AN INVESTIGATION INTO THE EFFECT OF ILLNESS BEHAVIOUR AND ANXIETY OF SURVIVORS OF A MYOCARDIAL INFARCTION ON THEIR SUBSEQUENT RECOVERY AND REHABILITATION

by

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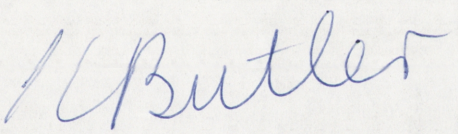
Unless it is stated in the text to the contary, the material contained in this thesis is a product of my own work.



ACKNOWLEDGEMENTS

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ABSTRACT

It has been postulated that the illness behaviour of patients might affect the chances of recovery and rehabilitation. Such an effect is likely to be strongest in a serious illness, particularly a life threatening illness such as a myocardial infarction.

If such effects exist it might be possible to increase the probability of recovery and full rehabilitation of the patient through psychotherapeutic intervention. In particular, if the types of illness behaviour which encourage recovery can be identified, this might assist in the execution of psychotherapeutic intervention.

This thesis examines differences in average values of measures of various types of illness behaviour for patients with different levels of various aspects of recovery and rehabilitation, from a sample of survivors of a myocardial infarction. As anxiety is thought to be a very important aspect of illness behaviour, it was examined separately.

Evidence and indications that persons with different levels of various aspects of recovery and rehabilitation had different illness behaviour patterns was obtained. These indications included:

(a) Evidence that patients who had a recurrence of heart trouble in the first eight months after release from hospital had a greater awareness of personal, social and financial worries in their lives, and that these worries might have contributed to their illness. This effect is unexplained.

(b) Evidence that persons whose pattern of life had changed in the first eight months after release from hospital had more affective disruption.

Indications were also found that patients who fared less well during recovery and rehabilitation had more state anxiety. However, few indications of differences in trait anxiety were found.

Many of the indications observed were not conclusive, and further investigation needs to be carried out.

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CHAPTER 1

INTRODUCTION

It has been postulated (Byrne 1978) that illness behaviour, or how a patient reacts to the onset of illness, will affect the process of recovery and rehabilitation of the patient. It would seem that if this effect exists then it is likely to be more prevalent in patients with serious illness, and particularly with illness that is life threatening. In this thesis the postulate discussed will be investigated on a sample of patients suffering from a myocardial infarction, which is a serious form of coronary heart disease.

If illness behaviour does have an effect on the chance of recovery and rehabilitation, then it might be possible to modify illness behaviour through psychotherapeutic intervention so that patients have a better chance of recovery and full rehabilitation. In particular, if the types of illness behaviour that increase the probability of levels of various attributes of recovery and rehabilitation can be identified then this will assist in the execution of psychotherapeutic intervention.

The data was obtained from a survey supervised by Dr. D.G. Byrne of the Psychology Department at the Australian National University. Exploratory statistical analysis, on some of the data collected, will be performed in this thesis to identify if patients who have different levels of certain attributes of recovery and rehabilitation have different illness behaviour patterns. As anxiety is thought to be a very important attribute of illness behaviour after serious illness (Lipowski

1975), anxiety was looked at separately. Only a small, although important part, of the analysis of Dr. Byrne's survey is discussed in this thesis.

The sample consisted of all patients admitted to the Coronary Care Units of the Canberra and Woden Valley Hospitals over a 12 month period who satisfied the following criteria;

(a) were 65 years of age or less

(b) were fluent in English

(c) had given consent to participate in the study

(d) had satisfied criteria of (i) serial ECG changes, (ii) elevated serum enzymes and (iii) clinical history of myocardial infarction, to give an unequivocal diagnosis of first myocardial infarction.

(e) had survived long enough to be discharged from coronary care.

Some 120 patients satisfied these criteria and entered the study. For comparison, a group of 40 patients, who were admitted to one of the coronary care units and fulfilled the age and language criteria but failed to attract a diagnosis of myocardial infarction or other serious illness, were studied. However, these patients will not be considered in this thesis.

All the patients in the study were interviewed in a general medical ward after being discharged from coronary care, and as close as possible to their discharge from hospital. The interviews were taken over a three day period. Blood and urine samples were taken, and information concerning the patient's physical status was obtained. In particular, information was obtained from the interview regarding the illness behaviour and anxiety of the patient.

A follow-up survey was conducted on each patient, 8 months after the initial interview. Amongst other information, the patient's level on various recovery and rehabilitation attributes were recorded. Seven of the patients died in the intervening period between this and the initial survey, all of further heart trouble.

