonomy (Independence) and individual prominence (Recognition) were uniformly lower for the Antarctic group. This study illustrated the differences in value structure for different subgroups of volunteers.

Leek (1970) studied the somatotypes of Antarctic volunteers and concluded that there was little difference between United States and New Zealand personnel. Most individuals were rated as mesomorphic with the next highest group being endomorph.

Taylor and Shurley (1971) used the 16 PF to distinguish between volunteers from the United States South Pole station and those at New Zealand's Scott Base station. The South Pole group were more self-sufficient, emotionally stable and taciturn yet more able to entertain fresh ideas than their New Zealand counterparts

Butcher and Ryan (1974) used the Minnesota Multiphasic Personality Inventory (MMPI) and the Personality Research Form (PRF) in a study of personality differences between Antarctic volunteers and a normal university control sample. They too found that the volunteers were generally better adjusted, more achievement orientated, more self-sufficient, and serious minded than the controls.

Taylor (1978) identified similarities and differences between those who occasionally and those who repeatedly wintered over by using the 16 PF. Both groups were slightly reserved, above average in intelligence, somewhat diffident, agreeable, radical and controlled when compared with normative data. Those who repeatedly wintered over, called the "professional isolates", were however significantly more self-sufficient and resourceful and inclined more towards introversion than the "occasionals".

Results in this section of the review are consistent and indicate that Antarctic volunteers are above average in intelligence, more achievement orientated and controlled as well as generally better adjusted than normative groups.

Differences among Occupational Groups of Volunteers

In seeking methods that were later used in prediction studies already reported in this review, Gunderson and Mahan (1966) examined the difference between nine occupational groups of Antarctic subjects using the following measures: the Allport-Vernon-Lindzey Study of Values (Allport, 1950), the Survey of Interpersonal Values (Gordon, 1960), the Firo-B questionnaire (Schultz, 1958) and four other scales derived by the authors for Antarctic screening. In addition each subject was rated on a series of personality traits by a psychologist and a psychiatrist. The authors maintain that results are largely subsumed under the concept of socio-economic status with the individual's own education and occupational status being related to this. Scientists and officers were found to come from different social backgrounds to technical and navy enlisted personnel. While scientists and officers were highly similar in socio-economic status they did differ with respect to some value orientations and they did so in a way that was consistent with their role requirements. For example scientists scored higher than officers on Theoretical and Aesthetic scales. Officers differed in terms of Leadership and Expressed Control from the enlisted men. The authors concluded that these value differences were consistent with the social backgrounds of the various occupational groups.

Natani and Shurley (1974) point out that the greatest difficulty for navy and civilian groups is that they do not possess clear cut common goals. Scientists are primarily motivated by individual research projects and the military personnel are motivated by support and routine maintenance goals and frequently the latter group does not have a clear understanding of the importance of the scientists' work.

Differences between occupational groups are most extreme in U.S. stations because of the mix of navy and civilian groups. Other stations not having these groups appear to be more homogeneous although Law (1960) does report that even in the Australian all-civilian stations there were splits between older ex-service personnel and younger scientists.

Motivation for Antarctic Service

No matter what the country of origin, the main reasons for undertaking Antarctic service appear to be 1) the desire to save money (Nardini et al., 1962; Rohrer, 1961; Taylor, 1969), 2) the desire to have an interesting experience (Law, 1960; Nardini et al., 1962; Taylor, 1969) and 3) the desire to increase knowledge, prestige and experience (McGuire & Tolchin, 1961; Nardini et al., 1962; Rohrer, 1961; Taylor, 1969). Other motives include, to be in a situation where status is primarily dependent on work efficiency and not social skill (Law, 1960), to escape marital conflict (Nardini et al., 1962) or other social pressure (Law, 1960).

Doll and Gunderson (1969) report that the scientists in Antarctica were primarily motivated by their individual research projects while the Navy personnel were influenced by other motives such as saving money. Consistent with this finding scientists rated job performance and job satisfaction more highly than did Navy personnel.

Taylor and Shurley (1971) reported similar motivation for both New Zealand Scott Base and United States South Pole station volunteers i.e. to overcome a challenge, to gain a unique experience and to save money.

Volkov, Mastusov and Ryabinin (1976) reported the rank order of motives of Soviet Antarctic subjects to be: financial advantage, education with adventure, professional development, prestige, overcoming difficulties, and finally a goal in life.

Personality Stability during Antarctic Duty - Psychometric Studies

Taylor and Shurley (1971) administered the 16 PF to New Zealand Antarctic personnel at Scott Base and United States personnel at Pole Station both before and after wintering over. They found that New Zealand subjects became more stable, taciturn and radical following their winter service, while the Americans who were already self-sufficient, controlled and calm became more so.

Blackburn, Shurley and Natani (1973) used the MMPI before and after wintering and found few noticeable changes except for two subjects who had initially shown moderate depression and afterwards produced invalid profiles.

Butcher and Ryan (1974) also used the MMPI before and after wintering and found no differences in personality structure over the period.

Taylor (1978) presented data from a ten year period of study in which he had used a range of measures to assess personality stability during wintering over. The 16 PF, Edwards Personal Preference Scale, and the Rokeach Scale (see, Myers, Murphy, Smith and Gofford, 1966) all showed personality stability. Taylor also used the Comrey Personality Scales (Comrey 1970) and found no change other than a significant reduction in socially desired responses or halo effect. Subsequent research findings with the Comrey Personality Scales confirmed the original finding (Taylor, personal communication).

Taylor and Felleti (1976) produced the Victoria Isolation Scale (VIS) which as a short form of the Isolation Symptomatology Questionnaire

(ISQ) that had originally been designed for laboratory work (Myers et al., 1966). When administered to four wintering over parties it indicated that no changes had taken place over this period (Taylor, 1978).

Few studies have looked at personality changes during summer duty in Antarctica. Taylor (1978), however, did report some changes in the 16 PF profiles of summer field parties. Subjects became more cautious (Factor L) and shrewd (Factor N) after their experience but no corresponding changes were found in the Edwards Personality Preference Scale, the Rokeach Scale or the Victoria Isolation Scale.

In conclusion, various studies show that the personalities of those selected for Antarctic service remain fairly stable despite the adjustment needed to an extreme wintering over environment. However the evidence is less clear for members of summer parties. While personality appears to remain stable this does not mean that day to day emotional fluctuations do not take place.

Emotional Changes during Wintering Over

In an early study Rohrer (1961) interviewed 163 men after they had wintered over and found that they reported substantial fluctuations in mood. They recounted experiencing more anxiety during the first two months, then depression during the long dark winter with symptoms of moodiness, headaches, sleep disturbances, hypersensitivity and withdrawal. Finally they became agitated in the month before they were due to return home. The symptoms appeared most extreme in persons who had been rejected by station personnel. Law (1960) also reported low morale during the midwinter period. Palmai (1963) claimed that headaches were the most common psychosomatic complaint with depression a frequent psychological complaint and using the Leary Interpersonal Checklist and Semantic Differentials confirmed the midwinter drop in morale.

Strange and Youngman (1971) commented that the wintering over symptoms of sleep disturbance, depression, and irritability were almost uniformly reported by investigators, for example Gunderson (1963) and Palmai (1963). Natani and Shurley (1974) maintain that this pattern of symptoms is well described and can now be considered part of a normal adjustment pattern.

Not all wintering over experiences were found to be negative. Mullin (1960) reported increased self confidence and self understanding and Wilson (1965) suggested that those who adapt well should be the focus of research rather than those who do not. Taylor and Shurley (1971) also report positive changes in self perception when they compared 16 PF profiles before and after wintering.

Psychophysiological Changes in Antarctica

A number of investigators have suggested that wintering over is accompanied by a decrement in cognitive ability. Both Mullin (1960) and Taylor (1980) found from interviews that many Antarcticans reported symptoms of intellectual inertia, impaired memory and concentration and that some of these responses persisted after they returned home.

Strange and Youngman (1971) went further to specify that 52% of staff wintering over reported some cognitive impairment.

A few studies have made objective evaluations of these reported cognitive changes. Ventsenostsev (1971) tested 41 subjects on four separate occasions during wintering over on the following tasks: numerical addition, number location, proof reading, tracking moving objects, and a memory task for numbers. Results suggest that most responses were stable and that some functions even improved over the winter. Deraipa (1971) used a series of cognitive tasks to evaluate the functioning of 70 Soviet Antarctic Personnel. Results generally indicated few changes although some tasks e.g. memory for numbers, tended to produce more errors early in the winter as compared with later. For other tasks e.g. processing increasing numerical information more errors were made later in the season as compared to earlier test sessions.

Taylor (personal communication) sought experimental evaluations of some of the reported psychophysiological changes during wintering over and Gregson (1978) used letter-string recall and elapsed time estimation tests to measure the changes in cognitive performance and found slight improvements in performance. In considering these results Taylor (1980) suggested that subjects might in fact have been functioning slowly in their everyday activities but have retained the capacity to respond momentarily to a stimulating test. It seems possible also that the tests used were insensitive to the effects experienced by Antarctic personnel.

White, Taylor and McCormick (1983) used the rate of change in time required by subjects to complete each of a series of "mental paper folding" tasks of increasing difficulty. This chronometric analysis assessed reaction time for each item rather than simply a total test time evaluation. The results indicated that wintering over did in fact decrease performance as compared to a normal sample. This study aside, there is little experimental evidence to demonstrate that cognitive impairment occurs during a winter in Antarctica.

As a part of the same group of studies initiated by Taylor, Barabasz (1978) reported a significant increase in EEG alpha density after a group had wintered over at Scott Base. In a further study Barabasz and Gregson (1978) found no decrement in olfactory perception, and suggested that any descriptive accounts of reduced sensitivity could be attributed to subjects' expectations of stress in Antarctic life.

In conclusion, the frequent descriptions of decreased psychophysiological responding following an Antarctic winter have as yet not been confirmed by experimental investigations.

Group Functioning in the Antarctic.

Whereas the review until now has dealt with responses of individuals to the Antarctic situation, the following sections bring together studies of group interaction. There are two sections, one concerned with summer parties and the other dealing with wintering over groups.

Participant Observation Studies of Summer Parties. Smith (1966) travelled with and made observations of an overland summer traverse party of seven men. He noted the development of informal group structure and defined two stages of its development. The first was a task oriented phase that took about a week to develop, and the second an interpersonal phase taking three and a half weeks. When the group was in the first phase and travelling over hazardous crevassed territory its initial reaction was not to perceive the danger, then to act in an inappropriate and careless way towards it and finally all activities were halted. The following day the group travelled in a slow careful fashion, and it was concluded that carefully reasoned action was slow to develop under these dangerous conditions.

The same group's response to boredom and monotony followed a four step pattern. It began after widespread daydreaming to fill in time, followed in order by sensitivity and criticism of those outside the group, an intense desire for stimulation even though this may have been destructive, and lastly the misinterpretation of familiar sounds.

When the participants were asked to choose their future traverse companions they tended to choose others in the group from whom they had, in the preceeding period, been spatially distant. At a later date when they were exposed to a larger group they tended to choose others with whom they had much daily contact.

Participant Observation Studies of Winter Parties. Participant observer studies have often been made by individuals who have gone to Antarctica to perform a different task but have subsequently written up their observations. Palmai (1963) wintered over on Macquaire Island as a Medical Officer and noted that morale dropped to its lowest point three quarters of the way through the year. At this time psychological symptoms increased and social interaction deteriorated. Over the whole winter period the personnel generally became less cooperative and conventional but also more responsible. Lugg (1973) also wintered over as a physician in an Australian station and reported that it was important for members to control their emotions if they were to be a successful wintering over group. Lugg took notes of group discussions and found that station activities were the most popular topics with biology and sex, which were next most popular, being discussed equally often. It was noted that his group did not suffer the midwinter drop in morale reported by Law (1960), Palmai (1962) and others.

Macpherson (1977) gave descriptive details of social process for wintering over parties in which he was base leader with a British Antarctic group. It was concluded that informal relationships between people in stations were most important and observed that they were often emotionally intense. He also noted a high degree of conflict between participants which arose because the subjects were unable to opt out of relationships with others, and that informal relationships changed rapidly in response to external pressure e.g. change in work routine.

In a rare psychological report from a Japanese station, Matsuda (1977) noted changes in vogue words, tastes in food, use of nicknames, seating at the dining table, order of bathing and film preferences as being of some importance in the confines of the Antarctic winter.

While participant observation studies have yielded rich descriptive data, insufficient systematic results have been gathered to warrant any overall conclusion. However reports of conflict over minor daily concerns are common.

Overview of Adaptive Studies

The results of a wide range of station and field, summer and winter, short and long term studies included in this section of the review are generally consistent. Antarctic volunteers were found to be above average in intelligence, stable, controlled and achievement orientated. They went to Antarctica mostly for financial gain, for adventure and to overcome the difficulties of living on "the ice". While wintering over, there were few changes in their personalities although they experienced considerable emotional fluctuation with headaches, sleep disturbances and depression being common. Group process played an important part in the success of Antarctic programmes but under stressful field conditions it did not always lead to rapid and rational decision making. During wintering over conflict sometimes arose about trivial issues and it was often intense as subjects could not opt out of relationships with others.

CHAPTER II - THE NATURE AND MEASUREMENT OF STRESS AND COPING

This chapter outlines the conceptual framework of stress and coping from which the present Antarctic study was developed. The chapter comprises four sections:

1. models of stress
2. types of stress measurement
3. the effects of stress and
4. the nature and measurement of coping.

Models of Stress

Stress is a concept that has stimulated a great deal of research. The concept has been used in three different ways (Cox 1978) and in this chapter each of them will be summarised. The first treats stress as a response to disturbing or noxious stimuli. The second treats stress as a stimulus impinging on the organism. The third approach treats stress as an imbalance between an organism's capacity and the environmental demands, that is as a lack of fit between the organism and the environment. In this latter model stress is the interaction between the dependent and independent variables.

<u>The Response Based Model of Stress</u>

Selye (1936, p32) first regarded stress as a nonspecific response of the body to any demand made upon it and his principal interest was in physiological reactions and consequences (see Figure 1). Selye (1956) advanced the concept of the General Adaptative Syndrome, as a universal defensive reaction that protected an organism from a source of threat. It was considered that neither the source of threat nor the species of the animal were important variables because the reaction was essentially the same for all organisms. The General Adaptative Syndrome was said to have three phases namely alarm, resistance and exhaustion. The alarm reaction was the initial response to the threat, and was followed by the resistance phase in which the alarm reaction was reduced and adaptive responses took over. The final phase, called exhaustion, occurred as the organism used its final reserves of energy and collapsed. The alarm reaction was likely to reappear as the organism died. Selye (1956) also suggested that if the defensive responses in the second phase were prolonged the so-called diseases of adaptation were likely to occur e.g. cardio-vascular disease and cerebro-vascular accidents.

Selye's concept of the non specific stress response has been highly influential in promoting research but problems have arisen with this concept. Firstly, not all noxious physical conditions e.g. exercise, fasting and heat, produce the General Adaptative Syndrome. Nor are the intercorrelations between the various physiological indices of the General Adaptative Syndrome e.g. heart rate, respiration rate and catecholamine excretion, always high. Furthermore, differing states of arousal appear to be triggered by different biochemical agents e.g. anxiety is thought to be associated with adrenalin release and aggression with noradrenalin release. Finally many stressors appear not to be directly associated with a physical event but rather with the psychological perception of that event for a given individual.

Kagan and Levi (1971) and Levi (1974) constructed a more advanced response based model to explain the direct influence of psychological factors in the mediation of physical disease. They maintained that most life events evoke a physiological response that prepares individuals for the physical demands placed upon them. Such a response is highly advantageous in the short term, but should the demand be prolonged, intense or repeated tissue damage will occur that leads to illness and reduced life expectancy. They suggested that genetic and learned influences interact with the psychosocial stimuli to produce stress responses and the precursors of disease and disorder. The model is in effect a cybernetic system with continuous feedback between all these various components. Within the model, intervening variables such as mental activity and physical agents can also alter the sequence of events .

Cox (1978) outlines three main objections to response based models of stress. Firstly, any type of stimulus that produces a specific physiological response must be viewed as a stressor. However, physical exercise, excitement and fasting are often regarded as enjoyable experiences and as such it is misleading to regard them as stressors. Secondly, stress responses can themselves become stimuli for further raising physiological excitation. For example, a person with coronary heart disease might become anxious about their high pulse rate which in turn may elevate heart rate further. The final criticism is that the non-specific stress response has been shown to be grossly oversimplified, for example, different states of arousal do appear to have different physiological correlates.

Figure 1: Response Based Model of Stress

```
ENVIRONMENT
                                                 STIMULUS

                    +--------------------+
                    |                    |
                    |                    |
                    |   Stressor         |
                    |                    |
                    |                    |
                    +--------------------+
                              |
+-----------------------------+-----------------------------+
                              |
PERSON                        |
                              |                  RESPONSE
                    +---------+----------+
                    |                    |
                    |                    |
                    |     Stress         |
                    |                    |
                    |                    |
                    +--------------------+
                              |
                    +---------+----------+
                    |                    |
      +-------------+--+            +----+---------------+
      |                |            |                    |
      |                |            |                    |
      |  Psychological |            |  Physiological     |
      |  Stress        |            |  Stress            |
      |                |            |                    |
      |                |            |                    |
      +----------------+            +--------------------+
```

The Stimulus Based Models of Stress

An alternative is to conceptualize stress as a stimulus, that impinges on the individual (see Figure 2). This engineering analogy of stress runs parallel to Hooke's Law of Elasticity, which states that a piece of matter will withstand a load or stress placed upon it, but only up to a certain point. Beyond this point permanent changes take place in the material and after the load is removed it will no longer return to its original shape. The analogue suggests that just as physical systems have elastic limit so do humans.

Some researchers have focused directly upon background variables as the stimuli that have determined stress. Studies using astronauts in the NASA Mercury programme (e.g. Ruff & Korchin, 1964) and Antarctic scientists (e.g. Gunderson & Nelson, 1969) have sought personality and background variables that correlate with good performance and low stress levels.

Weitz (1970) devised a classification system for stress inducing stimuli in different work situations that included: speeded information processing, noxious environmental stimuli, perceived threat, disrupted physiological function (e.g. disease), isolation and confinement, blocking, group pressure and frustation. Frankenhaeuser (1975) extended this list to include lack of control over events.

Despite the usefulness of this stimulus model it has many limitations. For example, undemanding and boring tasks are often considered as stressful as overdemanding tasks and yet the former case would not be predicted from the model. Cox (1978) comments that within this model it is very difficult to know exactly which stimulus or set of stimuli are the stressors and how these can be measured. In fact the individual's subjective evaluation of the stress level may be the important variable.

Figure 2: Stimulus Based Model of Stress

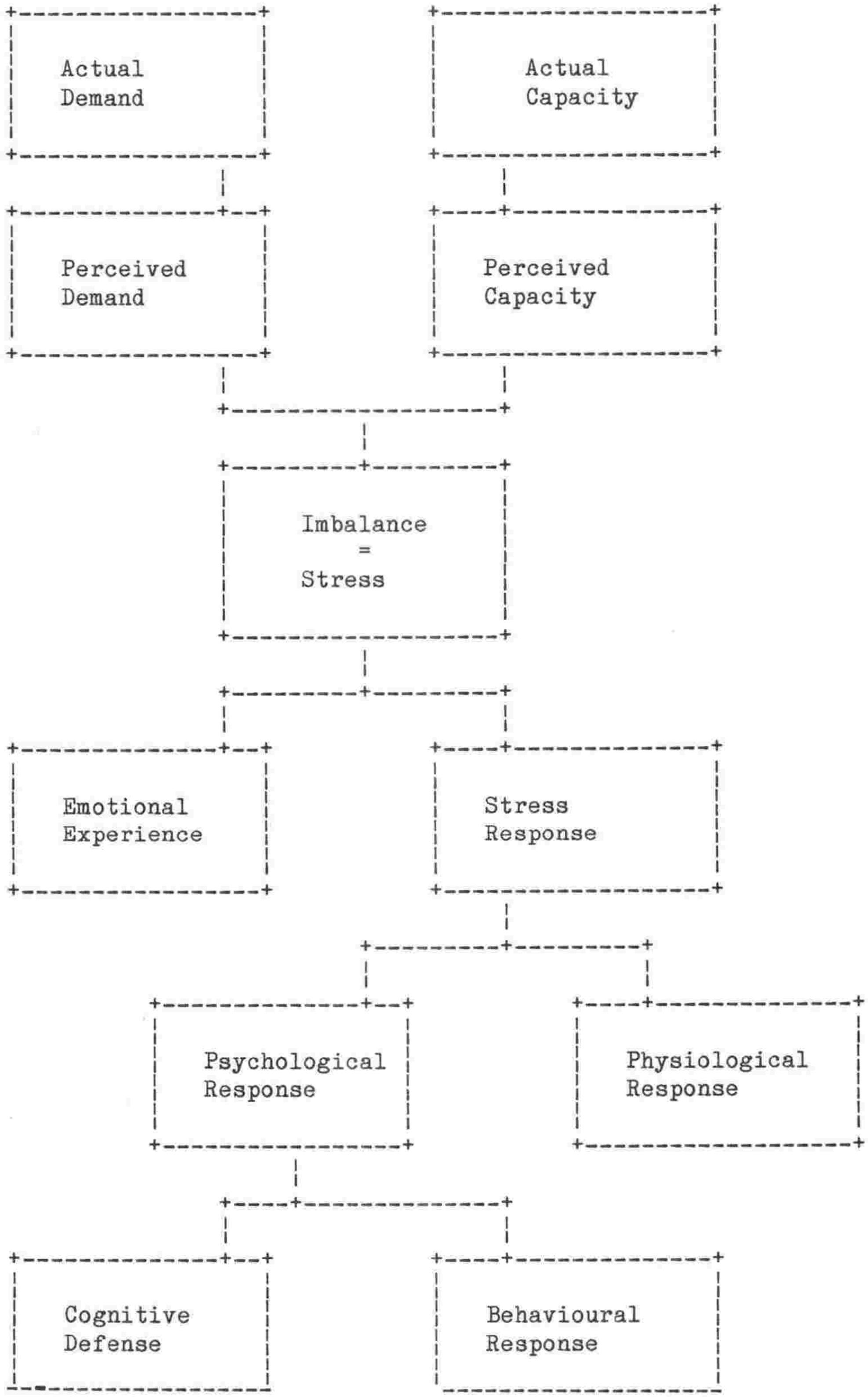
```
ENVIRONMENT
                                                          STIMULUS

                 +------------------+
                 |                  |
                 |                  |
                 |      Stress      |
                 |                  |
                 |                  |
                 +------------------+
                          |
+-------------------------+-----------------------------------+

PERSON                    |
                          |                               RESPONSE
                          |
                 +--------+---------+
                 |                  |
                 |                  |
                 |      Strain      |
                 |                  |
                 |                  |
                 +------------------+
```

The Interactional Model of Stress

A fusion of the response and stimulus models has been advocated by a number of authors including, French, Rogers and Cobb (1974), Lazarus (1976), McGrath (1976) and Coyne and Holroyd (1982). Cox (1978, p17) has also proposed an interactional model in which the cognitive appraisal of the situation rather than the actual situation, is emphasised as an important component (see Figure 3). The model contains seven stages:

1. the sources of demand from the environment and the existing capacity of the person constitute
2. the person's perception of this demand and their own perceived capacity to meet the demand
3. stress is the imbalance between the person's perception of their capacity and the demand they perceive is placed upon them. Cox (1978) emphasises that the cognitive appraisal of the situation, not the actual situation, is the important component in this model,
4. A discrepancy between capacity and demand is usually accompanied by the subjective emotional experience and an ongoing stress response,
5. The stress response has a psychological component e.g. a cognitive evaluation of the situation, and a physiological component e.g. increased heart rate,
6. The psychological response can give rise to a cognitive defence e.g. repression, and to a behavioural response e.g. escape from the situation,
7. The final stage is that of the feedback which returns information to all levels in the system.

Figure 3: Interactional Model of Stress



Types of Stress Measurement

The three models of stress outlined above have been used as a basis for a series of different methodologies.

The Stimulus Based Studies

Researchers who regarded the stimulus as the dependent variable concentrated on methods that would identify the background variables or stimuli that could account for the stress levels detected in various groups. For example Ruff and Korchin (1964) studied the backgrounds of Mercury astronauts and Gunderson and Nelson (1965) those of Antarctic volunteers to determine what factors accounted for good adjustment using measures such as biograpical questionnaires.

Response Based Studies

Researchers who treated the stress response as a dependent variable concentrated on assessing the physiological and psychological aspects of this response. An example of this type of stress measurement would be the measurement of short term memory before and after exposure to loud noise (Glass & Singer, 1972).

Combined Stimulus and Response Studies

Some studies are not easily classified within the foregoing models and they appear to contain a combination of approaches. For example Gunderson (1974) and Taylor (1980) have employed both stimulus and response models of stress. They have attempted to outline both the background variables that contributed to good Antarctic performance as well as to detail the responses of participants to the polar environment. This type of study draws on both types of stress model and therefore seems to improve the contribution beyond that of studies that used only one model.

Interactional Studies

Some studies attempted to measure directly the imbalance or discrepancy between perceived capacity and demand under stress e.g. La Rocco, House and French (1980). Blau (1981) asked bus operators to rate the extent to which upsetting situations were present in their job (perceived demand) and then to rate the frequency at which these incidents could occur for them to consider that they had a good job (perceived capacity). The perceived demand rating was then subtracted from the perceived capacity rating to produce a discrepancy score. This score was then considered to be the indicator of stress. This approach fits the interactional model of stress very closely but it does have a number of drawbacks. For example, Cronbach and Furby (1970) have commented that the use of discrepancy scores causes increased and unecessary unreliability and complexity by compounding the error from each rating scale. Caplan, Cobb, French, Harrison and Pinneau (1975) have also argued against the use of discrepancy scores because they contaminate the capacity and demand components of the measure.

While the interactional concept of stress is superior to other models the methodology that has arisen from this model was not adopted the present study because of the problems outlined above.

A Definition of Stress

Cox (1978, p25) presents a working definition of stress which has been adopted in the present study.

> "Stress, it is argued, can only be sensibly defined as a perceptual phenomenon arising from a comparison between the demand on the person and his ability to cope. An imbalance in this mechanism, when coping is important, gives rise to the experience of stress, and to the stress response. The latter represents attempts at coping with the source of stress. Coping is both psychological (involving cognitive and behavioural strategies) and physiological. If normal coping is ineffective, stress is prolonged and abnormal responses may occur. The occurrence of these, and prolonged exposure to stress per se, may give rise to functional and structural damage. The progress of these events is subject to great individual variation."

The Effects of Stress

Different researchers have emphasised different effects of stress,but in a convenient summary Cox (1978 p92) outlines the following subjective, behavioural, cognitive, physiological, health and organisational effects and costs of stress. These provide a comprehensive set of dimensions along which stress can be identified.

Subjective Effects. These include: anxiety, aggression, apathy, boredom, depression, fatigue, frustration, guilt and shame, irritability and bad temper, moodiness, low self-esteem, threat and tension, nervousness, and loneliness.

Behavioural Effects. These include: accident proneness, drug taking, emotional outbursts, excessive eating or loss of appetite, excessive drinking and smoking, excitability, impulsive behaviour, impaired speech, nervous laughter, restlessness, and trembling.

Cognitive Effects. These include: an inability to make decisions and concentrate, frequent forgetfulness, hypersensitivity to criticism, and mental blocks.

Physiological Effects. These include: increased blood and urine catecolamines and corticosteroids, increased blood glucose levels, increased heart rate and blood pressure, dryness of mouth, sweating, dilation of pupils, difficulty breathing, hot and cold spells, 'a lump in the throat', numbness and tingling in parts of the body.

__Health__ __Effects__. These include: asthma, amenorrhoea, chest and back pains, coronary heart disease, diarrhoea, faintness and dizziness, dyspepsia, frequent urination, headaches, insomnia, psychoses, psychsomatic disorder, diabetes mellitus, skin rash, ulcers, loss of sexual interest, and weakness.

__Organisational__ __Effects__. These include: absenteeism, poor industrial relations, poor productivity, high accident and labour turnover rates, poor organisational climate, anatagonism at work and job dissatisfaction.

__The Measurement of Stress Effects__

The above listing indicates that in any given case stress effects can be highly varied and it implies that any assessment must include a number of measures that sample a broad range of response modes. For that reason the present study was based upon four different measures and each of these is given detailed examination in a separate chapter.

The first of these was the Hopkins Symptom Checklist (HSCL) (Derogatis, Lipman, Uhlenhuth & Covi, 1974). This is a broadly based self report measure that evaluates a range of subjective, behavioural, cognitive, and physiological symptoms. The measure samples from the modes listed below:

1. Subjective items cover such areas as anxiety, depression, irritability and nervousness
2. Behavioural items cover such areas as emotional outbursts, eating disorders, restlessness and trembling

3. Cognitive items cover such areas as forgetfulness, mental blocks and hypersensitivity to criticism
4. Physiological items cover such areas as chest pains, headaches and diarrhoea.

The second measure was the Stress Arousal Checklist (SACL) (Mackay, Cox, Burrows & Lazzerini, 1978). It was selected to sample in greater depth the subjective elements of tension, apprehensiveness and excitement.

The third measure consisted of the Mental Paper Folding (MPF) and Series Completion (SC) Tests (White, Taylor & McCormick, 1983) and these were selected to sample speed and accuracy of information processing.

The final measure was the Adaptability Questionnaire (AQ) (Rivolier, personal communication). It was selected because it sampled the organisational mode of responding and in particular work performance in Antarctica. The AQ also included items on psychological adaptation and on social functioning.

The Nature and Measurement of Coping

Individuals experience stress as unpleasant and usually develop coping mechanisms to reduce these effects (Lazarus, 1966). Three situational factors and four personality factors are claimed to influence coping (Lazarus, 1966).
The situational factors are:

1. the location of the harmful agent as a preliminary in the development of direct action, flight or fight
2. the viability of alternatives to overcome the threat
3. other constraints in the environment which also serve to inhibit or encourage the expression of coping action.

The personality factors are:

1. the pattern of motivation that determines the costs and benefits of the kinds of actions likely to be undertaken
2. the ego resources such as impulse control and self confidence which directly influence coping
3. the defense dispositions that influence the likelihood with which an individual will respond in a particular way
4. the general beliefs that individuals have about the environment and their resources for coping.

Lazarus (1966) notes that coping reaction patterns range from direct action tendencies that strengthen the individual's resources against harm through to indirect defensive reactions which often have limited success in dealing with the threat. Lazarus (1966) suggests that experience, intelligence, education and life experience also influence coping.

Pearlin and Schooler (1978) note that the term coping subsequently acquired a variety of meanings since its initial use and it has been used interchangeably with mastery, defense and adaptation. To clarify the issue they define coping as a response to external life strains which serves to prevent, avoid or control emotional distress. They regard coping as inseparable from both the life strains experienced by individuals i.e. situational factors, and the state of their emotional lives i.e. personality factors. According to these authors, coping behaviour can be divided into three major types of responses i.e. those that:

1. change the situation out of which stressful experiences arise
2. control the meaning of a difficult experience after it occurs but before the emergence of stress
3. keep the emotional consequences of problems within manageable limits.

Pearlin and Schooler (1978) go on to evaluate the efficacy of a number of concrete coping behaviours which are examples of the three types of behaviour outlined above. Their results indicate that coping techniques are most likely to be used in close personal situations e.g. close friendships and marriage, and less in impersonal problems e.g. motor vehicle driving and work stress. In addition they found that coping styles were unevenly distributed in society and that men, the better educated, and the most affluent made greater use of the more effective mechanisms.

Folkman and Lazarus (1980) maintain that coping serves two main functions, the management and alteration of the person-environment relation that is the source of stress (i.e. problem focused coping), and the regulation of stressful emotions (i.e. emotion focused coping). They suggest that coping has been measured in three different ways:

1. as ego processes (e.g. Haan, 1977; Vaillant, 1971)
2. as a series of traits (e.g. Lazarus et al., 1974)

3. as a response to specific situations [e.g. illness (Moos, 1977), natural disasters, (e.g. Lucas, 1969) and bereavement (Parkes, 1972)].

The present study is concerned with coping and in particular with the influence of defense mechanisms on stress and coping responses. Initially Sigmund Freud (1915) and later Anna Freud (1946) developed the concept of defense mechanisms as intrapsychic coping techniques for the reduction of anxiety. They considered that defense mechanisms were person-specific rather than situation-specific, and later other researchers constructed a unidimensional bipolar personality continuum of "repression sensitization" (Byrne, 1961, 1964; Krohne, 1978). They suggested that individuals were to be found at each end of the repression sensitization continuum and that their reactions to stressors were unproductive and quite different in style, in that the "repressors" would tend to deny the harmful aspects of any stressor and the "sensitizers" would accentuate them. Between these extremes were those who would assess threats more realistically.

Byrne (1961) developed a useful scale for the assessment of repression sensitization, the repression items of which were later found to correlate highly with measures of social desirability and symptom denial (Krohne, 1978), and the sensitization items of which were found to correlate with measures of trait anxiety (Golin, Heron, Lakota & Reineck, 1967). Others found certain cognitive differences between the repressors and sensitizers in such functions as word recognition (Tempore, 1964), memory, (Bergquist, Lewinsohn, Sue & Flippo, 1968), and information processing (Feder, 1968). The repressors were also found to have more positive self images than sensitizers, and the self evaluation of both groups was likely to be distorted when compared to independent observations (Krohne, 1978).

Moos (1974) after a review of the Repression Sensitization scale (RSS) comments that while the measure has both conceptual and psychometric limitations, as a simple, objectively scored, easy to use technique it was very useful. For these reasons the RSS was adopted for use in the present study.

Overview of The Present Study

From a review, the interactional model of stress and coping was preferred and both stimulus and response dimensions were measured using the following tests:

1. a symptom measure, the Hopkins Symptom Checklist
2. an affect measure, the Stress Arousal Checklist
3. two cognitive measures, the Paper Folding and Series Completion Tests
4. an organizational measure, the Adaptability Questionnaire
5. a defense and coping style measure, the Repression Sensitization scale.

CHAPTER III - THE RESEARCH DESIGN

Introduction

The previous chapter set out the conceptual framework for the present study and this chapter discusses the methodological issues involved in the evaluation of levels of stress among members of the International Biomedical Expedition to the Antarctic. The chapter comprises four sections:

1. a brief introduction to nonrandomized experimental designs
2. a description of the removed treatments design with pretest and posttest
3. a description of the multivariate nonrandomized matching technique
4. the development and evaluation of the matched control group.

Each of these sections has been included because of the unique problems in constructing a research design for use on the IBEA. Difficulties arose because the experimental subjects had already been appointed by the international organising committee, and the author had to devise an experimental design appropriate to these conditions.

Nonrandomized Experimental Designs

Experiments have been defined by Cook and Campbell (1976) as experimenter-controlled or naturally occuring events ("treatments") which intervene in the lives of respondents and whose probable consequences can be empirically assessed. Experiments can be divided into two major categories, random and nonrandom, depending on the methods used to allocate subjects to experimental and control groups. Where subjects are allocated randomly to either group the procedure is known as a "true" experimental design, otherwise it is known as a quasi-experimental or non randomized design. For both types of design the following four basic principles of validity must be incorporated: 1) internal validity, 2) statistical conclusion validity 3) external validity and 4) construct validity.

Internal Validity. Internal validity concerns the degree to which the causal relationship can be attributed to specific experimental variables. An example of a threat to internal validity would be statistical regression - the effect due to the experimental and control groups being drawn from different populations and multiple observations simply producing scores that tend towards the different means of each of those populations.

Statistical Conclusion Validity. Statistical conclusion validity concerns the degree of certainty that can be attributed to a statistically derived result. Uncertainty arises for example from tests with low reliability because these include substantial levels of error variance in calculations and increase the probability of Type II errors.

<u>External Validity</u>. External validity refers to the degree to which research findings can be generalised across different time periods, settings and groups of subjects. For example in a given analysis the interaction between setting and treatment may be strong but unless and until different settings are sampled any conclusion will have little external validity.

<u>Construct Validity</u>. Construct validity refers to the identification of particular variables that caused any change between pre- and posttest. Poor construct validity for example, can arise in chemotherapy research where the effects of a drug and the effects of therapeutic expectations are confounded. Other difficulties arise from inadequate pre-operational differentiation between constructs.

From the range of non-randomized experimental strategies outlined by Cook and Campbell (1976) the removed treatments design with pre- and posttest was selected as most appropriate for the present study.

<u>The Removed Treatments Design with Pretest and Posttest</u>

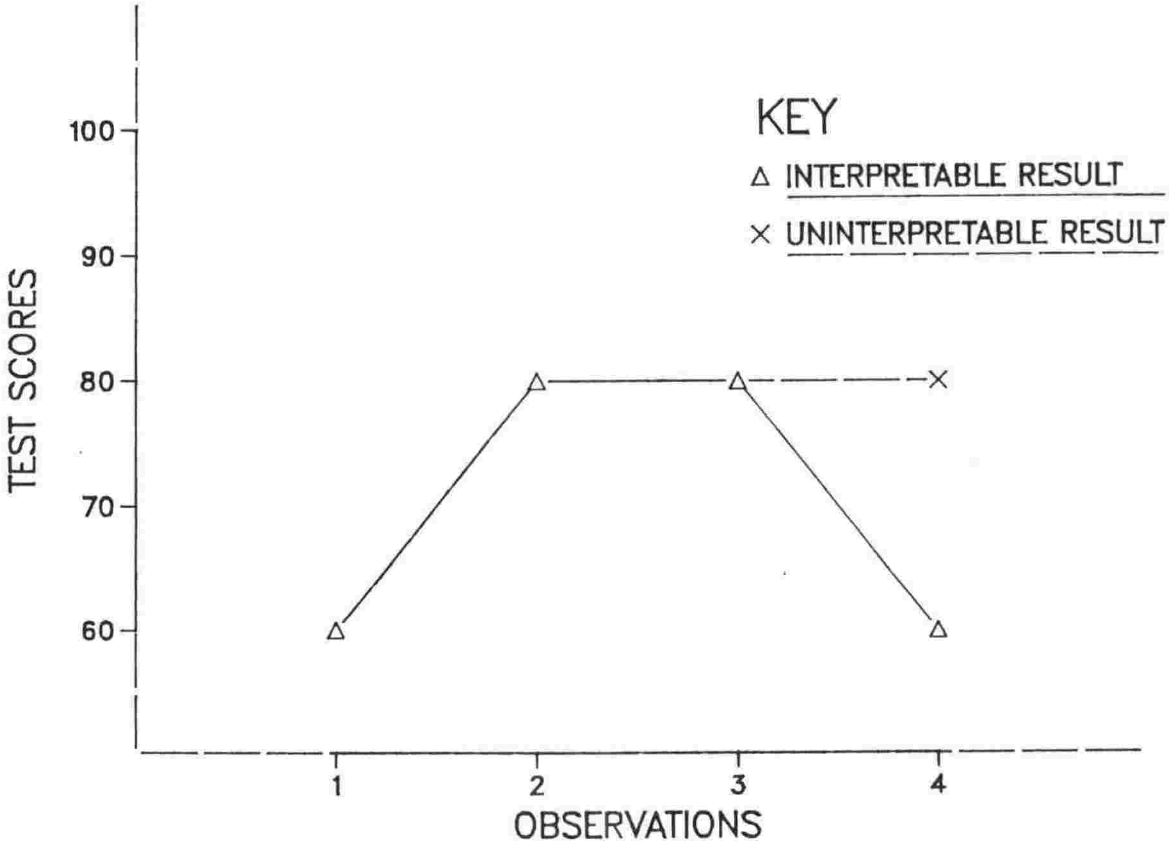
This design calls for four observations: one before treatment onset, one after treatment onset, the third before treatment offset, and the fourth and final observation after treatment offset. In the present study which analysed responses during an Antarctic traverse the design called for one observation to be made before the expedition began, two observations during the course of the expedition and the final observation after the expedition (see Figure 4).

In this design, if the treatment were effective there would be a difference between observation 1 and observation 2. This difference would be in the opposite direction to the difference between observation 3 and observation 4. Since it is possible that the effects seen after the introduction of treatment may disperse before observation 3, it is important that there be a noticeable difference after the withdrawal of treatment.

In the present study the design should lead to the expectation that pre-Antarctic stress responses should differ from the results of both the measurements made later on the Antarctic traverse and in turn these should differ from responses at the final observation. If all these conditions are not fullfilled then this design alone is not capable of producing interpretable results.

According to Cook and Campbell (1976) there are two main problems with the design. Firstly it may be difficult to obtain the pattern of statistical effects necessary to infer causality. This requires that a) the difference between observations 1 and 2 not be equal to the difference between observations 3 and 4, and that b) the difference between observations 2 and 3 not be equal to the difference between observations 3 and 4. Secondly, in experimental studies involving therapeutic outcome research, treatments are usually beneficial to clients and their cessation would cause ethical difficulties. In the present study, this was not a problem because the withdrawal of the "treatment" variable enabled subjects to return home from Antarctica.

Figure 4: Possible Distrubtion of Data Using the Withdrawal of Treatment Design


KEY
△ INTERPRETABLE RESULT
× UNINTERPRETABLE RESULT
TEST SCORES
100
90
80
70
60
1
2
3
4
OBSERVATIONS

Nonrandomized experiments are strongest when a series of different design features can be included in the one study (Cook & Campbell, 1976). For this reason a removed treatments design combined with a matched control group was adopted in the present study, and the latter design feature will now be discussed.

The Multivariate Nonrandomized Matched Control Group Design

Randomization is a method allowing for the experimental control of extraneous variables that cannot directly be influenced by other means. Hays (1963, p450) points out that randomization scatters "nuisance" effects throughout the data and avoids the possibility of an accumulation of these effects in particular treatment groups. This means that replications of experiments should produce consistent findings. Randomization is however not without its problems. The equivalence of nuisance effects between groups can be obtained using randomization, but only by using large numbers of subjects (Sherwood, Morris & Sherwood, 1975). Randomization with small numbers of subjects can accidently lead to high correlations between any variables not controlled for by some other method.

In experiments where randomization is not an appropriate procedure, matching is an alternative although it has been criticised by some experimenters e.g. Keppel (1973 p13). The opposition seems to be largely concerned with ex post facto designs where matching is undertaken at pre-test using outcome measures.

The aim of both randomization and matching is to produce the equivalent control and experimental groups necessary in experimentation to identify treatment effects. Assuming that groups are truly equivalent and that all subsequent influences including measurement error are controlled, all post-treatment changes may be attributed to the effect of the experimental variable. Sherwood, et al., (1975) outline a rationale and technique for obtaining experimental and control groups in which subjects are nonrandomly allocated, and in which individuals in each group are comparable. The assumption underlying their matching technique is that initial equivalence predicts later equivalence under the same conditions. It therefore follows that the more closely the groups can be matched initially on key variables, shown by other studies to be of importance in determining the relevant behaviour, the greater will be the degree of equivalence between them.

In the process of obtaining matched groups the first task is to identify the key variables that are likely to be of importance in determining the behaviour under examination. Psychological research would suggest that ideas, attitudes and actions are largely a product of the experiences and social expectations that impinge upon the individual. Therefore social background variables such as age, sex, marital status, education and ethnic affiliation, are indicators of both experience as well as future responses and account for the largest degree of variability in an individual's responses. Sherwood et al. (1975) note that beyond a certain point, the inclusion of extra variables usually fails to add to the predictability of human behaviour. This suggests that as the number of matched variables increases beyond a certain point, the non-matched variables tend to become more and more alike.

The multivariate matching technique is an important development because it contrasts with those methods that only match at pretest on outcome variables. It selects subjects on the basis that they have very similar backgrounds, or are drawn from the same subpopulation. Matching on pretest outcome variables simply means that, at one point in time, subjects are equivalent on one or more measures. Their differing and unknown backgrounds might easily cause shifts in future responding which are totally unconnected with the experimental variables. For example Campbell and Erlebacher (1970) discuss the case of compensatory education for needy children in which experimental and control subjects were matched on their pre-treatment scores. On follow-up it appeared that the control group were on average more able than the experimental group so that at post testing it appeared that the experimental group had deteriorated. The danger lay in concluding from these results that compensatory education had made the experimental group worse. In fact this effect could simply be attributed to the regression towards two quite different population means. The problem of regression forbids the use of matching on the basis of premeasures but does not rule out matching on other variables.