A further follow-up survey was carried out after another 16 months. However, none of the information in this final survey will be used in the analysis in this thesis.

In this thesis tests for differences in average values of measures of illness behaviour and anxiety before leaving hospital, for patients with different levels of various recovery and rehabilitation attributes at the 8 month follow-up survey, will be carried out. If differences are present it could then be postulated that a patient's reaction to his illness affects his chances of recovery and rehabilitation.

Due to the small data set, no attempt will be made at prediction of recovery and rehabilitation attributes.

CHAPTER 2

BOX-COX TRANSFORMATIONS

A large part of the statistical analysis in this thesis assumes a multivariate general linear model (Morrison, 1976). This model assumes a random sample of N, p dimensional multivariate normal random vectors $\underset{\sim}{y}_1^*,\ldots,\underset{\sim}{y}_N^*$ such that if

$$\underset{\sim}{Y}^* = \begin{pmatrix} \underset{\sim}{y}_1^{*\prime} \\ \vdots \\ \underset{\sim}{y}_N^{*\prime} \end{pmatrix} \qquad \text{then}$$

$$\underset{\sim}{Y}^* \sim N(\underset{\sim}{X}\underset{\sim}{\beta}^*, \underset{\sim}{I}_N \otimes \underset{\sim}{\Sigma})$$

where $\underset{\sim}{X}$ is a known $N \times k$ design matrix, $\underset{\sim}{\beta}^*$ is a $k \times p$ matrix of unknown parameters, $\underset{\sim}{I}_N$ is the $N \times N$ identity matrix, $\underset{\sim}{\Sigma}$ is some unknown variance matrix and $\otimes$ denotes the matrix tensor product. This implies that if a particular element of the random vectors is considered, then we have a random sample $y_1,\ldots,y_N$ such that if

$$\underset{\sim}{Y} = \begin{pmatrix} y_1 \\ \vdots \\ y_N \end{pmatrix} \qquad \text{then}$$

$$\underset{\sim}{Y} \sim N(\underset{\sim}{X}\underset{\sim}{\beta}, \sigma^2 \underset{\sim}{I}_N)$$

where $\underset{\sim}{\beta}$ is a $k \times 1$ vector of unknown parameters and σ^2 is also an unknown parameter.

However, many of the elements of some of the random vectors used in the analysis given in this thesis have highly skewed distributions, even within population units which have the same model term. This skewness reduces the validity of assuming the above model for the elements, and hence the general multivariate model for the random vectors used in the analysis.

Thus, to reduce the skewness, and to make the univariate assumptions for the elements, and hence the multivariate assumptions for the random vectors, more tenable we have transformed the elements individually by a power transformation of the form,

$$y^{(\lambda)} \equiv \begin{cases} (y+c)^{\lambda} & ; \quad \lambda \neq 0 \\ \log (y+c); & \lambda = 0 \end{cases} ,$$

for some λ. The constant c is added since powers can generally only be taken for positive numbers.

The value of λ for each element is chosen by a technique developed by Box-Cox (1964). We assume that we have a random sample $\underset{\sim}{Y} = (y_1,\ldots,y_N)'$ and that there exists a λ such that if $\underset{\sim}{Y}^{(\lambda)} = (y_1^{(\lambda)},\ldots, y_N^{(\lambda)})'$ then,

(i) $E[\underset{\sim}{Y}^{(\lambda)}] = \underset{\sim}{X}\underset{\sim}{\beta}$

(ii) $\text{var}(\underset{\sim}{Y}^{(\lambda)}) = \sigma^2 \underset{\sim}{I}_N$

(iii) $\underset{\sim}{Y}^{(\lambda)}$ has a multivariate normal distribution.

The technique of maximum likelihood is then used to choose an estimate, $\hat{\lambda}$, of λ.