Sherwood et al. (1975) present the following assumptions which underlie the multivariate matching technique:

1. any sample of subjects will not be homogeneous but will vary along many different dimensions

2. the relevant set of dimensions or variables of importance in influencing subject behaviour can be specified
3. the number of clusters of important dimensions will be less than the number of subjects
4. the place a subject occupies along the series of dimensions is defined by a purely mathematical process
5. matched pairs of control and experimental subjects will be more like each other than will non-matched pairs.

In a study demonstrating the use of the multivariate nonrandomized matching technique to select both experimental and control subjects Sherwood et al. (1975) matched one member of a pool of expected occupants of a housing project for the disabled and elderly with a control subject from the waiting list for the project. Had the experimental group already been selected the same procedure could also have been used to produce the matched control group only.

In the present study a group of Antarctic researchers was individually matched with a group of researchers at home. The following is an overview of the methodology adapted from Sherwood et al.(1975) which was used to achieve this,

1. a number of items were developed that evaluated theoretically important variables not including outcome measures,
2. the responses of the total subject pool were obtained on these items and factor analytic procedures then used to collapse the pool of variables into a small number of dimensions,

3. composite standard scores were produced for each subject on each dimension,
4. the distance in multidimensional space between each pair was calculated and the closest pairs (one member from each group) were then selected,
5. a check was made by experienced psychologists to determine that all pairs were good matches
6. identical test procedures were then given to both groups but only the experimental group subsequently underwent the "treatment".

As a further check on the ultility of the matching technique a second group of subjects was drawn at random from the total group of control subjects. The distance in multidimensional space between the experimental subjects and their randomly allocated pairs was then calculated in order to compare the average distance between them with that for the experimental and matched control pairs.

Method

Subjects

The subject pool from which controls were drawn consisted of 114 males from highly similar institutions to those of the IBEA personnel. They were firstly academic and technical staff at Victoria University of Wellington, secondly academic staff from the Wellington Clinical School, and thirdly Clinical Psychologists from the Justice Department and Wellington Hospital Board.

The Development Of The Screening Questionnaire

As the selection of the control group was post hoc, only the items already answered by IBEA subjects could be used to construct the screening questionnaire. Those items were drawn from two particular questionnaires. One of these, the Biographical Questionnaire (Rivolier, personal communication) contained many items that have been shown to be related to Antarctic performance (see Gunderson & Nelson, 1965). The other was a version of the Holmes and Rahe (1967) Social Readjustment Rating Scale that has been shown to be a consistent and moderately good predictor of the onset of illness and stress related disorders (Holmes & Masuda, 1974). From these two tests a total of 26 items was selected for their potential in the assessment of stress in the Antarctic. This initial version of the screening questionnaire was submitted to an experienced clinical psychologist for comment and subsequently three questions were withdrawn as the personal nature of these items would engender resistance from academic staff e.g. questions on marital relations. The final version of the screening questionnaire, presented in Appendix A, covered the following areas:

- age
- marital status
- number of children in respondent's family
- nationality
- religious affiliation
- occupational status
- academic speciality
- non-vocational interests
- ratings of residential stability

- ratings of occupational stability
- ratings of occupational responsibility change
- rating of personal achievement
- financial commitment
- occurrence of major illness or injury
- size of family of origin
- whether father living or deceased
- occupational status of father
- whether mother living or deceased
- occupational status of mother.

The Analysis Of The Screening Questionnaire

The results from the questionnaire were placed on disk on the IBM 4341 computer at Victoria University of Wellington and a principal factor analysis with iteration performed using the SPSS V/9 package (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975). Varimax rotation of factors with eigenvalues greater than one, as well as two, three and four factor analyses were performed in an attempt to find the most appropriate groupings of items. Finally in order to produce a strong structure that would demonstrate intersubject differences parsimoniously and graphically, a three factor solution was selected.

Three different scoring methods were then used with the resulting measure. In the first method simple scale scores were produced by scoring items with a factor loading equal to or greater than .30 as one, and items with loadings less than .30 as zero. In the second method principal factor scores were calculated from items with salient factor loadings. Here items with loadings equal to or greater than .30 were converted to standard scores, multiplied by their factor weightings and summed. The third method involved true factor scores in which all items were converted to standard scores, multiplied by their respective factor weights and summed. All three methods produced similar results as demonstrated by the high correlations between the matrices of corresponding interpoint distances in the different solutions (Poor & Wherry, 1976). As a consequence the simple scale score was selected for the final analysis. This method appeared particularly appropriate as the aim of the factor analysis was to reduce the volume of data rather than to produce a model of the underlying factor structure of the questionnaire.

The method produced three subscale scores and results of each control subject were compared with the scores of each experimental subject. The computer programme used to do this (Walkey, 1982) initially converts the scores on each scale to standard scores then calculates the distances in multidimensional space between each control subject and each experimental subject. Finally a list of the closest control subjects to each experimental subject was produced. The two control subjects closest to each experimental subject were then appraised using independent judges who were read the following instructions.

> A large number of University staff have now completed screening questionnaires and from these subjects I wish to select a matched control group for the IBEA subjects. The control group should have as many background and history variables as possible in common with the experimental IBEA group. To ensure this I have used a mathematical process. However all actuarial processes while highly accurate are entirely arbitrary. It is known that not all background

> variables have the same effect on potential responses to stress and I want you to use your clinical judgement to rate the quality of the matches produced. The first questionnaire you will receive is labelled 'Reference' and I want you to use it as a basis of comparison. Next you will receive a series six practise questionnaires which have been devised to range from extremely well matched to the 'Reference' through to extremely poorly matched to the 'Reference'. Examine each questionnaire in turn and make up your mind about the quality of these matches. After this I have a series of pairs of questionnaires for you to examine and rate using the six point scale from extremely well matched through to extremely poorly matched.

The judges' ratings were then summed and the subjects with the highest score were then contacted and asked to participate in the second phase of the study. The remainder were thanked for their cooperation so far.

The Comparative Evaluation of the Matching Technique

In order to evaluate the matching technique 12 subjects were selected ramdomly (using the random number tables from Armore, 1966) from the pool of control subjects and the multivariate distances between this randomly allocated control group and the experimental group was then calculated using the same method as for the matched samples. The mean distances between the control and experimental groups for both the random allocation and matched methods were then compared. The two allocation methods were subsequently graphed to illustrate the differences between pairs in three dimensional space. Then as a further test of the adequacy of this technique the matched control and experimental subjects were compared not only on the measures on which they were matched but also on the non-matched outcome variables that have been outlined in Chapter II. This was a particularly rigorous test of the important underlying assumption that as subjects had been matched on background variables they would be similar on outcome measures.

Results

The clinical ratings of the closeness of matching were very high and an overall mean of 4.17 (where 5.00 was "extremely well matched") and a small standard deviation of 0.73 indicates that all subjects were very well matched according to the clinicians (Table 2).

The distances between matched pairs in three dimensional space were also small with 0.52 being the mean distance, in comparison with the total sample range of from 0.00 to 5.09 (Table 2). This indicates that the mulivariate technique produced very close matching. These small distances also contrast with the distances obtained from the randomly selected experimental and control groups, where the mean distance was nearly five times as large and the standard deviation was over four times as large (Figure 5 cf Figure 6). From these results it is clear that the matching was adequate both methodologically and statistically and that the closeness of pairs achieved by matching was considered better than that achieved by random allocation.

Table 3 presents the t test data from the non-matched outcome variables, (i.e. HSCL, SACL, MPF and SC tests as outlined in Chapter II) and it can be seen that means and standard deviations for the control and experimental groups were very similar and that five of the nine t values are of less than one and no t value was significant. This indicates that the matching technique was very successful.

TABLE 2

Clinical Ratings and Multivariate Distances Between Experimental and Control Subjects.

Experimental and Control Subject Numbers	Clinical Ratings (Matched)	Multivariate Distances (Matched)	Multivariate Distances (Random)
1	4.34	0.19	1.51
2	4.67	0.19	3.38
3	3.67	0.38	1.21
4	3.34	0.50	3.40
5	4.00	0.38	3.32
6	4.67	0.68	3.58
7	4.00	0.50	2.81
8	4.00	0.88	1.82
9	4.67	0.73	4.07
10	4.00	0.38	1.31
11	4.00	0.82	1.53
12	5.00	0.65	.88
Mean	4.17	0.52	2.40
SD	0.73	0.23	1.09

Figure 5: Positions in Three Dimensional Space of Pairs of Experimental and Matched Control Subjects

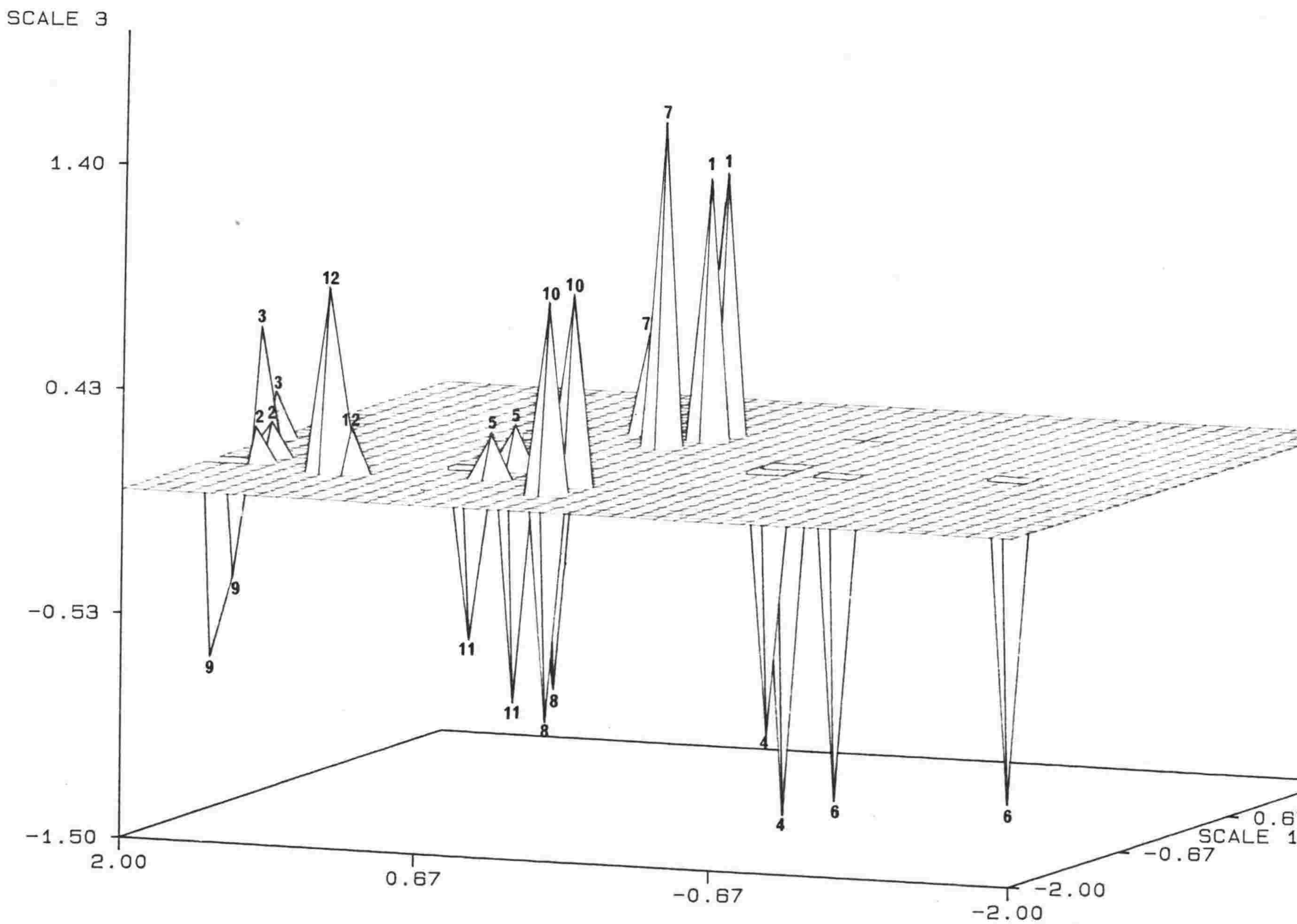

SCALE 3
1.40
0.43
-0.53
-1.50
2.00
0.67
-0.67
-2.00
SCALE 1
0.67
-0.67
-2.00
2.00
1
1
2
2
3
3
4
4
5
5
6
6
7
7
8
8
9
9
10
10
11
11
12
12

Figure 6: Positions in Three Dimensional Space of Pairs of Experimental and Randomly Allocated Control Subjects

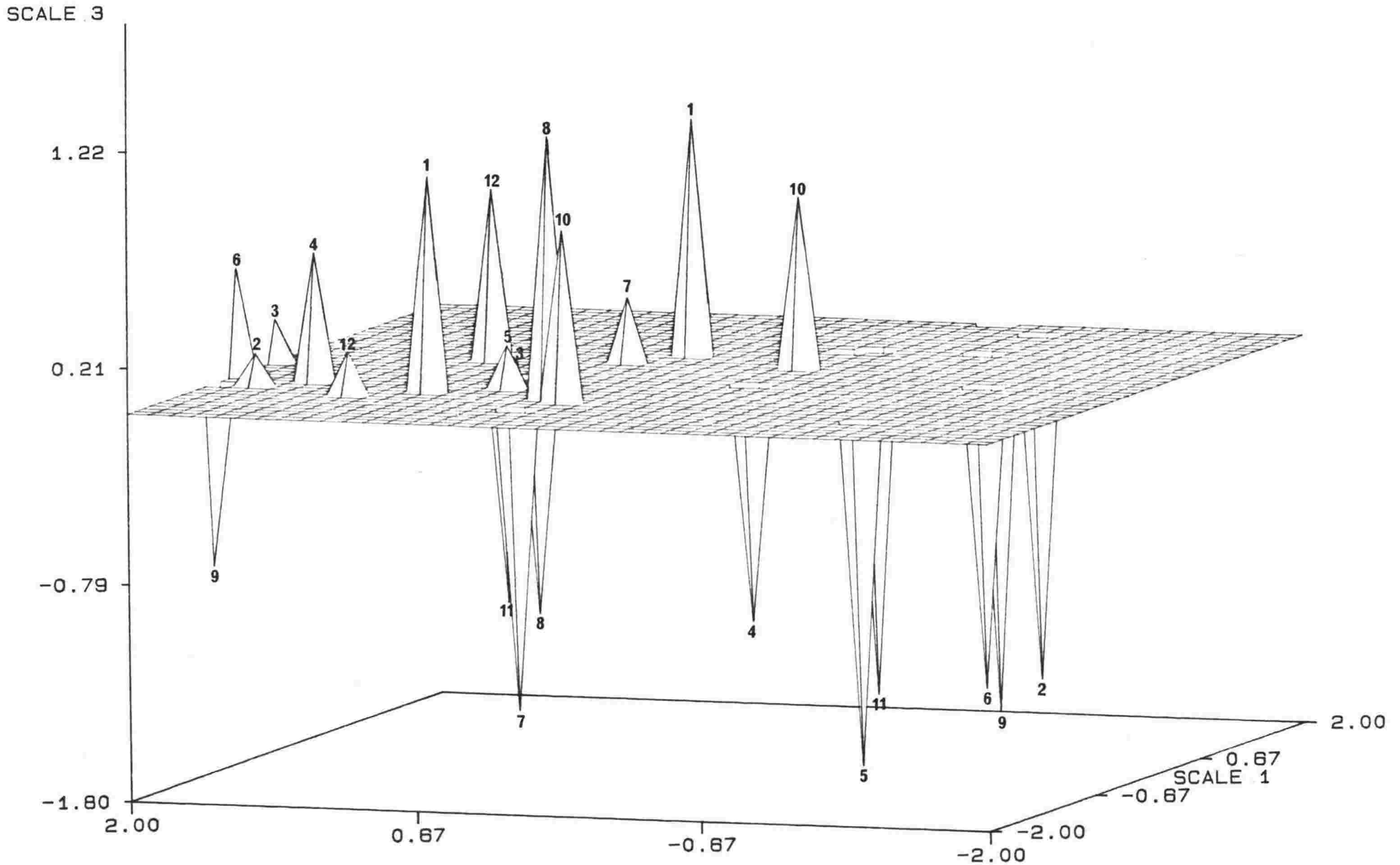

SCALE 3
1.22
0.21
-0.79
-1.80
2.00
0.67
-0.67
-2.00
-2.00
-0.67
SCALE 1
0.67
2.00

TABLE 3

Tests of Differences Between Non-matched Outcome Variables for Experimental and Control Subjects

Measure	Control Mean	Control SD	Experimental Mean	Experimental SD	t Value	Prob
SACL Arousal	10.33	3.20	12.00	4.20	-1.33	0.21
SACL Stress	5.58	4.10	3.50	4.40	1.09	0.30
HSCL Somatiz-ation	14.91	4.48	14.33	2.64	0.37	0.71
HSCL Obsessive Compulsive	12.25	5.06	11.67	3.99	0.27	0.80
HSCL Inter-personal Sensitivity	9.67	2.23	9.50	2.50	0.16	0.88
HSCL Depression	13.00	2.34	13.75	3.10	-0.60	0.56
HSCL Anxiety	6.92	2.34	7.33	1.78	-0.68	0.51
MPF Reaction Times	38.83	10.03	31.50	9.87	1.84	0.09
SC Correct Responses	19.42	4.10	18.33	3.94	1.00	0.34

Note for all cases df = 11 and t is not significant.

Conclusion

Experiments frequently are conducted by comparing the effects of a treatment variable on the responses of an experimental group with those of a no treatment control group. Optimally the allocation of subjects to these groups is random but where this is not possible non-random allocation procedures may be used. One such procedure is the withdrawal of treatment design in which subjects' responses are compared before, during and after exposure to the treatment. The rigor of such a design can be enhanced if it is combined with a matched control group. One sophisticated matching technique involves the sampling of population characteristics relevant to the experimental variable and subsequently developing a multidimensional measure to select subjects. Matching is carried out only on non-outcome variables as this avoids problems due to regression to possibly different population means. This technique has been employed in the present study because random allocation of subjects was not possible.

In this chapter the matching technique has been undertaken and in the subsequent evaluation the pairs of subjects were found to be highly similar both by independent judgement and by measuring distances between the pairs in the multidimensional space determined by clusters of selected background variables. In a comparative demonstration of the effectiveness of the technique, the distances between the matched pairs in the present study were found to be considerably smaller than those between pairs assigned by random allocation. Finally statistical comparisons between experimental and control subjects on non-matched outcome measures indicated that there were no significant differences between the two groups. The outcome indicated that the experimental design adopted in the present study is both theoretically and practically adequate for the special needs of research for a group of pre-selected Antarctic scientists and is clearly capable of producing interpretable results.

CHAPTER IV - EVALUATION OF THE HOPKINS SYMPTOM CHECKLIST

Introduction

The Hopkins Symptom Checklist (HSCL) (Derogatis, Lipman, Uhlenhuth & Covi, 1974) is a self report measure that samples many of the responses to stress that have been outlined in Chapter II. In its basic form it consists of 58 items and five subscales

1. somatization
2. obsessive compulsiveness
3. interpersonal sensitivity
4. depression
5. and anxiety.

Subjects rate each item on a four point scale of distress from "not-at-all" scored one, to "extremely" scored four. The instructions direct subjects to base their ratings on their experiences over the preceding week (see Appendix A). In this chapter a review of the development, reliability, validity and normalization of the HSCL will be presented and an evaluative review of the questionnaire undertaken.

The Development of the HSCL

The HSCL was developed by Parlorf, Kelman and Frank (1954) using items from the Cornell Medical Index as well as from an multidimensional scale (Lorr cited in Derogatis et al., 1974). The checklist was initially used to evaluate psychotropic drug effectiveness (Lipman, Cole, Park & Rickels, 1965; Uhlenhuth, Rickels, Fisher, Park, Lipman & Mock, 1966). Subsequently the measure was revised and enlarged and currently it exists in 35, 54, 58, 72, and 90 item versions. Of the different versions those with 58 and 90 items appear to be the best researched. The difference between them is that the HSCL-90 is a simple extension of the HSCL-58 to provide additional subscales (hostiliy, phobic anxiety, paranoid ideation, and psychotism) designed to measure more serious forms of psychiatric disturbance.

In its original form the symptom constructs used in the HSCL were established by both clinical and statistical methods. Experienced clinicians assigned the items of the HSCL to four homogeneous symptom clusters i.e. anxiety, depression, anger-hosility, and obsessive-compulsive-phobic (Lipman, Covi, Rickels, Uhlenhuth & Lazar, 1968). Factor analysis using data from 1,115 anxious neurotic patients produced five factors (Williams, Lipman, Rickels, Covi, Uhlenhuth & Mattsson, 1968) and subsequent studies have tended to confirm the underlying factor structure (Lipman, Richel, Covi, Derogatis & Uhlenhuth, 1969 and Derogatis, Lipman, Covi & Richels, 1971). The factor structure was produced and replicated in the above studies by using varimax rotations of the principal components. Only factors containing three or more items with loadings above .45 were selected from the rotated solution. The extended HSCL-90 scale was also found to have the basic five factor structure, together with the four others which are designed to broaden the measure (Lipman, Covi & Shapiro, 1979).

Reliability

The HSCL test-retest reliability over a seven day period was established with data from 425 outpatients and produced correlation coefficients ranging from .73 for the anxiety subscale, to .84 for the obsessive compulsive subscale (Rickels, Lipman, Garcia & Fisher, 1972).

Internal consistency was reported on a sample of 1,435 subjects with alpha coefficients ranging from .84 to .87 for the various subscales. The item-total correlations were all above .50 with most above the .70 level (Derogatis, Lipman, Rickels, Uhlenhuth & Covi, 1974).

Validity

The sensitivity of the HSCL to symptom changes induced by psychotropic drugs has been taken as a measure of its criterion related validity. For example Rickels et al. (1972) and Uhlenhuth et al. (1966) demonstrated HSCL changes following the administration of anti-anxiety agents to anxious neurotic outpatients. Covi, Lipman, Pattison, Derogatis and Uhlenhuth (1973) also found HSCL response changes following the withdrawal of minor and major tranquillisers and tricyclic antidepressants in hospitalized inpatients. Covi, Lipman and Derogatis (1973) found that the HSCL was sensitive to the differing effects of a tricyclic antidepressant, a minor tranquilliser, a placebo, group psychotherapy and minimal contact therapy. The measure was also somewhat sensitive to drug induced changes in different patient populations, i.e. charity clinical, private general and private psychiatric (Hesbacher, Rickels, Hutchinson, Sablosky, Whalen & Philips, 1970). However the subscale interpersonal sensitivity failed to differentiate between the effects of diazepam, phenobarbital or a placebo and the anxiety subscale failed to differentiate population types. This suggests differential sensitivity within the subscales.

The HSCL has also been used to differentiate degrees of emotionality in general hospital outpatients. For example Schwartz, Evans, Garcia, Rickels and Fisher (1973) found that the subscales, somatization and depression reflected symptom reduction in a study on lactation suppression in 260 mothers of newborn children.

Rickels, Lipman, Garcia and Fisher (1972) demonstrated concurrent validity by contrasting the initial HSCL distress levels of anxious and non-anxious gynaecological patients with those of markedly improved, moderately improved and unimproved anxious neurotic patients at the conclusion of treatment. Results confirmed the expected rank ordering of the results on the five HSCL factors. In a similar study Jacobs, Garcia, Rickels and Preucel (1973) demonstrated statistically significant differences between normal gynaecological and anxious neurotic gynaecological patients both before and four weeks after an abortion.

The construct validity of the HSCL was initially established by Derogatis, Lipman, Covi, Rickels and Uhlenhuth (1970). They found a high degree of agreement between the HSCL clusters as defined by experienced clinicians and empirically derived symptom dimensions from 837 patient ratings made by psychiatrists.

Prusorf and Klerman (1973) were able to discriminate between anxious and depressed outpatients on the basis of HSCL scores to an accuracy of approximately 65-70%. The anxious subjects had higher somatization scores and also higher anxiety than depression subscale scores. By contrast depressed patients showed higher overall distress scores and had higher depression than anxiety scores.

Rickels et al. (1972) showed that distress levels on the HSCL could rank order general hospital and psychiatric patients according to seriousness of disorder as judged by those in clinical practice.

Normative Studies

The HSCL was primarily developed for use with outpatients but it has also proved useful with both psychiatric general inpatients and non-institutionalised groups. Derogatis et al. (1974) gave details of a large scale study involving 1,435 anxious neurotic outpatients, 367 neurotic depressed outpatients, and 735 non-institutionalised persons living in Oakland, California, USA. Details of age, sex, race and social status are given along with means and standard deviations for individual items, subscales and populations and would suggest the broad acceptability of the HSCL for different populations.

The HSCL As A Measure Of Stress

Although the HSCL was originally developed as a measure of psychiatric symptoms for use in drug trials it has more recently been found to be useful as a measure of stress symptoms. For example as has been outlined in the validity section above, both Rickels et al. (1972) and Jacobs et al. (1973) used the HSCL to evaluate distress in gynaecological patients. Uhlenhuth, Lipman, Balter and Stern (1974) used a slightly modified version of the HSCL in a study on urban stress to examine the relationship between symptom intensity, recent undesirable personal events and demographic characteristics.

Pearlin, Menaghan, Lieberman and Mullan (1981) used HSCL items to assess stress responses in a longitudinal study of involuntary job disruptions. Taylor and Fraser (1981) used it as a measure of post-disaster stress with personnel involved in the body recovery and victim identification after a DC 10 crash at Mount Erebus, Antarctica and they proposed an an additional sixth item group (pre-occupation) as a particularly sensitive subscale of stress responses. Videka-Sherman (1982) used the measure to assess stress responses in parents of recently deceased children.

From the review above it can be concluded that the HSCL has high reliability, demonstrable validity and an adequate subscale replicability and on the basis of this it was selected as an appropriate checklist to evaluate and subsequently employ as a measure of stress.

The Present Study

The 58 item version of the HSCL was chosen over the 90 item version for use in the present study because it is better researched and the additional subscales in the HSCL-90 were considered of little importance because the severe disturbance which they are designed to measure occurs at a very low rate in Antarctic volunteers (Nardini, Herrmann & Rusmussen, 1962). As a prelude to using the checklist in the Antarctic the item characteristics, factor structure and reliability of the HSCL were evaluated using a normal population.

Method

Subjects

The evaluation sample consisted of 203 volunteer first and second year psychology students (72 males and 131 females) at Victoria University of Wellington. Thirty three subjects were tested again one week after the initial assessment in order to assess test-retest reliability.

Data Analysis

The responses were entered on disk on an IBM 4341 computer and the following analyses were then undertaken using the SPSS V/9 package (Nie et al., 1975):

1. Correlations between item scores and total test scores to produce a measure of item homogeneity
2. a series of factor analyses to investigate subscale structure and
3. two different types of reliability coefficient.

The factor analytic procedures undertaken were based on a number of recent reports (Walkey & Green, 1981 ; Walkey, 1982) showing that in order to reproduce and verify a factor structure the number of factors to be rotated should be determined by rotating one factor for each subscale previously claimed for a questionnaire. The initial analysis was a minimum eigenvalue solution in which those factors with eigenvalues less than unity were rotated. A five factor solution was then undertaken because there are five subscales claimed for the HSCL. Following this a four factor solution was produced in order to obtain a more accurate picture of the underlying structure.

Test-retest and Kuder Richardson reliability coefficents were calculated for the subscales and full scale scores as well as for the item grouping 'Preoccupation' which was reported to be useful by Taylor and Fraser (1981).

Results

The item to total test correlations were moderate to high with a mean of .48 and a range of .31 to .65 (Appendix B).

The initial varimax rotation produced 17 factors with eigenvalues greater than one and these accounted for 39 percent of the variance. This contrasts with the 8 factors found by Williams et al. (1968) which explained 52 per cent of the variance. This difference may have been due to their using psychiatric outpatients and the present investigation using a student sample. From this solution Williams et al. (1968) claimed that there were five interpretable factors but these were not easily identifiable from the solution using the minimum eigenvalue criterion in the present study. For the purposes of comparison of structures Tables 4 to 8 have items grouped according to the factor structure of Williams et al. (1968). Factor numbers in the Tables indicate the order in which the factors were found in that study.

The present five factor solution explained 23.4 per cent of the variance. Of the items in Factor 1 (as identified by Williams et al.) all except item 10 had factor loadings greater than .30. For Factor 2 all but item 13 had loadings greater than .42, while for Factor 3 only item 35 had a loading less than .30. The fourth factor was not isolated in the present five factor rotation but these items loaded highly on Factor 1, however for Factor 5 four of the seven items had loadings over .35 (see Tables 4 to 8).

In order to explore the factor structure more deeply a four factor rotation was obtained and again in this solution all seven items from Factor 4 loaded highly on Factor 1. The other three factors were replicated as in the previous solution (for the full correlation matrix, eigenvalues and unrotated factor scores see Appendix B).

No evidence was found for the existence of the cluster Preoccupation that was suggested by Taylor and Fraser (1981).

The reliability data for the HSCL-58 indicates that the full scale test-retest reliability was .76 while the subscale test-retest reliabilities were found to range from .69 to .77 which is only slightly lower than the range .73 to .84 found by Rickels et al. (1972) (Table 6). The Kuder Richardson coefficients ranged from .73 to .54 which are a little lower than those reported by Derogatis et al. (1974). The overall internal consistency was a high .93.

TABLE 4

Loadings on HSCL Factor 1

Item No.	Factor Solutions* Williams et al.	Four Factor	Five Factor	Minimum Eigenvalue Criterion
37 Feeling that people are unfriendly or dislike me.	.71	.62	.61	.52
41 Feeling inferior to others.	.68	.53	.51	.38
36 Feeling others do not understand you or are unsympathetic.	.63	.62	.63	.35
30 Feeling blue.	.63	.61	.70	.72
22 A feeling of being trapped or caught.	.61	.41	.46	.23
6 Feeling critical of others.	.61	.26	.35	.13
29 Feeling lonely.	.60	.62	.68	.77
26 Blaming youself for things.	.59	.47	.43	.47
54 Feeling hopeless about the future.	.59	.68	.71	.58
31 Worrying or stewed up about things.	.55	.45	.50	.28
34 Your feelings being easily hurt.	.53	.64	.52	.38
11 Feeling easily annoyed or irritated.	.50	.35	.45	.18
57 Feeling tense or keyed up.	.47	.45	.47	.32
24 Temper outbursts you could not control.	.46	.26	.30	.07
18 Feeling confused.	.37	.28	.35	.27
10 Worried about sloppiness or carelessness.	.33	.15	.15	.06

* This was the first factor extracted in all solutions.

TABLE 5

Loadings on HSCL Factor 2

Item No.	Factor Solutions* Williams et al.	Four Factor	Five Factor	Minimum Eigenvalue Criterion
42 Soreness of your muscles	.70	.62	.66	.75
52 Numbness or tingling in parts of your body.	.67	.46	.44	.43
56 Weakness in parts of your body.	.67	.62	.67	.48
27 Pains in the lower part of your back.	.66	.59	.54	.45
58 Heavy feelings in your arms or legs.	.65	.56	.54	.68
12 Pains in the heart or chest.	.61	.53	.54	.19
48 Trouble getting your breath.	.61	.49	.49	.17
49 Hot or cold spells.	.54	.50	.47	.41
4 Faintness or dizziness	.52	.46	.49	.14
39 Heart pounding or racing.	.49	.57	.48	.28
1 Headaches.	.48	.42	.47	.37
53 A lump in the throat.	.45	.40	.43	.45
13 Itching	.42	.40	.28	.19
40 Nausea or upset stomach.	.40	.59	.42	.34

* This was the second factor extracted in all solutions.

TABLE 6

Loadings on HSCL Factor 3

Item No.	Factor Solutions*: Williams et al.	Four Factor	Five Factor	Minimum Eigenvalue Criterion
45 Having to check and double-check what you do.	.69	.45	.50	.47
38 Having to do things very slowly in order to be sure you were doing them right.	.68	.53	.51	.75
9 Trouble remembering things.	.68	.47	.47	.16
46 Difficulty in making decisions.	.67	.60	.65	.35
51 Your mind goes blank.	.66	.49	.49	.14
55 Trouble concentrating.	.61	.50	.52	.11
35 Having to ask others what you should do.	.50	.20	.25	.04
28 Feeling blocked or stymied in getting things done.	.49	.51	.56	.20
18 Feeling confused.	.49	.41	.49	.12
8 Difficulty in speaking when you are excited.	.48	.44	.34	.19

* This was the third factor extracted in all solutions.

TABLE 7

Loadings on HSCL Factor 4

Item No.	Factor Solutions			
	Williams et al.	Four* Factor	Five* Factor	~ Minimum Eigenvalue Criterion
23 Suddenly scared for no good reason.	.62	.53	.50	.36
33 Feeling fearful.	.58	.50	.52	.36
2 Nervousness or shakiness inside.	.57	.46	.45	.21
17 Trembling.	.54	.41	.32	.08
50 Having to avoid certain things, places, or activities because they frighten you.	.47	.44	.43	.68
3 Being unable to get rid of bad thoughts.	.42	.58	.61	.35
7 Bad dreams.	.32	.38	.38	.40

* Loadings on Factor 1.
~ Loadings on Factor 14.

TABLE 8

Loadings on HSCL Factor 5

Item No.	Factor Solutions			
	Williams* et al.	Four+ Factor	Five* Factor	~ Minimum Eigenvalue Criterion
19 Poor appetite.	.54	.31	.42	.75
20 Crying easily.	.50	.28	.58	.21
5 Loss of sexual interest or pleasure.	.49	.05	.24	-.05
32 Feeling no interest in things.	.45	.33	.15	.02
2 Nervousness or shakiness inside.	.12	.09	.11	.05
14 Feeling low in energy or slowed down.	.32	.47	.43	.04
25 Constipation.	.24	.31	.37	.09

+ Loadings on Factor 4.
* Loadings on Factor 5.
~ Loadings on Factor 10.

TABLE 9

Reliability Data for the HSCL-58

Scale	Test-retest	Kuder Richardson
Somatization	.69	.73
Obsessive Compulsive	.69	.68
Interpersonal Sensitivity	.74	.63
Depression	.75	.76
Anxiety	.77	.61
Pre-occupation*	.75	.54
Total Distress Score	.76	.93

* This grouping was suggested by Taylor and Fraser (1981).

Conclusion

The present chapter presented an evaluation of the item characteristics, factor structure and reliability of the HSCL-58 for a non-clinical population. Overall the results confirmed the findings of previous studies e.g. Rickels et al. (1972) and Derogatis et al. (1974). Item to total test correlations were satisfactory and only slightly lower than those reported by other authors. Four of the five factors found previously were identified and the remaining factor was found to be imbedded within an extended first factor.

Both the test-retest and Kuder Richardson reliabilities of the measure were found to be satisfactory and similar to those obtained by other authors (e.g. Rickels et al., 1972).

In brief it appears that the psychometric rigor of the HSCL-58 has been confirmed and that the test is capable of producing interpretable results.

CHAPTER V - THE EVALUATION OF THE STRESS AROUSAL CHECKLIST

Introduction

In the previous chapter the evaluation of stress symptoms was discussed and in the present chapter a theoretical model of affective states is described because stress is usually experienced as a disruptive emotional sensation. This chapter then gives details of an evaluative analysis of the Stress Arousal Checklist, which is specifically designed to measure emotional fluctuations.

Theoretical Model of Affective States

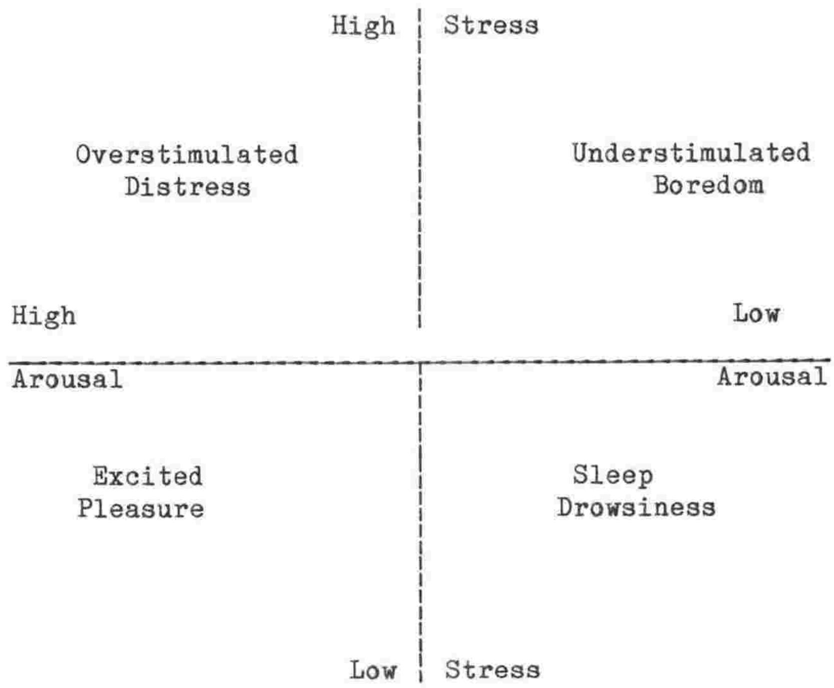
Early factor analytic studies of self reported affective states suggested that differing states are unrelated and that they do not exist in pairs of logical opposites e.g. excitement is not the opposite of boredom. These studies hypothesised that there were between six and twelve independent monopolar factors of affect e.g. tension, anger, fatigue, depression, confusion, and elation (Borgatta, 1961; Hendrick & Lilly, 1970; Izard, 1972; Lorr, Daston & Smith, 1967; McNair & Lorr, 1964; and Ryman, Biersner & La Rocco, 1974).

Russell (1980) found the idea of independent factors surprising, claiming that it is reasonable to expect at least inverse relationships as in sadness versus elation. Also the independence of affective dimensions was inherent in many psychological studies, such as in Izard's (1972) theory of discrete emotions, Ekman's (1972) work on facial expressions and Thayer's (1967) affect scales. Instead Russell (1980) advocated a circumplex model of affect in which an interrelated set of affect dimensions could be placed around a circle in a two dimensional bi-polar space. The bi-polar nature of the model indicated that particular affective states were not independent but had inverse relationships (Figure 7, adapted from Cox, 1978).

The evidence to support the circumplex model came from a series of studies that relied on the subjects' naive knowledge of affect rather than on any introspective evaluation of their current affective states. Abelson and Sermat (1962) had subjects rate the similarity and dissimilarity of pairs of facial expressions and used multidimensional scaling procedures in which similarity between two expressions was represented by their closeness in a geometric space. Their results fell into two dimensional space, the axes of which represented the concepts of pleasantness to unpleasantness and of sleep to tension. The same two independent dimensions were replicated subsequently in other studies e.g. Green and Cliff (1975).

Further supporting evidence for a circumplex model of affective states came from a series of studies that relied on the implicit structure of language to investigate their nature. Bush (1973), Neufield (1975, 1976) and Russell (1978) found that the dimensions of evaluation (pleasantness to unpleasantness) and activity (arousal to sleepiness) accounted for the major proportion of variance in judgements

Figure 7: An Outline Of The Circumplex Model of Affect
(adapted from Cox 1978, p45.)



of similarities of emotionally toned words. Some additional dimensions were found but they referred to the antecedents or consequences of affect rather than the emotion itself and so were of little importance.

Russell (1980) has in addition provided impressive evidence for his theoretical model by demonstrating that four different methods of affect dimension evaluation all produced similar results. The methods were (i) the ordering of affect words around a circular two dimensional space (ii) the multidimensional scaling of the similarity between emotion words (iii) the unidimensional scaling using the evaluation and activity dimensions and (iv) a principal components analysis of subjects' self report of their current affective states.

Subsequent research by Lorr, McNair and Fisher (1982) using factor analytic methods with the Profile of Mood States questionnaire also supports the bipolar nature of affect.

The circumplex model has particular relevance to the understanding of stress as it allows a clear separation between the dimensions of activity (arousal to sleepiness) and evaluation (pleasantness to unpleasantness). Cox (1978) has pointed out that some research has seriously confused these dimensions when interpreting the results of physiological measures. Lowe and McGrath (cited in McGrath, 1976) equated high physiological arousal as measured by pulse rate with stress, but according to the circumplex model the same arousal could be associated either with pleasure as in the case of excitement or with displeasure as in distress. Under the circumplex model it would be erroneous to assume that high arousal is necessarily associated with negative affect and it is important to measure activation and evaluation separately.

The Stress Arousal Checklist (SACL)

The SACL (Mackay, Cox, Burrows & Lazzerini, 1978) is of particular relevance to the study of stress because it enables the dimensions of the activity (arousal) and of evaluation (stress) to be separated. The test consists of 45 items and was derived from the Activation-Deactivation Adjective Checklist of Thayer (1967) with changes being made in the original wording as were appropriate for non American subjects (Appendix A). In the original form the effect on reliability of reordering the adjectives in the checklist was evaluated and coefficents were found to range from .87 to .57, with the mean test retest coefficient at .75, indicating that order effects were small. The original validity correlation (Thayer, 1967) between the checklist scores and a composite measure of heart rate and skin conductance was .68 and later work by the same author (Thayer, 1970) produced similar results. The sensitivity of the measure was demonstrated by finding that significant changes took place during typical daily sleep wakefulness patterns of university students and that significant changes in affect scores on the checklist preceded academic examinations (Thayer, 1967).

Four monopolar factors were found in the original checklist but in the revised version, a two factor bipolar structure was demonstrated (Mackay et al., 1978) that was in accord with the circumplex model advocated by Russell (1980) and utilized in the present study.

The validity of the new SACL was established by Burrows, Cox and Simpson (1977) who found that blood glucose levels of participants in a sales training course were negatively correlated with both the Stress and Arousal subscales (r= -.80 and -.88 respectively).

The potential of the SACL led the present author to evaluate the measure by replicating the factor structure hypothesised by Mackay et al. (1978), to assess its reliability and item characteristics, and later to apply the measure in a field setting. As Walkey and Green (1981) and Walkey (1982) have demonstrated, factor structures can best be replicated by rotating the number of factors claimed or hypothesised in the measure so two factors were rotated in the present study.

Method

Subjects

The evaluation sample consisted of 203 first and second year psychology students (72 male & 131 female) at Victoria University of Wellington.

Procedure

The Checklist was administered as part of a class laboratory exercise. Thirty three subjects were retested one week later. Subjects were instructed to circle the response on a four point scale that best described how they felt at the time. The data were scored according to two different methods, the first of which utilised the full four point scale and the second collapsed responses into a two point scale as advocated by Mackay et al. (1978).

The data were entered on to the IBM 4341 computer and a principal components analysis was then performed with a varimax rotation on the first two factors using the SPSS/V9 package (Nie et al., 1975). The test-retest reliability, Kuder Richardson internal consistency and split half reliability were also calculated for both the subscales. As affective states have high variability it was anticipated that one week test-retest reliability would be low when compared to concurrent assessment such as Kuder Richardson and split half reliability. In addition, item responses were correlated with total subscale scores in order to obtain a measure of homogeneity.

To obtain a clinically meaningful score as contrasted with this statistical analysis the negative adjective values are reversed and the item scores summed. Positive adjectives for the Stress subscale were items 1, 7, 9, 13, 14, 16, 19, 22, 23, 28 and 38, while negative adjectives were items 2, 5, 24, 35, 37, 41, 43 and 44. Positive items for the Arousal subscale were 3, 6, 10, 25, 29, 30, 31 and 32, while negative adjectives were items 11, 26, 27, 34, 39 and 42.

Results

The factor loadings obtained using the two different scoring systems and presented in Table 10 were almost identical to these obtained by Mackay et al. (1978). The two factor bi-polar structure emerged precisely as predicted, with every item classified correctly according to appropriate subscale while the factor loadings were of the predicted magnitude. The polarity of the stress factor was reversed but this is an analytic artifact and consequently of no importance. In using the original four point method of scoring only item 16 (dejected) fell below the .40 cut off point used in the original study and in using the two point method of scoring two items fell below the criterion. In general the first method gave higher factor loadings.

Table 11 shows that the test-retest reliabilities over one week were low and that the Kuder Richardson internal consistency and split half reliability were low to moderate. In fact the Kuder Richardson and split half reliability coefficents were twice as large as the test-retest coefficients. The item subscale correlations were lower than expected with a mean intercorrelation for the stress subscale of only .30, and for the arousal subscale .35 (see Appendix B).

TABLE 10

Factor Loadings on the SACL

STRESS

Item No	Adjective	Mackay Factor Loading	Present Factor Loading Method 1	Present Factor Loading Method 2
1	Tense	0.75	-0.67	-0.62
7	Apprehensive	0.54	-0.51	-0.45
9	Bothered	0.71	-0.70	-0.66
13	Worried	0.71	-0.57	0.49
14	Uneasy	0.72	-0.70	-0.64
16	Dejected	0.59	-0.35	-0.22
19	Nervous	0.64	-0.69	-0.64
22	Distressed	0.73	-0.64	-0.59
23	Fearful	0.42	-0.56	-0.42
28	Up-tight	0.70	-0.80	-0.79
38	Jittery	0.64	-0.68	-0.61
2	Relaxed	-0.68	0.72	0.64
5	Restful	-0.55	0.61	0.59
24	Peaceful	-0.68	0.70	0.66
35	Cheerful	-0.64	0.52	0.47
37	Contented	-0.73	0.52	0.64
41	Pleasant	-0.68	0.62	0.55
43	Comfortable	-0.56	0.67	0.64
44	Calm	-0.68	0.73	0.71

TABLE 10
(continued)

Factor Loadings on the SACL

AROUSAL

Item No	Adjective	Mackay Factor Loading	Present Factor Loading Method 1	Present Factor Loading Method 2
3	Vigorous	0.69	0.55	0.58
6	Active	0.71	0.75	0.72
10	Energetic	0.75	0.73	0.69
25	Activated	0.66	0.63	0.60
29	Alert	0.63	0.65	0.58
30	Lively	0.77	0.68	0.58
31	Stimulated	0.60	0.68	0.67
32	Aroused	0.56	0.58	0.53
11	Drowsy	-0.71	-0.62	-0.58
26	Tired	-0.61	-0.62	-0.58
27	Idle	-0.54	-0.56	-0.51
34	Somnolent	-0.56	-0.41	-0.34
39	Sluggish	-0.65	-0.63	-0.60
42	Sleepy	-0.75	-0.67	-0.60

TABLE 11

The Reliability of the SACL

Subscale	Reliability Type		
	Test-retest	Kuder Richardson	Split Half
Stress	.19	.41	.66
Arousal	.20	.49	.39

Conclusion

The present independent analysis using New Zealand student subjects produced an almost exact replication of the two factor bi-polar structure claimed by Mackay et al. (1978). It also added support to the evidence for the circumplex model of affect advocated by Russell (1980).

The study supports the contention (Walkey & Green, 1981; Walkey, 1982) that factor structures can best be replicated by rotating the number of factors that are claimed to be present in an instrument rather than by using a less conservative criterion such as the rotation of all factors with eigenvalues greater than one.

The results suggest that the four point method of scoring is slightly more sensitive than the two point method as higher factor loadings emerged using the former method.

The results of the reliability evaluation were satisfactory and indicated that, as expected, the test-retest reliability over one week was low because of the large variability of affective states over time. The internal consistency and split half reliability coefficients were low to moderate. Relatively low item to subscale correlations indicated that the test consisted of rather heterogeneous items.

In conclusion this test appears to have a stable factor structure but some caution needs to be taken in interpreting results because of the relatively low levels of reliability. Yet the value of the test for measuring stress and arousal was demonstrated and for that reason it was included in subsequent aspects of the present study.

CHAPTER VI - THE EVALUATION OF COGNITIVE PERFORMANCE

Introduction

In the previous two chapters the symptoms of and affective changes which accompanied stress have been discussed. In the present chapter the cognitive component will be covered and an evaluation of two cognitive measures presented.

As was indicated in Chapter II Selye (1956) proposed that after prolonged exposure to stressors individuals' energy reserves become drained, and the speed and accuracy on any performance task is decreased. However only recently have experimental studies of the effects of stress on behaviour been reported.

Summary of Research on Post Stress Performance

The research findings on the effects of post stress performance have been reviewed by Cohen (1980) and are summarized below:

1. The post stimulation effects of unpredictable and uncontrolled stress on performance have been systematically replicated across many laboratory situations and populations. They occur as a consequence of a wide variety of stressors including noise, electric shock, overcrowding and cold. Interventions that increase the predictability and control over stressors produce less post stimulation performance decrements,

2. stress effects can be induced by tasks that make high attentional demands,
3. post stimulation effects on social behaviour have been documented and these consequences usually involve insensitivity towards others (Cohen & Spacapan, 1978),
4. naturalistic situations that are stressful produce similar effects to laboratory studies e.g. studies have included motorway noise (Cohen, Glass & Singer, 1973) and airport noise (Cohen, Evans, Krantz & Stokols, 1980) as well as crowding (Baum & Valins, 1977).

Theories of Post Stress Performance Decrement

According to Cohen (1980) there are eight major theories of post stress performance decrement,

- adaptive cost,
- information overload,
- learned helplessness,
- arousal,
- frustration mood,
- persistent coping,
- dissonance and self perception, and finally
- experimental artifact theory.

Adaptive Cost Theory. This was originally outlined by Glass and Singer (1972) and states that the process of adaptation requires the completion of the cognitive task of redefining the stressor. It suggests that responding to unpredictable or uncontrolled situations requires more adaption than responding to predictable or controlled situations and therefore poorer performance is to be expected after exposure to the former situations.

Information Overload Theory. This proposes that unpredictable and uncontrolled stressors that are potentially threatening increase attentional requirements (Cohen, 1978). The demand increases because individuals must continually monitor potentially threatening stimuli, in order to discard distracting stimuli and to develop coping responses. Monitoring requires much information processing which results in cognitive fatigue and decreased performance.

Learned Helplessness Theory. Glass and Singer (1972) and Seligman (1975) proposed that when stressors are uncontrolled subjects learn that the delivery of reinforcers is independent of their responses and this leads to decreased likelihood of responding and so lower performance levels.

Arousal Theory. This theory states that unpredictable and uncontrolled situations can increase arousal to such an extent that performance is decreased (Glass & Singer, 1972) The decrease occurs because the relationship between arousal and performance is in the form of an inverted U-shaped function, in which performance increases with arousal to an optimal level after which higher levels of arousal cause decrements in performance.

Frustration Mood Theory. This simple explanation for post stress performance decrease suggests that unpredictable stress causes frustation, annoyance and irritabilty which results in decreased motivation and therefore poorer performance (Donnerstein & Wilson, 1976)

Persistent Coping Strategies Theory. This suggests that stress causes the adoption of various coping stategies that once used tend to be overlearned and when employed in nonstressful situations they cause performance decrements (Epstein & Karlin, 1975).

Dissonance and Self Perception Theories. These are derived from cognitive dissonance theory (Festinger, 1957) and self perception analysis (Bem, 1967). They suggest that if subjects choose to expose themselves to stressors they will interpret the experience as less stressful and show fewer decrements in performance than subjects who do not make the choice but are still subjected to the stress.

Experimental Artifacts Theory. As most laboratory stressors are aversive, subjects may come to dislike the experimenters and subsequently do not try as hard to fulfill their obligation on the post exposure performance tasks (Cohen, 1980).

Overview of Theoretical Studies

After considering the evidence for each theory Cohen (1980) states:

> "The research reviewed in this article does not provide evidence from which to accept or reject the adaptive cost hypothesis from which the literature has spawned. However,

many of the proposed explanations for stressor after effects are forms of that hypothesis. They suggest that post-stimulation effects are either directly or indirectly caused by a process of coping with stress. The mechanisms proposed included cognitive fatigue that results from the coping effects, feelings of helplessness that result from a failure to cope and the overlearning of a coping response. Thus ten years of intensive research has led to the recognition of the cost of adaption to stress .... although this work has answered few theoretical questions"

Measures of Post Stress Performance

Researchers have employed a variety of measures to assess cognitive decrement and a range of these are considered below. Glass and Singer (1972) used the Feather Tolerance Test, proofreading and the Stroop Test as cognitive performance measures.

1. The Feather Tolerence for Frustation Task comprises four problems only two of which are solveable. Subjects work on these puzzles for 15 minutes.
2. The proofreading task requires subjects to correct misspelling, grammatical mistakes, incorrect punctuation, transpositions and typographical errors.
3. The Stroop Test presents the names of four colours each printed in one of three colours. A control version of the task consists of the words printed in black and white. Subjects are instructed to read the words as fast as possible and comparisons are made between performance on the two forms of the test.

Other authors e.g. Gregson (1978) have used letter string recall and elapsed time estimation tasks to measure performance after exposure to stress.

While all the above methods have merit, recent work has provided a theoretical underpinning for the assessment of individual performance on psychometric measures (Sternberg, 1981). One promising new development is Chronometric Analysis (Posner, 1969) which uses Sternberg's (1966) memory scanning paradigm. In this task the subjects are shown a set of digits or letters which can easily be remembered. Then a probe figure is shown and the subject indicates if this probe figure was contained in the original string. Reaction times usually increase over successive items as the size of the string is increased. The slope of the reaction time function is said to be a measure of the rate at which information in short term memory can be processed. White, Taylor and McCormick (1983) used chronometric analysis and a "mental paper folding" task to assess and to demonstrate differing cognitive performance of subjects before and after wintering over in Scott Base, Antarctica.

From the foregoing studies it can be concluded that two types of measure, reaction time and accuracy have been found to be useful in the assessment of post stress performance. One test of each type was selected for use in the present study and detailed evaluations of these are included in the section below.

The Present Study

The "Mental Paper Folding" (MPF) Test of White, Taylor and McCormick (1983) and the "Series Completion" (SC) Test that was developed by the same authors but is as yet unpublished were used in the present study. Both tests were constructed using items from the Differential Aptitude Test (Bennett, Seashore & Wesman, 1959). In the MPF Test successive items were designed to produce increasing reaction times thus creating a reaction time function that is a measure of information processing speed. In the SC Test it was predicted that with successive items the number of correct responses would decrease and so produce a second evaluation of information processing.

Each of the two tests have four forms and the intercorrelations between comparable forms were taken as a measure of alternate form reliability. The four forms were used to minimize memory effects that might arise within the withdrawal of treatment design that is outlined in Chapter III.

Method

Subjects

Twenty four Police Recruits were assessed on each of four occasions one week apart. One subject was dropped from the Police Training Programme and so was unavailable for later testing.

The Mental Paper Folding Test

The MPF Test consists of a series of two-dimensional patterns which when "mentally folded" would appear as a three dimensional shape. The subject's task was to chose which of several given three dimensional shapes corresponded to the one obtained by folding up the two dimensional shape. There were four comparable forms of the test (A, B, C and D) each with 10 items.

The maximum completion time for each item was set at 60 seconds which gave most subjects sufficient time to complete it.

The Series Completion Test

The SC Test consists of a series of 20 patterns each of which followed a general rule or overall pattern that subjects were to try to perceive. Again four comparable forms of the test (A, B, C and D) were constructed but in this test cumulative item timing was conducted for a maximum of eight minutes. This was sufficent time for most subjects to complete the first 10 items so only these were used in subsequent analyses.

Administration

On all four occasions the MPF Test was administered first and the SC Test second. The order in which each of the 24 subjects was presented with the different forms of both tests is shown in Table 12.

TABLE 12

Order of Test Administration for the MPF and SC Tests

Subject	Test Administration			
	1	2	3	4
1	A	B	C	D
2	B	C	D	A
3	C	D	A	B
4	D	A	B	C
5	B	A	C	D
6	A	D	C	B
7	D	C	B	A
8	C	B	A	D
9	A	C	D	B
10	C	D	B	A
11	D	B	A	C
12	B	A	C	D
13	A	D	B	C
14	D	B	C	A
15	B	C	A	D
16	C	A	D	B
17	B	D	C	A
18	D	C	A	B
19	C	A	B	D
20	A	B	D	C
21	D	A	C	B
22	A	C	B	D
23	C	B	D	A
24	B	D	A	C

Analysis

Three types of analyses were undertaken, as follows:

1. an item analysis with resulting regression lines for relevant functions was used to check the expected progressive increase in completion times for the MPF Test and progressive decrease in correct responses for the SC Test.
2. the mean completion times and number of correct responses were produced for each form of each test on each testing occasion
3. interform correlations were calculated to produce alternate form reliability for each test.

Results

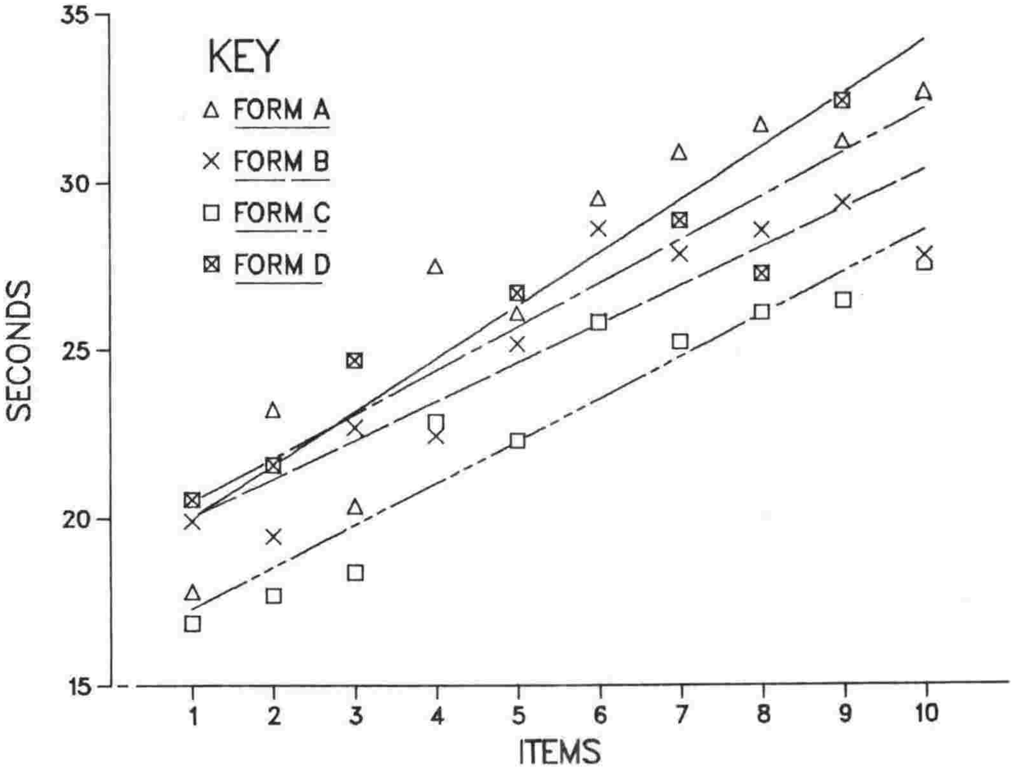
The reaction time function for the MPF Test was plotted for successive items and indicates that the predicted linear increase in reaction times over progressive items was evident (Figure 8). The confirmation of item characteristics indicates that the test was capable of producting the expected chronometric function.

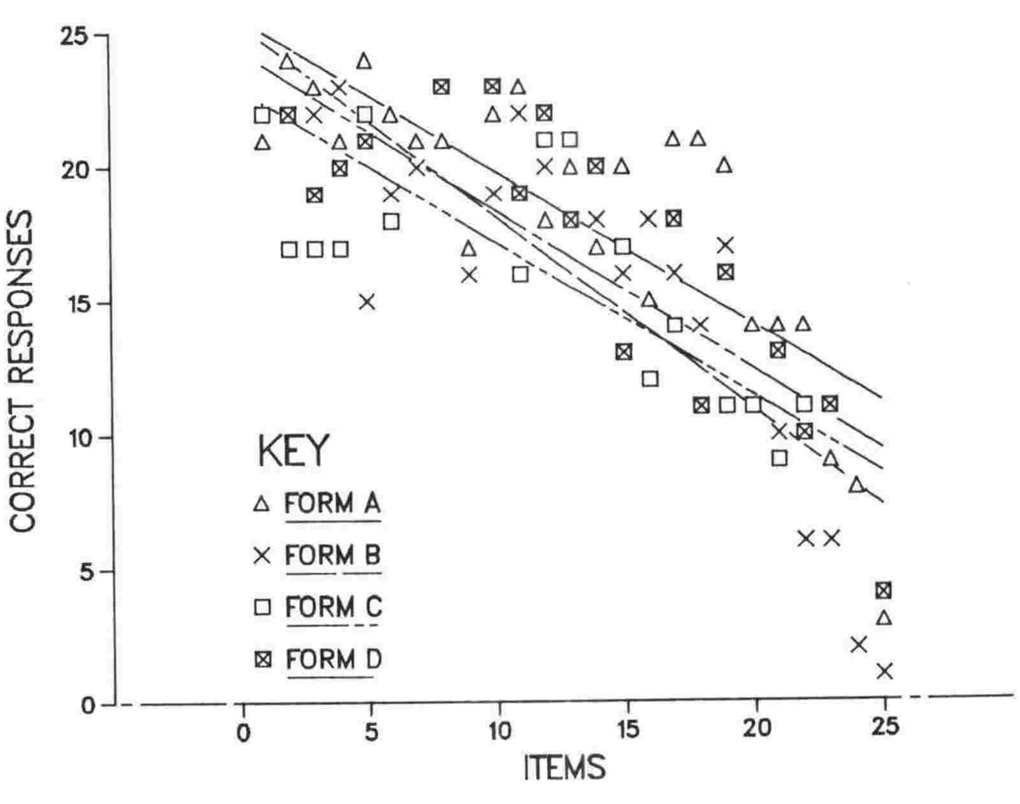
The correct responses function of the SC Test was plotted for successive items and confirmed that the expected decrease in correct responses occurs with progressive items (Figure 9). This function is an indication of the test's sensitivtiy as a measure of accuracy of information processing.

In the following evaluations the characteristics of the two tests are contrasted in order to accentuate and clarify their differences.

Figure 8: Regression Lines Indicating Increasing Completion Time per Item on the MPF Test

Figure 9: Regression Lines Indicating Decreasing Correct Responses per Item on the SC Test


KEY
FORM A
FORM B
FORM C
FORM D
SECONDS
35
30
25
20
15
1
2
3
4
5
6
7
8
9
10
ITEMS


CORRECT RESPONSES
25
20
15
10
5
0
KEY
FORM A
FORM B
FORM C
FORM D
0
5
10
15
20
25
ITEMS

The frequencies of correct responses and completion times were recorded and then collapsed to give total frequency correct on each form for both tests, together with total completion times for the 10 items on the MPF Test and for the first 10 items of the SC Test (Tables 13 & 14). The results indicate that the number of correct responses on the MPF Test increased across both forms and administrations (Table 13). However there appears to be little pattern in completion times, either across forms or administrations. The stability of completion times across forms and administrations indicated that the test was a reliable measure of reaction time. The total correct responses and total completion times for the SC Test indicates that there was stability in the correct response scores over forms and a uniform increase in accuracy between first and last administration (Table 14). Completion times decreased across administrations, but there was little evidence of stability across forms. This suggests that as expected the MPF Test was a more stable measure of reaction time than of accuracy while the SC Test was a more stable measure of accuracy than reaction time.

The completion times and correct responses were averaged across all forms of each test and in general responses were stable across both tests (Table 15). This expected lack of change was taken as preliminary evidence both for the equivalence of the four forms and for the stability of responses over time. The correlations between comparable forms presented in Tables 16 and 17 provides further evidence for their equivalence. Inter-form correlations for correct responses on Table 16 for the MPF Test were generally low (.07) to moderate (.49) with a mean of .35. For the SC Test the correlations ranged from moderate (.58) to high (.81) with a mean of .67. This indicates that the SC Test was a reliable measure of accuracy of information processing but that the MPF Test did not have this characteristic. Correlations for completion times presented in Table 17 for the MPF Test range from moderate (.38) to high (.76) with a mean of .61 and for the SC Test they range from a low (.00) to a moderate (.48) with a mean of .34. This indicates that the MPF Test was a reliable measure of speed of information processing but that the SC Test did not have this characteristic. From the above results it would appear that the MPF Test was a more reliable test of speed than accuracy and the SC Test was more reliable for accuracy than for speed.

TABLE 13

Mean of total correct responses and total completion times for the MPF Test

	Form			
	A	B	C	D
	Correct Responses			
Administration				
1	14.67	15.33	15.67	13.67
2	17.67	19.17	19.50	15.50
3	16.33	18.83	20.00	17.17
4	20.17	19.33	22.50	15.50
Form Means	17.21	18.17	19.42	15.46
	Completion Times (sec)			
1	337	233	209	281
2	256	218	259	310
3	234	280	224	257
4	281	277	215	199
Form Means	227.1	198.1	226.3	261.9

TABLE 14

Mean of total correct responses and total completion times for the SC Test

	Form			
	A	B	C	D
	Correct Responses			
Administration				
1	18.33	15.17	18.50	15.83
2	18.17	17.67	18.17	15.83
3	19.17	15.17	12.67	20.83
4	20.67	17.50	19.67	16.17
Form Means	19.08	16.37	17.25	17.17
	Completion Times (sec)			
1	208	232	221	244
2	159	209	180	219
3	128	208	186	163
4	147	195	186	160
Form Means	160.6	210.9	186.2	197.0

TABLE 15

Mean of total correct responses and total completion times per person on the MPF and SC Tests

Tests	Form A	Form B	Form C	Form D
Correct Responses				
MPF	14.83	17.96	18.08	19.37
SC	16.96	17.47	16.96	18.50
Completion Times (sec)				
MPF	235.2	260.8	248.8	243.0
SC	226.4	191.9	171.3	164.8

TABLE 16

Inter-Form Correlations of Correct Responses on the MPF and SC Tests

	MPF Test*			
	Form			
Administration	A	B	C	D
A		.401	.280	.413
B			.497	.071
C				.463
D				
	SC Test**			
A		.587	.672	.602
B			.650	.736
C				.819
D				

* mean = .354
** mean = .678

TABLE 17

Inter-Form Correlations of Completion Times on the MPF and SC Tests

	MPF Test*			
	Form			
Administration	A	B	C	D
A		.647	.760	.668
B			.626	.382
C				.608
D				
	SC Test**			
A		.000	.485	.396
B			.440	.258
C				.475
D				

* mean = .615
** mean = .342

Conclusion

The research review in this chapter indicates that post stress performance decrements have been well documented and occur in response to a wide range of stressors including the cold (Cohen, 1980). It was therefore appropriate to assess cognitive performance before during and after a long Antarctic traverse in order to test for changes in performance. This chapter has outlined the evaluation of two cognitive performance tests and demonstrated that the MPF Test is a reliable measure of speed of information processing and that the SC Test is a reliable measure of accuracy of problem solving.

CHAPTER VII- THE EVALUATION OF THE ADAPTABILITY QUESTIONNAIRE

Introduction

In the previous three chapters the measurement of symptoms, affective changes and cognitive changes following exposure to stressors has been discussed and suitable instruments investigated. In the present chapter an evaluation of a rating scale measure of Antarctic work performance is undertaken.

Ratings scales have been used to evaluate Antarctic performance since the early research was stimulated by organisations connected with the International Geophysical Year (Weybrew, Molish & Youniss, 1961). They have been found to be flexible and easy to use measures and have included a 14 item five point scale (Rivolier, 1974), a similar 12 item five point scale (Owens, 1975) and a seven item three or four point scales (Weybrew et al., 1961), which have been considered in Chapter I.

Rivolier (personal communication) developed a nine item six point scale, the Adaptability Questionnaire (AQ), which was designed to assess physical and psychological adaptation, adaptation to individual and camp work, relations with other participants, relations with persons in authority, involvement in research projects and adaptation to boredom (see Appendix A). While this measure appears to have direct relevance to the current project it had not previously been subjected to any formal psychometric evaluation. As Saal, Downey, and Lahey (1980) have indicated rating scales require attention because of potential problems arising from: halo effects, leniency and severity effects, central tendency and restricted range, and interrater reliability or agreement.

<u>Halo Effects</u>. These have been defined as a rater's inability or unwillingness to distinguish between the dimensions of a given ratee's behaviour (DeCotiis, 1977). While there might be some disagreement over this conceptual definition there are primarily three operational indicators of low levels of halo effects:

1. low intercorrelations between items
2. a statistically significant item main effect as based on a Rater X Ratee X Item analysis of variance
3. a large number of principal components compared to the number of items in a test.

<u>Leniency or Severity</u>. These have been defined as response sets in which some raters consistently give higher or lower ratings than is warranted, given some external criterion of known true performance level (DeCotiis, 1977).

It has been suggested by Landy, Farr, Saal and Freytag (1976) that some leniency effects are to be expected in the work evaluation of highly selected staff because their performance is in fact generally very good. However if ratings are to have maximum ultility then leniency should be minimised.

Operational indicators of these responses include:

1. median ratings above the midpoint indicate leniency while median ratings below the midpoint indicate severity
2. significant negative skewness of the distribution indicates leniency and significant positive skewness reflects severity
3. if in a Rater X Ratee X Item analysis of variance there is no statistically significant Ratee X Item interaction.

Central Tendency and Restriction of Range. Raters might have a tendency either to cluster their observations about the midpoint of scales or to cluster their responses about a particular point, either favourable or unfavourable.

The operational indicator of central tendency is the proximity of the median rating from the midpoint.

Restricted range is indicated by:

1. the degree of kurtosis or peakedness that characterises the distrubtion and
2. a lack of any significant main effects in a Rater X Ratee X Item analysis of variance.

Interrater Reliability or Agreement. This criterion concerns the agreement between raters on the observation or occurrence of a particular sequence of behaviour. Saal et al. (1980) suggest that while it is important to establish reliability care needs to be taken in interpreting this concept as high reliability does not necessarily reflect high validity.

Four operational indicators have been developed for interrater reliability

1. high correlations between raters
2. high overall internal consistency within dimensions e.g. when the scale is used as a self report and observational measure
3. high internal consistency as measured by the Kuder Richardson formula
4. strong Ratee X Item interaction in a Rater X Ratee X Item analysis of variance.

Method

The subjects were 10 males who had wintered over in Scott Base, Antarctica and data were collected as part of the regular New Zealand Antarctic Research programme (Taylor, personal communication). For the present study each subject completed a questionnaire about themselves (self report ratings) and about each of their companions (observational ratings). Analyses were also conducted in the combined data (all ratings). This resulted in a Rater X Ratee X Item matrix.

The data were placed on disk on the IBM 4341 computer and the following analyses were conducted using the SPSS/V9 package (Nie et el. 1975):

1. the means for each item were calculated and compared to the distribution midpoint
2. the standard deviations and variances for each item were calculated to assess the distribution of ratings

3. the skewness and kurtosis were calculated for each item
4. the correlations between items were calculated
5. correlations between pairs of rater were calculated as well as Kuder Richardson measures of reliability (Magnusson, 1967).
6. a Rater X Ratee X Item analysis of variance was undertaken
7. the principal components analyses with oblique and orthogonal (varimax) rotations were conducted

Results

Halo Effects

The median intercorrelations between items were moderate (range 0.23 to 0.53) (Table 18).

There were three factors with eigenvalues greater than one which is a reasonably large number for a test with only nine items (Table 19).

There was a significant Item main effect in the Rater X Ratee X Item analysis of variance (Table 20).

These data suggest that the Adaptability Questionnaire has only moderate halo error.

TABLE 18

Intercorrelations between Adaptability Questionnaire Items

Item	Median Inter -correlation	Range
Physical Adaption	.25	-.00 - .48
Psychological Adaption	.32	.05 - .48
Adaption to Individual Work	.40	.01 - .56
Adaption to Daily Activities and Chores	.40	-.02 - .56
Relations with Other Participants	.44	.31 - .76
Relations with People in Authority	.35	.15 - .49
Adaption as "Subject"	.53	.24 - .79
Attitude towards Psychological Research	.23	.01 - .80
Adaption to Boredom	.32	-.01 - .59

TABLE 19

Factor Structure of the Adaptability Questionnaire

Item	Factor Structure					
	Oblique			Varimax		
	I	II	III	I	II	III
Physical Adaption	.06	.90	-.18	.04	.16	.64
Psychological Adaption	.58	.20	-.17	.25	.03	.70
Adaption to Individual Work	.56	.57	-.28	.70	.01	.28
Adaption to Daily Activities and Chores	.65	-.14	-.20	.71	-.04	.33
Relations with Other Participants	.71	.32	-.63	.63	.40	.37
Relations with People in Authority	.68	.23	-.42	.47	.10	.36
Adaption as "Subject"	.71	.13	-.89	.64	.75	.18
Attitude towards Psychological Research	.23	.14	-.95	.00	.95	.12
Adaption to Boredom	.58	-.28	-.36	.73	.21	-.16

Note: Three factors accounted for 75.4% of the variance.

Leniency or Severity

The median values of items ranged from 4.07 to 5.16 which were considerably above the midpoint of 3.00 and indicated that there was a high degree of rater leniency (Table 21).

Seven of the nine items were significantly skewed (Table 21) and indicated the leniency of the raters.

There was also a significant Ratee X Item interaction that confirmed the skewness of data (Table 21).

Central Tendency or Restricted Range

High median values of items indicated no tendency towards the midpoint (Table 21).

The Kurtosis results in Table 21 indicated that none of the items was either significantly 'flat-topped' or 'peaked'.

The two significant Rater X Ratee X Item analysis of variance further indicated that restricted range is not a problem (Table 20).

TABLE 20

Rater X Ratee X Item Analysis of Variance for the Adaptability Questionnaire

Source	Sum of Squares	DF	Variance Estimate	F
Ratee	44.38	9	4.93	5.15**
Items	24.55	8	3.07	2.25*
Raters	97.39	8	12.17	
Interaction Rater X Item	73.38	72	1.02	3.29**
Interaction Rater X Ratee	68.98	72	0.96	
Interaction Ratee X Item	87.39	64	1.37	
Interaction Rater X Ratee X Item	178.51	576	0.31	
Total	574.57	809		

* $p < .05$ ** $p < .01$

TABLE 21

Distribution Characteristics of Ratings on the Adaptability Questionnaire

Item	Mean	Standard Deviation	Skewness	Kurtosis
Physical Adaption	4.70	0.99	-0.76**	0.92
Psychological Adaption	4.63	1.00	-0.48*	-0.25
Adaption to Individual Work	5.16	0.79	-0.86**	0.55
Adaption to Daily Activities and Chores	4.95	0.92	-0.58**	-0.44
Relations with Other Participants	4.85	0.78	-0.33	-0.18
Relations with People in Authority	4.91	0.95	-0.84**	0.36
Adaption as "Subject"	4.63	0.94	-0.40*	-0.63
Attitude towards Psychological Research	4.07	0.98	-0.15	-2.04
Adaption to Boredom	4.98	1.04	-0.94**	0.28

**p<.01 *p<.05

Interrater Reliability or Agreement

The results indicate that interrater reliability was high at .73 (Table 22).

Internal consistency as measured by the Kuder Richardson formula was nigh for both the self report and observational ratings (Table 22).

Internal consistency was also high when calculated for all ratings (Table 22).

This reliability was confirmed by the significant Ratee X Item interaction (Table 21).

Factor Structure

In order to investigate the underlying factor structure of the questionnaire further an oblique rotation of the principal components solution was undertaken. It was assumed that the unidimensional questionnaire would contain highly intercorrelated items and consequently highly correlated factors, however this was not found to be the case (see Table 23) and a varimax rotation was therefore performed. The two rotations produced highly similar patterns although the order of Factors II and III appeared in different orders for the two methods. The first factor was interpreted as General Adaption, the second Factor as Physical Adaption and the third Factor as Adaption to Research. These three factors accounted for 75.4% of the variance.

TABLE 22

The Reliability of the Adaptability Questionnaire

Reliability Type	r
Interrater	.73
Kuder Richardson (all ratings)	.85
Kuder Richardson (self report)	.78
Kuder Richardson (observational)	.79

TABLE 23

Factor Intercorrelations for the Adaptability Questionnaire

Factor	Factor		
	I	II	III
I	1.00	0.98	-0.39
II	0.98	1.00	-0.12
III	-0.39	-0.12	1.00

Conclusion

The evaluation of the Adaptability Questionnaire was generally positive, and that outcome was of particular interest since the measure was constructed with no attempt at psychometric validation. Some halo effects were found, but these were small and items appeared to be sensitive to the different performance dimensions.

The measure did however suffer from some of the expected leniency effects because of the highly selected nature of the sample however these could be reduced by altering the scale so that ratings could be more evenly distributed, as follows:

The present scale

```
       bad       average      good
       / \         / \         / \
     [] []       [] []       [] []
```

the suggested improvement

```
bad      average      good      exceptional
 |         / \         / \           |
[]       [] []       [] []          []
```

The scale was satisfactory with regard to a lack of central tendency and had little restriction of the range of responses.

Interrater reliability was moderate to high but it is likely that this could be improved by

1. providing more behavioural description of the performance dimensions along which ratings were to be made
2. training raters in scoring procedures before using the scales
3. restricting the time interval within which ratings were made.

The factoring procedure suggests three factors were present in the AQ and these were labelled, general adaptation, physical adaptation, and adaptation to research.

Overall the AQ was found to be a useful measure that has been developed specifically to assess the performance of personnel in the Antarctic. It appeared to stand up very well to psychometric evaluation and therefore it is capable of producing interpretable results.

CHAPTER VIII - THE EVALUATION OF STRESS DURING IBEA

Introduction

In Chapter II it was determined that as a working definition, stress was to be regarded as a substantial imbalance that arises when there is a discrepancy between the individuals' perception of demands and their capacity to respond to them (also see; Cox, 1978; McGrath, 1976). If this disrepancy were sustained it could give rise to stress symptoms, to changes in affect and to decreased cognitive and behavioural performance (Pearlin, Menaghan, Lieberman & Mullan, 1981). It follows that stress can be measured by assessing symptom development, changes in affective states, and cognitive and behavioural performance, before, during and after any exposure to stressors. In the present study, symptom development was assessed by using the Hopkins Symptom Checklist (HSCL) (Derogatis, Lipman, Rickels, Uhlenhuth & Covi, 1974), (see Chapter IV), affective states were assessed by using the Stress Arousal Checklist (SACL) (Mackay, Cox, Burrows & Lazzerini, 1978), (see chapter V) cognitive performance by a "mental paper folding" test (MPF) (White, Taylor & McCormick, 1983) and a "series completion" test (SC) (see Chapter VI), and finally behavioural performance by using the Adaptability Questionnaire (AQ) (Rivolier, personal communication) (see Chapter VII). The latter measure was restricted to the experimental group alone, unlike all the other measures, because it was inappropriate to assess Antarctic environmental adaptation among a control group in New Zealand. For this reason the AQ results will not be be considered in this chapter which concerns comparisons between experimental and control groups, but will be reported in subsequent chapters.

Method

Participants

The experimental subjects were three physiologists and one technician from the United Kingdom, three physicians from France, one physiologist, one physician and one documentary film producer from Australia, one biochemist from Argentina and one psychologist from New Zealand. All subjects were involved in a comprehensive set of experiments in which they played the role of either experimenter and/or subject. A second psychologist (the present thesis principal supervisor) was involved at the begining and end of the expedition and undertook interviews and part of the overall test administration.

The experimental subjects were part of the IBEA expedition which was divided into three phases:

1. Phase I - involved thirty one days of psychological and physiological testing and experimentation in the Commonwealth Institute of Health in Sydney, Australia,
2. Phase II - a seventy two day traverse of the windswept and isolated polar plateau of French Terre Adelie Land in which subjects lived under primitive conditions and travelled in open vehicles,

3. Phase III - a thirteen day period of post Antarctic testing - again in Sydney.

The control subjects were 12 New Zealand professional researchers and practitioners who were drawn from academic and technical staff at Victoria University of Wellington, and Wellington Hospital Board and from the Department of Justice, Psychological Services. A detailed discussion of the method used for the selection of the multivariate nonrandomized matched control group has been outlined in Chapter III.

Procedure

The experimental subjects were tested on four occasions:

1. during the first week of Phase I in Sydney (observation one for the experimental group),
2. on or close to day 25 of the Antarctic stage (Phase II) (observation two for the experimental group),
3. on or close to day 45 of the Antarctic stage (Phase II) (observation three for the experimental group),
4. during the first week of Phase III in Sydney (observation four for the experimental group).

In order to provide the four observations for the control subjects they were all tested at equivalent intervals to those given above, in Wellington, New Zealand, with the same tests as the experimental group.

Design

The experimental design outlined in Chapter III consisted of a withdrawal of treatment design with pretest and posttest used in conjunction with a multivariate nonrandomized matched control group. This cluster of design features enabled both intra- and intergroup nypotheses to be tested.

Hypotheses

It was hypothesised:

1. that HSCL total distress and subscale scores would be higher overall for the experimental group than for the control group,
2. that the HSCL total distress and subscale scores for the experimental group would be higher during than before or after the Antarctic phase,
3. that SACL stress scores would be higher for the experimental than for the control group,
4. that the highest SACL stress levels for the experimental group would be found during the Antarctic phase,
5. that SACL arousal scores would be higher for the experimental than for the control group,
6. that the highest SACL arousal levels would be found in the experimental group during the Antarctic phase,
7. that MPF reaction times would be slower for the experimental group than for the control group,

8. that the slowest MPF reaction times would be found in the experimental group during the Antarctic phase,
9. that the correct responses on the SC test would be lower for the experimental group than for the control group,
10. that the lowest number of correct SC responses would be given by the experimental group during the Antarctic phase.

Analysis

The appropriate statistical design for use with the present study was a three way anaylsis of variance (observations X groups X subjects) which was used to assess the effects of observations and groups and the interaction between them (McNemar, 1962 p322). Analyses were conducted for all measures using the IBM 4341 computer with a programme written by Walkey (1982).

Results

The between group and within group hypotheses were considered separately. The comparisons between the groups (Hypotheses 1, 3, 5, 7, and 9) required a significant F value from the analysis of variance, while for the within group comparisons (Hypotheses 2, 4, 6, 8, and 10) a pattern of results consistent with the withdrawal of treatment design. For this second group of hypotheses, observation one should be substantially different from observation two but not from observation three. In addition observation four should be substantially different from observation three but not from observation one. A full description of the methodological requirements for this design was given in Chapter III.

The results showed:

1. there was no overall significant difference between experimental and control groups on the HSCL total or subscale scores (Table 24),
2. the pattern of results in Figures 10-16 indicates that the requirements of the withdrawal of treatment design were not fulfilled for the HSCL total or subscale scores,
3. there was no overall significant difference between SACL stress scores between groups (Table 24)
4. the requirements of the withdrawal of treatment design was not fulfilled for the SACL stress data (Figure 17),
5. there was no significant difference on SACL arousal scores between groups (Table 24),
6. the requirements of the withdrawal of treatment design were not fulfilled for the SACL arousal data (Figure 18),
7. there was no significant difference on MPF reaction times between groups (Table 24),
8. the requirements of the withdrawal of treatment design were not fulfilled for the MPF reaction time data (Figure 19),
9. there was no significant difference on SC accuracy scores between groups (Table 24),
10. the requirements of the withdrawal of treatment design were not fulfilled for SC accuracy data (Figure 20).

In summary none of the above hypotheses was confirmed. A closer examination of the data with reference to each of the separate measures taken on the four observations is presented below.

Observation one showed that, as expected, both groups were found to be similar on all means, indicating that the experimental and control groups were well matched (Table 25). With regard to the HSCL, at observation one the control group was only very slightly higher on the HSCL total distress scores (Figure 10), somatization (Figure 11), obsessive-compulsive (Figure 12), and interpersonal sensitivity (Figure 13). but slightly lower than the experimental group on the depression (Figure 14), anxiety (Figure 15), and preoccupation subscales (Figure 16). Initially the control group was slightly higher in SACL stress scores (Figure 17), and lower on SACL arousal scores than the experimental group (Figure 18). The reaction times on the MPF test were slightly greater for the experimental group (Figure 19), while the accuracy on the SC test was identical for the two groups (Figure 20).

At observation two when the experimental group was in Antarctica its HSCL total distress scores remained steady while those of the control group dropped slightly (Figure 10). The latter were slightly lower on the interpersonality sensitivity, anxiety and depression subscales (Figures 13, 14, & 15). Though the SACL stress scores increased for the experimental group and decreased for the control the arousal scores dropped for both groups (Figures 17 & 18). The MPF reaction times dropped slightly for both groups and SC accuracy was constant for the control group but dropped slightly for the experimental group (Figures 19 & 20) .

At observation three the HSCL total distress scores for both groups dropped slightly and at that stage scores on all subscales were lower for the control than the experimental group (Figures 10 to 16). The SACL stress and arousal scores remained similar to previous levels for the experimental group but stress decreased and arousal increased for the controls (Figures 17 & 18). The MPF reaction times dropped slightly for the experimental group but rose slightly for the controls while SC accuracy increased for both groups (Figures 19 & 20).

On the fourth observation when the experimental group had returned from Antarctica to Sydney the HSCL total distress scores decreased by comparison with the third observation. The control group's HSCL total distress scores rose slightly at this time and at that stage their scores were higher on all of the HSCL subscales (Figures 10 to 16). SACL stress increased for both groups while arousal scores remained at previous levels (Figures 17 & 18). MPF reaction times decreased for both groups and SC accuracy decreased slightly (Figures 19 & 20).

TABLE 24

Summary of All Anova Results between Stress Measures and Across Groups and Observations

Measures	F Values		
	Group*	Observation**	Group X *** Observation
Hopkins Symptom Checklist			
Total Distress Score	0.03	1.70	0.63
Somatization	0.14	1.08	0.84
Obsessive-compulsive	0.09	1.93	0.35
Interpersonal sensitivity	0.16	1.74	0.39
Depression	0.05	0.45	0.68
Anxiety	0.04	1.05	0.84
Preoccupation	0.03	0.66	0.36
Stress Arousal Checklist			
Stress	0.31	0.90	0.61
Arousal	0.86	2.91	2.53
Mental Paper Folding			
Reaction Times	3.09	3.69	0.92
Series Completion			
Number Correct	0.03	1.09	0.10

Note: all F values were non significant. * df=1, ** df=3, *** df=11. The cluster `Preoccupation' was suggested by Taylor and Frazer (1981).