If $L_{max}(\lambda)$ is the maximum over $\underset{\sim}{\beta}$ and σ^2 of the log likelihood, we have that (bar a constant),

$$L_{max}(\lambda) = -N/2 \log s(\lambda;\underset{\sim}{z}^{(\lambda)})$$

where $s(\lambda;\underset{\sim}{z}^{(\lambda)}) = \underset{\sim}{z}^{(\lambda)}(\underset{\sim}{I} - \underset{\sim}{X}(\underset{\sim}{X}'\underset{\sim}{X})^{-}\underset{\sim}{X}')\underset{\sim}{z}^{(\lambda)}$

$$\underset{\sim}{z}^{(\lambda)} = \underset{\sim}{y}^{(\lambda)} \cdot 1/(\dot{y})^{\lambda-1}$$

and $\dot{y} = \prod_{i=1}^{N} (y_i + c)^{1/N}$ is the geometric mean of $y_1+c, y_2+c,\ldots,y_N+c$. This strictly assumes that the N dimensional unit vector is in the range of $\underset{\sim}{X}$. $\hat{\lambda}$ can then be obtained by maximizing $L_{max}(\lambda)$ or minimizing the residual sums of squares $s(\lambda;\underset{\sim}{z}^{(\lambda)})$. Ninety-five percent approximate confidence intervals can be formed by producing the set

$$\{\lambda : |L_{max}(\hat{\lambda}) - L_{max}(\lambda)| < \tfrac{1}{2}\chi^2(.05) = 1.92\}$$

For this thesis, computer programmes were written to list values of $L_{max}(\lambda)$ and $s(\lambda;\underset{\sim}{z}^{(\lambda)})$ for λ between -5.0 and 5.0 in increments of .1. From the results of running these programmes, $\hat{\lambda}$ and approximate 95% confidence intervals for λ were produced. The confidence intervals were deliberately chosen to be slightly conservative. The powers chosen were usually not exactly $\hat{\lambda}$ but a "round number" close to $\hat{\lambda}$ and within the 95% confidence interval.

Results for this thesis will be tabulated in a form similar to the following;

Element	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	.7	3.69	110.62	(.1,1.2)	.5
2	1.2	18.26	57.01	(.8,1.6)	1
⋮					
p	.5	7.93	81.32	(0 , .9)	.5

Res. S.S. $\equiv s(\lambda;\underset{\sim}{z}^{(\lambda)})$ at $\lambda = \hat{\lambda}$

$L(\lambda) \equiv L_{max}(\lambda)$ at $\lambda = \hat{\lambda}$.

The final column is the value of λ finally chosen in the transformation.

If the value of λ chosen is less than 0, then the ordering of the sample units is reversed. This must be borne in mind in the ensuing statistical analysis.

A model which will be often used is that the independent random vectors form two groups of size n_1 and n_2 respectively ($n_1+n_2 = N$) such that if a given vector, $\underset{\sim}{y}^*$, is in the i-th group,

$$\underset{\sim}{y}^* = \underset{\sim}{\mu}_i^* + \underset{\sim}{\varepsilon}^*$$

where $\underset{\sim}{\varepsilon}^* \sim N(\underset{\sim}{0},\underset{\sim}{\Sigma})$

and $\underset{\sim}{\mu}_1^*$, $\underset{\sim}{\mu}_2^*$, $\underset{\sim}{\Sigma}$ are vectors of parameters. Then for an individual element, y, in the i-th group

$$y = \mu_i + \varepsilon$$

where $\varepsilon \sim N(0,\sigma^2)$

and μ_1, μ_2, σ^2 are unknown parameters. In this case it can be shown that if

$$z_{ij}^{(\lambda)} = \frac{y_{ij}^{(\lambda)}}{(\dot{y})^{\lambda-1}}$$

where

$y_{ij}^{(\lambda)}$ is the j-th transformed element in the i-th group,

and

$$z_{i.}^{(\lambda)} = \sum_{j=1}^{n_i} \frac{z_{ij}^{(\lambda)}}{n_i} \quad ,$$

then

$$s(\lambda;\underset{\sim}{z}^{(\lambda)}) = \sum_{i=1}^{2} \sum_{j=1}^{n_i} (z_{ij}^{(\lambda)})^2 - \sum_{i=1}^{2} n_i (z_{i.}^{(\lambda)})^2$$

Many of the elements which are transformed in this thesis have a large proportion of their observed values on one particular value, usually the lowest value which is physically possible. In these cases the transformations will not make the data very close to what would be expected with the assumed model. However, it is hoped that these transformations will at least bring the data "closer" to the model assumptions used in the analysis.

CHAPTER 3

MEASUREMENT OF ILLNESS BEHAVIOUR

In this study, illness behaviour, or how a patient reacts to illness, was measured by the Illness Behaviour Questionaire (IBQ), reported in Pilowsky and Spence (1975) and Pilowsky, Chapman and Bonica (1977). The questionnaire (Appendix A) consists of 62 items each of which can be answered yes or no. It was constructed to assess "the patient's attitudes and feelings about his illness, his perceptions of the reactions significant others in the environment (including his doctor's) to himself and his illness, and the patient's own view of his current psychosocial condition".