Figure 10: HSCL Total Distress Scores for Experimental and Control Groups for all Observations

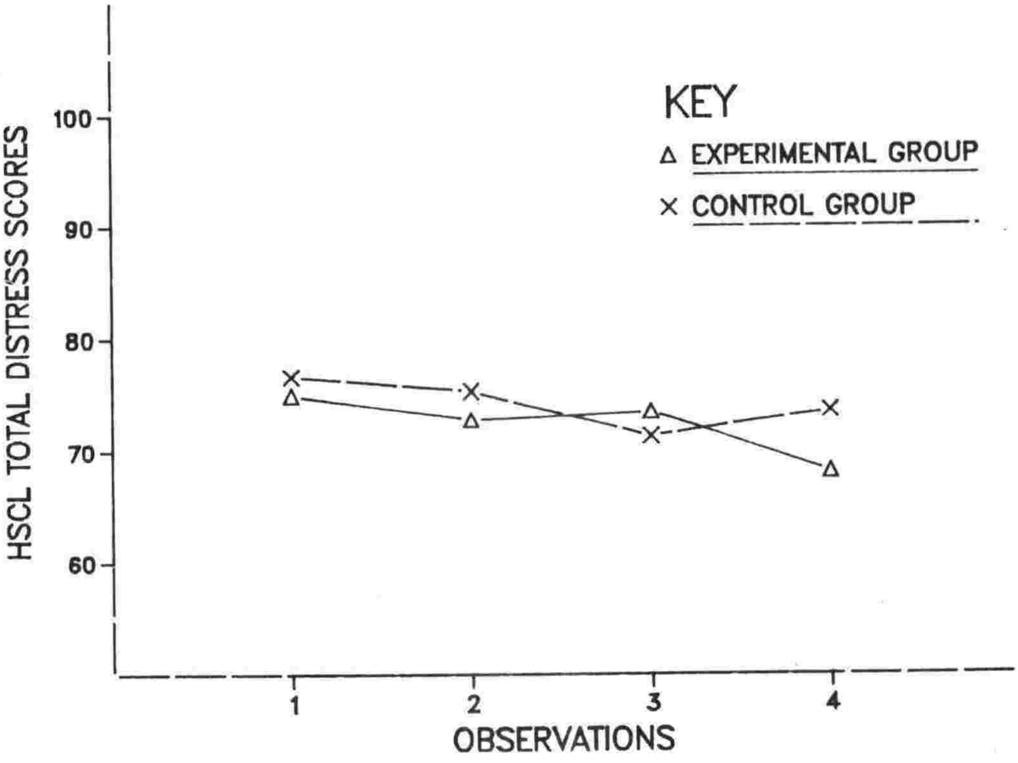
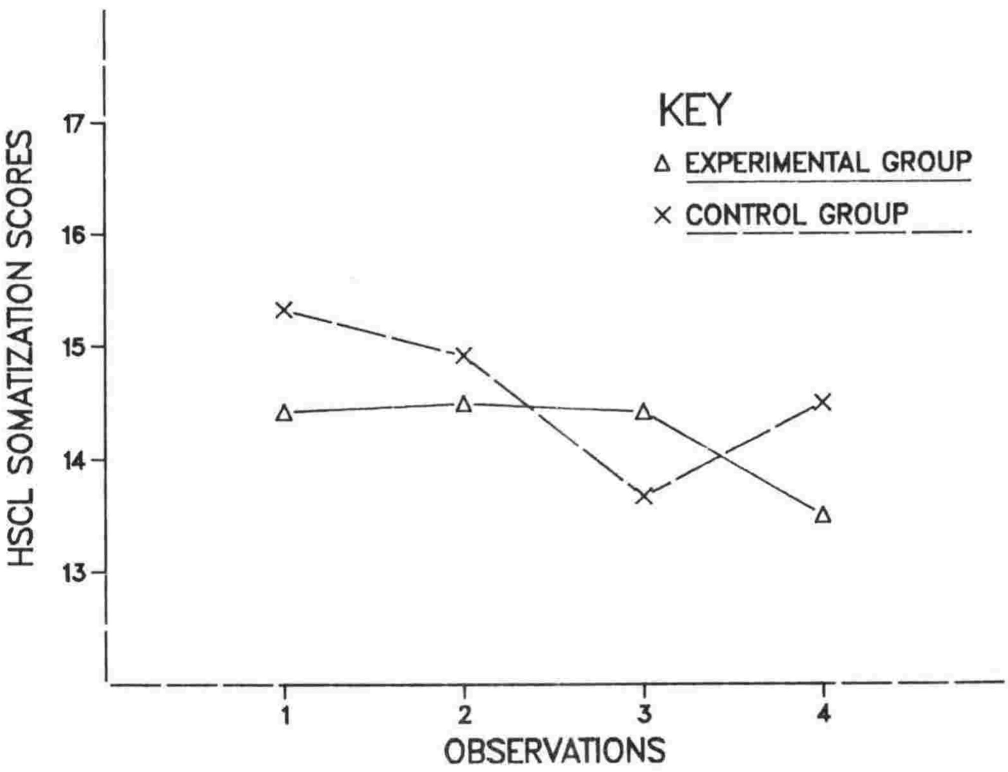

KEY
△ EXPERIMENTAL GROUP
× CONTROL GROUP
HSCL TOTAL DISTRESS SCORES
100
90
80
70
60
1
2
3
4
OBSERVATIONS

Figure 11: HSCL Somatization Scores for Experimental and Control Groups for all Observations

Figure 12: HSCL Obsessive-Compulsive Scores for Experimental and Control Groups for all Observations


KEY
Δ EXPERIMENTAL GROUP
× CONTROL GROUP
HSCL SOMATIZATION SCORES
17
16
15
14
13
1
2
3
4
OBSERVATIONS

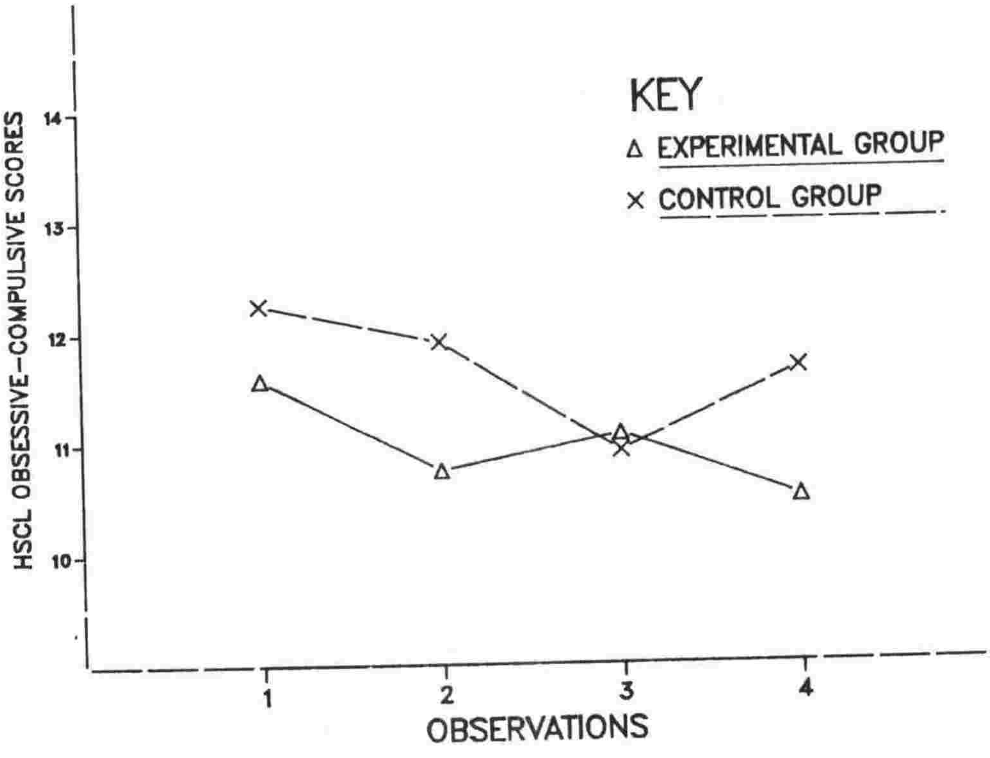
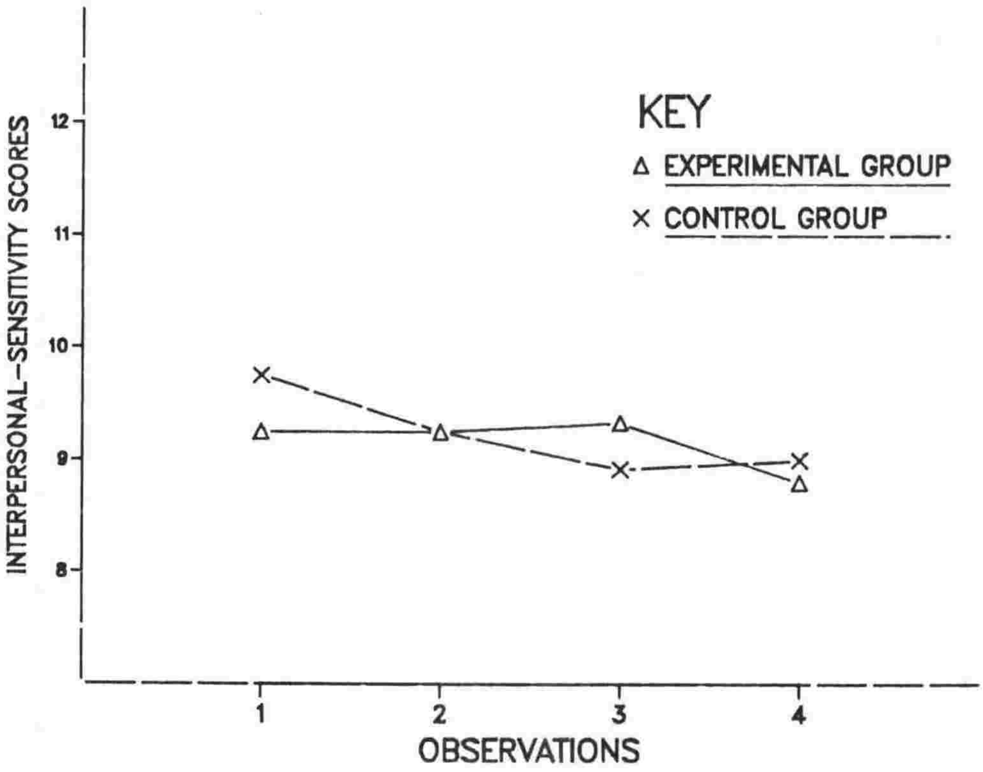

KEY
Δ EXPERIMENTAL GROUP
× CONTROL GROUP
HSCL OBSESSIVE-COMPULSIVE SCORES
14
13
12
11
10
1
2
3
4
OBSERVATIONS

Figure 13: HSCL Interpersonal Sensitivity Scores for Experimental and Control Groups for all Observations

Figure 14: HSCL Depression Scores for Experimental and Control Groups for all Observations


KEY
EXPERIMENTAL GROUP
CONTROL GROUP
INTERPERSONAL-SENSITIVITY SCORES
12
11
10
9
8
1
2
3
4
OBSERVATIONS

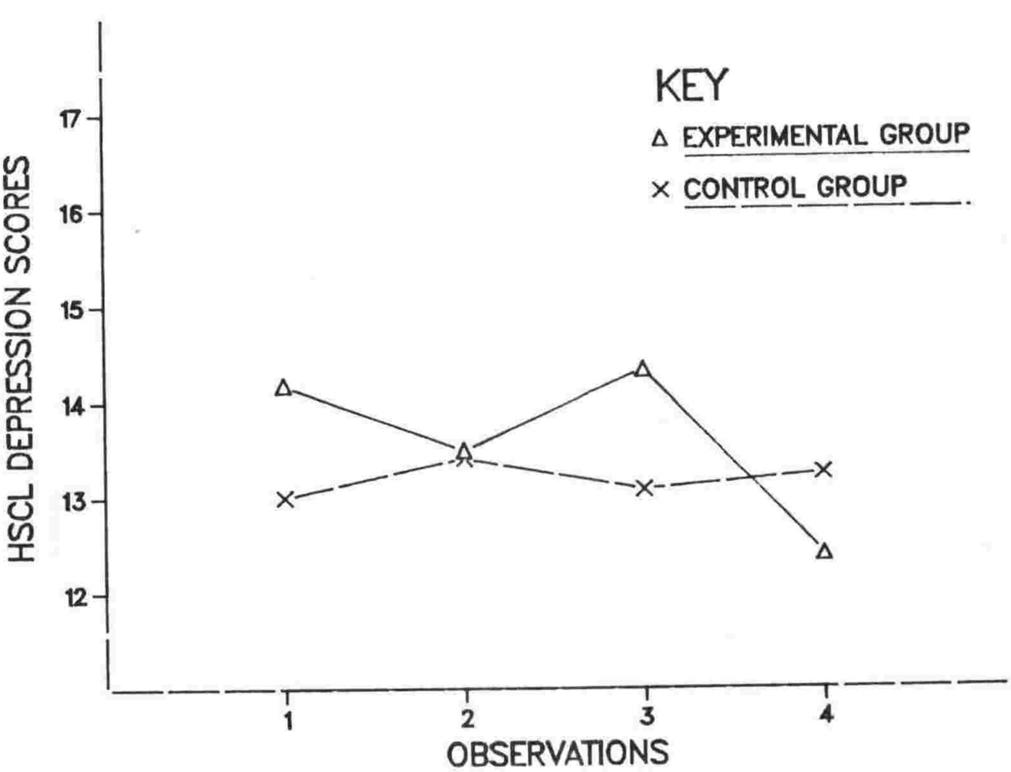
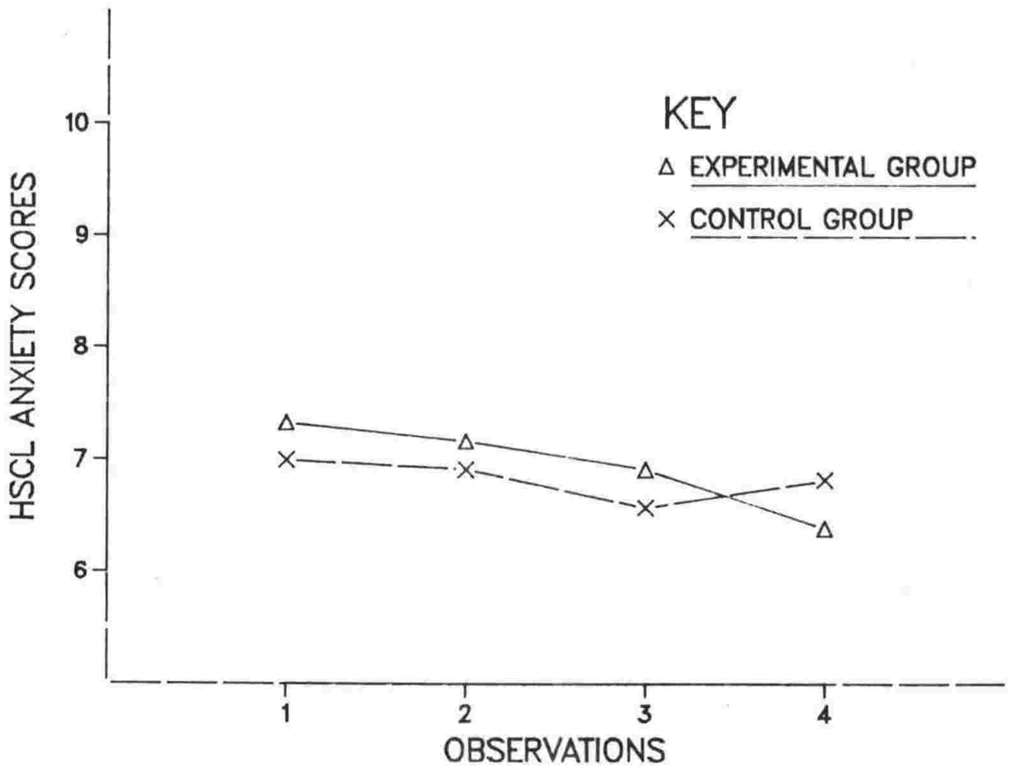

KEY
EXPERIMENTAL GROUP
CONTROL GROUP
HSCL DEPRESSION SCORES
17
16
15
14
13
12
1
2
3
4
OBSERVATIONS

Figure 15: HSCL Anxiety Scores for Experimental and Control Groups for all Observations

Figure 16: HSCL Preoccupation Scores for Experimental and Control Groups for all Observations


KEY
Δ EXPERIMENTAL GROUP
× CONTROL GROUP
HSCL ANXIETY SCORES
10
9
8
7
6
1
2
3
4
OBSERVATIONS

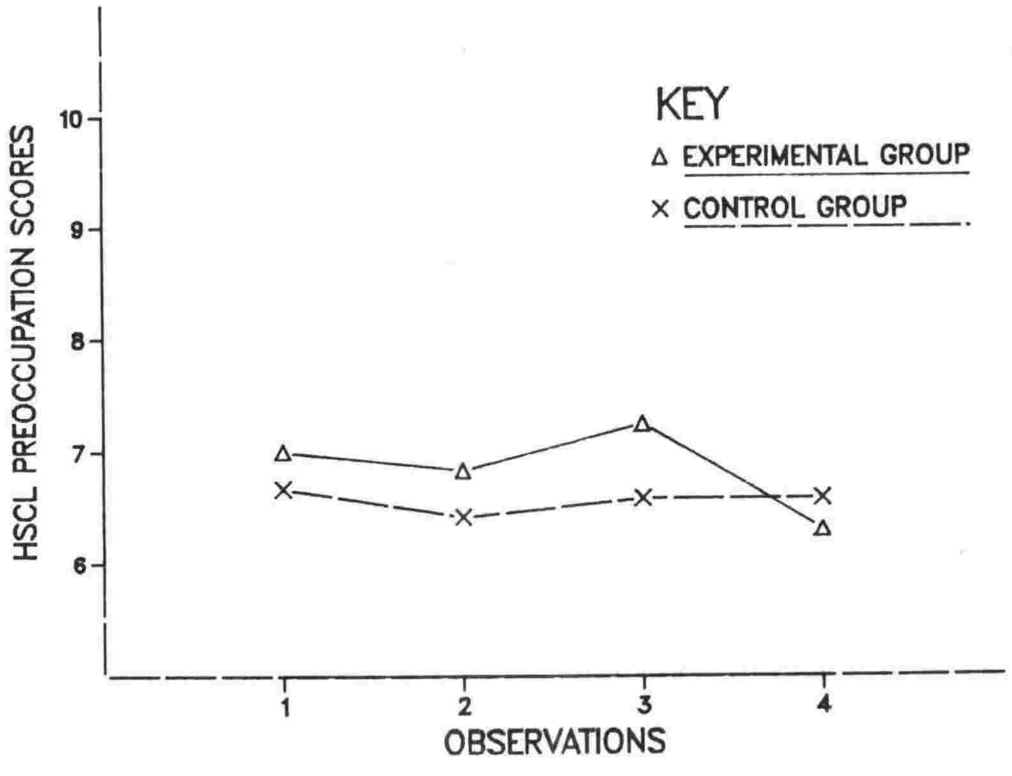
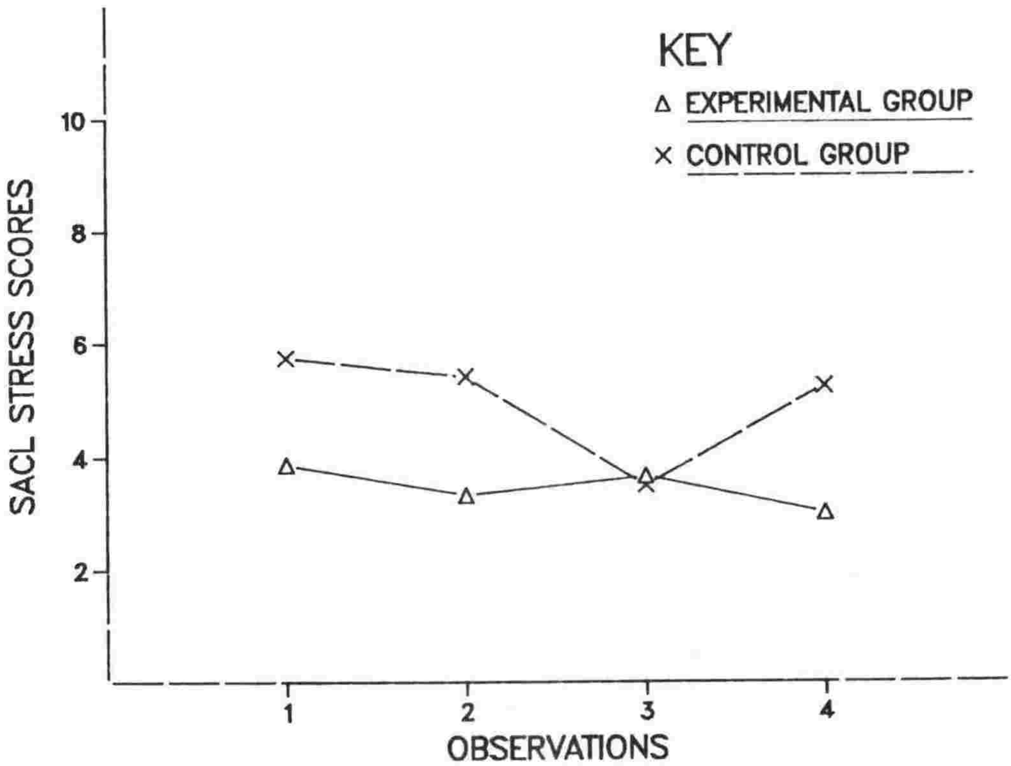

KEY
Δ EXPERIMENTAL GROUP
× CONTROL GROUP
HSCL PREOCCUPATION SCORES
10
9
8
7
6
1
2
3
4
OBSERVATIONS

Figure 17: SACL Stress Scores for Experimental and Control Groups for all Observations

Figure 18: SACL Arousal Scores for Experimental and Control Groups for all Observations


KEY
△ EXPERIMENTAL GROUP
× CONTROL GROUP
SACL STRESS SCORES
10
8
6
4
2
1
2
3
4
OBSERVATIONS

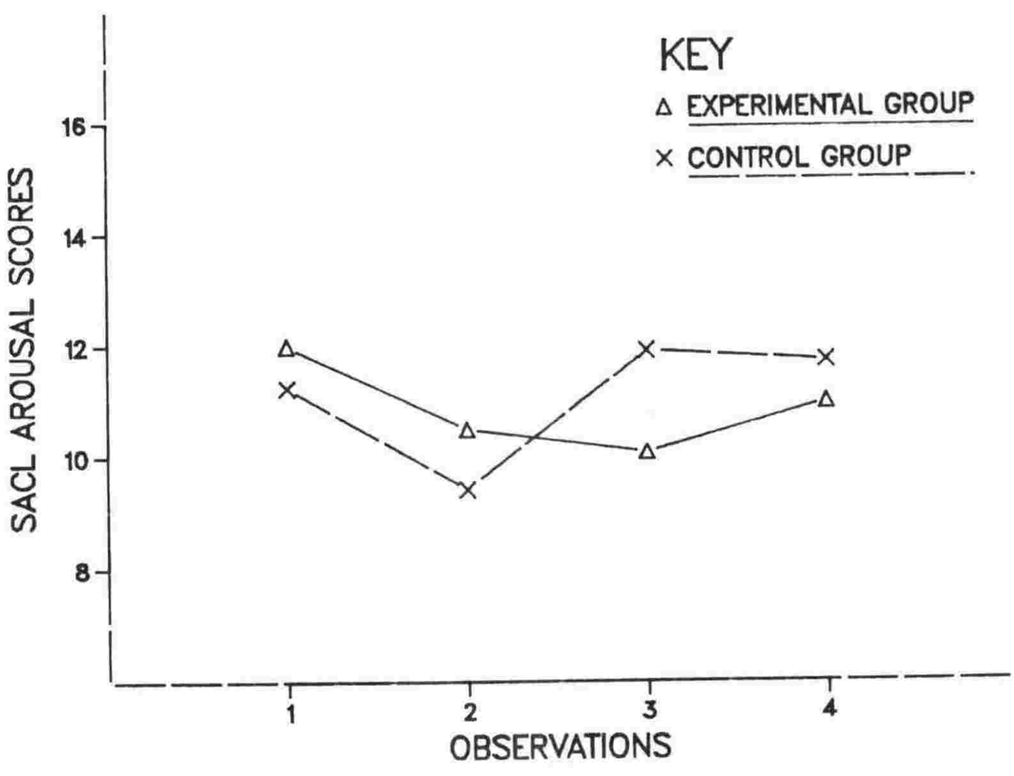
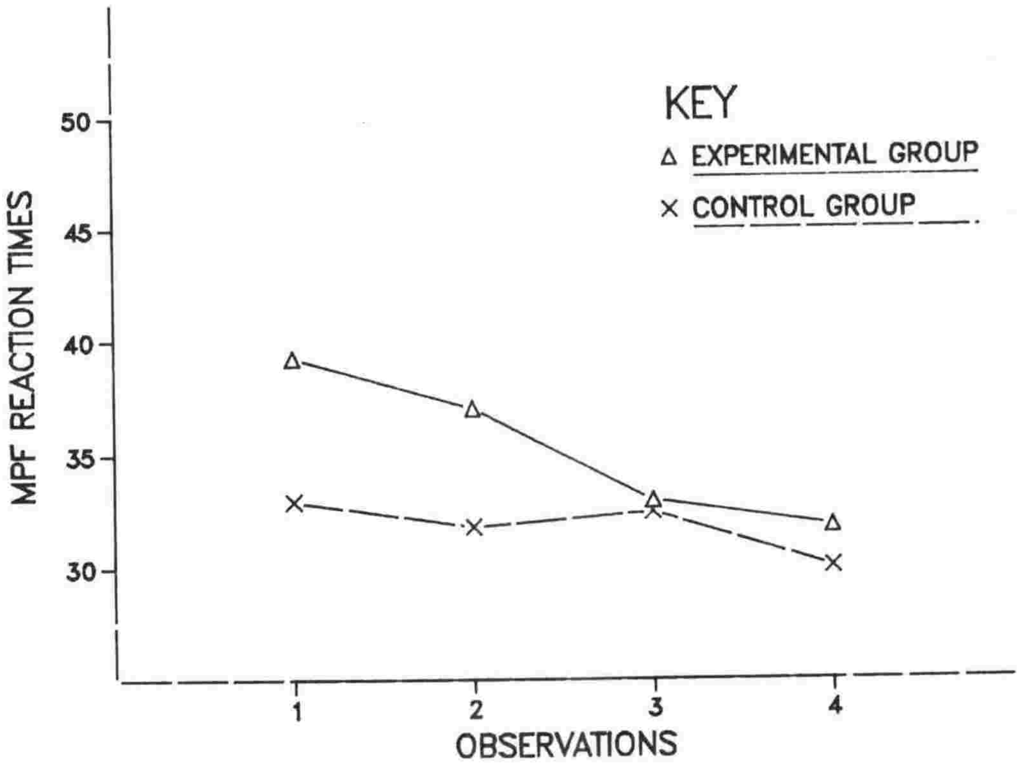

KEY
△ EXPERIMENTAL GROUP
× CONTROL GROUP
SACL AROUSAL SCORES
16
14
12
10
8
1
2
3
4
OBSERVATIONS

Figure 19: MPF Reaction Times for Experimental and Control Groups for all Observations

Figure 20: SC Correct Responses for Experimental and Control Groups for all Observations


KEY
△ EXPERIMENTAL GROUP
× CONTROL GROUP
MPF REACTION TIMES
50
45
40
35
30
1
2
3
4
OBSERVATIONS

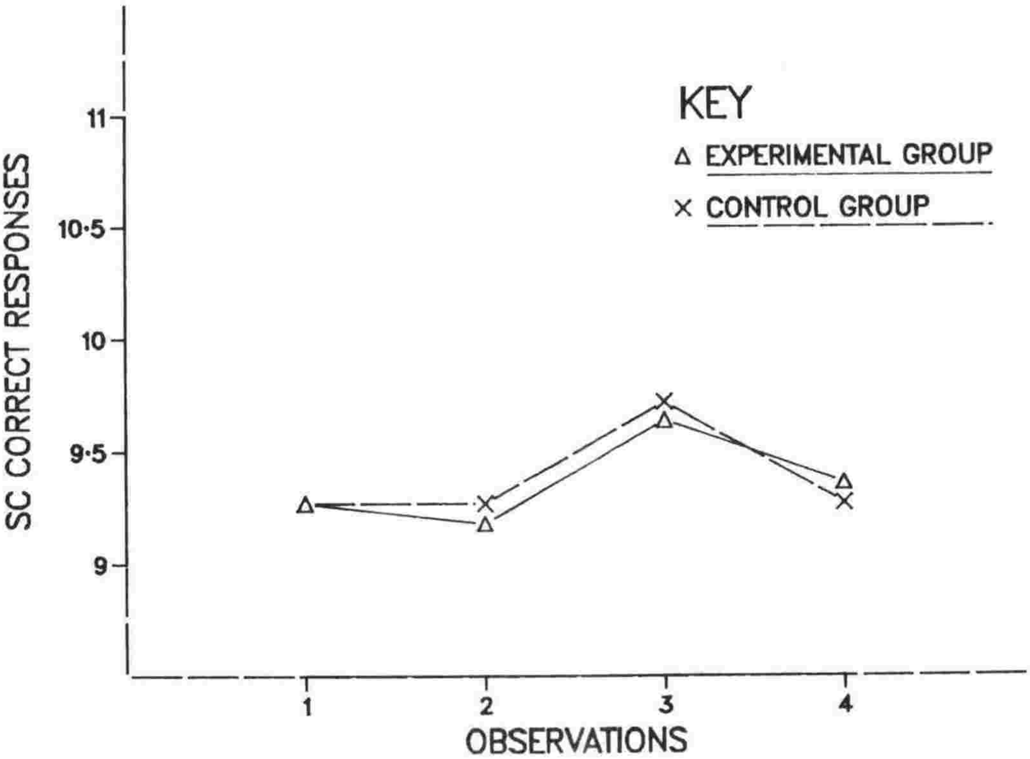

KEY
△ EXPERIMENTAL GROUP
× CONTROL GROUP
SC CORRECT RESPONSES
11
10·5
10
9·5
9
1
2
3
4
OBSERVATIONS

TABLE 25

Means and Standard Deviations of Stress Measures for Observation 1

Measures	Experimental		Control	
	Mean	SD	Mean	SD
Hopkins Symptom Checklist				
Total Distress Score	74.08	16.61	76.67	15.34
Somatization	14.42	2.61	15.33	5.25
Obsessive-compulsive	11.58	3.82	12.25	5.06
Interpersonal sensitivity	9.25	2.34	9.75	2.26
Depression	14.17	2.92	13.00	2.52
Anxiety	7.33	1.78	7.00	1.13
Preoccupation	7.00	1.60	6.67	1.72
Stress Arousal Checklist				
Stress	3.67	4.31	5.75	4.22
Arousal	12.00	4.16	11.25	2.14
Mental Paper Folding				
Reaction Times	39.24	10.05	32.96	7.25
Series Completion				
Number Correct	9.27	0.79	9.27	1.10

TABLE 26

Means and Standard Deviations of Stress Measures for Observation 2

Measures	Experimental		Control	
	Mean	SD	Mean	SD
Hopkins Symptom Checklist				
Total Distress Score	72.82	17.95	75.42	13.01
Somatization	14.50	2.81	14.92	2.50
Obsessive-compulsive	10.75	3.47	11.92	3.50
Interpersonal sensitivity	9.25	1.91	9.25	2.05
Depression	13.50	4.10	13.42	2.39
Anxiety	7.17	1.85	6.92	1.31
Preoccupation	6.83	2.76	6.42	1.78
Stress Arousal Checklist				
Stress	3.33	4.81	5.42	5.30
Arousal	10.50	4.91	9.42	2.97
Mental Paper Folding				
Reaction Times	37.02	11.41	31.81	9.97
Series Completion				
Number Correct	9.18	0.98	9.27	0.65

TABLE 27

Means and Standard Deviations of Stress Measures for Observation 3

Measures	Experimental		Control	
	Mean	SD	Mean	SD
Hopkins Symptom Checklist				
Total Distress Score	73.58	15.52	71.33	12.77
Somatization	14.42	3.03	13.67	1.83
Obsessive-compulsive	11.08	3.12	10.92	3.92
Interpersonal sensitivity	9.33	2.19	8.92	2.11
Depression	14.33	4.94	13.08	2.50
Anxiety	6.92	1.24	6.58	1.17
Preoccupation	7.25	2.73	6.58	1.88
Stress Arousal Checklist				
Stress	3.67	5.18	3.50	3.06
Arousal	10.08	4.50	11.92	1.83
Mental Paper Folding				
Reaction Times	32.97	7.22	32.45	10.30
Series Completion				
Number Correct	9.64	0.92	9.72	0.47

TABLE 28

Means and Standard Deviations of Stress Measures for Observation 4

Measures	Experimental		Control	
	Mean	SD	Mean	SD
Hopkins Symptom Checklist				
Total Distress Score	68.20	9.81	73.67	13.23
Somatization	13.50	1.51	14.50	2.94
Obsessive-compulsive	10.50	2.95	11.67	4.48
Interpersonal sensitivity	8.80	1.48	9.00	2.09
Depression	12.40	1.90	13.25	2.09
Anxiety	6.40	0.70	6.83	0.94
Preoccupation	6.30	1.06	6.58	1.44
Stress Arousal Checklist				
Stress	2.90	2.64	5.25	4.69
Arousal	11.00	4.24	11.75	2.42
Mental Paper Folding				
Reaction Times	31.82	9.97	29.94	8.54
Series Completion				
Number Correct	9.36	0.92	9.27	1.10

Discussion

The results indicated that there were no significant differences between the experimental and control groups on any of the 11 measures that were employed in the present study. It was therefore important to establish the level or degree of stress experienced by each of the groups. From a closer examination of the group mean scores on the HSCL subscales and full scale it was found that neither the IBEA nor the control group was under stress as compared with a normal sample (McCormick, Taylor, Siegert & Welch, in process).

Conclusion

The standard deviations of group scores presented in Tables 25 to 28 indicated that a highly variable pattern of responses was in evidence over the four observation periods. Generally the psychometric results indicated that the experimental subjects coped well during the expedition although there were some notable exceptions to this with one expeditioner returning home after only one third of the Antarctic traverse. The topic of coping style will be examined in the next chapter while a descriptive account of the conflicts involved in the laboratory and field phases are examined in Chapter XI.

CHAPTER IX - COPING DURING IBEA

The Antarctic continent is reputed to have the worst weather in the world and to undertake a long overland traverse using open vehicles, living in tents, and consuming unvaried rations, must by any criterion, e considered extremely stressful. Fuller descriptive details of the environmental constraints experienced during IBEA are given in Chapter XI. Yet despite these conditions there was no evidence of maladaptive stress over a wide range of measures (Chapter VIII). This chapter therefore examines the possible use of coping techniques by the IBEA members, that might help to explain the low stress levels.

Coping has been defined as a response to external strains that serves to prevent, avoid or control emotional distress (Pearlin & Schooler, 1978; also see Chapter II). The coping may have physical, psychological or social components but since the present study is concerned primarily with the psychological coping techniques the focus will be upon the defense mechanisms of sensitization and repression. These particular dimensions were selected because of their relevance to the present study and because they were capable of being psychometrically evaluated.

As was outlined in the review of stress and coping studies presented in Chapter II, Byrne (1961) developed a useful Repression Sensitization Scale (RSS) scale for the assessment of these dimensions. Byrne (1961) has suggested that individuals are to be found at each end of the repression sensitization continuum and that their reactions to stressors are unproductive but quite different in style. Those scoring low on the RSS, the "repressors", tend to deny the harmful aspects of any stressor and the "sensitizers", who score high on the measure, tend to accentuate them. Between these two extremes are those who would assess any threats more realistically. The repression items of the RSS were later found to correlate highly with measures of social desirability and symptom denial (Krohne, 1978), while the sensitization items were found to correlate with measures of trait anxiety (Golin, Heron, Lakota & Reineck, 1967). Another study also found differences between the two types of emotional expressiveness with repressors reporting less emotion than sensitizers (Lueger & Evans, 1981).

In the present study a multimethod multitrait matrix (Campbell & Fiske, 1959) was used to evaluate the measure against the K scale of the MMPI, and the Taylor Manifest Anxiety Scale (MAS). The multimethod multitrait method consists of a matrix of intercorrelations among several traits each measured by different methods. Evidence of convergent validity is indicated by high correlations between different methods measuring the same trait. By contrast, discriminant validity requires that different traits measured either by the same or different methods should not correlate significantly or should correlate negatively. The K scale was chosen for use in the present study because it is a measure of test-taking attitude with items relating to personal defensiveness, defects and troubles while the MAS (Taylor, 1953) was chosen because it is a well established measure and sensitive measure of anxiety.

The present chapter therefore involved a multimethod multitrait evaluation of the RSS against the K scale and the MAS in order to establish the utility of the former. In addition correlations between the individual RSS scores and HSCL, SACL, MPF, SC and AQ scores were calculated in order to establish the relationship between coping style and stress.

Method

Subjects

The same 12 experimental subjects that have been described in full in Chapter VIII were involved in the present chapter.

Tests and Administrations

The MMPI from which items for the RSS, K scale and MAS measures were taken, was administered at the first testing period (observation 1). The HSCL, SACL and information processing tests (MPF & SC) together with the self report and observer Adaptability Questionnaires (AQ) were completed four times.

Analysis

A multimethod multitrait analysis was conducted with the measures designed to evaluate defenses and coping i.e. the RSS, K scale and the MAS.

Correlations between stress measures and the RSS were then calculated to test the hypothesis that self reported stress would be higher for sensitizers than repressors. For the purposes of this evaluation the HSCL, SACL, MPF, SC, and AQ results were summed across observations to give total score per subject.

Scores on the RSS were also compared with the norms given by Byrne (1961) so that the coping styles of IBEA subjects could be compared with those of the normative sample.

Results

The multimethod multitrait matrix indicated that there was a high positive correlation between the RSS and the MAS, as well as a high negative correlation between the RSS and both the K scale and the MAS (Table 29). These findings confirm both the convergent and discriminant validity of the RSS, i.e. that repression correlated positively with measures of defensiveness and negatively with trait anxiety.

While there were overlapping items between these MMPI derived scales that may artifically elevate correlations, Bryne (1961) demonstrated that the removal of these items caused only a small decrease in correlation coefficients and confirmed the utility of the present procedure.

The relationship between sensitization, repression and stress is given in Table 30 and indicates that there was a high positive correlation between the RSS and both HSCL and SACL stress scales. The results suggest that increasing sensitization was correlated with increasing stress, and conversly increasing repression was correlated with decreasing stress.

The correlation between the SACL arousal scale and the RSS was strongly negative. There were however no significant correlations between the MPF or SC tests and the RSS. On the other hand there was a significant negative correlation between self reported adaptability and the RSS and this result was higher than the correlation between the RSS and the observer's ratings on the Adaptability Questionnaire ($\underline{r}$ = -.63 cf -.47).

Of particular interest was the finding that the sum of the observer's ratings on the AQ for the highest repressor was lower than the sum of the ratings that the subject assigned to himself (observer's rating = 134 cf self report rating = 212). Conversely the observer rated the two subjects who scored nearest the sensitization end of the scale as more well adapted than they had rated themselves (145 cf 141). Unfortunately the sample size was too small to provide a statistical evaluation of such ratings but the results suggest that the repressors overestimated their adapability while the others underestimated theirs.

According to the normative data and cut off points developed by Byrne (1961) seven of the 12 subjects scored sufficently low on the RSS to be described as repressors and five subjects scored within the normal range. It was of interest that none scored sufficently highly to be regarded as sensitizers except that two of the subjects in the normal range were within the top 35% of the normative sample, indicating that they tended towards sensitization.

TABLE 29

Correlations between Defense and Anxiety Measures and the RSS

Measures	Measures		
	MAS	K	RSS
MAS	1.00	-.62*	.78**
K		1.00	-.79**
RSS			1.00

** p<.01 * p<.05

TABLE 30

Correlations Between the HSCL, SACL, MPF, SC, and the RSS

Measures	RSS
HSCL Stress	.57**
SACL Stress	.66*
SACL Arousal	-.78**
MPF Completion Time	-.29
SC Correct Responses	.28
Self report Adaptability	-.63*
Observers ratings of Adaptability	-.47

* p<.05   ** p<.01

Discussion

The high postive correlations found between identical traits measured by different tests, and the high negative correlations found between contrasting traits measured by the same tests, suggested that the RSS had good convergent and discriminant validity.

Of interest in the present study was the finding that higher sensitization scores correlated with higher self reported stress, and conversely that higher repression scores correlated with lower self reported stress. Both findings provide support for the conceptualization of Byrne (1961) that repressors deny stress symptoms and therefore fail to report them, while others have more accurate evaluations and report higher levels of stress. The results therefore suggest that some degree of repression was adopted frequently for coping both with the arduous laboratory experiments and the long polar traverse where hardship, discomfort and threat were ever present. The utility of repression as a defense mechanism for coping with Antarctic conditions had been suggested by Gunderson and Nelson (1964) but had not been evaluated further. This style of coping could explain the overall low levels of stress reported in the previous chapter.

While in general the repressors reported lower levels of stress and better adaption than the normals, the finding was not entirely consistent. For example, one expedition member with a high repression score described himself as adapting well but the observer regarded him as a poor performer while others (who themselves were higher on sensitization) criticised the same person for being careless in exposing himself to unnecessary cold injury in the extremely harsh Antarctic environment. As Krohne (1978) suggested, high repression can lead to maladaptive behaviour due to an underestimation of environmental hazards.

Conclusion

The RSS has been shown to be psychometrically sound and the repression sensitization concept of defense has proved to be helpful in explaining the low levels of stress reported in the IBEA. Those with scores in the normal range were found to experience greater levels of stress as well as lower levels of arousal and self reported adaption than the repressors. Conversly, the latter reported lower levels of stress, higher arousal and better adaptation. However the participant observer found that the normals were better adapted than they reported themselves to be and conversely that the repressors were less well adapted.

Questions arise about the optimal levels of repression sensitization that would be necessary and appropriate for the attainment of goals for individuals and groups who work in stressful environments but they are beyond the scope of the present study. The next topic to be considered in the present study is the prediction of stress and arousal from the range of biographic, clinical and psychometric measures that were obtained.

CHAPTER X - THE PREDICTION OF PERFORMANCE DURING IBEA

The two preceding chapters examined the levels of stress and coping during IBEA and the present chapter will examine the extent to which the psychological assessments undertaken at the beginning of the expedition could be used to predict performance during the subsequent phases.

Psychological studies on the prediction of Antarctic performance have been undertaken since the International Geophysical Year (IGY) of 1958-1959 (Weybrew, Molish & Youniss, 1961; Nelson, Gunderson & Ryman, 1969; Taylor, 1978). The studies have employed three groups of predictor variables :

1. biographic data
2. clinical ratings
3. psychometric data.

The outcome of these studies has been detailed in Chapter I and in summary it can be said that a large number of variables including examples from all three groupings above have mild predictive capability with respect to the prediction of Antarctic performance but few have proved to be sufficently robust for adoption on a routine basis.

In the present study biographic data, clinical ratings and psychometric tests were used to predict Antarctic performance. The specific predictor variables were as follows:

1. biographic variables: a limited number of biographic predictors were utilised in the present study because the group was homogeneous with respect to a large number of background variables i.e. the subjects were all male, all married (legal or common law), highly educated, and all employed at Universities or other professional or research organisations, consequently the predictors used were: polar experience, age, and number of research projects for which the individual was responsible
2. clinical predictors: predictions of the HSCL, SACL and AQ scores (Appendix A), of Rater 1 (Professor of Clinical Psychology and principal thesis supervisor) made from interviews as well as from standard Rorschach, MMPI, TAT and Rosensweig tests, and predictions from Raters 2 and 3 (both experienced and senior clinicians) were based on test results alone
3. psychometric measures: Hopkins Symptom Checklist (HSCL)(Derogatis, Lipman, Covi & Rickels, 1974) and Stress Arousal Checklist (SACL) (Mackay, Cox, Burrows & Lazzerini, 1978) to provide symptom and affective dimensions, Weschler Adult Intelligence Scale (WAIS) (Weschler, 1958), the Video Interpersonal Distance Scale (IPD) (Walkey & Gilmour, 1979) and the Recent Life Changes Questionnaire (RLC) (adapted from Holmes & Rahe 1967), to provide indications of problem solving ability, preferred interpersonal distance, and recent life changes.

Method

Details of the administration of measures together with a description of the subjects involved have been given in earlier chapters.

Assessments

The principal thesis supervisor (Rater 1) conducted a comprehensive psychological interview with each subject during Phase I and also administered the MMPI, TAT, Rorschach, IPD, WAIS, and a Biographical Questionnaire. The author administered the HSCL, SACL and the AQ to all subjects on all four observation periods and the sum of scores for last three observations on these measures provided the criterion against which predictors were evaluated.

Analysis

Spearman correlations were calculated between the prediction measures taken at Phase I and the criterion measures taken later during Phases II and III.

Results

Of the biographic variables polar or related experience proved to be a good predictor of performance on IBEA and predicted to a significant degree low HSCL and SACL stress and high SACL arousal, and high self reported adaptability (Table 31). Age was negatively correlated to a significant degree with low stress and high self reported adaption. The number of projects in which a subject was personally involved in did not correlate significantly with any of the criterion variables (Table 31).

The inter-rater reliability for clinical judgements was generally low, with a mean correlation coefficient of .32 and a range of from -.01 to .79. Taken separately the clinical predictions of Rater 1 who had access to both interview findings as well as test materials were better than for Raters 2 & 3 who only had the test material (mean correlations .42 cf .29). Rater 1 and 2 were best able to predict the Observer's Ratings of the others adaptability as compared to other criterion measures (Table 32).

Of the psychometric variables, high initial stress scores on the HSCL correlated significantly with later HSCL and SACL arousal scores, but not the later SACL stress scores. Likewise the initial SACL stress scores predicted later HSCL and SACL arousal scores but not the later SACL stress scores. The SACL arousal scores predicted the later HSCL scores and self reported adaptation scores but they did not predict other criterion scores. The IPD correlated only with the Observer's rating of Adaptability, and the WAIS IQ and RLC measures did not correlate significantly with any of the later criterion scores (Table 33).

TABLE 31

Spearman Correlations between Biographic Predictors and Criterion Scores

Predictors (taken during Phase 1)	Criterion Scores (taken during Phases 2 & 3)				
Biographic Predictors	HSCL Stress	SACL Stress	SACL Arousal	Adaptation Observer's Ratings	Adaptation Self Report
Polar Experience	-.72**	-.70**	.52*	.42	.48
Age	-.23	-.62*	.21	-.26	.61*
Number of IBEA projects	.03	.35	-.42	.07	-.43

** p<.01 *p<.05

TABLE 32

Spearman Correlations between Clinical Predictors and Criterion Scores

Predictors (taken during Phase 1)	Criterion Scores (taken during Phases 2 & 3)				
Clinical Predictors	HSCL Stress	SACL Stress	SACL Arousal	Adaptation Observer's Ratings	Adaptation Self Report
Rater 1	.52*	.42	-.16	.75**	-.25
Rater 2	.23	.01	.03	.50*	.23
Rater 3	.32	.56*	.62*	.23	.31

** p<.01 *p<.05

TABLE 33

Spearman Correlations between Psychometric Predictors and Criterion Scores

Predictors (taken during Phase 1)	Criterion Scores (taken during Phases 2 & 3)				
Psychometric Predictors	HSCL Stress	SACL Stress	SACL Arousal	Adaptation Observer's Ratings	Adaptation Self Report
HSCL Stress	.73**	.44	-.54*	-.29	-.41
SACL Stress	.68**	.26	-.57*	.05	-.10
SACL Arousal	-.60*	-.26	.24	-.06	.50*
IPD	.46	.03	-.24	-.57*	.01
WAIS IQ	-.42	-.49	.44	-.08	.18
RLC	.33	.44	-.28	.26	-.40

** p<.01 *p<.05

Discussion

Of the biographic variables, past polar or related experience was the best predictor of overall performance during IBEA and it correlated significantly with three of the five criterion measures. The finding was in accord with Gunderson and Nelson (1965) and Owen (1975) who found experience a useful predictor, but it contrasted with Smith (1961) who did not.

Age was a moderate predictor of performance, as there was a significant negative correlation with SACL stress scores indicating increasing stress with decreasing age but a significant positive correlation with self-reported adaptability indicating that the older subjects reported better adaptation. The result contrasts with Weybrew et al. (1961) and Owens (1975) who found that younger subjects performed better than older subjects especially on field trips. It was noted that while the injuries during IBEA were largely sustained by the older subjects their significance was obscured because they were given the same weight as other items on the Adaptability Questionnaire.

The reliability of the clinical ratings was as low and confirms the findings of other studies e.g. Gunderson and Nelson (1964) and Gunderson (1965). The predictions improved when interview data was available to the rater and that result confirmed the findings of Gunderson and Kapfer (1966) that judgements based on test data and interviews were better than those based on test data alone. But overall, the predictive value of clinical judgement was of limited value.

Initial HSCL scores correlated highly with later HSCL results and indicated that this measure was a strong predictor. This finding is in accord with Weybrew et al. (1961) and Owens (1975) who found that initial neuroticism scores had good predictive value. Both the inital SACL stress and arousal scores correlated highly with later HSCL scores indicating that this measure also had good predictive ability. None of the other measures used in the present study appeared to be good predictors.

Conclusion

The best predictors of Antarctic performance were past polar experience, followed by age, the HSCL stress and SACL stress and arousal scales and then the clinical ratings that included subject interviews. However future progress in the prediction of Antarctic performance will be limited unless a comprehensive range of measures is taken with a large range of subjects to construct actuarial tables with reference to the different types of Antarctic environment i.e. winter vs summer and field vs station.

CHAPTER XI - A PARTICIPANT OBSERVATION STUDY OF IBEA

A psychometric and clinical evaluation of stress and coping during IBEA was outlined in Chapters VIII to X and by contrast a descriptive account of the expedition will be presented in this chapter. Each of these methods of evaluation assesses different aspects of behaviour although the more objective and independent techniques are less liable to error. The error in subjective methods could be reduced if the observer sampled small time periods and had a clearly defined role. In the present study the observer recorded observations at the end of each day in a diary; his role was defined as that of a participant observer recording group process but not intervening in it thoughout the laboratory and field phases of the expedition.

The IBEA study had taken some five years to organise before the actual experimentation began, and at several points during the planning stages the viability of the project was in doubt. Four of the participants had been involved since the very inception of the project and their dedication was at a peak by the time the twelve field subjects and one examining psychologist gathered with numerous laboratory staff from Australia and France, in Sydney, Australia in late October 1980.

The participants had diverse motives for joining the project, and they ranged from career scientists who had an uncompromising drive to produce "results" that boarded on the obsessional, through to others who were recruited at the last minute as replacements because of unforseen withdrawals and who were motivated solely by the prospect of an exciting trip before them. In between were those who joined to re-experience Antarctic life after a twenty year interval, and others came out of a sense of loyalty to comrades already on the expedition. The subjects also had differing expectations, with some anticipating hardship at the limits of human endurance and others expecting to face only minor difficulties.

The different motives for, and expectations about, the expedition gave rise to tension and divisions within the group from day two of the project when a series of acutely painful subcutaneous injections of mild toxins were administered as part of an immunological project. It had been rumoured that the experiments were likely to be unpleasant and these warnings became reality. The subjects knew from brief protocols about those studies as well as from all the others that had been circulated beforehand that they were to receive four injections but after receiving the first some had doubts that they could withstand the remainder. They described the injections as "like being stabbed with a burning hot needle".

These first painful laboratory experiences set the pattern for the whole of the initial phase of 31 days of pre-Antarctic experiments, and caused a split between those who were conducting the current investigations and those who were subject to them. The split was at times complex because the role of experimenter and subject changed constantly in accord with a research design that required participants to alternate between conducting experiments and being subjects for others' research.

The murmurings of resentment and frustration increased gradually throughout Phase I because of the fatigue that grew during the seemingly endless and unbroken days of investigations. It was made worse for those six subjects who participated in sleep studies and were periodically required to wear a cloth helmet and head electrodes during the hot summer nights. By day five people were out late, eating, drinking and making merry with a healthy but determined sense of escapism which belied the fact that many had to be up about 5.00 a.m. next morning to start blood tests.

The resentment turned to angry protestations after the prolonged cold chamber and noradrenalin experiments and threatened to carry over to the cold bath experiment. In the cold chamber experiment subjects found themselves shivering for several hours in a refrigerated room with hands and feet turning blue and numb while welts developed on their backs from the string mesh of beds on which they lay. Four subjects complained of feeling dehumanised and degraded when they were covered with a multitude of external and internal probes, but others who were reasonably familiar with the routine had no such fears. The adverse reaction engendered by the cold chamber experiment was however of little consequence as compared to that which followed the noradrenaline experiment. Of the first four subjects to undertake this experiment, one left with seven punctures in his arm from unsuccessful attempts to insert a canular through which noradrenalin would have been infused. His worry was that were he to sustain any nerve damage in the arm from the experiment he might not have been able to continue his professional career as a surgeon. The second person emerged from the laboratory with wild staring eyes and later he admitted with some disquiet that he had cried from the physical pain during the experiment. He was astonished to realise that his tears had gone either unnoticed or unmentioned by the experimenters. The third person went into shock during the infusion of noradrenaline and had to be withdrawn from the experiment. The fourth subject on the same day finished the experiment at 10 p.m., and emerged white faced and very drawn.

These matters were discussed in a meeting next day that was initiated by the examining psychologist because of the mounting tension and concern about group cohesion. Already the group was split four ways: those who had just undergone the experiment and wanted to express their feelings, those who were conducting the experiment and wanted to placate and reassure everyone about the safety of their procedures, those who wanted to discuss the whole topic of setting the limits of experimentation, and finally those who had not up to that point been involved in this sequence of laboratory procedures and who seemed rather amazed by the intensity of the feelings that the others had expressed. Overall the range of reactions was sharply contrasted, with some regarding the cold chamber and noradrenaline experiments as quite outrageous and others who considered it such a privilege to be involved in the study that they felt obliged to tolerate whatever level of suffering was involved in the experiments.

The various points of view were expressed at the special meeting, but without resolution. Discussions continued for a long time afterwards in small informal groups that met spontaneously in the times between many of the experimental investigations. The anger and resentment expressed did not diminish and so apprehensions were not reduced for other experiments that were to come. For example some were anxious about the cold bath experiment which involved full body immersion in water of 15 degrees Centigrade for one hour, especially for the six subjects who were to be "artificially acclimitized" by taking one such bath per day for ten days. Their fears were not reduced when they heard the physiologists disagree about the most suitable way to rewarm subjects after the cold baths, particularly if they had reached the critical stage of clinical hypothermia with a core temperature as low as 35 degrees Centigrade. Fortunately when the actual cold bath studies began they were conducted in such a friendly, warm and considerate atmosphere that the fears were dispelled and few difficulties were encountered.

The protests and complaints led some of the experimenters to modify those procedures that had come under the strongest criticism; for example the examining psychologist reduced the duration of the group dynamics session by one hour and some of the physiologists resolved to put subjects under less pressure to go to extreme limits in some of their experiments. All experimenters gave more explanation about the rationale of their studies and they gave more information about the conditions subjects might expect to find in them. The modifications and information were appreciated by many but two subjects were convinced that "soft sell" techniques were being used by the experimenters to ensure the continued extraction of "data" from subjects.

The group became even more highly fragmented as time passed, a process aggravated because the subjects were not all living in the same motel and group cohesion was less well developed than it might have been. There was also resentment over the degree of sponsorship for watches and additional clothing that one national group had achieved for themselves prior to Phase I. The resentment was somewhat eased when the expedition leader was able to arrange for all the remaining expedition members to receive complimentary digital watches. However it was not generally known until the Antarctic phase that additional clothing had been obtained by four subjects and at that time it was too late to either prohibit its use or to obtain a supply sufficient for everyone. There was also resentment because in a research enterprise in which all subjects were ostensibly to be treated the same, four were able to have their wives with them in Sydney during Phase I and III and the others were not.

The most unpleasant of the laboratory investigations had been completed by the time the group was two thirds of the way through Phase I and the subjects were more confident of either being able to cope or if necessary to exercise their right to refuse to participate in any subsequent experiment. For the final 10 days all subjects had reached a stage of profound fatigue but they keep on going. Pressure was brought to bear on two subjects to ensure that they would turn up to experiments on time but generally things ran smoothly. During that period the intense introspection of the group turned outward toward the prospect of the Antarctic traverse. There was speculation about what would happen "on the ice" and everyone was intent upon seeing that their personal and scientific equipment was properly packed and ready in time for transportation. Underneath however, the group was still highly divided and resentful because of the unreasonable demands of some experimenters. The effects of separation from home and family began to take its toll and this was to increase dramatically when Antarctica was reached.

The complete group lived together for the first time on the ship 'Thala Dan' on the 10 day voyage from Hobart for Terre Adelie Land and with the input of fresh daily experiences during this time the conflicts of Phase I seemed to fade. The forced activities of Phase I gave way to forced inactivity on the ship and with about a third of the expedition seasick there was little energy in the group. The focal point during these days became the three big meals, two of which were served with wine. As the ship got further south the group turned outward even more as the first icebergs appeared on the radar and on the horizon, and the first whales and penguins were sighted. The earlier disputes seemed trivial in the presence of the awesome beauty of the Antarctic icecap rising from the pack ice up into the clouds.

On arrival at the French Base, Dumont D'Urville, the subjects were greeted warmly by the staff as heroic fools who were about to expose themselves needlessly to harsh and primitive conditions during the traverse. These comments were received with mild amusement at the time but were to return to mind later when many questioned the conditions and restrictions that they were obliged to live under for seventy consecutive days.

The group was split briefly for logistic reasons when four members were flown inland from the coast to set up camp at a point known as D10 but it was united again four days later in the first camp. At the time there was a general air of excitement and toleration in the group but there were also competing demands for space in the one small heated laboratory caravan.

The early stage ashore was a time of critical preparation for some, while others had little to do but get on with the daily camp chores. Although all the essential experimental equipment had been tested previously some proved to be unreliable and its repair placed extra demands and strains on technical staff.

Throughout the traverse the IBEA party, who lived under spartan conditions, was accompanied by a French Glaciological support party who lived under more comfortable conditions. It had been arranged previously that there would be a minimum of association between the support and research group.

Difficulties arose because some subjects lived in spacious tents that were large enough for three but two pairs each had smaller and older tents that were cramped and uncomfortable, and in which it was very difficult for them to hang damp clothes and bedding up to dry. On several occasions subjects in one of these small tents were either unable or unwilling share the cooking and other chores, and as a consequence one of the pair found himself doing much of the work and feeling generally depressed and exploited by the other. There was little that could be done to improve the situation until the end of each two week period when tent pairs changed according to a prearranged roster.

The experiments at this stage were so different from those in Sydney that most of the subjects took part without complaint. There were small recorders to be carried on a belt, ratings to make of thermal comfort and oxygen consumption masks to put on for a few hours, apart from their daily diaries and other periodic psychological questionnaires to complete. The weather was very good and on some days the group went without shirts and renamed the area the "Antarctic Riviera". The celebrations over Christmas and New Year helped to maintain good morale over this early period, but they stirred up nostalgic memories of friends and families back home.

The group set off on the first part of the actual traverse on New Years Day 1981, leaving D10 for the barren icy wasteland of the Antarctic plateau. Then a new series of problems began. One person sustained a serious back injury and had to spend much the rest of the traverse sleeping in a caravan instead of in his tent. He had to travel in a large closed vehicle with the support and logistics team instead of riding on one of the small open skidoos used by the IBEA group. Two of the French subjects found it difficult not to socialise with their fellow countrymen in the support group and they were resentful when the leader sternly admonished them.

The travel was slow because of delays and equipment breakdowns and as a result the daily destinations were not often reached. As the journey continued inland the temperature often dropped below -20 degrees

Centigrade and with strong winds the chill factor made conditions unpleasant. Some individuals revelled in the adversity while others found the desolate landscape awe inspiring and enjoyed the experience. However for others the harsh conditions were rapidly taking their toll. They disliked camping, found the French Army rations unpalatable, the scenery dull and boring, and every kilometre they travelled inland took them further away from their homes, families and any sense of security. The situation became so bad that on day 20 of the trip the leader reported that one of the party felt unable to continue with the expedition and had to return as soon as possible to Dumont D'Urville. The leader then asked whether anyone else on the expedition felt unable to go on, but all others agreed to continue (although he had his own doubts about a second man). The recommitment to the IBEA programme itself generated an increased energy level in the group but despite this many of the old problems continued. There were disagreements over the distribution of workloads and complaints about the food, equipment and the slow progress of the expedition. The criticisms were so persistent that they greatly irritated those who did not find the conditions so bad. Of interest was the observation that the subjects who complained in this situation were not always the ones who found the Phase 1 experiments distressing.

For safety reasons three logistic personnel returned to Dumont D'Urville with the man who had withdrawn from IBEA and their departure necessitated a substantial reduction of support for the remaining expedition members. As a result of this and the slow progress of travel up to this point plans had to be revised. This was achieved after considerable discussion because two expeditioners saw the aim of the whole project as being to expose people to adverse Antarctic conditions and they advocated maximising the time spent travelling. Others thought they could meet the experimental requirements with less travel and they wanted a minimum of adversity. The advice of the field leader eventually prevailed and the travel time was reduced while the experimental time remained unaltered.

A week later the expedition had reached its turning point at a spot called D59 where a crashed and three quarters buried C130 Hercules aircraft provided the turning point. Once again the group reactions were divergent. Some were anxious that the experimental work would not be completed, one was depressed and simply wanted to get back to civilisation as fast as he possibly could and others found it was a historic moment of exquisite beauty that gave them intense enjoyment and delight.

At about this time the filming of a documentary about the expedition became a matter of conflict. The film maker had selected an articulate English speaker as his main character and as a result others felt that they were being ignored. The reactions presented a dilemma for the film maker who was torn between his professional judgement on the one hand and his dependence on his team mates for their cooperation and support on the other. He eased the situation by broadening the scope of the documentary to include the activities and impressions of other expeditioners.

The weather, which up until this point had been uncharacteristically good, changed and the group experienced more than two weeks of high winds, blown drifting snow and poor visibility. The subjects were becoming tired and relationships with their tent and travelling companions were getting flat.

The original idea of establishing random pairs of tent and travelling companions at regular intervals of 14 days was to control for any prior relationships, to reduce the formation of sub-groups and to foster a balanced group spirit. The changes themselves however required some resilience. For the few days after such a change there was a time of cautious adjustment, followed by a period of discussion and compromise before working out a routine. The personal habits of the men became a matter of importance as some were fastidiously clean and had elaborate rituals for dishwashing and tent organisation while others were careless, untidy and not so careful about cleanliness. If the pair established a routine they grew very close and expressed a mutual desire for long lasting friendship.

The closeness of pairs was a function of the mutual dependence of the subjects on one another to make their lives comfortable and tolerable. Some pairs got on so well that they were sad when the time came for them to change. Once the change had taken place the 'affection' for the old partner usually waned as the new relationship was built up. When a routine could not be worked out there was considerable trouble and on two or three occasions particular individuals approached the leader and asked him for a special change of partner. Great diplomacy was needed on these occasions to find an commonly acceptable solution. It was interesting that the dislikes that started in these situations were often more enduring than the friendships that arose.

By day 50 of the traverse the travel was coming to an end and the sense of fatigue deepened. The feelings were exacerbated by the uneven distribuion of routine work about which those with heavy work loads made few complaints about the uneven distribution because their previous complaints had gone unheeded. The long run of bad weather also caused participants to become dispirited. Many complained of poor sleep and most started to withdraw socially in order to preserve their inner reserves of energy. Morale improved slightly on day 54 when the sea could be seen for the first time for some thirty five days. The next day a helicopter flew in from Dumont D'Urville with the first lot of mail the group had received since begining the traverse and this proved to be a deeply moving time. Those who received news of trouble, illness or injury at home seemed bitterly hurt. Others who received little or no mail, as it later transpired due to a postal strike in their country, thought the worst. Even those that received good news from home suddenly seemed to become aware of the long separation and were saddened. The leader after reading his mail returned to work to sort out food boxes, slipped and ripped a tendon in his leg. Luckily the same helicopter that brought in the mail was able to take him out to the Dumont D'Urville basecamp for treatment. He was back with the expedition on crutches the next day and was even more determined to make his contribution to the team. Although there was some signs of rivalry for leadership during his absence the group rallied around enough to keep the project going as planned. Later there was general agreement that the total restriction on any form of contact from home while on the traverse had been a harsh and unnecessary experimental requirement.

There was then a delay of four days because of bad weather but when conditions improved the party was able to depart from the icecap. The journey back from D10 to Dumont D'Urville by helicopter, a warm shower (the first in fifty days) and steak and chips were all highly acclaimed. However those pleasures were not enough to do more than produce momentary satisfaction. Some of the most bitter and irrational arguments then broke out about the relative contributions of different personnel on the expedition. No resolution was found to the many recriminations that were made. Difficulties were compounded by the failure of some of the microbiological equipment and the subsequent need to repeat these studies.

The four day return voyage by ship from Dumont D'Urville to Hobart was largely uneventful. The subjects were generally quiet, withdrawn and tired. Many slept a great deal of the time and some remained in bed for several days on end and ate very little. This time few displayed obvious signs of sea sickness.

After a short delay in Hobart the group split into three to travel to Sydney, one man returned with his wife who had come to meet him, two went via a stopover in Melbourne and the main body of eight travelled together. The arrival in Sydney was heralded by friends, relatives and the Sydney based personnel including the examining psychologist. Despite the warmth of the welcome the situation was marred by a serious disagreement over the press conference that was held in Sydney airport. The person who arrived back first took advantage of the situation to make the most of his own project with the press and the main party which arrived shortly afterwards were given considerably less attention. The result was that the credit in the subsequent newspaper articles was shared disproportionately and the accounts were distorted.

At this time the change in many people was dramatic not only had the return to Australia lifted their state of depression but many had already begun to deny that there had been difficulties and problems on the ice. The food that had previously been detested by many was now reported to the press as "not being too bad". They minimized some injuries that had been sustained and denied many of the interpersonal hostilites.

Once again as the subjects took part in the follow up experiments the earlier subgroups of experimenters and subjects started to emmerge and with them the old rationalizations and conflicts. In fact the final experiments were not as much of a problem as before but some of the younger people had become very restless and were intolerant of the long hours to be endured in the hot and cold chambers. Meetings were held once again to discuss the limits beyond which people would not tolerate experimental interventions. Homilies were given again about the importance of IBEA and how small our suffering had been compared to those of earlier scientists. The comments were generally regarded as an insult to the group's intelligence. Many subjects were more open in their expression of hositility than they had been previously and withdrew from experiments without concern for the consequences. In one particular experiment the drop out rate was over 50 per cent.

In the final group discussion held shortly before the end of the expedition some of the resentment and even a little praise was expressed in the group. The examining psychologist commented that he was disappointed but not entirely surprised by the high levels of tension and defensiveness that still remained in the group.

After a few more days the subjects dispersed to their homes in Argentina, France, the United Kingdom, and New Zealand to face the daunting task of analysing and documenting the huge pools of data they had gathered in the three phases of the study.

Summary and Conclusion

The International Biomedical Expedition to the Antarctic involved three phases. The first consisted of 31 days of medical, physiological and psychological investigations in Sydney, Australia; the second, a 71 day traverse on the Antarctic plateau that involved living and travelling under primitive conditions; the third consisted of a further 13 days of post-tests in Sydney. Although the overall aims of the expedition were met there were serious disagreements throughout the project and these were aggravated by the highly intensive and sustained nature of the demands made upon participants. Phase I was characterised by conflicts over experiments and although these resulted in some improvements being made in experimental conditions the underlying issues remained unresolved throughout the three phases. Phase II was characterised by difficultes that arose with the harsh and isolated environment as well with the maintenance of interpersonal relationships that would sustain group functioning. The final phase was characterised by the re-emergence of the Phase I problems although in general the subjects responded more assertively at this time to the demands placed upon them. Overall the subjects appeared to find the experience quite stressful and at times very unpleasant.

CHAPTER XII - OVERVIEW AND CONCLUSION

The review of Antarctic studies in Chapter I indicated that Antarctic volunteers are above average in intelligence, stable, controlled and achievement orientated. Those who winter over showed considerable emotional fluctuation but little or no personality change. Their Antarctic performance can most accurately be predicted from biographic variables, while attitude and other questionnaires also made an important contribution. Clinical and peer ratings appeared to contribute least to prediction.

The review of stress and coping studies in Chapter II showed that an interactive model of stress and coping was the most useful. In this model stress is viewed as an imbalance between the perceived demand of a situation and the individual's perceived capacity to fulfill this demand. Coping is the process in which the imbalance is minimised, by behavioural, physiological or psychological means. As a result of the broad range of possible manifestations of stress and coping a wide sampling of response modes is needed to identify them.

The stress responses of a group of Antarctic scientists were compared with a matched control group of researchers in New Zealand (Chapter III). The multivariate nonrandomised matching technique was used to select the control group. It proved to be a practical and useful method of selecting a small number of control subjects on the basis that they were as similar as possible to the Antarctic experimental group on 27 biographic variables and on the basis of independent judgement.

The measures used in the present study and evaluated in Chapters IV to VII were found to be psychometrically adequate. The Hopkins Symptom Checklist had high reliability and internal consistency and four of the five factors were replicable. The Stress Arousal Checklist had a highly robust bipolar factor structure and moderate reliability and internal consistency. The Mental Paper Folding and Series Completion Tests evaluated information processing and produced reaction time and accuracy functions that varied in accordance with expectations and enabled the accurate evaluation of cognitive performance. An evaluation of the responses on the series of rating scales that make up the Adaptability Questionnaire indicated that some leniency errors were present but that the scales were generally free from the other problems frequently associated with rating scales (e.g. halo effects and unreliability).

The evaluation of the above tests indicated that they were all capable of producing interpretable results however there was no evidence of differences in stress responses either between Antarctic and non Antarctic phases or between the experimental (Antarctic) group as compared to the control (non Antarctic) group. This finding was replicated across symptom, affect, amd information processing measures (Chapter VIII).

While the examination of group data did not reveal evidence of stress, there were considerable individual variations in stress responses. When coping style was assessed using the Repression

Sensitization Scale it was concluded that the majority who scored high on repression experienced low stress and conversely those who scored higher on sensitization experienced high stress (Chapter IX). While repression appears to be a useful strategy to cope with the harsh Antarctic environment it was also found that extreme repression led to a possible underestimation of environmental stressors resulting in cold injury.

The results of the prediction of Antarctic performance study (Chapter X) are in accord with previous findings that biographic predictors were of most value, psychometric measures were also useful and clinical assessments were of lesser value. The preparation of actuarial tables and the investigation of moderator variables would appear to be a fruitful line of research in predicting Antarctic performance.

Chapter XI is a descriptive participant observation study of the expedition which outlines the conflicts and difficulties experienced during the IBEA and points to the pervasive interpersonal difficulties that did little to miminise the discomforts of the project.

The research programme represents a systematic attempt to assess stress on a variety of carefully evaluated measures and using an experimental design that was sensitive to differential responding. Despite these design features no psychometric evidence for the existence of stress was found. This result is in sharp contrast to the descriptive account of the expedition which outlines the series of conflicts and problems that occurred. The discrepancy is likely to be accounted for by the work on coping style, in that many of the expeditioners used repression as a means of dealing with stressors and consequently reported few stress responses. As the expedition members largely achieved their scientific aims it appears that repression is a useful coping style for dealing with the difficulties of an Antarctic traverse. Further work in evaluating the efficency of a variety of coping techniques for particular types of individual under different conditions would therefore be useful.

REFERENCES

Abelson, R.P. & Sermat, V. Multidimensional scaling of facial expressions. _Journal of Experimental Psychology_, 1962, _63_, 546-554.

Adorno, T.W., Frenkel-Brunswick, E., Levinson, D.J., & Sanford, R.N. _The authoritarian personality_. New York: Harper. 1950.

Allport, G.W., Vernon, P.E., & Lindzey, G. _A study of values_. Massacheusetts: Houghton Mifflin. 1951.

Armore, S.J. _Introduction to statistical analysis and inference for psychology and education_. New York: J. Wiley and Sons, 1966.

Arthur, R.J. Success is predictable. _Military Medicine_, 1971, _136_, 539-545.

Barabasz, A.F. Electroencephalography, isolation, and hypnotic capacity at Scott Base. _New Zealand Antarctic Record_, 1978, _1_, 35-42.

Barabasz, A.F., & Gregson, R.A.M. Effects of wintering over on the perception of odourants at Scott Base. _New Zealand Antarctic Record_, 1978, _1_, 14-23.

Baum, A., & Vallins, S. _Architecture and social behavior_. Hillsdale, N.J.: Erlbaum. 1977.

Bem, D.J. Self perception: An alternative interpretation of cognitive dissonance phenomena. _Psychological Review_, 1967, _74_, 183-200.

Bennett, G.K., Seashore, H.G., & Wesman, A.G. Differential Aptitude Tests Manual. New York: Psychological Corporation. 1959.

Bergquist, W.H., Lewinsohn, P.M., Sue, D.W., & Flippo, J.R. Short and long term memory for various types of stimuli as a function of repression-sensitization. Journal of Experimental Research in Personality, 1968, 3, 28-38.

Blackburn, A.B., Shurley, J.T., & Natani, K. Psychological adjustment at a small Antarctic station: an MMPI study. In O.G. Edholm and E.K.E. Gunderson [Eds.], Polar Human Biology. London: Heineman Medical Books, 1973, 369-383.

Blau, G. An empirical investigation of job stress, social support, service length, and job strain. Organizational Behavior and Human Performance, 1981, 27, 279-302.

Borgatta, E.I. Mood, personality amd interaction. Journal of General Psychology, 1961, 64, 105-137.

Bryne, D. The Repression-Sensitization Scale: rational, reliability, and validity. Journal of Personality, 1961, 29, 334-349.

Bryne, D. Repression-sensitization as a dimension of personality. In B.A. Maher [Ed.], Progress in experimental personality research. (Vol. 1). New York: Academic Press, 1964, 164-220.

Burrows, G.C., Cox, T., & Simpson, G.C. The measurement of stress in a sales training situation. Journal of Occupational Psychology. 1977, 50, 45-51.

Bush, L.E., II. Individual differences multidimensional scaling of adjectives denoting feelings. Journal of Personality and Social Psychology, 1973, 25, 50-57.

Butcher, J.N., & Ryan, M. Personality stability and adjustment to an extreme environment. Journal of Applied Psychology, 1974, 59, 107-109.

Cattell, R.B., Saunders, D.R., & Stice, G. Handbook for the Sixteen Personality Factor Questionnaire. Champaign: Institute for Personality and Ability Testing. 1957.

Campbell, D.T., & Erlebacher, A. How regression artifacts in quasi-experimental evaluations can mistakenly make compensatory education look harmful. In J. Hellmuth [Ed.], Compensatory education: A national debate. Vol 3, New York: Brunner/Mazel, 1970.

Campbell, D.T., & Fiske, D.W. Convergent and discriminant validity by the multitrait-multimethod matrix. Psychological Bulletin, 1959, 56, 81-105.

Cronbach, L., & Furby, L. How should we measure "change" - or should we. Psychological Bulletin, 1970, 74, 68-80.

Cohen, S. Environmental load and the allocation of attention. In A Baum, J.E. Singer and S. Valins, [Eds.], Advances in environmental psychology, (Vol. 1). Hillsdale, N.J.: Erlbaum, 1978.

Cohen, S. Aftereffects of stress on human performance and social behaviour: A review of research and theory. Psychological Bulletin, 1980, 88, 82-108.

Cohen, S., Evans, G.W., Krantz, D.S., & Stokols, D. Physiological, motivational, and cognitive effects of aircraft noise on children: moving from the laboratory to the field. American Psychologist, 1980, 35, 231-243.

Cohen, S., Glass, D.C., & Singer, J.E. Apartment noise, auditory discrimination, and reading ability in children. Journal of Experimental Social Psychology, 1973, 9, 407-422.

Cohen, S., & Spacapan, S. The aftereffects of stress: An attentional interpretation. Environmental Psychology and Nonverbal Behaviour, 1978, 3, 43 -57.

Comrey, A.L. Manual for the Comrey Personality Scales. San Diego, California: E.I.T.S. 1970.

Cook, T.D., & Campbell, D.T. The design and conduct of quasi-experiments and true experiments in field settings. In M.D. Dunnette [Ed.], Handbook of industrial and organisational psychology. Chicago: Rand McNally, 1976, 223-326.

Covi, L., Lipman, R.S., Pattison, J.H., Derogatis, L.R., & Uhlenhuth, E.H. Length of treatment with anxiolytic-sedatives and response to sudden withdrawal. Acta Psychiatrica Scandinavica, 1973, 49, 51-64.

Cox, T. Stress. London: Macmillan Press, 1978.

Coyne, J.C., & Holroyd, K. Stress, coping and illness: A transactional perspective. In T. Millan, C. Green, & R. Meagher, [Eds.], Handbook of Health Care Clinical Psychology. New York: Pleum Press, 1982, 103-127.

Crocq, L., Rivolier, J., & Cazes, G. Selection and psychological adaption of individuals living in small isolated groups in the French Antarctic stations. In O.G. Edholm and E.K.E. Gunderson [Eds.], _Polar Human Biology_. London: Heineman Medical Books, 1973, 362-368.

de Monchaux, C., Davies, A., & Edholm, O.G. Psychological studies in the Antarctic. _British Antarctic Survey Bulletin_, 1979, _48_, 93-97.

DeCotiis, T.A. An analysis of the external validity and applied relevance of three rating formats. _Organisational Behavior and Human Performance_, 1977, _19_, 247-266.

Derogatis, L.R., Lipman, R.S., Covi, L., & Rickels, K. Neurotic symptom dimensions: As perceived by psychiatrists and patients of various social classes. _Archives of General Psychiatry_, 1971, _24_, 454-464.

Derogatis, L.R., Lipman, R.S., Rickels, K., Uhlenhuth, E.H., & Covi, L. The Hopkins Symptom Checklist (HSCL): a self report symptom inventory. _Behavioral Science_, 1974, _19_, 1-15.

Deriapa, N.R. The state of higher human nervous activity in Antarctica according to data from certain psychophysiological tests. _Soviet Antarctic Information Bulletin_, 1971, _7_, 339-341. (Abstract).

Doll, R.E., & Gunderson E.K.E. Occupational group as a moderator of the job satisfaction-job performance relationship. _Journal of Applied Psychology_, 1969, _53_, 359-361.

Doll, R.E., & Gunderson E.K.E. The relative importance of selected behavioural characteristics of group members in an extreme environment. _The Journal of Psychology_, 1970, _75_, 231-237.

Doll, R.E., Gunderson, E.K.E., & Ryman, D.H. Relative predictability of occupational groups and performance criteria in an extreme environment. Journal of Clinical Psychology, 1969, 25, 399-402.

Donnerstein, E., & Wilson, D.W. Effects of noise and perceived control on ongoing and subsequent aggressive behavior. Journal of Personality and Social Psychology, 1976, 34, 774-781.

Dooley, B.B. Effects of social density on men with "close" or "far" personal space. Journal of Population, 1978, 1, 251-265.

Ekman, P. Universals and cultural differences in facial expressions of emotion. In J.K. Cole [Ed.], Nebraska symposium on motivation, (Vol. 19). Lincoln: University of Nebraska, 1972.

Epstein, Y., & Karlin, R.A. Effects of acute experimental crowding. Journal of Applied Social Psychology, 1975, 5, 34-53.

Feder, C.Z. Relationship between self-acceptance and adjustment, repression-sensitization and social competence. Journal of Abnormal Psychology, 1968, 73, 317-322.

Festinger, L.A. A theory of cognitive dissonance. New York: Harper, 1957.

Folkman, S., & Lazarus, R.S. An analysis of coping in a middle-aged community sample. Journal of Health and Social Behavior, 1980, 21, 219-239.

Frankenhaeuser, M. Experimental approaches to the study of catecholamines and emotion. In L. Levi [Ed.], _Emotions: Their parameters and measurement_. New York: Raven Press. 1975.

French, J.R.P., Rogers, W., & Cobb, S. Adjustment as person-environment fit. In G.V. Coehlo and D.A. Hamburg [Eds.], _Coping and Adaptation_. New York: Basic Books. 1974.

Freud, A. _The ego and the mechanisms of defense_. New York: International Universities, 1946.

Freud, S. Repression. In _Collected Papers_, (Vol. IV). London: Hogarth Press, 1946, 84-97. (Originally published 1915).

Fuchs, V. The human element in exploration. _British Antarctic Survey Bulletin_, 1963, _1_, 1-8.

Glass, D.C., & Singer, J.E. _Urban stress: Experiments on noise and social stressors_. New York :Academic Press, 1972.

Golin, S., Herron, E.W., Lakota, R., & Reineck, L. Factor analytic study of manifest anxiety, extraversion, and repression-sensitization scales. _Journal of Consulting Psychology_, 1967, _31_, 564-569.

Gordon, L.V. _Manual for Survey of Interpersonal Values_. Chicago: Science Research Association, 1960.

Green, R.S., & Cliff, N. Multidimensional comparisons of structures of vocally and facially expressed emotions. _Perception and Psychoph ysics_, 1975, _17_, 429-438.

Gregson, R.A.M. Monitoring cognitive performance in Antarctica. New Zealand Antarctic Record, 1978, 1, 24 -32.

Gunderson, E.K.E. Emotional symptoms in extremely isolated groups. Archives of General Psychiatry, 1963, 9, 362-368.

Gunderson, E.K.E. Determinants of reliability in personality ratings. Journal of Clinical Psychology, 1965, 21, 164-169.

Gunderson, E.K.E. Mental health problems in Antarctia. Archives of Environmental Health, 1968, 17, 558-564.

Gunderson E.K.E. Psychological studies in Antarctica. In E.K.E. Gunderson [Ed.], Human adaption to Antarctic conditions. Massacheusetts: Heffernan Press, 1974, 115-131.

Gunderson, E.K.E., & Kapfer, E.L. The predictive validity of clinical ratings for an extreme environment. British Journal of Psychiatry, 1966, 112, 405-412.

Gunderson E.K.E., & Mahan J.L. Cultural and psychological differences amoung occupational groups. The Journal of Psychology, 1966, 62, 287-304.

Gunderson, E.K.E., & Nelson, P.D. Clinical agreement in assessing for an unknown environment. Journal of Clinical Psychology, 1964, 20, 290-295.

Gunderson E.K.E., & Nelson, P.D. Biographical predictors of performance in an extreme environment. Journal of Psychology, 1965, 61, 59-67.

Gunderson, E.K.E., & Nelson, P.D. Life status and interpersonal values. Educational and Psychological Measurement, 1966a, 26, 121-130.

Gunderson, E.K.E., & Nelson, P.D. Criterion measures for extremely isolated groups. Personnel Psychology, 1966b, 19, 67-80.

Gunderson, E.K.E., & Rahe, R.H. [Eds.], Life stress and illness. Springfield, Ill.: Thomas 1974.

Gunderson, E.K.E., & Ryman, D.H. Convergent and discriminant validities of performance evaluations in extremely isolated groups. Personnel Psychology, 1971, 24, 715-724.

Haan, N. Coping and Defending. New York: Academic Press. 1977.

Hays, L. W. Statistics for psychologists. New York: Holt, Rinehart and Winston. 1963.

Hendrick, C., & Lilly, R.S. The structure of mood: A comparison between sleep deprivation and normal wakefulness conditions. Journal of Personality, 1970, 38, 453-465.

Hesbacher, P.T., Rickels, K., Hutchison, E.R., Sablosky, L., Whalen, E.M., & Phillips, F.J. Setting patient and doctor effects on drug response in neurotic patients: II Differential improvements. Psychoparmacologica, 1970, 18, 209-226.

Holmes, T.H., & Masuda, M. Life change and illness susceptibility. In B.S. Dohrenwend & B.P. Dohrenwend [Eds.], Stressful life events: Their nature and effects. New York: Wiley and Sons. 1974, 45-72.

Holmes T.H., & Rahe, R.H. The Social Readjustment Rating Scale. Journal of Psychosomatic Research, 1967, 11, 213-218.

Hunt, E. Mechanics of verbal ability. Psychological Review, 1978, 85, 109-130.

Izard, C.E. Patterns of emotions. New York: Academic Press, 1972.

Jacobs, R., Kafry, D., & Zedeck, S. Expectations of behaviourally anchored rating scales. Personnel Psychology, 1980, 33, 595-640.

Jones, M.B. The Pensacola Z Survey: A study of authoritarian tendency. Psychological Monographs, 1957, 71, 23.

Kagan, A., & Levi, L. Adaptions of the psychosocial environment to man's abilities and needs. In L. Levi [Ed.], Society, stress and disease. Vol 1. London: Oxford University Press. 1971.

Keppel, G. Design and analysis: A researcher's handbook. New Jersey: Prentice-Hall. 1973.

Kline, P. The validity of the Dynamic Personality Inventory. British Journal of Medical Psychology, 1968, 41, 307-311.

Krohne, H.W. Individual differences in coping with stress and anxiety. In C.D. Spielberger & I.G. Sarason, [Eds.], Stress and Anxiety. Vol. 5, New York : Wiley, 1978, 233-260.

La Forge, R., & Suczek. R. The interpersonal dimension of personality. III: An interpersonal checklist. Journal of Personality, 1955, 24, 94-112.

La Rocco, J.M., House, J.S., & French, J.P.R. Social support, occupational stress and health. _Journal of Health and Social Behavior_, 1980, _21_, 202-218.

Landy, F.J., Farr, L.J., Saal, F.E. & Freytag, W.R. Behaviorally anchored scales for rating the performance of Police Officers. _Journal of Applied Psychology_, 1976, _61_, 750-758.

Law, P. Personality problems in Antarctica. _The Medical Journal of Australia_, 1960, _47_, 273-282.

Lazarus, R.S. _Psychological stress and the coping process_. New York: McGraw Hill, 1966.

Lazarus, R.S. _Patterns of adjustment_. New York: McGraw Hill. 1976.

Lazarus, R.S., Averill, J.R., & Option, E.M. Towards a cognitive theory of emotion. In M.B. Arnold, [Ed.], _Feelings and Emotions_. New York: Academic Press. 1974.

Leek, G.M. The physique of voluntary Antarctic personnel. _New Zealand Journal of Health, Physical Education and Recreation_, 1970, _3_, 50-60.

Levi, L. Stress, distress and psychosocial stimuli. In A. Mclean [Ed.], _Occupational stress_. Illinois: C.C. Thomas. 1974.

Lipman, R.S., Cole, J.O., Park, L.C., & Rickels, K. Sensitivity of symptom and non-symptom-focused criteria of outpatient drug efficacy. _American Journal of Psychiatry_, 1965, _122_, 24-27.

Lipman, R.S., Covi, L., Rickels, K., Uhlenhuth, E.H., & Lazar,B.A. Selected measures of change in outpatient drug evaluation. In _Psychopharmacology: A review of progress 1957-1959_. P.H.S. Publication No 1836, U.S. Government Printing Office, Washington, D.C. 1968, 249-254.

Lipman, R.S., Covi, L., & Shapiro, A.K. The Hopkins Symptom Checklist: Factors derived from the HSCL-90. _Journal of Affective Disorders_, 1979, _1_, 9 -24.

Lipman, R.S., Rickels, K., Covi, L., Derogatis, L.R., & Uhlenhuth, E.H. Factors of symptom distress: doctor ratings of anxious neurotic outpatients. _Archives of General Psychiatry_, 1969, _21_, 328 -338.

Lorr, M., Daston, P., & Smith, I.R. An analysis of mood states. _Educational and Psychological Measurement_, 1967, _27_, 89-96.

Lorr, M., McNair, D.M., & Fisher, S. Evidence for bipolar mood states. _Journal of Personality Assessment_, 1982, _46_, 432-436.

Lucus, R.A. _Men in Crisis_. New York: Basic Books, 1969.

Lueger, R.J., & Evans, R.G. Emotional expressivity and sex role perceptions of repressors and sensitizers. _Journal of Personality Research_, 1981, _45_, 288-294.

Lugg, D.J. Adaption of small groups to life on an isolated Antarctic station. In O.G. Edholm and E.K.E. Gunderson [Eds.], _Polar Human Biology_. London: Heineman Medical Books, 1973, 401-409.

MacKay, C., Cox, T., Burrows, G., & Lazzerini, T. An inventory for the measurement of self-reported stress and arousal. British Journal of Social and Clinical Psychology, 1978, 17, 283-284.

Magnusson, D. Test Theory. Massachusetts: Addison Wesley, 1967.

McCormick, I.A., Taylor, A.J.W., Siegert, R.J., & Welch, G.W. The evaluation and normalization of the Hopkins Symptom Checklist in New Zealand. Paper in process. Department of Psychology, Victoria University of Wellington, New Zealand.

McGrath, J.E. Stress and behavior in organisations. In M.D. Dunnette [Ed.], Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1976.

McGuire, F., & Tolchin, S. Group adjustment at the South Pole. British Journal of Psychiatry, 1961, 107, 954-960.

McNair, D.M., & Lorr, M. An analysis of mood in neurotics. Journal of Abnormal and Social Psychology, 1964, 69, 620-627.