To reduce the dimension of the data and to help describe the prominent pattern of illness behaviour, Byrne and Whyte (1978) subjected the results of the questionnaire, for those patients who suffered a myocardial infarction, to a factor analysis. The factor loadings obtained are presented in table 1.

The factors were labelled and described as (Byrne and Whyte 1978);

Factor 1 - Somatic Concern: general somatic concern.

Factor 2 - Psychosocial Precipitants: recognition that personal, social and financial worries prior to illness may have contributed to the present episode.

Table 1. Ranked-Ordered Items from IBQ Loading Significantly on Factors ($p < 0.01$)

	IBQ	Factors I	II	III	IV	V	VI	VII	VIII
29.	Jealous of other people's good health	+0.76							
38.	Disease attention through radio,T.V. etc.	+0.72							
44.	Thinks something matter with mind	+0.55							
40.	Upset by appearance of face or body	+0.49							
6.	Thinks more liable to illness than others	+0.46							
20.	More sensitive to pain than others	+0.45							
27.	Other problems in life		+0.75						
60.	Personal worries not caused by illness		+0.74						
43.	Family problems		+0.56						
31.	Financial problems		+0.50						
52.	Work problems		+0.46						
57.	Thinks symptoms caused by worry		+0.42						
18.	Gets anxious easily			+0.69					
47.	Gets sad easily			+0.60					
17.	Illness influences relationships with others			+0.41					
62.	Hard to show personal feelings				+0.77				
22.	Can express personal feelings to others				-0.71				
3.	Illness interferes with life					+0.68			
2.	Thinks something seriously wrong with body					+0.62			
34.	Worries about possibility of serious illness					+0.59			
12.	Trouble with nerves						+0.68		
59.	Hard to relax						+0.59		
54.	Often gets depressed						+0.45		
30.	Obsessional thoughts about health							+0.69	
9.	Annoyed at reassurances by others							+0.54	
42.	Frequently try to explain to others how feeling							+0.43	
13.	Easily cheered up by doctor								+0.59
7.	Belief in doctor's judgement								+0.41
	% Variance	19.9	8.7	7.1	6.0	5.8	5.4	4.4	4.2
	Cumulative % variance	19.9	28.6	35.7	41.7	47.5	52.9	57.3	61.5

Factor 3 - Affective Disruption: suggests an affective response to illness, to the point where interpersonal relationships are interfered with.

Factor 4 - Affective Inhibition: indicates difficulty in expressing personal feelings.

Factor 5 - Illness Recognition: indicates a recognition by the patient of the presence of serious illness.

Factor 6 - Subjective Tension: suggests the experience of subjective tension.

Factor 7 - Sick Role Acceptance: indicates a recognition and acceptance of the sick role.

Factor 8 - Trust in the Doctor: acceptance of medical reassurance.

Byrne and Whyte (1979a) have produced some descriptive statistics for scores of the 8 illness behaviour factors, for patients in the survey, and have used them in a comparative description of coronary care patients. An attempt has been made (Byrne, Whyte and Lance 1979) to classify the survivors of a myocardial infarction in the survey into groups based on their factor scores, using a cluster analysis technique.

In this thesis the factors will be considered only as a systematic way of reducing the data from the Illness Behaviour Questionaire into a small number of physically reasonable variables. Thus, we will consider the 8 illness behaviour factors as the measures of illness behaviour to be used in the analysis.

CHAPTER 4

ILLNESS BEHAVIOUR AND RETURNING TO WORK

In this chapter tests will be constructed to see if patients with different levels of work rehabilitation attributes after 8 months had different average values for the 8 illness behaviour factors, shortly before release from hospital. The levels of the work rehabilitation attributes were obtained from interviews in the 8 month follow-up survey. The sample for each series of tests consisted of patients who gave commital answers to the work rehabilitation attribute being considered and properly completed the IBQ questionnaire.

As many of the factors had highly skewed sample distributions the factors were transformed using the Box-Cox technique described in chapter 2, using the appropriate multivariate model for the tests to be carried out. As the minimum possible value of each of the factors was zero, c was taken to be 1. Thus the power transformations were always taken on positive variables.

The first attribute considered was whether the patient had fully returned to work. The levels were,

A ≡ have not fully returned to work,

B ≡ have fully returned to work.