Macpherson, N. Adaption of groups to Antarctic isolation. Polar Record, 1977, 18, 581-585.

Matsuda, T. The transition of social life of wintering parties of Japanese Antarctic Research Expedition. Antarctic Record, 1977, 59, 149-171.

Mattsson, N.B., Williams, H.V., Rickels, K., Lipman, R.S., & Uhlenhuth, E.H. Dimensions of symptom distress in anxious neurotic outpatients. Psychopharmacology Bulletin, 1969, 5, 19-31.

Meehl, P.E. Clinical versus statistical prediction: A theoretical analysis and a review of the evidence. Minneapolis: University of Minnesota Press, 1954.

Mischel, W. Personality and assessment. New York: Wiley, 1968.

Mischel, W. Towards a cognitive social learning reconceptualization of personality. Psychological Review, 1973, 80, 252-283.

Moos, R. Psychological techniques in assessment of adaptive behavior. In G.V. Coelho, D.A. Hamberg, & J.E. Adams [Eds.], Coping and Adaptation. New York: Basic Books, 1974, 334-399.

Moos, R. Coping with Physical Illness. New York: Pleum Publications, 1977.

Mullin, C.S. Some psychological aspects of isolated Antarctic living. American Journal of Psychiatry, 1960, 117, 323-325.

Myers. T.I., Murphy, D.B., Smith, S., & Goffard, S.J. Experimental studies in sensory deprivation and social isolation. (HumRRo Technical Report. 66-8). Washington, D.C.:Washington University, June 1966.

Nardini, J.E., Hermann, R.S., & Rasmussen, J.E. Navy psychiatric assessment in the Antarctic. The American Journal of Psychiatry, 1962, 119, 97-105.

Natani, K., & Shurley, J.T. Sociopsyhological aspects of a winter vigal at South Pole Station. In E.K.E. Gunderson [Ed.], _Human adaptation to Antarctic conditions_. Massacheusetts: Heffernan Press, 1974, 89-114.

Nie, N.H., Hull, C.H., Jenkins, J.C., Steinbrenner, K., & Bent, D.H. _SPSS: statistical package for the social sciences_. Second edition. New York: McGraw Hill. 1975.

Neufeld, R.W.J. A multidimensional scaling analysis of schizophrenics' and normals' perceptions of verbal similarity. _Journal of Abnormal Psychology_, 1975, _84_, 498-507.

Neufeld, R.W.J. Simultaneous processing of multiple stimulus dimensions among paranoid and non-paranoid schizophrenics. _Multivariate Behavioral Research_, 1976, _11_, 425-441.

Owens, A.G. _The assessment of individual performance in small Antarctic groups. Part I. Officers-in-charge, rating scales_. Psychological Research Unit, Australian Military Forces, August 1966, Report No. 3/66.

Owens, A.G. _The assessment of individual performance in small Antarctic groups. Part II. Ratings on the Leary Interpersonal Checklist (ICL)_. Psychological Research Unit, Australian Military Forces, August 1967a, Report No. 9/67.

Owens, A.G. The assessment of individual performance in small Antarctic groups. Part III. Analysis of Leary Interpersonal Checklist (ICL) items. Psychological Research Unit, Australian Military Forces, October 1967b, Report No. 10/67.

Owens, A.G. The performance and selection of men in small Antarctic groups. Psychological Research Unit, Australian Military Forces, July 1975, Report No. 4/74.

Palmai, G. Psychological observations on an isolated group in Antarctica. British Journal of Psychiatry, 1963, 109, 364-370.

Parkes, C.M. Bereavement: Studies in Grief in Adult Life. New York: International Universities, 1972.

Parloff, M.B., Kelman, H.C., & Frank, J.D. Comfort, effectiveness and self awareness as criteria of improvement in psychotherapy. American Journal of Psychiatry, 1954, 111, 343-351.

Pearlin, L.I., Menaghan, E.G., Lieberman, M.A., & Mullan, J.T. The stress process. Journal of Health and Social Behavior, 1980, 22, 337-356.

Pearlin, L.I., & Schooler, C. The structure of coping. Journal of Health and Social Behavior, 1978, 19, 2-21.

Poor, D.D.S., & Wherry, R.J. Invariance of multidimensional configurations. British Journal of Mathematical and Statistical Psychology, 1976, 29, 114-125.

Prusoff, B.A., & Klermen, G.L. Differentiating depressed from anxious neurotic outpatients: Use of discriminant function for separation of neurotic affective states. 1974, _30_, 302-309.

Rickels, K., Lipman, R.S., Garcia, C.R., & Fisher, E. Evaluating clinical improvements in anxious outpatients: A comparison of normal and treated neurotic patients. _American Journal of Psychiatry_, 1972, _128_, 119-123.

Rivolier, J. Physiological and psychological studies conducted by Continental European and Japanese expeditions. In E.K.E. Gunderson [Ed.], _Human adaptation to Antarctic conditions_. Massacheusetts: Heffernan Press, 1974.

Rotton, J., Olszewski, D., Charleton, M., & Soler, E. Loud speech, conglomerate noise, and behavioral aftereffects. _Journal of Applied Psychology_, 1978, _63_, 360-365.

Ruff, G.E., & Korchin, S.J. Psychological responses on the Mercury astronauts. In G.H. Grosser, H. Wechsler and M. Greenblatt, [Eds.], _The threat of impending disaster_. Massacheusetts: MIT Press. 1964.

Russell, J.A. A circumplex model of affect. _Journal of Personality and Social Psychology_, 1980, _39_, 1161-1178.

Russell, J.A. Evidence of convergent validity on the dimensions of affect. _Journal of Personality and Social Psychology_, 1978, _36_, 1152-1168.

Roher, J.H. Interpersonal relationships in isolated small groups. In B.E. Flaherty [Ed.], Psychophysiological aspects of space flight. New York: Columbia University Press. 1961, 263-271.

Ryman, D.H., Biersner, R.J., & La Rocco, J.M. Reliabilities and validities of the mood questionnaire. Psychological Reports, 1974, 35, 479-484.

Saal, F.E., Downey, R.G., & Lahey, M.A. Rating the raters: Assessing the psychometric quality of rating data. Psychological Bulletin, 1980, 88, 413-428.

Schultz, W.C. Firo: a three dimensional theory of interpersonal behavior. New York: Holt, Rinehart & Winston, 1958.

Seligman, M.P. Helplessness: On depression, development and death. San Francisco: Freeman, 1975.

Selye, H. A syndrome produced by diverse noxous agents. Nature, 1936, 138, 32.

Selye, H. The stress of life. New York: McGraw Hill. 1956.

Seymour, G.E., & Gunderson, E.K.E. Attitudes as predictors of adjustment in extremely isolated groups. Journal of Clinical Psychology, 1971, 27, 333-338.

Sherrod, D.R., & Downs, R. Environmental determinants of altruism: The effects of stimulus overload and perceived control on helping. Journal of Experimental Social Psychology, 1974, 10, 468-479.

Sherwood, C.C., Morris, J.N., & Sherwood, S. A multivariate, nonrandomized matching technique for studying the impact of social interventions. In E.L. Struening & M. Guttentag, [Eds.], Handbook of evaluation research. Beverley Hills: Sage Publications, 1975, Vol 1, 183-224.

Shear, L.M., & Gunderson, E.K.E. Stable attitude factors in natural isolated groups. The Journal of Social Psychology, 1966, 70, 199-204.

Siple, P.A. 90 Degrees South: The Story of the American South Pole Conquest. New York: Pitman. 1959, 309-312.

Smith, W.M. Scientific personnel in Antarctica: Their recruitment, selection and performance. Psychological Reports, 1961, 9, 163-182.

Smith, W.M., & Jones, M.B. Astronauts, Antarctic scientists and personal autonomy. Journal of Aerospace Medicine, 1962, 33, 162-166.

Smith, W.M. Observations over the lifetime of a small isolated group: Structure, danger, boredom, and vision. Psychological Reports Monograph, 1966, Suppl. 3, 19, 475-514.

Sternberg, R.J. High speed scanning in human memory. Science, 1966, 153, 652-654.

Sternberg, R.J. Testing and cognitive performance. American Psychologist, 1981, 36, 1181-1189.

Strange, R.E., & Youngman, S.E. Emotional aspects of wintering over. Antarctic Journal of the United States, 1971, 6, 255 -257.

Taylor, A.J.W. Professional isolates in New Zealand's Antarctic research programme. _International Review of Applied Psychology_, 1969a, _18_, 135-138.

Taylor, A.J.W. Ability, stability, and social adjustment among Scott Base personnel, Antarctica. _Occupational Psychology_, 1969b, _43_, 81-93.

Taylor, A.J.W. Adaption of New Zealand research personnel in the Antarctic. In O.G. Edholm and E.K.E. Gunderson [Eds.], _Polar Human Biology_. London: Heineman Medical Books, 1973, 417-429.

Taylor, A.J.W. Summary of psychological effects of Antarctic service. _New Zealand Antarctic Record_, 1978, _1_, 31-34.

Taylor, A.J.W. Some behavioural science in Antarctica. _New Zealand Family Physican_, 1980, _71_, 75-80.

Taylor, A.J.W., & Felletti, G.I. The Victoria Isolation Scale. Form A: The ISQ revised and adapted. _Journal of Consulting and Clinical Psychology_, 1976, _44_, 305.

Taylor, A.J.W. & Frazer, A.G. _Psychological sequalae of Operation Overdue following the DC10 aircrash in Antarctica_. Victoria University of Wellington, Publications in Psychology, 1981, 27.

Taylor, A.J.W., & Shurley, J.T. Some Antarctic troglodytes. _International Review of Applied Psychology_, 1971, _20_, 143-148.

Taylor, J.A. A personality scale of manifest anxiety. _Journal of Abnormal and Social Psychology_, 1953, _48_, 285-290.

Tempore, V.J. Extension of the repression-sensitization hypothesis to success and failure experience. Psychological Reports, 1964, 15, 39-45.

Thayer, R.E. Measurement of activation through self report. Psychological Reports, 1967, 20, 663-678.

Thayer, R.E. Activation states as assessed by verbal report and four psychophysiological variables. Psychophysiology, 1970, 7, 86-94.

Uhlenhuth, E.H., Lipman, R.S., Balter, M.B., & Stern, M. Symptom intensity and life stress in the city. Archives of General Psychiatry, 1974, 31, 759-764.

Uhlenhuth, E.H., Rickels, K., Fisher, S., Park, L.C., Lipman, R.S., & Mock, J. Drug, doctors' verbal attitude and clinical setting in the symptomatic response to pharmacotherapy. Psychopharmacologia, 1966, 9, 392-418.

Vaillant, G. Theoretical hierarchy of adaptive ego mechanisms. Archives of General Psychiatry, 1971, 24, 107-118.

Ventsenostsev, B.B. Psychophysiological studies of workers in the Antarctic. In A.L. Matusov [Ed.], Medical Research on Arctic and Antarctic Expeditions. Jerusalem : Israel Programme for Scientific Translations, 1973. (Abstract).

Vermeulen, L.P. Development of criterion for adjustment to Antarctic conditions: preliminary findings. South African Journal of Antarctic Research, 1975, 5, 21-24. (Abstract).

Videka-Sherman, L. Coping with the death of a child. _American Journal of Orthopsychiatry_, 1982, _52_, 688-698.

Volkov, I.P., Mastusov, A.L., & Ryabinin, I.F. A socio-psychological study of typical motives for joining the Soviet Antarctic Expedition, In [Ed.], A.F. Treshnikov. _Problems of the Arctic and Antarctic, collection of articles_. 1976, _42_, 84-90.

Walkey, F.H. The Multivariate Fear of Death Scale: An independent analysis. _Journal of Consulting and Clinical Psychology_, 1982, _50_, 466-467.

Walkey, F.H. _A computer programme to evaluate multivariate distances_. Unpublished programme, Victoria University of Wellington, 1982.

Walkey, F.H. _A computer programme for three way analysis of variance_. Unpublished programme, Victoria University of Wellington, 1982.

Walkey, F.H., & Gilmour, D.R. Comparative evaluation of a videotaped measure of interpersonal distance. _Journal of Consulting and Clinical Psychology_, 1978, _47_, 575-580.

Walkey, F.H., & Green, D.E. The structure of the Eysenck Personality Inventory: A comparison between simple and more complex analyses of a multiple scale questionnaire. _Multivariate Behavioral Research_, 1981, _16_, 361-372.

Weitz, J. Psychological research needs on the problems of human stress. In J.E. McGrath [Ed.], _Social and psychological factors in stress_. New York: Holt, Rinehart and Winston, 1970.

Welford, A.T. Stress and performance. _Ergonomics_, 1973, _16_, 567.

Wechsler, D. _The measurement of adult intelligence_. Baltimore: Williams & Wilkins, 1958.

Weybrew, B.B., Molish, H.B., & Youniss, R.P. _Prediction of adjustment to the Antarctic_. U.S. Naval Medical Reasearch Laboratory Report No. 350. Bureau of Medicine and Surgery, Navy Department. 1961.

White, K.G., Taylor, A.J.W., & McCormick, I.A. A note on the chronometric analysis of cognitive ability: Antarctic effects. _New Zealand Journal of Psychology_, 1983, _12_, 36-41.

Williams, H.V., Lipman, R.S., Rickels, K., Covi, L., Uhlenhuth, E.H., & Mattsson, N.B. Replication of symptom distress factors in anxious neurotic patients. _Mutivariate Behavioral Research_, 1968, _3_, 199-212.

Wilson, O. Human adaptation to life on Antarctica. In P. Van Oye and J. Van Mieghein [Eds.], _Biogeography and ecology in Antarctica_. _Monographs of Biology_. The Hague: Junk, 1965, _15_, 690-752.

Appendix A

PRINCIPAL MEASURES USED DURING IBEA

The measures used in the current study are presented in the following pages.

1. Screening Questionnaire
2. Hopkins Symptom Checklist
3. Stress Arousal Checklist
4. Adaptability Questionnaire
5. Mental Paper Folding test
6. Series Completion test.

SCREENING QUESTIONNAIRE

CONFIDENTIAL

NAME:______________________________

DATE:______________

DEPARTMENT:______________________

INSTRUCTIONS: Please decide on the correct response for you and place the appropriate number on the brackets on the right hand side of the page.

1. Age ( )

2. Marital Status
Single (1); Legal or common law marriage (2);
Separated or Divorced (3); Spouse deceased (4). ( )

3. How many children do you have? ( )

4. What is your nationality?
New Zealander (1); British (2); Australian (3);
North American (4); Other (6) specify________ ( )

5. What is your religious affiliation?
None (1); Protestant (2); Roman Catholic (3);
Jewish (4); Islamic (5);
Other (6) specify ______________ ( )

6. What is your occupational designation?
Technical Officer (1); Technician (2);
Professor (3); Associate Professor (4);
Reader (5); Senior Lecturer (6);
Lecturer (7); Junior Lecturer (8);
Student (9); Other (10) specify____________ ( )

7. What is your academic speciality?

____

8. Do you enjoy these activities?

Reading:	No (1); Yes (2);	( )
Movies:	Yes (2); No (1);	( )
Live Theatre:	No (1); Yes (2);	( )
Music:	Yes (2); No (1);	( )

9. Have you moved residence within the last two years?

a. within Wellington: No (1); Yes (2); ( )
b. between cities: Yes (2); No (1); ( )

10. Have you changed your occupation in the last two years?

No (1); Yes (2); ( )

11. Has your level of responsibility at work changed in the last two years?

No (1); Increased (2); Decreased (3); ( )

12. Have you had a major personal achievement in the last two years?

No (1); Yes (2); ( )

13. Have you taken on a major financial committment such as a home or property on the last two years?

Yes (2); No (1); ( )

14. Have you suffered a major injury or illness in the last two years?

No (1); Yes (2); ( )

15. How many brothers and sisters have you? ( )

16. Is your father?

Employed (1); Retired (2); Deceased (3); ( )

17. If deceased how many years ago did he die? ( )

18. Is your mother?

Employed (1); Retired (2); Deceased (3); ( )

19. If deceased how many years ago did she die? ( )

Thank you.

HOPKINS SYMPTOM CHECKLIST

NAME:______________________________ DATE:________

INSTRUCTIONS: How have you felt during the past seven days including today? Use the following scale to describe how distressing you have found these things over this time.

Not at all	A little	Quite a bit	Extremely
1	2	3	4

1. Headaches [ ]
2. Nervousness or shakiness inside [ ]
3. Being unable to get rid of bad thoughts or ideas [ ]
4. Faintness or dizziness [ ]
5. Loss of sexual interest or pleasure [ ]
6. Feeling critical of others [ ]
7. Bad dreams [ ]
8. Difficulty in speaking when you are excited [ ]
9. Trouble remembering things [ ]
10. Worried about sloppiness or carelessness [ ]
11. Feeling easily annoyed or irritated [ ]
12. Pains in the heart or chest [ ]
13. Itching [ ]
14. Feeling low in energy or slowed [ ]
15. Thoughts of ending your life [ ]
16. Sweating [ ]
17. Trembling [ ]
18. Feeling confused [ ]
19. Poor appetite [ ]
20. Crying easily [ ]
21. Feeling shy or uneasy with the opposite sex [ ]
22. A feeling of being trapped or caught [ ]
23. Suddenly scared for no reason [ ]
24. Temper outbursts you could not control [ ]
25. Constipation [ ]
26. Blaming youself for things [ ]

27. Pains in the lower part of my back [ ]

28. Feeling blocked or stymied in getting things done [ ]

29. Feeling lonely [ ]

30. Feeling blue [ ]

31. Worrying or stewing about things [ ]

32. Feeling no interest in things [ ]

33. Feeling fearful [ ]

34. Your feelings being easily hurt [ ]

35. Having to ask others what you should do [ ]

36. Feeling others do not understand you or are unsympathetic [ ]

37. Feeling that people are unfriendly or dislike you [ ]

38. Having to do things very slowly in order to be sure you are doing them right [ ]

39. Heart pounding or racing [ ]

40. Nausea or upset stomach [ ]

41. Feeling inferior to others [ ]

42. Soreness of your muscles [ ]

43. Loose bowel movements [ ]

44. Difficulty falling asleep or staying asleep [ ]

45. Having to check and double check what you do [ ]

46. Difficulty making decisions [ ]

47. Wanting to be alone [ ]

48. Trouble getting your breath [ ]

49. Hot or cold spells [ ]

50. Having to avoid certain places or activities because they frighten you [ ]

51. Your mind going blank [ ]

52. Numbness or tingling in parts of your body [ ]

53. A lump in your throat [ ]

54. Feeling hopeless about the future [ ]

55. Trouble concentrating [ ]

56. Weakness in parts of your body [ ]

57. Feeling tense or keyed up [ ]

58. Heavy feelings in your arms or legs [ ]

STRESS AROUSAL CHECKLIST

NAME:__________________________________ DATE:__________

INSTRUCTIONS: Circle the response that best describes how you feel at the moment.

Definitely Feel	Feel Slightly	Do Not Understand or Cannot Decide	Definitely Do Not Feel
++	+	?	-

Tense	++	+	?	-	Peaceful	++	+	?	-
Relaxed	++	+	?	-	Activated	++	+	?	-
Vigorous	++	+	?	-	Tired	++	+	?	-
Stirred-up	++	+	?	-	Idle	++	+	?	-
Restful	++	+	?	-	Up-tight	++	+	?	-
Active	++	+	?	-	Alert	++	+	?	-
Apprehensive	++	+	?	-	Lively	++	+	?	-
Expectant	++	+	?	-	Stimulated	++	+	?	-
Worried	++	+	?	-	Aroused	++	+	?	-
Energetic	++	+	?	-	At Rest	++	+	?	-
Drowsy	++	+	?	-	Somnolent	++	+	?	-
Insensitive	++	+	?	-	Cheerful	++	+	?	-
Bothered	++	+	?	-	Passive	++	+	?	-
Uneasy	++	+	?	-	Contented	++	+	?	-

Intense	++	+	?	-	Jittery	++	+	?	-
Dejected	++	+	?	-	Sluggish	++	+	?	-
Leisurely	++	+	?	-	Still	++	+	?	-
Quiet	++	+	?	-	Pleasant	++	+	?	-
Nervous	++	+	?	-	Sleepy	++	+	?	-
Placid	++	+	?	-	Comfortable	++	+	?	-
Quiescent	++	+	?	-	Calm	++	+	?	-
Distressed	++	+	?	-	Excited	++	+	?	-
Fearful	++	+	?	-					

I.B.E.A. ADAPTABILITY QUESTIONNAIRE

WRITER'S NAME: DATE:

SUBJECT'S NAME:

PHYSICAL ADAPTABILITY GOOD AVERAGE BAD
Disturbed patterns of sleep, appetite, physical resistance, tiredness, illnesses etc*
( ) ( ) ( ) ( ) ( ) ( )
Give details: ______________________

PSYCHOLOGICAL ADAPTABILITY GOOD AVERAGE BAD
Variable mood, anxiety, irritability, sadness, depression, excitation, family worries, personal worries etc.
( ) ( ) ( ) ( ) ( ) ( )
Give details: ______________________

ADAPTABILITY TO INDIVIDUAL WORK GOOD AVERAGE BAD
Difficulties with equipment, efficiency, planning, subjects, subjects etc.*
( ) ( ) ( ) ( ) ( ) ( )
Give details: ______________________

ADAPTABILITY TO DAILY ACTIVITIES AND CHORES GOOD AVERAGE BAD
Difficulties with skidoo, camping, cooking, water, snow, cleaning, participation in group work, logistics etc.*
( ) ( ) ( ) ( ) ( ) ( )
Give details: ______________________

RELATIONS WITH OTHER PARTICIPANTS — GOOD / AVERAGE / BAD

Tendency to close in on oneself and to aggressivity. Problems with: French technician, IBEA technician, IBEA scientists, same nationality, different nationality, same discipline, different discipline, etc.*

( ) ( ) ( ) ( ) ( ) ( )

Give details: ______________________________

____

____

____

____

____

RELATIONS WITH PEOPLE IN AUTHORITY — GOOD / AVERAGE / BAD

Problem with scientific coordinator (field or Paris), logistic chief (field or Paris), laboratory, national body etc.*

( ) ( ) ( ) ( ) ( ) ( )

Give details: ______________________________

____

____

____

____

____

ADAPTION AS "SUBJECT" — GOOD / AVERAGE / BAD

Experimental restraints, scientists, attitude etc.*

( ) ( ) ( ) ( ) ( ) ( )

Give details: ______________________________

____

____

____

____

____

ATTITUDE TOWARDS PSYCHOLOGICAL RESEARCH — GOOD / AVERAGE / BAD

Problems related to: the questionnaires the accounts, psychological observations, the observer etc*

( ) ( ) ( ) ( ) ( ) ( )

Give details: ______________________________

____

____

____

____

____

* For each item above underline the type(s) of disturbances that occured.

ADAPTABILITY TO BOREDOM FOR THE DURATION OF THE STAY.

GOOD		AVERAGE		BAD	
( )	( )	( )	( )	( )	( )

Give details: ____

____

____

____

____

____

Thank you.

MENTAL PAPER FOLDING TEST

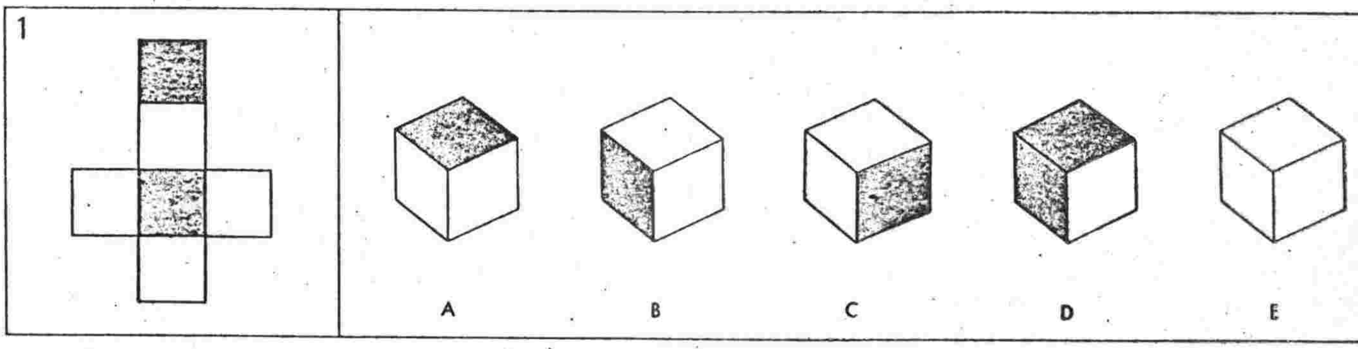
INSTRUCTIONS

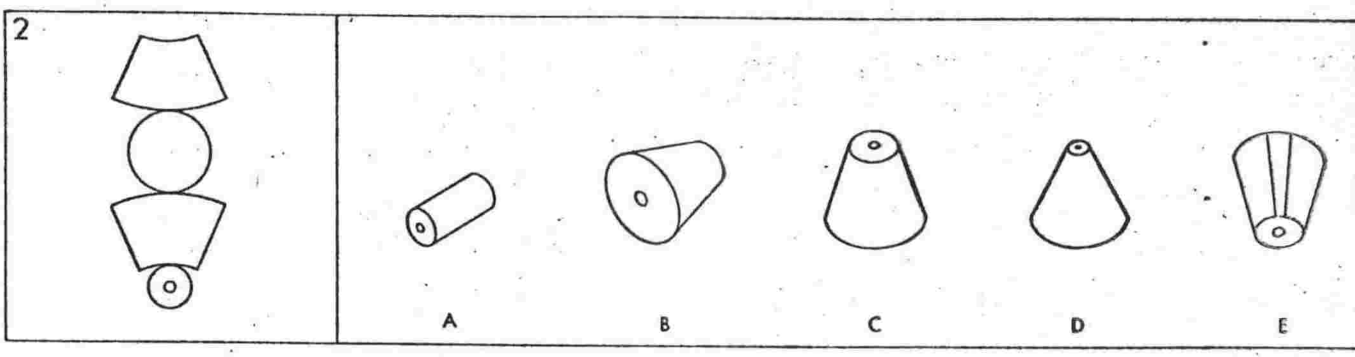
This test consists of ten patterns which can be folded into figures. For each pattern five figures are shown. You are to decide which of these figures can be made from the pattern shown. The pattern always shows the outside of the figure. Two examples are given on the following two cards.

You will be timed for the completion of each item, a maximum time of sixty seconds per item is allowed. As each item is completed indicate to the administrator before turning to the next item. You may or may not be able to complete in the allotted time.

Answers are to be marked on the separate answer sheet according to the choices made.

Examples similar to the test items are shown on the following cards. Make sure you understand these and wait for the examiner to tell you to begin.





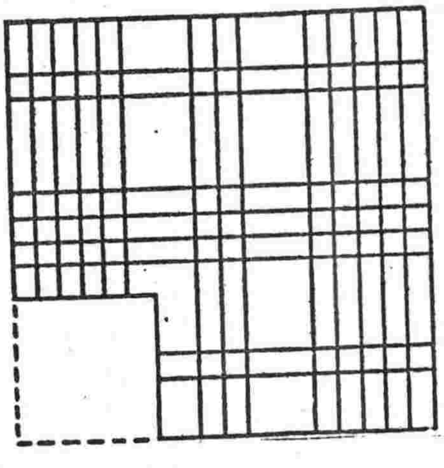
SERIES COMPLETION TEST

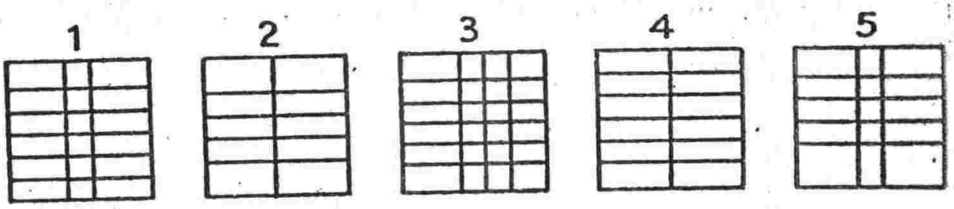
INSTRUCTIONS

This test consists of a number of problems similar to the examples on the following two cards. The problems consist of a number of figures which form a series, one square of which is left blank. You are to choose one of the five figures, numbered 1-5, to fill the blank and thus complete the series.

You are to solve as many as you can in 8 minutes. Indicate your answer by circling the number on the answer card which is the same as the one you have chosen. You may or may not be able to complete in the allotted time.

Examples similar to the test items are given on the following two cards. Make sure you understand these and wait for the examiner to tell you to begin.





Appendix B

PSYCHOMETRIC CHARACTERISTICS OF THE HSCL AND SACL

The Hopkins Symptom Checklist

1. Item means and standard deviations
2. Item-total test correlations
3. Inter item correlation matrix
4. Eigenvalves and variance proportions
5. Factor Loadings
6. Final communility estimates

The Stress Arousal Checklist

1. Item means and standard deviations
2. Item-total stress subscale correlations
3. Item-total arousal subscale correlations
4. Inter item correlation matrix
5. Eigenvalves and variance proportions
6. Factor Loadings
7. Final communility estimates

HOPKINS SYMPTOM CHECKLIST ITEM CHARACTERISTICS.

MEANS AND STD DEVIATIONS

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7
MEAN	1.58911	1.75743	1.71287	1.24257	1.32673	2.03960	1.42574
STD DEV	0.77555	0.76332	0.84449	0.47376	0.65577	0.80324	0.75107
	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14
MEAN	1.43069	1.78218	1.63366	2.12871	1.17822	1.28713	2.10891
STD DEV	0.71072	0.85929	0.74943	0.87148	0.48656	0.62033	0.87418
	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20	ITEM 21
MEAN	1.16832	1.42574	1.13366	1.66337	1.21287	1.33168	1.46535
STD DEV	0.50014	0.67428	0.39519	0.79522	0.52711	0.68668	0.74064
	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27	ITEM 28
MEAN	1.63366	1.19802	1.43564	1.12376	1.63366	1.35644	1.95050
STD DEV	0.86067	0.49915	0.73864	0.41071	0.79454	0.71354	0.93443
	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35
MEAN	1.65347	1.81683	2.10396	1.51485	1.36634	1.68812	1.43564
STD DEV	0.80342	0.85292	0.92186	0.76117	0.62649	0.85621	0.65283
	ITEM 36	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42
MEAN	1.53465	1.46535	1.43069	1.32178	1.32178	1.48020	1.48515
STD DEV	0.73389	0.73389	0.68215	0.61525	0.66199	0.71383	0.78688
	ITEM 43	ITEM 44	ITEM 45	ITEM 46	ITEM 47	ITEM 48	ITEM 49
MEAN	1.14356	1.81188	1.42574	1.62376	1.67822	1.20297	1.23267
STD DEV	0.46165	1.02421	0.69607	0.76427	0.77294	0.49212	0.54665
	ITEM 50	ITEM 51	ITEM 52	ITEM 53	ITEM 54	ITEM 55	ITEM 56
MEAN	1.27723	1.37129	1.17822	1.21782	1.54455	2.07921	1.30198
STD DEV	0.60048	0.69523	0.49668	0.53910	0.77299	0.87170	0.60913
	ITEM 57	ITEM 58					
MEAN	1.96535	1.29208					
STD DEV	0.88873	0.66080					

HOPKINS SYMPTOM CHECKLIST ITEM ANALYSIS- ITEM TOTAL TEST CORRELATIONS.

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10
TOTAL	0.36626	0.56586	0.56593	0.34391	0.31561	0.42868	0.43060	0.43893	0.43947	0.42417
	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20
TOTAL	0.56239	0.28023	0.35027	0.46745	0.63418	0.40487	0.51079	0.62101	0.34616	0.40781
	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27	ITEM 28	ITEM 29	ITEM 30
TOTAL	0.45277	0.59448	0.47598	0.49751	0.22653	0.59232	0.33576	0.57853	0.52075	0.56260
	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36	ITEM 37	ITEM 38	ITEM 39	ITEM 40
TOTAL	0.65033	0.60634	0.54309	0.59476	0.45426	0.61899	0.51082	0.32472	0.55104	0.47144
	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45	ITEM 46	ITEM 47	ITEM 48	ITEM 49	ITEM 50
TOTAL	0.51408	0.39496	0.35338	0.54243	0.46285	0.53322	0.53499	0.43389	0.41590	0.45885
	ITEM 51	ITEM 52	ITEM 53	ITEM 54	ITEM 55	ITEM 56	ITEM 57	ITEM 58		
TOTAL	0.53051	0.35264	0.41441	0.64054	0.58476	0.58674	0.64887	0.49288		

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9
ITEM 1	1.00000	0.17536	0.21397	0.23200	0.07942	0.15404	0.21640	0.04285	0.12632
ITEM 2	0.17536	1.00000	0.34677	0.16352	0.14919	0.19426	0.16368	0.30358	0.21486
ITEM 3	0.21397	0.34677	1.00000	0.11278	0.26907	0.22954	0.27997	0.27338	0.16705
ITEM 4	0.23200	0.16352	0.11278	1.00000	0.15998	0.26225	0.29556	0.01324	0.16710
ITEM 5	0.07942	0.14919	0.26907	0.15998	1.00000	0.30589	0.22123	0.08085	0.19756
ITEM 6	0.15404	0.19426	0.22954	0.26225	0.30589	1.00000	0.20282	0.08327	0.10627
ITEM 7	0.21640	0.16368	0.27997	0.29556	0.22123	0.20282	1.00000	0.10215	0.22149
ITEM 8	0.04285	0.30358	0.27338	0.01324	0.08085	0.08327	0.10215	1.00000	0.30101
ITEM 9	0.12632	0.21486	0.16705	0.16710	0.19756	0.10627	0.22149	0.30101	1.00000
ITEM 10	0.03076	0.20916	0.17886	0.16746	0.11316	0.24737	0.20775	0.21363	0.22312
ITEM 11	0.21114	0.27154	0.38171	0.18910	0.24815	0.46176	0.24270	0.11890	0.17050
ITEM 12	0.23458	0.05000	0.10094	0.35110	0.05048	0.12188	0.17254	0.09344	0.22421
ITEM 13	0.08099	0.20036	0.22464	0.10040	0.11068	0.14681	0.08870	0.23720	0.08058
ITEM 14	0.22778	0.17399	0.19083	0.12810	0.08515	0.25598	0.12604	0.15635	0.19731
ITEM 15	0.24332	0.27690	0.39770	0.26777	0.18038	0.26816	0.31157	0.31291	0.24780
ITEM 16	0.10785	0.25965	0.17206	0.09560	-0.06862	0.09732	0.05291	0.26951	0.16085
ITEM 17	0.03399	0.28944	0.21992	0.22456	0.19540	0.15564	0.29341	0.41398	0.21802
ITEM 18	0.21829	0.34018	0.32208	0.16500	0.08794	0.20012	0.29946	0.14337	0.33628
ITEM 19	0.09332	0.11661	0.03740	0.13088	0.01368	0.10925	0.14694	0.09934	0.06993
ITEM 20	0.16376	0.21121	0.12215	0.17966	0.16693	0.12941	0.14928	0.02185	0.15678
ITEM 21	0.01406	0.30626	0.33400	0.04534	0.06440	0.15285	0.25919	0.36402	0.06625
ITEM 22	0.08642	0.34115	0.40216	0.19462	0.38943	0.27297	0.13472	0.21855	0.24138
ITEM 23	0.23693	0.28339	0.33620	0.21663	0.02935	0.09202	0.33137	0.23522	0.27505
ITEM 24	0.12296	0.28543	0.22546	0.08038	0.07444	0.24750	0.13931	0.19048	0.15809
ITEM 25	0.00425	0.08037	0.17468	0.15177	-0.02158	0.09063	0.08639	0.03805	0.06267
ITEM 26	0.05324	0.37775	0.39114	0.03900	0.07809	0.11639	0.24598	0.36890	0.25418
ITEM 27	0.41881	0.05906	0.12115	0.18448	0.03695	0.10545	0.11462	0.08820	0.09480
ITEM 28	0.10223	0.35276	0.30344	0.17336	0.21327	0.16834	0.22867	0.13714	0.25913
ITEM 29	0.14562	0.29221	0.38791	0.09124	0.14043	0.19098	0.23747	0.18426	0.11352

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9
ITEM 30	0.17898	0.34406	0.32723	0.11051	0.15201	0.22124	0.23107	0.18003	0.13536
ITEM 31	0.12963	0.46023	0.41558	0.11284	0.14928	0.23629	0.28066	0.27303	0.21086
ITEM 32	0.15788	0.32734	0.30078	0.03825	0.12977	0.27570	0.11942	0.27781	0.22556
ITEM 33	0.10655	0.43643	0.41608	0.08464	0.15527	0.19842	0.18498	0.20256	0.14896
ITEM 34	0.24810	0.40131	0.35030	0.19970	0.15581	0.24954	0.27713	0.30359	0.19798
ITEM 35	0.21774	0.23309	0.38143	0.10703	0.08423	0.21361	0.12718	0.11901	0.17000
ITEM 36	0.26552	0.32148	0.35329	0.21180	0.19345	0.27617	0.23485	0.19540	0.13826
ITEM 37	0.23272	0.25579	0.33707	0.16023	0.17871	0.28085	0.23450	0.22429	0.11420
ITEM 38	0.04465	0.24942	0.10347	0.07537	0.05087	0.05043	0.04817	0.20041	0.23723
ITEM 39	0.20549	0.36832	0.11168	0.29414	0.14504	0.11503	0.24038	0.25037	0.14265
ITEM 40	0.22974	0.20447	0.12159	0.22578	0.08896	0.12562	0.12334	0.23269	0.21129
ITEM 41	0.23236	0.31528	0.32889	0.16874	0.09892	0.11417	0.15500	0.22773	0.20381
ITEM 42	0.32012	0.04781	0.15077	0.13650	0.14443	0.11901	0.16228	0.14049	0.14971
ITEM 43	0.11000	0.16991	0.13178	0.06745	0.05793	0.09193	0.10982	0.15937	0.21718
ITEM 44	0.15900	0.33589	0.20758	0.15603	0.06975	0.21471	0.37626	0.19387	0.20759
ITEM 45	0.13213	0.22343	0.20899	0.12279	0.06432	0.26334	0.07981	0.19068	0.24731
ITEM 46	0.08202	0.26066	0.37908	0.06095	0.09760	0.19458	0.06376	0.20821	0.38215
ITEM 47	0.13522	0.35612	0.29220	0.20063	0.33606	0.26904	0.18574	0.23542	0.27597
ITEM 48	0.16746	0.14497	0.09304	0.32125	0.07098	0.26904	0.15539	0.30357	0.23448
ITEM 49	0.08581	0.17170	0.15621	0.20361	0.13384	0.02423	0.21799	0.18898	0.24612
ITEM 50	0.03216	0.34282	0.35397	0.12969	0.19840	0.17311	0.28856	0.24342	0.15618
ITEM 51	0.18285	0.26431	0.25027	0.19345	0.24548	0.12499	0.23885	0.25875	0.49414
ITEM 52	0.15230	0.07523	0.07516	0.09023	0.00363	0.20669	0.12901	0.16201	0.13804
ITEM 53	0.25083	0.17740	0.09435	0.24012	0.02285	0.25572	0.18759	0.07855	0.23181
ITEM 54	0.20912	0.35990	0.49222	0.14016	0.34410	0.26958	0.21568	0.34072	0.14951
ITEM 55	0.16613	0.25333	0.30138	0.15804	0.19820	0.20156	0.19140	0.21770	0.32203
ITEM 56	0.32715	0.30813	0.23710	0.31382	0.16278	0.34149	0.28306	0.28417	0.23085
ITEM 57	0.22466	0.47158	0.38441	0.15004	0.13904	0.23889	0.23836	0.26004	0.17248
ITEM 58	0.24505	0.20035	0.19561	0.26521	0.16904	0.09995	0.16922	0.17574	0.20898

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18
ITEM 1	0.03076	0.21114	0.23458	0.08099	0.22778	0.24332	0.10785	0.03399	0.21829
ITEM 2	0.20916	0.27154	0.05000	0.20036	0.17399	0.27690	0.25965	0.28944	0.34018
ITEM 3	0.17886	0.38171	0.10094	0.22464	0.19083	0.39770	0.17206	0.21992	0.32208
ITEM 4	0.16746	0.18910	0.35110	0.10040	0.12810	0.26777	0.09560	0.22456	0.16500
ITEM 5	0.11316	0.24815	0.05048	0.11068	0.08515	0.18038	-0.06862	0.19540	0.08794
ITEM 6	0.24737	0.46176	0.12188	0.14681	0.25598	0.26816	0.09732	0.15564	0.20012
ITEM 7	0.20775	0.24270	0.17254	0.08870	0.12604	0.31157	0.05291	0.29341	0.29946
ITEM 8	0.21363	0.11890	0.09344	0.23720	0.15635	0.31291	0.26951	0.41398	0.14337
ITEM 9	0.22312	0.17050	0.22421	0.08058	0.19731	0.24780	0.16085	0.21802	0.33628
ITEM 10	1.00000	0.31632	0.08443	0.19528	0.11436	0.24497	0.19203	0.28374	0.17605
ITEM 11	0.31632	1.00000	0.13336	0.06014	0.33415	0.31531	0.19414	0.22427	0.27820
ITEM 12	0.08443	0.13336	1.00000	0.17577	0.18808	0.20323	0.10120	0.28948	0.04010
ITEM 13	0.19528	0.06014	0.17577	1.00000	0.02462	0.34056	0.06312	0.35003	0.04563
ITEM 14	0.11436	0.33415	0.18808	0.02462	1.00000	0.31062	0.19948	0.11606	0.31064
ITEM 15	0.24497	0.31531	0.20323	0.34056	0.31062	1.00000	0.12576	0.38904	0.31830
ITEM 16	0.19203	0.19414	0.10120	0.06312	0.19948	0.12576	1.00000	0.25214	0.34284
ITEM 17	0.28374	0.22427	0.28948	0.35003	0.11606	0.38904	0.25214	1.00000	0.15972
ITEM 18	0.17605	0.27820	0.04010	0.04563	0.31064	0.31830	0.34284	0.15972	1.00000
ITEM 19	0.12283	0.16750	0.02593	0.05559	0.17617	0.25972	0.19167	0.12545	0.25489
ITEM 20	0.06327	0.17772	0.03067	0.23082	0.08871	0.37263	0.03734	0.16582	0.29660
ITEM 21	0.20110	0.24589	-0.05181	0.15171	0.28249	0.39189	0.14924	0.27937	0.30109
ITEM 22	0.19199	0.33513	0.12104	0.10481	0.24505	0.36356	0.18436	0.24707	0.40045
ITEM 23	0.11509	0.20417	0.07930	0.12075	0.16696	0.38398	0.11782	0.24347	0.21891
ITEM 24	0.22682	0.45348	0.10129	0.09482	0.18812	0.29882	0.24508	0.32788	0.33561
ITEM 25	0.06721	0.17767	0.06335	0.03557	0.12855	0.16451	0.09623	0.11214	0.12820
ITEM 26	0.34165	0.29836	0.04103	0.24475	0.15801	0.33122	0.19970	0.37854	0.41015
ITEM 27	0.15236	0.16588	0.18871	0.26219	0.24054	0.24928	0.04495	0.09485	0.14237
ITEM 28	0.30078	0.33777	0.08516	0.16197	0.28680	0.18825	0.18364	0.26052	0.37918
ITEM 29	0.11862	0.27719	0.01878	0.13076	0.37277	0.44304	0.14512	0.14661	0.33823

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18
ITEM 30	0.12800	0.30630	-0.02884	0.20333	0.40055	0.43418	0.16222	0.16156	0.37075
ITEM 31	0.22823	0.42914	0.09159	0.20854	0.28838	0.31795	0.29661	0.22114	0.49589
ITEM 32	0.26251	0.32711	0.11372	0.21219	0.36392	0.34626	0.13302	0.21665	0.34529
ITEM 33	0.06473	0.26859	0.06221	0.11205	0.29015	0.32621	0.22960	0.32370	0.37858
ITEM 34	0.16996	0.33411	0.09826	0.20691	0.17855	0.42527	0.20528	0.28555	0.36383
ITEM 35	0.21596	0.22451	0.22424	0.09500	0.10824	0.29238	0.17558	0.19742	0.28389
ITEM 36	0.16793	0.43639	0.10801	0.16382	0.19571	0.44488	0.23144	0.42138	0.39518
ITEM 37	0.19390	0.34928	0.12884	0.36074	0.26182	0.42261	0.29136	0.28194	0.27828
ITEM 38	0.14473	0.09040	0.05239	0.00023	0.13787	0.09269	0.17263	0.13604	0.21358
ITEM 39	0.23535	0.20074	0.37254	0.19992	0.11952	0.27582	0.21978	0.49747	0.31402
ITEM 40	0.14854	0.19519	0.22267	0.30696	0.15407	0.31645	0.15968	0.29119	0.19734
ITEM 41	0.22817	0.20405	0.15345	0.17020	0.13104	0.35777	0.15197	0.24752	0.31248
ITEM 42	0.21851	0.20594	0.27983	0.19224	0.21211	0.19601	0.21827	0.23840	0.20664
ITEM 43	0.10963	0.16407	0.12917	0.23754	0.12133	0.30423	0.10634	0.19427	0.17296
ITEM 44	0.25330	0.27809	0.07759	0.06195	0.18414	0.34378	0.24622	0.19764	0.40442
ITEM 45	0.17649	0.20447	0.12741	0.15332	0.27499	0.19328	0.25850	0.20808	0.30515
ITEM 46	0.21853	0.27475	0.10094	0.04011	0.21801	0.21856	0.36065	0.16733	0.46182
ITEM 47	0.18198	0.22428	0.12679	0.16253	0.16257	0.29524	0.22598	0.28809	0.26807
ITEM 48	0.28355	0.20559	0.30529	0.15039	0.26060	0.22435	0.24805	0.44819	0.21360
ITEM 49	0.22124	0.12480	0.21742	0.16879	0.10287	0.11081	0.25632	0.29289	0.21541
ITEM 50	0.22680	0.18817	0.05142	0.18593	0.18862	0.32427	0.17397	0.19948	0.20683
ITEM 51	0.30055	0.24098	0.05344	0.21301	0.22783	0.30586	0.21299	0.37982	0.30819
ITEM 52	0.14954	0.21110	0.13555	0.13989	0.17278	0.15904	0.18827	0.15685	0.21563
ITEM 53	0.26006	0.22595	0.07887	0.03520	0.16055	0.23239	0.25002	0.11954	0.32276
ITEM 54	0.14855	0.33856	0.09784	0.22220	0.26520	0.53387	0.21160	0.31428	0.30780
ITEM 55	0.29595	0.31397	0.20115	0.16934	0.32159	0.22032	0.13702	0.21463	0.37598
ITEM 56	0.30893	0.33879	0.30432	0.17755	0.27428	0.35491	0.31530	0.38951	0.31361
ITEM 57	0.10036	0.33982	0.12941	0.24374	0.35068	0.41614	0.19079	0.28240	0.44098
ITEM 58	0.19705	0.14174	0.23962	0.30415	0.16858	0.37739	0.22199	0.19268	0.30165

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 19	ITEM 20	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27
ITEM 1	0.09332	0.16376	0.01406	0.08642	0.23693	0.12296	0.00425	0.05324	0.41881
ITEM 2	0.11661	0.21121	0.30626	0.34115	0.28339	0.28543	0.08037	0.37775	0.05906
ITEM 3	0.03740	0.12215	0.33400	0.40216	0.33620	0.22546	0.17468	0.39114	0.12115
ITEM 4	0.13088	0.17966	0.04534	0.19462	0.21663	0.08038	0.15177	0.03900	0.18448
ITEM 5	0.01368	0.16693	0.06440	0.38943	0.02935	0.07444	-0.02158	0.07809	0.03695
ITEM 6	0.10925	0.12941	0.15285	0.27297	0.09202	0.24750	0.09063	0.11639	0.10545
ITEM 7	0.14694	0.14928	0.25919	0.13472	0.33137	0.13931	0.08639	0.24598	0.11462
ITEM 8	0.09934	0.02185	0.36402	0.21855	0.23522	0.19048	0.03805	0.36890	0.08820
ITEM 9	0.06993	0.15678	0.06625	0.24138	0.27505	0.15809	0.06267	0.25418	0.09480
ITEM 10	0.12283	0.06327	0.20110	0.19199	0.11509	0.22682	0.06721	0.34165	0.15236
ITEM 11	0.16750	0.17772	0.24589	0.33513	0.20417	0.45348	0.17767	0.29836	0.16588
ITEM 12	0.02593	0.03067	-0.05181	0.12104	0.07930	0.10129	0.06335	0.04103	0.18871
ITEM 13	0.05559	0.23082	0.15171	0.10481	0.12075	0.09482	0.03557	0.24475	0.26219
ITEM 14	0.17617	0.08871	0.28249	0.24505	0.16696	0.18812	0.12855	0.15801	0.24054
ITEM 15	0.25972	0.37263	0.39189	0.36356	0.38398	0.29882	0.16451	0.33122	0.24928
ITEM 16	0.19167	0.03734	0.14924	0.18436	0.11782	0.24508	0.09623	0.19970	0.04495
ITEM 17	0.12545	0.16582	0.27937	0.24707	0.24347	0.32788	0.11214	0.37854	0.09485
ITEM 18	0.25489	0.29660	0.30109	0.40045	0.21891	0.33561	0.12820	0.41015	0.14237
ITEM 19	1.00000	0.20257	0.16554	0.16178	0.17936	0.20787	0.13049	0.25840	0.10150
ITEM 20	0.20257	1.00000	0.04717	0.33289	0.31545	0.32185	0.22417	0.24205	0.21444
ITEM 21	0.16554	0.04717	1.00000	0.24535	0.36855	0.19143	0.05506	0.27422	0.03290
ITEM 22	0.16178	0.33289	0.24535	1.00000	0.28551	0.29142	0.26964	0.32660	0.04355
ITEM 23	0.17936	0.31545	0.36855	0.28551	1.00000	0.29112	0.24388	0.30927	0.17800
ITEM 24	0.20787	0.32185	0.19143	0.29142	0.29112	1.00000	0.28058	0.30719	0.13814
ITEM 25	0.13049	0.22417	0.05506	0.26964	0.24388	0.28058	1.00000	0.07864	0.05244
ITEM 26	0.25840	0.24205	0.27422	0.32660	0.30927	0.30719	0.07864	1.00000	0.07351
ITEM 27	0.10150	0.21444	0.03290	0.04355	0.17800	0.13814	0.05244	0.07351	1.00000
ITEM 28	0.16291	0.18854	0.20598	0.39181	0.21312	0.31252	0.17160	0.39091	0.19822
ITEM 29	0.15156	0.18232	0.45629	0.31914	0.24640	0.19697	0.10046	0.25997	0.04296

CORRELATION MATRIX

	ITEM 19	ITEM 20	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27
ITEM 30	0.19782	0.27414	0.44275	0.27411	0.24922	0.16678	0.12184	0.37034	0.06694
ITEM 31	0.12829	0.21247	0.30041	0.36803	0.25778	0.34232	0.13667	0.50055	0.17029
ITEM 32	0.10988	0.28084	0.33186	0.47919	0.22792	0.34239	0.19302	0.40390	0.15509
ITEM 33	0.12425	0.15561	0.28483	0.36085	0.38734	0.28773	0.09361	0.43086	-0.00419
ITEM 34	0.15886	0.35452	0.32415	0.29652	0.38969	0.30244	0.08201	0.47478	0.12586
ITEM 35	0.19182	0.15329	0.12398	0.25003	0.26832	0.21319	0.00202	0.24207	0.17765
ITEM 36	0.24449	0.35716	0.35461	0.37464	0.38861	0.32077	0.02696	0.41436	0.09030
ITEM 37	0.08990	0.08709	0.41424	0.23973	0.30403	0.21154	0.03906	0.30234	0.13771
ITEM 38	0.13117	0.02277	0.24141	0.20229	0.15740	0.07010	-0.03138	0.14569	-0.03077
ITEM 39	0.37069	0.22893	0.11740	0.22372	0.18029	0.27022	0.09757	0.34412	0.23608
ITEM 40	0.21620	0.25655	0.01778	0.19919	0.13745	0.14940	0.09068	0.21577	0.37740
ITEM 41	-0.00857	0.23168	0.33747	0.32015	0.36013	0.16741	0.13567	0.27662	0.15067
ITEM 42	0.13361	0.02297	0.02899	0.15354	0.08353	0.14814	-0.03277	0.18223	0.34619
ITEM 43	0.13957	0.24140	-0.00720	0.15807	0.09192	0.10748	0.11574	0.23904	0.29699
ITEM 44	0.39708	0.22356	0.25371	0.19798	0.15108	0.22724	0.17389	0.27560	0.16709
ITEM 45	0.19924	0.19230	0.13492	0.28655	0.15709	0.20838	0.12802	0.15747	0.19379
ITEM 46	0.16275	0.17261	0.17900	0.38693	0.22235	0.30060	0.22833	0.25528	0.02818
ITEM 47	0.20560	0.34269	0.21942	0.37534	0.29493	0.20319	0.17309	0.27696	0.10977
ITEM 48	0.17784	0.13841	0.13542	0.16468	0.20013	0.27563	-0.00183	0.21656	0.31717
ITEM 49	0.12078	0.11148	0.00158	0.22437	0.21320	0.24057	-0.01810	0.33468	0.24550
ITEM 50	0.11127	0.10166	0.33494	0.30338	0.28070	0.08529	0.08209	0.29735	0.03529
ITEM 51	0.17696	0.14719	0.11690	0.31990	0.18850	0.21630	0.08220	0.33752	0.17317
ITEM 52	0.17743	0.05922	-0.01018	0.10694	0.09776	0.13991	0.03767	0.20408	0.32524
ITEM 53	0.25621	0.15329	0.09376	0.20500	0.19020	0.19780	0.05740	0.19883	0.24984
ITEM 54	0.17808	0.25790	0.45025	0.54065	0.32517	0.31438	0.13142	0.35883	0.06127
ITEM 55	0.12554	0.10550	0.12757	0.29086	0.12385	0.27840	0.05586	0.30070	0.13835
ITEM 56	0.21716	0.15186	0.08396	0.27849	0.12961	0.29220	0.02884	0.23999	0.31200
ITEM 57	0.19637	0.27980	0.24381	0.39959	0.19499	0.33384	0.16174	0.36944	0.13726
ITEM 58	0.17770	0.22401	0.06653	0.32904	0.11036	0.19669	0.03113	0.20481	0.20017

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 28	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36
ITEM 1	0.10223	0.14562	0.17898	0.12963	0.15788	0.10655	0.24810	0.21774	0.26552
ITEM 2	0.35276	0.29221	0.34406	0.46023	0.32734	0.43643	0.40131	0.23309	0.32148
ITEM 3	0.30344	0.38791	0.32723	0.41558	0.30078	0.41608	0.35030	0.38143	0.35329
ITEM 4	0.17336	0.09124	0.11051	0.11284	0.03825	0.08464	0.19970	0.10703	0.21180
ITEM 5	0.21327	0.14043	0.15201	0.14928	0.12977	0.15527	0.15581	0.08423	0.19345
ITEM 6	0.16834	0.19098	0.22124	0.23629	0.27570	0.19842	0.24954	0.21361	0.27617
ITEM 7	0.22867	0.23747	0.23107	0.28066	0.11942	0.18498	0.27713	0.12718	0.23485
ITEM 8	0.13714	0.18426	0.18003	0.27303	0.27781	0.20256	0.30359	0.11901	0.19540
ITEM 9	0.25913	0.11352	0.13536	0.21086	0.22556	0.14896	0.19798	0.17000	0.13826
ITEM 10	0.30078	0.11862	0.12800	0.22823	0.26251	0.06473	0.16996	0.21596	0.16793
ITEM 11	0.33777	0.27719	0.30630	0.42914	0.32711	0.26859	0.33411	0.22451	0.43639
ITEM 12	0.08516	0.01878	-0.02884	0.09159	0.11372	0.06221	0.09826	0.22424	0.10801
ITEM 13	0.16197	0.13076	0.20333	0.20854	0.21219	0.11205	0.20691	0.09500	0.16382
ITEM 14	0.28680	0.37277	0.40055	0.28838	0.36392	0.29015	0.17855	0.10824	0.19571
ITEM 15	0.18825	0.44304	0.43418	0.31795	0.34626	0.32621	0.42527	0.29238	0.44488
ITEM 16	0.18364	0.14512	0.16222	0.29661	0.13302	0.22960	0.20528	0.17558	0.23144
ITEM 17	0.26052	0.14661	0.16156	0.22114	0.21665	0.32370	0.28555	0.19742	0.42138
ITEM 18	0.37918	0.33823	0.37075	0.49589	0.34529	0.37858	0.36383	0.28389	0.39518
ITEM 19	0.16291	0.15156	0.19782	0.12829	0.10988	0.12425	0.15886	0.19182	0.24449
ITEM 20	0.18854	0.18232	0.27414	0.21247	0.28084	0.15561	0.35452	0.15329	0.35716
ITEM 21	0.20598	0.45629	0.44275	0.30041	0.33186	0.28483	0.32415	0.12398	0.35461
ITEM 22	0.39181	0.31914	0.27411	0.36803	0.47919	0.36085	0.29652	0.25003	0.37464
ITEM 23	0.21312	0.24640	0.24922	0.25778	0.22792	0.38734	0.38969	0.26832	0.38861
ITEM 24	0.31252	0.19697	0.16678	0.34232	0.34239	0.28773	0.30244	0.21319	0.32077
ITEM 25	0.17160	0.10046	0.12184	0.13667	0.19302	0.09361	0.08201	0.00202	0.02696
ITEM 26	0.39091	0.25997	0.37034	0.50055	0.40390	0.43086	0.47478	0.24207	0.41436
ITEM 27	0.19822	0.04296	0.06694	0.17029	0.15509	-0.00419	0.12586	0.17765	0.09030
ITEM 28	1.00000	0.20235	0.21329	0.43339	0.43472	0.35408	0.22934	0.13340	0.27820
ITEM 29	0.20235	1.00000	0.62567	0.34444	0.42336	0.36220	0.37730	0.21338	0.39173

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 28	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36
ITEM 30	0.21329	0.62567	1.00000	0.44828	0.45251	0.33103	0.45277	0.11722	0.38773
ITEM 31	0.43339	0.34444	0.44828	1.00000	0.40547	0.44197	0.40056	0.22198	0.36601
ITEM 32	0.43472	0.42336	0.45251	0.40547	1.00000	0.36412	0.35448	0.25724	0.28852
ITEM 33	0.35408	0.36220	0.33103	0.44197	0.36412	1.00000	0.37173	0.36204	0.36180
ITEM 34	0.22934	0.37730	0.45277	0.40056	0.35448	0.37173	1.00000	0.24429	0.54381
ITEM 35	0.13340	0.21338	0.11722	0.22198	0.25724	0.36204	0.24429	1.00000	0.36293
ITEM 36	0.27820	0.39173	0.38773	0.36601	0.28852	0.36180	0.54381	0.36293	1.00000
ITEM 37	0.09180	0.38455	0.36734	0.35465	0.21022	0.22252	0.44589	0.16666	0.45025
ITEM 38	0.23655	0.14659	0.18757	0.14997	0.22237	0.15284	0.19706	0.10165	0.15389
ITEM 39	0.32208	0.11600	0.17924	0.28282	0.25002	0.24767	0.23868	0.33052	0.32227
ITEM 40	0.22695	0.08910	0.18421	0.21394	0.29161	0.19419	0.25694	0.16903	0.21759
ITEM 41	0.25958	0.36100	0.32496	0.24129	0.27524	0.32780	0.39278	0.23212	0.39069
ITEM 42	0.30348	0.02330	0.03670	0.19761	0.17896	0.10192	0.03371	0.22573	0.19474
ITEM 43	0.18955	0.02749	0.16820	0.18687	0.17088	0.05808	0.23971	0.05557	0.06601
ITEM 44	0.27093	0.21664	0.34763	0.35278	0.26525	0.24750	0.29018	0.19758	0.35290
ITEM 45	0.26204	0.15837	0.24933	0.21755	0.21337	0.17678	0.14877	0.19198	0.17550
ITEM 46	0.28728	0.30516	0.28299	0.32412	0.37740	0.27890	0.25315	0.40991	0.24511
ITEM 47	0.26026	0.30825	0.27993	0.26363	0.26608	0.20355	0.23852	0.27919	0.32234
ITEM 48	0.25998	0.06553	0.04160	0.22742	0.23762	0.20946	0.12737	0.14152	0.24905
ITEM 49	0.29537	0.04856	0.07052	0.27755	0.18894	0.20021	0.21959	0.13278	0.27123
ITEM 50	0.27285	0.27231	0.28421	0.36110	0.29572	0.42961	0.21739	0.17265	0.20388
ITEM 51	0.38837	0.15133	0.19916	0.24998	0.21046	0.23444	0.22057	0.18993	0.22330
ITEM 52	0.22278	0.09320	0.06570	0.19838	0.16404	0.09292	0.13135	0.18899	0.07852
ITEM 53	0.21904	0.06028	0.07638	0.15442	0.22244	0.18975	0.13713	0.33689	0.29520
ITEM 54	0.27170	0.52167	0.46898	0.42285	0.46816	0.39761	0.43078	0.28669	0.51908
ITEM 55	0.48125	0.34485	0.34750	0.41070	0.43311	0.21079	0.27323	0.29751	0.25232
ITEM 56	0.38476	0.18440	0.18360	0.38681	0.29609	0.23015	0.24826	0.29308	0.31591
ITEM 57	0.41728	0.35239	0.43133	0.59345	0.39423	0.40714	0.35186	0.22338	0.38706
ITEM 58	0.32971	0.12600	0.13953	0.26026	0.30291	0.22096	0.20577	0.23408	0.23037

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45
ITEM 1	0.23272	0.04465	0.20549	0.22974	0.23236	0.32012	0.11000	0.15900	0.13213
ITEM 2	0.25579	0.24942	0.36832	0.20447	0.31528	0.04781	0.16991	0.33589	0.22343
ITEM 3	0.33707	0.10347	0.11168	0.12159	0.32889	0.15077	0.13178	0.20758	0.20899
ITEM 4	0.16023	0.07537	0.29414	0.22578	0.16874	0.13650	0.06745	0.15603	0.12279
ITEM 5	0.17871	0.05087	0.14504	0.08896	0.09892	0.14443	0.05793	0.06975	0.06432
ITEM 6	0.28085	0.05043	0.11503	0.12562	0.11417	0.11901	0.09193	0.21471	0.26334
ITEM 7	0.23450	0.04817	0.24038	0.12334	0.15500	0.16228	0.10982	0.37626	0.07981
ITEM 8	0.22429	0.20041	0.25037	0.23269	0.22773	0.14049	0.15937	0.19387	0.19068
ITEM 9	0.11420	0.23723	0.14265	0.21129	0.20381	0.14971	0.21718	0.20759	0.24731
ITEM 10	0.19390	0.14473	0.23535	0.14854	0.22817	0.21851	0.10963	0.25330	0.17649
ITEM 11	0.34928	0.09040	0.20074	0.19519	0.20405	0.20594	0.16407	0.27809	0.20447
ITEM 12	0.12884	0.05239	0.37254	0.22267	0.15345	0.27983	0.12917	0.07759	0.12741
ITEM 13	0.36074	0.00023	0.19992	0.30696	0.17020	0.19224	0.23754	0.06195	0.15332
ITEM 14	0.26182	0.13787	0.11952	0.15407	0.13104	0.21211	0.12133	0.18414	0.27499
ITEM 15	0.42261	0.09269	0.27582	0.31645	0.35777	0.19601	0.30423	0.34378	0.19328
ITEM 16	0.29136	0.17263	0.21978	0.15968	0.15197	0.21827	0.10634	0.24622	0.25850
ITEM 17	0.28194	0.13604	0.49747	0.29119	0.24752	0.23840	0.19427	0.19764	0.20808
ITEM 18	0.27828	0.21358	0.31402	0.19734	0.31248	0.20664	0.17296	0.40442	0.30515
ITEM 19	0.08990	0.13117	0.37069	0.21620	-0.00857	0.13361	0.13957	0.39708	0.19924
ITEM 20	0.08709	0.02277	0.22893	0.25655	0.23168	0.02297	0.24140	0.22356	0.19230
ITEM 21	0.41424	0.24141	0.11740	0.01778	0.33747	0.02899	-0.00720	0.25371	0.13492
ITEM 22	0.23973	0.20229	0.22372	0.19919	0.32015	0.15354	0.15807	0.19798	0.28655
ITEM 23	0.30403	0.15740	0.18029	0.13745	0.36013	0.08353	0.09192	0.15108	0.15709
ITEM 24	0.21154	0.07010	0.27022	0.14940	0.16741	0.14814	0.10748	0.22724	0.20838
ITEM 25	0.03906	-0.03138	0.09757	0.09068	0.13567	-0.03277	0.11574	0.17389	0.12802
ITEM 26	0.30234	0.14569	0.34412	0.21577	0.27662	0.18223	0.23904	0.27560	0.15747
ITEM 27	0.13771	-0.03077	0.23608	0.37740	0.15067	0.34619	0.29699	0.16709	0.19379
ITEM 28	0.09180	0.23655	0.32208	0.22695	0.25958	0.30348	0.18955	0.27093	0.26204
ITEM 29	0.38455	0.14659	0.11600	0.08910	0.36100	0.02330	0.02749	0.21664	0.15837

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45
ITEM 30	0.36734	0.18757	0.17924	0.18421	0.32496	0.03670	0.16820	0.34763	0.24933
ITEM 31	0.35465	0.14997	0.28282	0.21394	0.24129	0.19761	0.18687	0.35278	0.21755
ITEM 32	0.21022	0.22237	0.25002	0.29161	0.27524	0.17896	0.17088	0.26525	0.21337
ITEM 33	0.22252	0.15284	0.24767	0.19419	0.32780	0.10192	0.05808	0.24750	0.17678
ITEM 34	0.44589	0.19706	0.23868	0.25694	0.39278	0.03371	0.23971	0.29018	0.14877
ITEM 35	0.16666	0.10165	0.33052	0.16903	0.23212	0.22573	0.05557	0.19758	0.19198
ITEM 36	0.45025	0.15389	0.32227	0.21759	0.39069	0.19474	0.06601	0.35290	0.17550
ITEM 37	1.00000	0.04487	0.09644	0.14083	0.42604	0.10679	0.18363	0.25604	0.17511
ITEM 38	0.04487	1.00000	0.21344	0.15430	0.24749	0.05368	0.03965	0.08806	0.36631
ITEM 39	0.09644	0.21344	1.00000	0.42856	0.21282	0.38501	0.22190	0.38866	0.31746
ITEM 40	0.14083	0.15430	0.42856	1.00000	0.21885	0.33873	0.53183	0.29518	0.27345
ITEM 41	0.42604	0.24749	0.21282	0.21885	1.00000	0.10576	0.19739	0.19222	0.16724
ITEM 42	0.10679	0.05368	0.38501	0.33873	0.10576	1.00000	0.13601	0.13850	0.14785
ITEM 43	0.18363	0.03965	0.22190	0.53183	0.19739	0.13601	1.00000	0.27837	0.28880
ITEM 44	0.25604	0.08806	0.38866	0.29518	0.19222	0.13850	0.27837	1.00000	0.35715
ITEM 45	0.17511	0.36631	0.31746	0.27345	0.16724	0.14785	0.28880	0.35715	1.00000
ITEM 46	0.19839	0.31236	0.21643	0.17165	0.32369	0.04857	0.21026	0.28412	0.44288
ITEM 47	0.15127	0.24529	0.35482	0.25198	0.33555	0.09435	0.19982	0.29394	0.22816
ITEM 48	0.13666	0.07916	0.34190	0.25667	0.08939	0.19411	0.11199	0.32290	0.26934
ITEM 49	0.13801	0.03679	0.27923	0.28701	0.12024	0.32614	0.24155	0.19408	0.13062
ITEM 50	0.17996	0.26577	0.22867	0.22504	0.29143	0.16670	0.01724	0.19847	0.19233
ITEM 51	0.22523	0.23811	0.25433	0.25799	0.27052	0.28750	0.23612	0.20338	0.29885
ITEM 52	0.12622	0.06601	0.25099	0.30892	0.08017	0.36324	0.25672	0.23249	0.21116
ITEM 53	0.19522	0.05479	0.26762	0.24872	0.14055	0.23050	0.09362	0.24578	0.21568
ITEM 54	0.35792	0.22290	0.25739	0.12254	0.36227	0.13605	0.05867	0.24943	0.19573
ITEM 55	0.23762	0.18498	0.38824	0.17115	0.29836	0.28460	0.14468	0.31211	0.31312
ITEM 56	0.24054	0.11647	0.46956	0.33770	0.15684	0.40902	0.21660	0.30682	0.17636
ITEM 57	0.30708	0.24632	0.36625	0.30656	0.32437	0.19490	0.23046	0.32621	0.25720
ITEM 58	0.15947	0.12791	0.39178	0.39823	0.18635	0.50114	0.23696	0.24331	0.09606

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 46	ITEM 47	ITEM 48	ITEM 49	ITEM 50	ITEM 51	ITEM 52	ITEM 53	ITEM 54
ITEM 1	0.08202	0.13522	0.16746	0.08581	0.03216	0.18285	0.15230	0.25083	0.20912
ITEM 2	0.26066	0.35612	0.14497	0.17170	0.34282	0.26431	0.07523	0.17740	0.35990
ITEM 3	0.37908	0.29220	0.09304	0.15621	0.35397	0.25027	0.07516	0.09435	0.49222
ITEM 4	0.06095	0.20063	0.32125	0.20361	0.12969	0.19345	0.09023	0.24012	0.14016
ITEM 5	0.09760	0.33606	0.07098	0.13384	0.19840	0.24548	0.00363	0.02285	0.34410
ITEM 6	0.19458	0.26904	0.26904	0.02423	0.17311	0.12499	0.20669	0.25572	0.26958
ITEM 7	0.06376	0.18574	0.15539	0.21799	0.28856	0.23885	0.12901	0.18759	0.21568
ITEM 8	0.20821	0.23542	0.30357	0.18898	0.24342	0.25875	0.16201	0.07855	0.34072
ITEM 9	0.38215	0.27597	0.23448	0.24612	0.15618	0.49414	0.13804	0.23181	0.14951
ITEM 10	0.21853	0.18198	0.28355	0.22124	0.22680	0.30055	0.14954	0.26006	0.14855
ITEM 11	0.27475	0.22428	0.20559	0.12480	0.18817	0.24098	0.21110	0.22595	0.33856
ITEM 12	0.10094	0.12679	0.30529	0.21742	0.05142	0.05344	0.13555	0.07887	0.09784
ITEM 13	0.04011	0.16253	0.15039	0.16879	0.18593	0.21301	0.13989	0.03520	0.22220
ITEM 14	0.21801	0.16257	0.26060	0.10287	0.18862	0.22783	0.17278	0.16055	0.26520
ITEM 15	0.21856	0.29524	0.22435	0.11081	0.32427	0.30586	0.15904	0.23239	0.53387
ITEM 16	0.36065	0.22598	0.24805	0.25632	0.17397	0.21299	0.18827	0.25002	0.21160
ITEM 17	0.16733	0.28809	0.44819	0.29289	0.19948	0.37982	0.15685	0.11954	0.31428
ITEM 18	0.46182	0.26807	0.21360	0.21541	0.20683	0.30819	0.21563	0.32276	0.30780
ITEM 19	0.16275	0.20560	0.17784	0.12078	0.11127	0.17696	0.17743	0.25621	0.17808
ITEM 20	0.17261	0.34269	0.13841	0.11148	0.10166	0.14719	0.05922	0.15329	0.25790
ITEM 21	0.17900	0.21942	0.13542	0.00158	0.33494	0.11690	-0.01018	0.09376	0.45025
ITEM 22	0.38693	0.37534	0.16468	0.22437	0.30338	0.31990	0.10694	0.20500	0.54065
ITEM 23	0.22235	0.29493	0.20013	0.21320	0.28070	0.18850	0.09776	0.19020	0.32517
ITEM 24	0.30060	0.20319	0.27563	0.24057	0.08529	0.21630	0.13991	0.19780	0.31438
ITEM 25	0.22833	0.17309	-0.00183	-0.01810	0.08209	0.08220	0.03767	0.05740	0.13142
ITEM 26	0.25528	0.27696	0.21656	0.33468	0.29735	0.33752	0.20408	0.19883	0.35883
ITEM 27	0.02818	0.10977	0.31717	0.24550	0.03529	0.17317	0.32524	0.24984	0.06127
ITEM 28	0.28728	0.26026	0.25998	0.29537	0.27285	0.38837	0.22278	0.21904	0.27170
ITEM 29	0.30516	0.30825	0.06553	0.04856	0.27231	0.15133	0.09320	0.06028	0.52167

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 46	ITEM 47	ITEM 48	ITEM 49	ITEM 50	ITEM 51	ITEM 52	ITEM 53	ITEM 54
ITEM 30	0.28299	0.27993	0.04160	0.07052	0.28421	0.19916	0.06570	0.07638	0.46898
ITEM 31	0.32412	0.26363	0.22742	0.27755	0.36110	0.24998	0.19838	0.15442	0.42285
ITEM 32	0.37740	0.26608	0.23762	0.18894	0.29572	0.21046	0.16404	0.22244	0.46816
ITEM 33	0.27890	0.20355	0.20946	0.20021	0.42961	0.23444	0.09292	0.18975	0.39761
ITEM 34	0.25315	0.23852	0.12737	0.21959	0.21739	0.22057	0.13135	0.13713	0.43078
ITEM 35	0.40991	0.27919	0.14152	0.13278	0.17265	0.18993	0.18899	0.33689	0.28669
ITEM 36	0.24511	0.32234	0.24905	0.27123	0.20388	0.22330	0.07852	0.29520	0.51908
ITEM 37	0.19839	0.15127	0.13666	0.13801	0.17996	0.22523	0.12622	0.19522	0.35792
ITEM 38	0.31236	0.24529	0.07916	0.03679	0.26577	0.23811	0.06601	0.05479	0.22290
ITEM 39	0.21643	0.35482	0.34190	0.27923	0.22867	0.25433	0.25099	0.26762	0.25739
ITEM 40	0.17165	0.25198	0.25667	0.28701	0.22504	0.25799	0.30892	0.24872	0.12254
ITEM 41	0.32369	0.33555	0.08939	0.12024	0.29143	0.27052	0.08017	0.14055	0.36227
ITEM 42	0.04857	0.09435	0.19411	0.32614	0.16670	0.28750	0.36324	0.23050	0.13605
ITEM 43	0.21026	0.19982	0.11199	0.24155	0.01724	0.23612	0.25672	0.09362	0.05867
ITEM 44	0.28412	0.29394	0.32290	0.19408	0.19847	0.20338	0.23249	0.24578	0.24943
ITEM 45	0.44288	0.22816	0.26934	0.13062	0.19233	0.29885	0.21116	0.21568	0.19573
ITEM 46	1.00000	0.39200	0.20405	0.12722	0.25009	0.32975	0.12509	0.17575	0.31484
ITEM 47	0.39200	1.00000	0.14640	0.14275	0.25747	0.26973	0.13716	0.19293	0.37801
ITEM 48	0.20405	0.14640	1.00000	0.28592	0.11168	0.20034	0.23801	0.28259	0.19191
ITEM 49	0.12722	0.14275	0.28592	1.00000	0.16627	0.25592	0.24964	0.24922	0.22848
ITEM 50	0.25009	0.25747	0.11168	0.16627	1.00000	0.27657	0.03369	0.10454	0.29481
ITEM 51	0.32975	0.26973	0.20034	0.25592	0.27657	1.00000	0.35492	0.26101	0.26994
ITEM 52	0.12509	0.13716	0.23801	0.24964	0.03369	0.35492	1.00000	0.31882	0.08288
ITEM 53	0.17575	0.19293	0.28259	0.24922	0.10454	0.26101	0.31882	1.00000	0.15568
ITEM 54	0.31484	0.37801	0.19191	0.22848	0.29481	0.26994	0.08288	0.15568	1.00000
ITEM 55	0.39594	0.26692	0.27547	0.35787	0.14793	0.35349	0.30048	0.23836	0.39345
ITEM 56	0.12771	0.27082	0.37540	0.37064	0.13723	0.30958	0.26523	0.28351	0.26186
ITEM 57	0.33229	0.30960	0.20954	0.20101	0.32574	0.27054	0.13804	0.20275	0.44765
ITEM 58	0.17927	0.23363	0.13807	0.38939	0.13345	0.26092	0.23473	0.32329	0.29095

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 55	ITEM 56	ITEM 57	ITEM 58
ITEM 1	0.16613	0.32715	0.22466	0.24505
ITEM 2	0.25333	0.30813	0.47158	0.20035
ITEM 3	0.30138	0.23710	0.38441	0.19561
ITEM 4	0.15804	0.31382	0.15004	0.26521
ITEM 5	0.19820	0.16278	0.13904	0.16904
ITEM 6	0.20156	0.34149	0.23889	0.09995
ITEM 7	0.19140	0.28306	0.23836	0.16922
ITEM 8	0.21770	0.28417	0.26004	0.17574
ITEM 9	0.32203	0.23085	0.17248	0.20898
ITEM 10	0.29595	0.30893	0.10036	0.19705
ITEM 11	0.31397	0.33879	0.33982	0.14174
ITEM 12	0.20115	0.30432	0.12941	0.23962
ITEM 13	0.16934	0.17755	0.24374	0.30415
ITEM 14	0.32159	0.27428	0.35068	0.16858
ITEM 15	0.22032	0.35491	0.41614	0.37739
ITEM 16	0.13702	0.31530	0.19079	0.22199
ITEM 17	0.21463	0.38951	0.28240	0.19268
ITEM 18	0.37598	0.31361	0.44098	0.30165
ITEM 19	0.12554	0.21716	0.19637	0.17770
ITEM 20	0.10550	0.15186	0.27980	0.22401
ITEM 21	0.12757	0.08396	0.24381	0.06653
ITEM 22	0.29086	0.27849	0.39959	0.32904
ITEM 23	0.12385	0.12961	0.19499	0.11036
ITEM 24	0.27840	0.29220	0.33384	0.19669
ITEM 25	0.05586	0.02884	0.16174	0.03113
ITEM 26	0.30070	0.23999	0.36944	0.20481
ITEM 27	0.13835	0.31200	0.13726	0.20017
ITEM 28	0.48125	0.38476	0.41728	0.32971
ITEM 29	0.34485	0.18440	0.35239	0.12600

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 55	ITEM 56	ITEM 57	ITEM 58
ITEM 30	0.34750	0.18360	0.43133	0.13953
ITEM 31	0.41070	0.38681	0.59345	0.26026
ITEM 32	0.43311	0.29609	0.39423	0.30291
ITEM 33	0.21079	0.23015	0.40714	0.22096
ITEM 34	0.27323	0.24826	0.35186	0.20577
ITEM 35	0.29751	0.29308	0.22338	0.23408
ITEM 36	0.25232	0.31591	0.38706	0.23037
ITEM 37	0.23762	0.24054	0.30708	0.15947
ITEM 38	0.18498	0.11647	0.24632	0.12791
ITEM 39	0.38824	0.46956	0.36625	0.39178
ITEM 40	0.17115	0.33770	0.30656	0.39823
ITEM 41	0.29836	0.15684	0.32437	0.18635
ITEM 42	0.28460	0.40902	0.19490	0.50114
ITEM 43	0.14468	0.21660	0.23046	0.23696
ITEM 44	0.31211	0.30682	0.32621	0.24331
ITEM 45	0.31312	0.17636	0.25720	0.09606
ITEM 46	0.39594	0.12771	0.33229	0.17927
ITEM 47	0.26692	0.27082	0.30960	0.23363
ITEM 48	0.27547	0.37540	0.20954	0.13807
ITEM 49	0.35787	0.37064	0.20101	0.38939
ITEM 50	0.14793	0.13723	0.32574	0.13345
ITEM 51	0.35349	0.30958	0.27054	0.26092
ITEM 52	0.30048	0.26523	0.13804	0.23473
ITEM 53	0.23836	0.28351	0.20275	0.32329
ITEM 54	0.39345	0.26186	0.44765	0.29095
ITEM 55	1.00000	0.38573	0.38246	0.30512
ITEM 56	0.38573	1.00000	0.46056	0.50903
ITEM 57	0.38246	0.46056	1.00000	0.31383
ITEM 58	0.30512	0.50903	0.31383	1.00000

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

ALL PRIOR ESTIMATES OF COMMUNALITY WERE 1.000000

	1	2	3	4	5	6	7	8
EIGENVALUES	14.123595	3.447690	2.120568	1.892796	1.777299	1.684670	1.662356	1.558824
PORTION	0.244	0.059	0.037	0.033	0.031	0.029	0.029	0.027
CUM PORTION	0.244	0.303	0.340	0.372	0.403	0.432	0.460	0.487

	9	10	11	12	13	14	15	16
EIGENVALUES	1.490110	1.386656	1.345200	1.271228	1.177014	1.142768	1.066881	1.043337
PORTION	0.026	0.024	0.023	0.022	0.020	0.020	0.018	0.018
CUM PORTION	0.513	0.537	0.560	0.582	0.602	0.622	0.640	0.658

	17	18	19	20	21	22	23	24
EIGENVALUES	1.010424	0.932811	0.895156	0.861585	0.841613	0.813093	0.751348	0.741444
PORTION	0.017	0.016	0.015	0.015	0.015	0.014	0.013	0.013
CUM PORTION	0.676	0.692	0.707	0.722	0.737	0.751	0.764	0.777

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

	25	26	27	28	29	30	31	32
EIGENVALUES	0.696303	0.651854	0.645489	0.635990	0.601794	0.570015	0.555424	0.543381
PORTION	0.012	0.011	0.011	0.011	0.010	0.010	0.010	0.009
CUM PORTION	0.789	0.800	0.811	0.822	0.832	0.842	0.852	0.861

	33	34	35	36	37	38	39	40
EIGENVALUES	0.528796	0.514232	0.477097	0.448336	0.439061	0.434249	0.414883	0.393930
PORTION	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
CUM PORTION	0.870	0.879	0.887	0.895	0.903	0.910	0.917	0.924

	41	42	43	44	45	46	47	48
EIGENVALUES	0.363058	0.347463	0.326608	0.323755	0.317363	0.294976	0.276554	0.270257
PORTION	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005
CUM PORTION	0.930	0.936	0.942	0.947	0.953	0.958	0.963	0.967

	49	50	51	52	53	54	55	56
EIGENVALUES	0.248762	0.241820	0.227804	0.212391	0.198490	0.185606	0.172196	0.145834
PORTION	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003
CUM PORTION	0.972	0.976	0.980	0.983	0.987	0.990	0.993	0.996

	57	58
EIGENVALUES	0.140388	0.117371
PORTION	0.002	0.002
CUM PORTION	0.998	1.000

4 FACTORS WERE RETAINED.

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

	FACTOR PATTERN			
	FACTOR1	FACTOR2	FACTOR3	FACTOR4
ITEM 1	0.35028	0.22239	0.35615	0.31220
ITEM 2	0.57230	-0.18576	-0.10318	-0.14973
ITEM 3	0.56677	-0.29192	0.07640	-0.04186
ITEM 4	0.34341	0.27040	0.28113	0.09746
ITEM 5	0.30547	-0.05646	0.12257	-0.04814
ITEM 6	0.41678	-0.00128	0.13076	0.32842
ITEM 7	0.42558	0.02471	0.24461	-0.01025
ITEM 8	0.44537	-0.03104	-0.08358	-0.48710
ITEM 9	0.42748	0.15105	-0.27830	-0.12115
ITEM 10	0.41612	0.15467	-0.12407	-0.13726
ITEM 11	0.55333	-0.06370	0.06104	0.31281
ITEM 12	0.27697	0.40009	0.20289	-0.06456
ITEM 13	0.35283	0.11645	0.31467	-0.37878
ITEM 14	0.45282	-0.03950	-0.04187	0.32886
ITEM 15	0.64854	-0.09364	0.36978	-0.02805
ITEM 16	0.40391	0.09114	-0.26531	-0.02932
ITEM 17	0.53333	0.15033	0.10945	-0.47600
ITEM 18	0.61880	-0.06882	-0.22972	0.24721
ITEM 19	0.34613	0.12318	-0.07369	0.19460
ITEM 20	0.41094	-0.02814	0.18873	0.17089
ITEM 21	0.45756	-0.46418	0.10981	-0.14877
ITEM 22	0.59791	-0.17207	-0.12746	0.06192
ITEM 23	0.48651	-0.18491	0.19525	-0.07124
ITEM 24	0.50220	-0.00670	-0.07587	0.15452
ITEM 25	0.22377	-0.09334	-0.06847	0.22812
ITEM 26	0.60420	-0.11722	-0.09930	-0.26751
ITEM 27	0.31876	0.45279	0.28078	0.17245
ITEM 28	0.57186	0.09506	-0.29384	0.01185
ITEM 29	0.52293	-0.46106	0.11969	0.14368

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
ITEM 30	0.56102	-0.41319	0.09429	0.14297
ITEM 31	0.65144	-0.15317	-0.10328	0.02333
ITEM 32	0.60650	-0.15038	-0.13507	0.08623
ITEM 33	0.56007	-0.26453	-0.06922	-0.08188
ITEM 34	0.60150	-0.24060	0.23120	-0.05798
ITEM 35	0.45933	0.05465	-0.01943	0.11401
ITEM 36	0.63286	-0.17450	0.25414	0.03619
ITEM 37	0.51228	-0.20414	0.35326	-0.03623
ITEM 38	0.31651	-0.10517	-0.39786	-0.15413
ITEM 39	0.56002	0.37355	-0.04510	-0.13298
ITEM 40	0.47056	0.41051	0.08147	-0.09760
ITEM 41	0.51823	-0.21173	0.10883	-0.13181
ITEM 42	0.38255	0.50826	0.05808	-0.03139
ITEM 43	0.35129	0.28141	0.01990	-0.05593
ITEM 44	0.53449	0.07816	-0.08070	0.18053
ITEM 45	0.45032	0.11296	-0.34107	0.13618
ITEM 46	0.52791	-0.13799	-0.47283	0.13790
ITEM 47	0.53287	-0.05889	-0.07905	-0.02183
ITEM 48	0.43732	0.35482	-0.01753	-0.04437
ITEM 49	0.42038	0.36080	-0.04602	-0.22444
ITEM 50	0.46233	-0.21642	-0.08463	-0.25556
ITEM 51	0.52718	0.17917	-0.22368	-0.16825
ITEM 52	0.34482	0.41696	-0.09476	0.11234
ITEM 53	0.41301	0.30208	-0.04384	0.26159
ITEM 54	0.65088	-0.33671	0.12470	-0.03837
ITEM 55	0.57705	0.10746	-0.24617	0.09251
ITEM 56	0.58950	0.39106	0.08392	0.03023
ITEM 57	0.65431	-0.10331	-0.04092	0.06005
ITEM 58	0.49421	0.36690	0.07177	-0.05242

HOPKINS SYMPTOM CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2	FACTOR3	FACTOR4
14.123595	3.447690	2.120568	1.892796

FINAL COMMUNALITY ESTIMATES

ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9	ITEM 10
0.396462	0.395105	0.414036	0.279584	0.113840	0.298667	0.241669	0.443570	0.297681	0.231314
ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20
0.411804	0.282111	0.380543	0.316511	0.566903	0.242702	0.545599	0.501540	0.178276	0.234488
ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27	ITEM 28	ITEM 29	ITEM 30
0.459013	0.407192	0.314081	0.281881	0.115514	0.460222	0.415205	0.422539	0.521007	0.514801
ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36	ITEM 37	ITEM 38	ITEM 39	ITEM 40
0.459043	0.416135	0.395155	0.476506	0.227344	0.496862	0.430201	0.293294	0.472877	0.406105
ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45	ITEM 46	ITEM 47	ITEM 48	ITEM 49	ITEM 50
0.342606	0.409032	0.206119	0.330890	0.350428	0.540313	0.294144	0.319424	0.359385	0.333061
ITEM 51	ITEM 52	ITEM 53	ITEM 54	ITEM 55	ITEM 56	ITEM 57	ITEM 58		
0.388360	0.314359	0.332176	0.554042	0.413695	0.508399	0.444082	0.386756		

STRESS AROUSAL CHECKLIST ITEM ANALYSIS

MEANS AND STD DEVIATIONS

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7
MEAN	2.92118	2.28079	3.01478	3.09852	2.69458	2.69951	3.01478
STD DEV	1.04535	1.00246	1.00236	1.05312	1.06952	1.04519	1.01707
	ITEM 8	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14
MEAN	2.73892	3.00493	2.91626	2.93596	3.43350	3.09852	3.13793
STD DEV	0.98293	1.05538	1.10708	1.05344	0.87838	1.00992	1.01994
	ITEM 15	ITEM 16	ITEM 17	ITEM 18	ITEM 19	ITEM 20	ITEM 21
MEAN	3.16749	3.54680	2.70936	2.20197	3.34975	2.77340	2.95567
STD DEV	1.00569	0.74563	1.08512	0.95627	0.89600	1.00881	0.70571
	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27	ITEM 28
MEAN	3.46305	3.70443	2.33005	2.82759	2.41379	3.07882	3.17241
STD DEV	0.88012	0.67584	1.03619	0.95172	1.15021	1.06877	1.04115
	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35
MEAN	2.34483	2.88177	2.58128	2.80788	2.72906	3.07389	2.18227
STD DEV	0.90067	1.01270	1.01817	0.97368	1.04384	0.65963	0.90722
	ITEM 36	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42
MEAN	2.61084	2.33005	3.43842	3.11823	2.66010	2.14286	2.83251
STD DEV	0.99069	1.04570	0.89548	1.08355	1.01364	0.88120	1.14819
	ITEM 43	ITEM 44	ITEM 45				
MEAN	2.10837	2.12315	3.21675				
STD DEV	0.89999	0.93322	0.89681				

NUMBER OF OBSERVATIONS= 203

STRESS AROUSAL CHECKLIST ITEM ANALYSIS- ITEM TOTAL STRESS SUBSCALE CORRELATIONS

	ITEM 1	ITEM 2	ITEM 5	ITEM 7	ITEM 9	ITEM 13	ITEM 14	ITEM 16	ITEM 19	ITEM 22
STRESS	0.29100	0.00446	0.15474	0.42326	0.44335	0.38048	0.49178	0.48949	0.44902	0.51008

	ITEM 23	ITEM 24	ITEM 28	ITEM 35	ITEM 37	ITEM 38	ITEM 41	ITEM 43	ITEM 44
STRESS	0.32836	0.22802	0.35969	0.12202	0.07515	0.32491	0.27242	0.19835	0.14254

STRESS AROUSAL CHECKLIST ITEM ANALYSIS- ITEM AROUSAL SUBSCALE CORRELATIONS

	ITEM 3	ITEM 4	ITEM 10	ITEM 11	ITEM 25	ITEM 26	ITEM 27	ITEM 29	ITEM 30	ITEM 31
AROUSAL	0.46872	0.42754	0.49511	0.22459	0.53407	0.08154	0.20767	0.36558	0.56140	0.48595

	ITEM 32	ITEM 34	ITEM 36	ITEM 39	ITEM 42
AROUSAL	0.49812	0.28773	0.27266	0.10545	0.15779

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9
ITEM 1	1.00000	-0.62598	-0.06030	0.35335	-0.38472	-0.03991	0.35032	0.01842	0.43112
ITEM 2	-0.62598	1.00000	0.11902	-0.31707	0.44515	0.21322	-0.35854	-0.01064	-0.47391
ITEM 3	-0.06030	0.11902	1.00000	0.24717	0.01347	0.47679	-0.04877	0.17477	-0.10770
ITEM 4	0.35335	-0.31707	0.24717	1.00000	-0.30279	0.13047	0.23897	0.03932	0.33807
ITEM 5	-0.38472	0.44515	0.01347	-0.30279	1.00000	0.05921	-0.19607	0.00383	-0.28812
ITEM 6	-0.03991	0.21322	0.47679	0.13047	0.05921	1.00000	-0.09825	0.24129	-0.29036
ITEM 7	0.35032	-0.35854	-0.04877	0.23897	-0.19607	-0.09825	1.00000	0.25643	0.40579
ITEM 8	0.01842	-0.01064	0.17477	0.03932	0.00383	0.24129	0.25643	1.00000	0.02988
ITEM 9	0.43112	-0.47391	-0.10770	0.33807	-0.28812	-0.29036	0.40579	0.02988	1.00000
ITEM 10	-0.11695	0.24433	0.53646	0.10902	0.07445	0.70974	-0.20993	0.14358	-0.32166
ITEM 11	0.01787	-0.07196	-0.25227	0.08604	0.09240	-0.38625	0.20881	-0.04969	0.30752
ITEM 12	-0.03269	0.04661	0.00393	0.08739	-0.03754	0.05631	-0.01275	-0.01734	0.02439
ITEM 13	0.26999	-0.28662	-0.06991	0.28407	-0.30658	-0.09844	0.28293	0.13077	0.58476
ITEM 14	0.44206	-0.46898	-0.07464	0.36521	-0.28340	-0.14668	0.46093	0.13980	0.62483
ITEM 15	0.29515	-0.19910	0.27254	0.44241	-0.24677	0.21295	0.22020	0.20471	0.32571
ITEM 16	0.27151	-0.21967	-0.11022	0.20845	-0.14339	-0.16926	0.30916	0.09443	0.39289
ITEM 17	-0.26906	0.33935	0.05403	-0.06146	0.36249	0.12340	-0.11720	0.05846	-0.21488
ITEM 18	0.04076	0.00252	-0.19422	-0.12800	0.11386	-0.22625	0.00710	-0.12796	0.02844
ITEM 19	0.50526	-0.47915	-0.07193	0.29907	-0.25993	-0.04052	0.47778	0.16603	0.57404
ITEM 20	-0.25174	0.21498	-0.09459	-0.09538	0.33930	-0.07898	-0.12699	-0.08492	-0.12449
ITEM 21	-0.11884	0.08066	0.01493	0.00591	0.23777	-0.08527	0.05609	0.09742	-0.06617
ITEM 22	0.43804	-0.40620	-0.02463	0.39384	-0.26449	-0.12783	0.34073	0.14044	0.58379
ITEM 23	0.30320	-0.30801	-0.05198	0.28456	-0.15290	-0.08431	0.35928	0.08447	0.41154

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9
ITEM 24	-0.34149	0.43458	0.07631	-0.20687	0.46664	0.16974	-0.30059	-0.06565	-0.37270
ITEM 25	-0.13315	0.15477	0.39708	0.17509	0.01610	0.59961	-0.10476	0.16332	-0.24065
ITEM 26	0.13843	-0.22148	-0.29731	0.00705	-0.12614	-0.46021	0.20633	-0.03533	0.30825
ITEM 27	-0.01214	0.01159	-0.09813	-0.07731	0.14676	-0.25346	0.03991	0.03853	0.15326
ITEM 28	0.54928	-0.48773	-0.02143	0.42239	-0.41484	-0.13867	0.43704	0.04904	0.61195
ITEM 29	-0.00254	0.15541	0.31786	0.15190	0.13557	0.50503	-0.12989	0.07983	-0.24137
ITEM 30	-0.18187	0.30594	0.42602	0.09917	0.14475	0.63977	-0.15210	0.16777	-0.27273
ITEM 31	-0.02651	0.12061	0.30198	0.23719	-0.03164	0.53245	-0.13741	0.10293	-0.20538
ITEM 32	0.12610	-0.00532	0.30726	0.22615	-0.09465	0.41485	-0.00712	0.17493	-0.13878
ITEM 33	-0.37808	0.47046	-0.05293	-0.16024	0.54188	0.01576	-0.16408	-0.04516	-0.25492
ITEM 34	0.05874	-0.05399	-0.17387	0.13200	0.15846	-0.20459	0.15332	0.01463	0.12036
ITEM 35	-0.29276	0.43335	0.25833	-0.07070	0.19541	0.35563	-0.26583	0.13690	-0.39389
ITEM 36	-0.02976	0.04577	-0.11881	-0.13389	0.26104	-0.21389	0.02539	-0.09469	0.03025
ITEM 37	-0.38820	0.46369	0.13701	-0.21398	0.36059	0.18631	-0.33509	0.02164	-0.53976
ITEM 38	0.48133	-0.49627	-0.01828	0.36343	-0.35572	-0.05954	0.34616	0.12507	0.43771
ITEM 39	0.14813	-0.22213	-0.22496	0.14158	-0.13529	-0.43183	0.24996	-0.02665	0.31984
ITEM 40	-0.18426	0.24055	-0.10710	-0.23281	0.39237	-0.11090	-0.15837	-0.10939	-0.11874
ITEM 41	-0.29942	0.43632	0.12090	-0.08459	0.36694	0.29409	-0.20674	0.07757	-0.39467
ITEM 42	0.05494	-0.10947	-0.29033	0.04237	0.03473	-0.41341	0.15474	-0.06964	0.25806
ITEM 43	-0.40657	0.56969	0.10797	-0.17846	0.38429	0.20320	-0.22350	0.01535	-0.43837
ITEM 44	-0.47209	0.54494	-0.07075	-0.30456	0.42475	0.02798	-0.28879	-0.00795	-0.42283
ITEM 45	0.11864	-0.02949	0.28279	0.22888	-0.10096	0.37087	0.03446	0.12629	-0.00636

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18
ITEM 1	-0.11695	0.01787	-0.03269	0.26999	0.44206	0.29515	0.27151	-0.26906	0.04076
ITEM 2	0.24433	-0.07196	0.04661	-0.28662	-0.46898	-0.19910	-0.21967	0.33935	0.00252
ITEM 3	0.53646	-0.25227	0.00393	-0.06991	-0.07464	0.27254	-0.11022	0.05403	-0.19422
ITEM 4	0.10902	0.08604	0.08739	0.28407	0.36521	0.44241	0.20845	-0.06146	-0.12800
ITEM 5	0.07445	0.09240	-0.03754	-0.30658	-0.28340	-0.24677	-0.14339	0.36249	0.11386
ITEM 6	0.70974	-0.38625	0.05631	-0.09844	-0.14668	0.21295	-0.16926	0.12340	-0.22625
ITEM 7	-0.20993	0.20881	-0.01275	0.28293	0.46093	0.22020	0.30916	-0.11720	0.00710
ITEM 8	0.14358	-0.04969	-0.01734	0.13077	0.13980	0.20471	0.09443	0.05846	-0.12796
ITEM 9	-0.32166	0.30752	0.02439	0.58476	0.62483	0.32571	0.39289	-0.21488	0.02844
ITEM 10	1.00000	-0.41637	0.04261	-0.19183	-0.20893	0.19051	-0.17814	0.16920	-0.19437
ITEM 11	-0.41637	1.00000	0.05155	0.23862	0.26628	0.00083	0.32841	0.09624	0.11610
ITEM 12	0.04261	0.05155	1.00000	0.04649	-0.03944	0.05190	0.12760	0.12245	0.19583
ITEM 13	-0.19183	0.23862	0.04649	1.00000	0.63555	0.32973	0.34227	-0.09119	-0.02071
ITEM 14	-0.20893	0.26628	-0.03944	0.63555	1.00000	0.37312	0.34949	-0.20961	-0.04901
ITEM 15	0.19051	0.00083	0.05190	0.32973	0.37312	1.00000	0.18755	-0.05497	-0.08168
ITEM 16	-0.17814	0.32841	0.12760	0.34227	0.34949	0.18755	1.00000	-0.06571	0.12207
ITEM 17	0.16920	0.09624	0.12245	-0.09119	-0.20961	-0.05497	-0.06571	1.00000	0.17135
ITEM 18	-0.19437	0.11610	0.19583	-0.02071	-0.04901	-0.08168	0.12207	0.17135	1.00000
ITEM 19	-0.12504	0.08679	0.03285	0.30092	0.52116	0.23134	0.24584	-0.29718	0.00959
ITEM 20	-0.03924	0.13534	0.01643	-0.12375	-0.11381	-0.24542	-0.05165	0.32394	0.18623
ITEM 21	-0.03012	0.13600	0.01519	-0.09803	-0.01210	0.03144	0.02748	0.18996	0.08669
ITEM 22	-0.15815	0.17631	0.07205	0.43854	0.52409	0.40972	0.46469	-0.19013	-0.01756
ITEM 23	-0.15896	0.16798	0.03344	0.31849	0.49752	0.23343	0.29283	-0.14472	-0.03739

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18
ITEM 24	0.26156	-0.03043	0.04327	-0.33872	-0.31028	-0.21483	-0.11941	0.34990	0.19219
ITEM 25	0.52186	-0.23327	-0.09373	-0.06465	-0.09268	0.27859	-0.11763	0.09984	-0.19001
ITEM 26	-0.47417	0.63483	0.04207	0.24174	0.25072	-0.06449	0.24861	-0.10148	0.11718
ITEM 27	-0.21614	0.37825	0.19545	0.18540	0.08989	-0.05840	0.22520	0.20340	0.27982
ITEM 28	-0.23652	0.19969	0.08026	0.50166	0.56489	0.40726	0.35623	-0.28407	0.02949
ITEM 29	0.47594	-0.38359	-0.12105	-0.24979	-0.12748	0.22012	-0.16421	0.00681	-0.16173
ITEM 30	0.65347	-0.29020	-0.08123	-0.20153	-0.21419	0.17994	-0.12376	0.15328	-0.24104
ITEM 31	0.49137	-0.24205	-0.01745	-0.11856	-0.12049	0.20903	-0.11426	0.00581	-0.19236
ITEM 32	0.43966	-0.20994	-0.07000	0.01431	0.00688	0.25041	-0.05915	0.12025	-0.04851
ITEM 33	0.02739	0.17773	0.16113	-0.13422	-0.25767	-0.17820	0.02591	0.48957	0.24851
ITEM 34	-0.14740	0.30606	0.04697	0.15994	0.24231	0.00364	0.24960	0.18231	0.21952
ITEM 35	0.47367	-0.22082	-0.03752	-0.36009	-0.41251	-0.10416	-0.25052	0.19991	-0.05976
ITEM 36	-0.15624	0.25587	0.06398	-0.05055	-0.00051	-0.12307	0.10855	0.18899	0.33420
ITEM 37	0.29340	-0.07959	-0.04875	-0.44814	-0.40029	-0.18934	-0.20721	0.24638	0.00232
ITEM 38	-0.07264	0.10338	0.10963	0.28044	0.48090	0.33583	0.28423	-0.25032	-0.05189
ITEM 39	-0.40852	0.48807	0.08632	0.30145	0.31665	0.02717	0.32400	-0.05063	0.19662
ITEM 40	-0.06519	0.16960	0.19411	-0.13155	-0.20342	-0.19640	0.02443	0.30131	0.32143
ITEM 41	0.32694	-0.13408	0.02832	-0.28846	-0.34701	-0.15003	-0.06673	0.29732	0.09484
ITEM 42	-0.40054	0.70324	0.07726	0.20214	0.25232	-0.06990	0.30989	0.04815	0.15270
ITEM 43	0.26752	-0.06052	0.05300	-0.31137	-0.38309	-0.20612	-0.15514	0.27066	0.07223
ITEM 44	0.12024	0.01813	0.06137	-0.30708	-0.43402	-0.28582	-0.07591	0.30440	0.20498
ITEM 45	0.44220	-0.16864	-0.11358	-0.02916	0.03210	0.22850	-0.00784	0.02944	-0.09171

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 19	ITEM 20	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27
ITEM 1	0.50526	-0.25174	-0.11884	0.43804	0.30320	-0.34149	-0.13315	0.13843	-0.01214
ITEM 2	-0.47915	0.21498	0.08066	-0.40620	-0.30801	0.43458	0.15477	-0.22148	0.01159
ITEM 3	-0.07193	-0.09459	0.01493	-0.02463	-0.05198	0.07631	0.39708	-0.29731	-0.09813
ITEM 4	0.29907	-0.09538	0.00591	0.39384	0.28456	-0.20687	0.17509	0.00705	-0.07731
ITEM 5	-0.25993	0.33930	0.23777	-0.26449	-0.15290	0.46664	0.01610	-0.12614	0.14676
ITEM 6	-0.04052	-0.07898	-0.08527	-0.12783	-0.08431	0.16974	0.59961	-0.46021	-0.25346
ITEM 7	0.47778	-0.12699	0.05609	0.34073	0.35928	-0.30059	-0.10476	0.20633	0.03991
ITEM 8	0.16603	-0.08492	0.09742	0.14044	0.08447	-0.06565	0.16332	-0.03533	0.03853
ITEM 9	0.57404	-0.12449	-0.06617	0.58379	0.41154	-0.37270	-0.24065	0.30825	0.15326
ITEM 10	-0.12504	-0.03924	-0.03012	-0.15815	-0.15896	0.26156	0.52186	-0.47417	-0.21614
ITEM 11	0.08679	0.13534	0.13600	0.17631	0.16798	-0.03043	-0.23327	0.63483	0.37825
ITEM 12	0.03285	0.01643	0.01519	0.07205	0.03344	0.04327	-0.09373	0.04207	0.19545
ITEM 13	0.30092	-0.12375	-0.09803	0.43854	0.31849	-0.33872	-0.06465	0.24174	0.18540
ITEM 14	0.52116	-0.11381	-0.01210	0.52409	0.49752	-0.31028	-0.09268	0.25072	0.08989
ITEM 15	0.23134	-0.24542	0.03144	0.40972	0.23343	-0.21483	0.27859	-0.06449	-0.05840
ITEM 16	0.24584	-0.05165	0.02748	0.46469	0.29283	-0.11941	-0.11763	0.24861	0.22520
ITEM 17	-0.29718	0.32394	0.18996	-0.19013	-0.14472	0.34990	0.09984	-0.10148	0.20340
ITEM 18	0.00959	0.18623	0.08669	-0.01756	-0.03739	0.19219	-0.19001	0.11718	0.27982
ITEM 19	1.00000	-0.15834	-0.03799	0.50299	0.53127	-0.35423	-0.09729	0.14709	-0.01342
ITEM 20	-0.15834	1.00000	0.22224	-0.10984	-0.04063	0.48865	0.05192	0.02575	0.14980
ITEM 21	-0.03799	0.22224	1.00000	-0.00664	0.04505	0.13520	-0.03355	0.08370	0.03747
ITEM 22	0.50299	-0.10984	-0.00664	1.00000	0.52252	-0.28783	-0.08743	0.15210	0.09258
ITEM 23	0.53127	-0.04063	0.04505	0.52252	1.00000	-0.24881	-0.11810	0.15174	0.04612

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 19	ITEM 20	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27
ITEM 24	-0.35423	0.48865	0.13520	-0.28783	-0.24881	1.00000	0.18349	-0.17746	0.10156
ITEM 25	-0.09729	0.05192	-0.03355	-0.08743	-0.11810	0.18349	1.00000	-0.27820	-0.24939
ITEM 26	0.14709	0.02575	0.08370	0.15210	0.15174	-0.17746	-0.27820	1.00000	0.36799
ITEM 27	-0.01342	0.14980	0.03747	0.09258	0.04612	0.10156	-0.24939	0.36799	1.00000
ITEM 28	0.54532	-0.30198	-0.05692	0.58775	0.46677	-0.50271	-0.15471	0.26257	0.17458
ITEM 29	-0.08884	-0.03889	0.02417	-0.04005	-0.03506	0.23285	0.42777	-0.42992	-0.36780
ITEM 30	-0.12879	-0.01666	0.04112	-0.15489	-0.14534	0.26854	0.53861	-0.38280	-0.19260
ITEM 31	-0.03403	-0.08319	-0.00529	-0.01459	-0.07283	0.06125	0.50753	-0.29517	-0.34256
ITEM 32	0.00931	0.01594	-0.03407	0.05811	0.01108	0.11223	0.44488	-0.27787	-0.24702
ITEM 33	-0.21577	0.43973	0.15162	-0.14297	-0.06495	0.49959	0.00756	-0.04223	0.23667
ITEM 34	0.06495	0.24847	0.26231	0.08573	0.16028	0.14521	-0.15309	0.19440	0.26556
ITEM 35	-0.24325	0.16435	0.09774	-0.29222	-0.31540	0.39911	0.32899	-0.27663	-0.23443
ITEM 36	-0.04668	0.36208	0.25135	0.03169	0.01220	0.34757	-0.07677	0.16809	0.35640
ITEM 37	-0.43027	0.24957	0.11384	-0.34438	-0.31660	0.54317	0.31115	-0.22524	-0.18728
ITEM 38	0.61004	-0.19636	-0.05526	0.46349	0.33787	-0.38080	-0.11417	0.09696	0.05682
ITEM 39	0.23255	0.03822	0.05868	0.25377	0.14260	-0.19366	-0.34018	0.49679	0.46214
ITEM 40	-0.10284	0.39875	0.11032	-0.11126	-0.12570	0.33829	-0.09697	0.04480	0.32188
ITEM 41	-0.32066	0.26492	0.16149	-0.30274	-0.28618	0.60955	0.30105	-0.26375	-0.08560
ITEM 42	0.10534	0.12948	0.09465	0.13101	0.11452	-0.06149	-0.28478	0.66749	0.44246
ITEM 43	-0.34805	0.22893	0.12452	-0.31366	-0.32147	0.50823	0.21843	-0.21092	-0.06039
ITEM 44	-0.43068	0.36633	0.12109	-0.35306	-0.34231	0.54650	0.15222	-0.10767	0.02496
ITEM 45	0.12082	-0.12601	-0.10207	-0.01489	-0.09797	0.06115	0.33981	-0.24575	-0.16769

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 28	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36
ITEM 1	0.54928	-0.00254	-0.18187	-0.02651	0.12610	-0.37808	0.05874	-0.29276	-0.02976
ITEM 2	-0.48773	0.15541	0.30594	0.12061	-0.00532	0.47046	-0.05399	0.43335	0.04577
ITEM 3	-0.02143	0.31786	0.42602	0.30198	0.30726	-0.05293	-0.17387	0.25833	-0.11881
ITEM 4	0.42239	0.15190	0.09917	0.23719	0.22615	-0.16024	0.13200	-0.07070	-0.13389
ITEM 5	-0.41484	0.13557	0.14475	-0.03164	-0.09465	0.54188	0.15846	0.19541	0.26104
ITEM 6	-0.13867	0.50503	0.63977	0.53245	0.41485	0.01576	-0.20459	0.35563	-0.21389
ITEM 7	0.43704	-0.12989	-0.15210	-0.13741	-0.00712	-0.16408	0.15332	-0.26583	0.02539
ITEM 8	0.04904	0.07983	0.16777	0.10293	0.17493	-0.04516	0.01463	0.13690	-0.09469
ITEM 9	0.61195	-0.24137	-0.27273	-0.20538	-0.13878	-0.25492	0.12036	-0.39389	0.03025
ITEM 10	-0.23652	0.47594	0.65347	0.49137	0.43966	0.02739	-0.14740	0.47367	-0.15624
ITEM 11	0.19969	-0.38359	-0.29020	-0.24205	-0.20994	0.17773	0.30606	-0.22082	0.25587
ITEM 12	0.08026	-0.12105	-0.08123	-0.01745	-0.07000	0.16113	0.04697	-0.03752	0.06398
ITEM 13	0.50166	-0.24979	-0.20153	-0.11856	0.01431	-0.13422	0.15994	-0.36009	-0.05055
ITEM 14	0.56489	-0.12748	-0.21419	-0.12049	0.00688	-0.25767	0.24231	-0.41251	-0.00051
ITEM 15	0.40726	0.22012	0.17994	0.20903	0.25041	-0.17820	0.00364	-0.10416	-0.12307
ITEM 16	0.35623	-0.16421	-0.12376	-0.11426	-0.05915	0.02591	0.24960	-0.25052	0.10855
ITEM 17	-0.28407	0.00681	0.15328	0.00581	0.12025	0.48957	0.18231	0.19991	0.18899
ITEM 18	0.02949	-0.16173	-0.24104	-0.19236	-0.04851	0.24851	0.21952	-0.05976	0.33420
ITEM 19	0.54532	-0.08884	-0.12879	-0.03403	0.00931	-0.21577	0.06495	-0.24325	-0.04668
ITEM 20	-0.30198	-0.03889	-0.01666	-0.08319	0.01594	0.43973	0.24847	0.16435	0.36208
ITEM 21	-0.05692	0.02417	0.04112	-0.00529	-0.03407	0.15162	0.26231	0.09774	0.25135
ITEM 22	0.58775	-0.04005	-0.15489	-0.01459	0.05811	-0.14297	0.08573	-0.29222	0.03169
ITEM 23	0.46677	-0.03506	-0.14534	-0.07283	0.01108	-0.06495	0.16028	-0.31540	0.01220

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 28	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36
ITEM 24	-0.50271	0.23285	0.26854	0.06125	0.11223	0.49959	0.14521	0.39911	0.34757
ITEM 25	-0.15471	0.42777	0.53861	0.50753	0.44488	0.00756	-0.15309	0.32899	-0.07677
ITEM 26	0.26257	-0.42992	-0.38280	-0.29517	-0.27787	-0.04223	0.19440	-0.27663	0.16809
ITEM 27	0.17458	-0.36780	-0.19260	-0.34256	-0.24702	0.23667	0.26556	-0.23443	0.35640
ITEM 28	1.00000	-0.16930	-0.25289	-0.06699	-0.02576	-0.27111	0.03902	-0.43176	-0.05941
ITEM 29	-0.16930	1.00000	0.54425	0.43355	0.36381	0.05774	-0.08476	0.37710	-0.09298
ITEM 30	-0.25289	0.54425	1.00000	0.49428	0.48393	0.06789	-0.14249	0.46003	-0.11023
ITEM 31	-0.06699	0.43355	0.49428	1.00000	0.58759	-0.06069	-0.18221	0.41531	-0.19179
ITEM 32	-0.02576	0.36381	0.48393	0.58759	1.00000	0.01672	-0.10111	0.27522	-0.08816
ITEM 33	-0.27111	0.05774	0.06789	-0.06069	0.01672	1.00000	0.26648	0.17787	0.29966
ITEM 34	0.03902	-0.08476	-0.14249	-0.18221	-0.10111	0.26648	1.00000	-0.11361	0.45330
ITEM 35	-0.43176	0.37710	0.46003	0.41531	0.27522	0.17787	-0.11361	1.00000	-0.01433
ITEM 36	-0.05941	-0.09298	-0.11023	-0.19179	-0.08816	0.29966	0.45330	-0.01433	1.00000
ITEM 37	-0.60272	0.30957	0.30349	0.29318	0.22303	0.33177	-0.01400	0.56769	0.09115
ITEM 38	0.62473	-0.09630	-0.05174	0.01773	0.06869	-0.24832	0.09574	-0.30604	-0.08016
ITEM 39	0.37678	-0.44272	-0.36617	-0.39466	-0.32559	0.02408	0.32711	-0.38966	0.19987
ITEM 40	-0.17405	-0.16922	-0.03452	-0.21054	-0.11665	0.41316	0.20804	-0.01305	0.36060
ITEM 41	-0.45865	0.27445	0.39625	0.23253	0.12446	0.37597	0.06692	0.49982	0.12637
ITEM 42	0.20235	-0.46088	-0.28959	-0.27202	-0.26361	0.12717	0.38899	-0.30798	0.27317
ITEM 43	-0.50081	0.20407	0.29114	0.21724	0.09732	0.39501	0.07817	0.46680	0.07530
ITEM 44	-0.48052	0.07291	0.16739	0.03891	0.08610	0.48164	0.12990	0.39436	0.27699
ITEM 45	0.04991	0.23797	0.44807	0.40349	0.42777	-0.19608	-0.10252	0.22501	-0.15533

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45
ITEM 1	-0.38820	0.48133	0.14813	-0.18426	-0.29942	0.05494	-0.40657	-0.47209	0.11864
ITEM 2	0.46369	-0.49627	-0.22213	0.24055	0.43632	-0.10947	0.56969	0.54494	-0.02949
ITEM 3	0.13701	-0.01828	-0.22496	-0.10710	0.12090	-0.29033	0.10797	-0.07075	0.28279
ITEM 4	-0.21398	0.36343	0.14158	-0.23281	-0.08459	0.04237	-0.17846	-0.30456	0.22888
ITEM 5	0.36059	-0.35572	-0.13529	0.39237	0.36694	0.03473	0.38429	0.42475	-0.10096
ITEM 6	0.18631	-0.05954	-0.43183	-0.11090	0.29409	-0.41341	0.20320	0.02798	0.37087
ITEM 7	-0.33509	0.34616	0.24996	-0.15837	-0.20674	0.15474	-0.22350	-0.28879	0.03446
ITEM 8	0.02164	0.12507	-0.02665	-0.10939	0.07757	-0.06964	0.01535	-0.00795	0.12629
ITEM 9	-0.53976	0.43771	0.31984	-0.11874	-0.39467	0.25806	-0.43837	-0.42283	-0.00636
ITEM 10	0.29340	-0.07264	-0.40852	-0.06519	0.32694	-0.40054	0.26752	0.12024	0.44220
ITEM 11	-0.07959	0.10338	0.48807	0.16960	-0.13408	0.70324	-0.06052	0.01813	-0.16864
ITEM 12	-0.04875	0.10963	0.08632	0.19411	0.02832	0.07726	0.05300	0.06137	-0.11358
ITEM 13	-0.44814	0.28044	0.30145	-0.13155	-0.28846	0.20214	-0.31137	-0.30708	-0.02916
ITEM 14	-0.40029	0.48090	0.31665	-0.20342	-0.34701	0.25232	-0.38309	-0.43402	0.03210
ITEM 15	-0.18934	0.33583	0.02717	-0.19640	-0.15003	-0.06990	-0.20612	-0.28582	0.22850
ITEM 16	-0.20721	0.28423	0.32400	0.02443	-0.06673	0.30989	-0.15514	-0.07591	-0.00784
ITEM 17	0.24638	-0.25032	-0.05063	0.30131	0.29732	0.04815	0.27066	0.30440	0.02944
ITEM 18	0.00232	-0.05189	0.19662	0.32143	0.09484	0.15270	0.07223	0.20498	-0.09171
ITEM 19	-0.43027	0.61004	0.23255	-0.10284	-0.32066	0.10534	-0.34805	-0.43068	0.12082
ITEM 20	0.24957	-0.19636	0.03822	0.39875	0.26492	0.12948	0.22893	0.36633	-0.12601
ITEM 21	0.11384	-0.05526	0.05868	0.11032	0.16149	0.09465	0.12452	0.12109	-0.10207
ITEM 22	-0.34438	0.46349	0.25377	-0.11126	-0.30274	0.13101	-0.31366	-0.35306	-0.01489
ITEM 23	-0.31660	0.33787	0.14260	-0.12570	-0.28618	0.11452	-0.32147	-0.34231	-0.09797

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

CORRELATION MATRIX

	ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45
ITEM 24	0.54317	-0.38080	-0.19366	0.33829	0.60955	-0.06149	0.50823	0.54650	0.06115
ITEM 25	0.31115	-0.11417	-0.34018	-0.09697	0.30105	-0.28478	0.21843	0.15222	0.33981
ITEM 26	-0.22524	0.09696	0.49679	0.04480	-0.26375	0.66749	-0.21092	-0.10767	-0.24575
ITEM 27	-0.18728	0.05682	0.46214	0.32188	-0.08560	0.44246	-0.06039	0.02496	-0.16769
ITEM 28	-0.60272	0.62473	0.37678	-0.17405	-0.45865	0.20235	-0.50081	-0.48052	0.04991
ITEM 29	0.30957	-0.09630	-0.44272	-0.16922	0.27445	-0.46088	0.20407	0.07291	0.23797
ITEM 30	0.30349	-0.05174	-0.36617	-0.03452	0.39625	-0.28959	0.29114	0.16739	0.44807
ITEM 31	0.29318	0.01773	-0.39466	-0.21054	0.23253	-0.27202	0.21724	0.03891	0.40349
ITEM 32	0.22303	0.06869	-0.32559	-0.11665	0.12446	-0.26361	0.09732	0.08610	0.42777
ITEM 33	0.33177	-0.24832	0.02408	0.41316	0.37597	0.12717	0.39501	0.48164	-0.19608
ITEM 34	-0.01400	0.09574	0.32711	0.20804	0.06692	0.38899	0.07817	0.12990	-0.10252
ITEM 35	0.56769	-0.30604	-0.38966	-0.01305	0.49982	-0.30798	0.46680	0.39436	0.22501
ITEM 36	0.09115	-0.08016	0.19987	0.36060	0.12637	0.27317	0.07530	0.27699	-0.15533
ITEM 37	1.00000	-0.46192	-0.26617	0.16708	0.55028	-0.16813	0.55095	0.52631	0.06587
ITEM 38	-0.46192	1.00000	0.25244	-0.12952	-0.34326	0.15362	-0.42781	-0.44999	0.17081
ITEM 39	-0.26617	0.25244	1.00000	0.14945	-0.22516	0.57705	-0.20103	-0.07322	-0.23028
ITEM 40	0.16708	-0.12952	0.14945	1.00000	0.27078	0.21031	0.31734	0.29044	-0.12550
ITEM 41	0.55028	-0.34326	-0.22516	0.27078	1.00000	-0.12302	0.57339	0.51427	0.13602
ITEM 42	-0.16813	0.15362	0.57705	0.21031	-0.12302	1.00000	-0.11170	0.01935	-0.12322
ITEM 43	0.55095	-0.42781	-0.20103	0.31734	0.57339	-0.11170	1.00000	0.56756	0.01982
ITEM 44	0.52631	-0.44999	-0.07322	0.29044	0.51427	0.01935	0.56756	1.00000	-0.10303
ITEM 45	0.06587	0.17081	-0.23028	-0.12550	0.13602	-0.12322	0.01982	-0.10303	1.00000

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

ALL PRIOR ESTIMATES OF COMMUNALITY WERE 1.000000

	1	2	3	4	5	6	7	8
EIGENVALUES	10.426551	6.570332	3.537872	1.602946	1.500312	1.364250	1.161792	1.148016
PORTION	0.232	0.146	0.079	0.036	0.033	0.030	0.026	0.026
CUM PORTION	0.232	0.378	0.456	0.492	0.525	0.556	0.581	0.607

	9	10	11	12	13	14	15	16
EIGENVALUES	1.052938	0.987890	0.928750	0.836589	0.811281	0.771176	0.719168	0.704543
PORTION	0.023	0.022	0.021	0.019	0.018	0.017	0.016	0.016
CUM PORTION	0.630	0.652	0.673	0.692	0.710	0.727	0.743	0.758

	17	18	19	20	21	22	23	24
EIGENVALUES	0.676473	0.668716	0.635672	0.593111	0.571287	0.548500	0.505372	0.490122
PORTION	0.015	0.015	0.014	0.013	0.013	0.012	0.011	0.011
CUM PORTION	0.773	0.788	0.802	0.816	0.828	0.840	0.852	0.863

	25	26	27	28	29	30	31	32
EIGENVALUES	0.470833	0.454979	0.416239	0.409075	0.394557	0.364541	0.346305	0.340665
PORTION	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.008
CUM PORTION	0.873	0.883	0.892	0.901	0.910	0.918	0.926	0.934

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

	33	34	35	36	37	38	39	40
EIGENVALUES	0.328783	0.304407	0.293609	0.271155	0.256231	0.240296	0.231738	0.209591
PORTION	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005
CUM PORTION	0.941	0.948	0.954	0.960	0.966	0.971	0.976	0.981

	41	42	43	44	45
EIGENVALUES	0.201953	0.191663	0.176514	0.150948	0.132258
PORTION	0.004	0.004	0.004	0.003	0.003
CUM PORTION	0.986	0.990	0.994	0.997	1.000

2 FACTORS WERE RETAINED.

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

FACTOR PATTERN

	FACTOR1	FACTOR2
ITEM 1	-0.59213	0.31246
ITEM 2	0.68812	-0.22784
ITEM 3	0.26104	0.48658
ITEM 4	-0.33592	0.41786
ITEM 5	0.48754	-0.39343
ITEM 6	0.44452	0.61680
ITEM 7	-0.52019	0.10660
ITEM 8	-0.01452	0.23848
ITEM 9	-0.75049	0.06347
ITEM 10	0.52484	0.55665
ITEM 11	-0.36833	-0.50658
ITEM 12	-0.03906	-0.12677
ITEM 13	-0.58754	0.08617
ITEM 14	-0.69680	0.16294
ITEM 15	-0.28417	0.48889
ITEM 16	-0.43717	-0.09213
ITEM 17	0.37428	-0.26405
ITEM 18	-0.02813	-0.41454
ITEM 19	-0.61777	0.25884
ITEM 20	0.28256	-0.42861
ITEM 21	0.08915	-0.20255
ITEM 22	-0.61014	0.19927
ITEM 23	-0.52272	0.12729

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

INITIAL FACTOR METHOD: PRINCIPAL AXIS

FACTOR PATTERN

	FACTOR1	FACTOR2
ITEM 24	0.63475	-0.28541
ITEM 25	0.41177	0.49876
ITEM 26	-0.48293	-0.45161
ITEM 27	-0.22761	-0.51001
ITEM 28	-0.77479	0.22509
ITEM 29	0.42784	0.51509
ITEM 30	0.52367	0.49895
ITEM 31	0.35246	0.58334
ITEM 32	0.24793	0.52870
ITEM 33	0.39947	-0.47071
ITEM 34	-0.15220	-0.38616
ITEM 35	0.66765	0.18330
ITEM 36	0.02905	-0.49254
ITEM 37	0.72386	-0.08757
ITEM 38	-0.61213	0.29655
ITEM 39	-0.53034	-0.44142
ITEM 40	0.20864	-0.52067
ITEM 41	0.65365	-0.08323
ITEM 42	-0.39844	-0.54613
ITEM 43	0.66335	-0.17745
ITEM 44	0.61873	-0.39582
ITEM 45	0.13627	0.51756

STRESS AROUSAL CHECKLIST FACTOR ANALYSIS

VARIANCE EXPLAINED BY EACH FACTOR

FACTOR1	FACTOR2
10.426551	6.570332

FINAL COMMUNALITY ESTIMATES

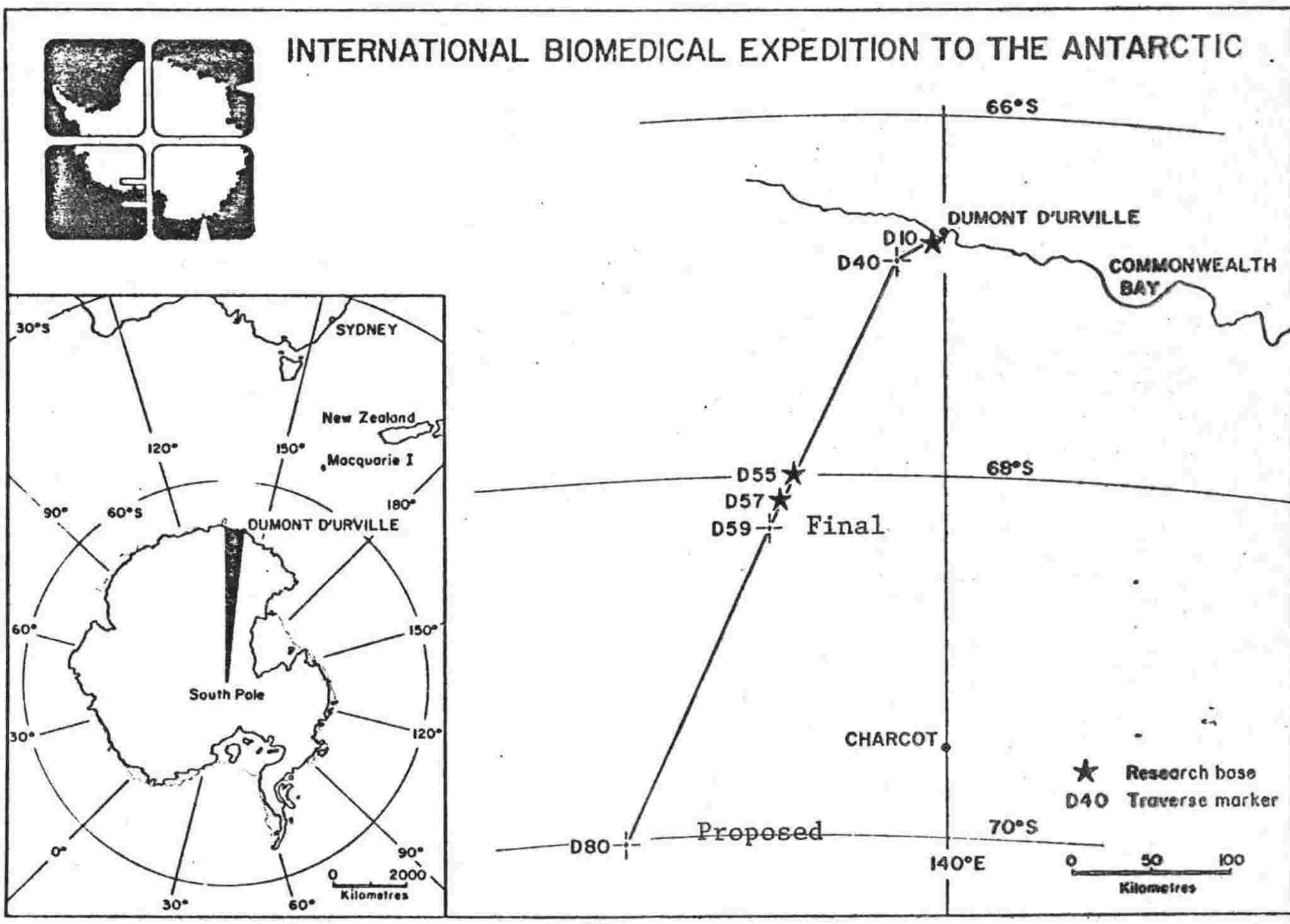
ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6	ITEM 7	ITEM 8	ITEM 9
0.448251	0.525422	0.304907	0.287448	0.392487	0.578040	0.281966	0.057084	0.567257
ITEM 10	ITEM 11	ITEM 12	ITEM 13	ITEM 14	ITEM 15	ITEM 16	ITEM 17	ITEM 18
0.585321	0.392282	0.017596	0.352625	0.512083	0.319768	0.199602	0.209811	0.172632
ITEM 19	ITEM 20	ITEM 21	ITEM 22	ITEM 23	ITEM 24	ITEM 25	ITEM 26	ITEM 27
0.448631	0.263543	0.048974	0.411979	0.289443	0.484371	0.418317	0.437173	0.311919
ITEM 28	ITEM 29	ITEM 30	ITEM 31	ITEM 32	ITEM 33	ITEM 34	ITEM 35	ITEM 36
0.650969	0.448363	0.523180	0.464514	0.340995	0.381148	0.172288	0.479350	0.243442
ITEM 37	ITEM 38	ITEM 39	ITEM 40	ITEM 41	ITEM 42	ITEM 43	ITEM 44	ITEM 45
0.531642	0.462653	0.476115	0.314625	0.434182	0.457022	0.471515	0.539507	0.286441

Appendix C

MEMBERS OF THE IBEA

Dr C. Bachelard	- Expedition Polaires Francaise
Associate Professor G. Budd	- Commonwealth Institute of Health
Dr J-P. Clevy	- Expedition Polaires Francaise
Professor R. Goldsmith	- Chelsea College, University of London
Dr I. Hampton	- University of Leeds
Mr D. Layman	- Chelsea College, University of London
Dr I. Light	- Institute of Environmental and Offshore Medicine, Aberdeen
Dr D. Lugg	- Antarctic Division, Department of Science and the Environment, Hobart
Mr I. McCormick	- Victoria University of Wellington
Mr D. Parer	- Australian Broadcasting Commission, Melbourne
Dr J. Regnard	- Laboratore de Physiologie, University of Paris
Dr R. Vallverdu	- Direccion Nacional del Antartico, Buenos Aires

PROPOSED AND FINAL ROUTE TAKEN BY IBEA.



AUTHOR INDEX

SUBJECT INDEX