Differences in the average factor values for the two levels were tested using Hotelling's T^2 test for the case of two samples (Morrison 1976, pp.136-140). This assumes the model described in the

second last paragraph of chapter 2. It is based on the statistic

$$T^2 = \frac{n_A n_B}{n_A + n_B} (\underset{\sim}{\bar{x}}_A - \underset{\sim}{\bar{x}}_B)' \underset{\sim}{s}^{-1} (\underset{\sim}{\bar{x}}_A - \underset{\sim}{\bar{x}}_B)$$

where,

n_A = # of patients with level A

n_B = # of patients with level B

$\underset{\sim}{\bar{x}}_A \equiv$ vector of sample means of factors for patients with level A

$\underset{\sim}{\bar{x}}_B \equiv$ vector of sample means of factors for patients with level B

$\underset{\sim}{s} \equiv$ pooled sample covariance matrix of factors over levels A and B.

Then under the hypothesis of no differences in the means for the two levels $F = \frac{n_A+n_B-p-1}{(n_A+n_B-2)p} T^2$ has an F distribution with p, n_A+n_B-p-1 degrees of freedom where p = the number of factors. Thus, if there are no differences $F = \frac{n_A+n_B-9}{(n_A+n_B-2).8} T^2$ has an F-distribution with 8, n_A+n_B-9 degrees of freedom.

Two sided, two sample t-tests were then performed on each factor to see if there were any further indications of differences in average values of the factors between the two levels of the attribute. These tests have the disadvantage that they are correlated and there is a higher probability of significance due to chance than for a single test. However, as the T^2 test was not significant at the usual .05 level it was felt that t-tests were more appropriate than tests taking into account the correlations and higher probability, since in the non-significance case we are only looking for indications, and the t-tests are more sensitive to these indications.

The results obtained were,

No. of patients with level A: 13

No. of patients with level B: 77

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	< 1.91	>173.30	-	-5
2	- .2	73.64	9.03	(-.8,.3)	0
3	.5	33.15	44.95	(-.3,1.2)	.5
4	- .3	29.66	49.95	(-1.1,.5)	0
5	-1.5	22.53	62.32	(-2.3,-.7)	-1
6	- .7	23.48	60.47	(-1.5,0)	-1
7	-4.4	4.73	132.56	($-\infty$, -3.1)	-4
8	3.5	8.62	105.58	(2.2,5.0)	4

Factor	Mean for level A	Mean for level B
1	.858	.802
2	.747	.570
3	1.305	1.296
4	.592	.374
5	.719	.780
6	.608	.748
7	.478	.776
8	13.440	10.670

$$S = \begin{bmatrix} .13 & & & & & & & \\ -.012 & .26 & & & & & & \\ -.031 & .024 & .058 & & & & & \\ -.0098 & .020 & -.0022 & .15 & & & & \\ -.018 & -.018 & -.0089 & -.0056 & .070 & & & \\ .0087 & -.0087 & -.022 & -.0077 & .0013 & .059 & & \\ .040 & .14 & -.022 & -.0049 & .025 & .028 & .15 & \\ -.18 & -.0027 & .17 & -.15 & -.0087 & -.0095 & -.10 & 37.8 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 17.543$ $F = 2.018$

degress of freedom (d.o.f.): 8, 81

Significance: .1

t-tests d.o.f.: 88

Factor	t	Sig.
1	.51	-
2	1.16	-
3	.12	-
4	1.88	.1
5	- .77	-
6	-1.92	.1
7	2.55*	.05
8	1.50	-

It should be noted that these results are for the transformed factors, and hence the factors which have been transformed with a negative power will have their ordering reversed.

It was observed graphically that the significant difference in the t-test for factor 7 was mainly due to question 42, namely "Do you frequently try to explain to others how you are feeling?"

From these results we can conclude that there are indications that patients who have not fully returned to work have different illness behaviour. In particular there are indications that they have more affective inhibition, subjective tension and are more likely to answer yes to whether they frequently try to explain to others how they are feeling.

It is possible that the indications of differences in illness behaviour of those who did not return fully to work were due to age, since some of those who did not fully return to work were already

retired. Also it seems reasonable that older patients might be more likely to prematurely retire because of their illness.

Thus histograms of the distribution of ages for those patients who fully returned to work and for those who did not were produced (Graph 1). A t-test was performed to test for differences in the age distribution of the two levels of the return to work attribute. The results were,

$\bar{x}_A = 55.39$ $\bar{x}_B = 51.75$

Sample pooled variance, $s^2 = 51.49$

$t = 1.69$ d.o.f.: 88

Significance: .1

Thus there is an indication that those who return to work are younger.

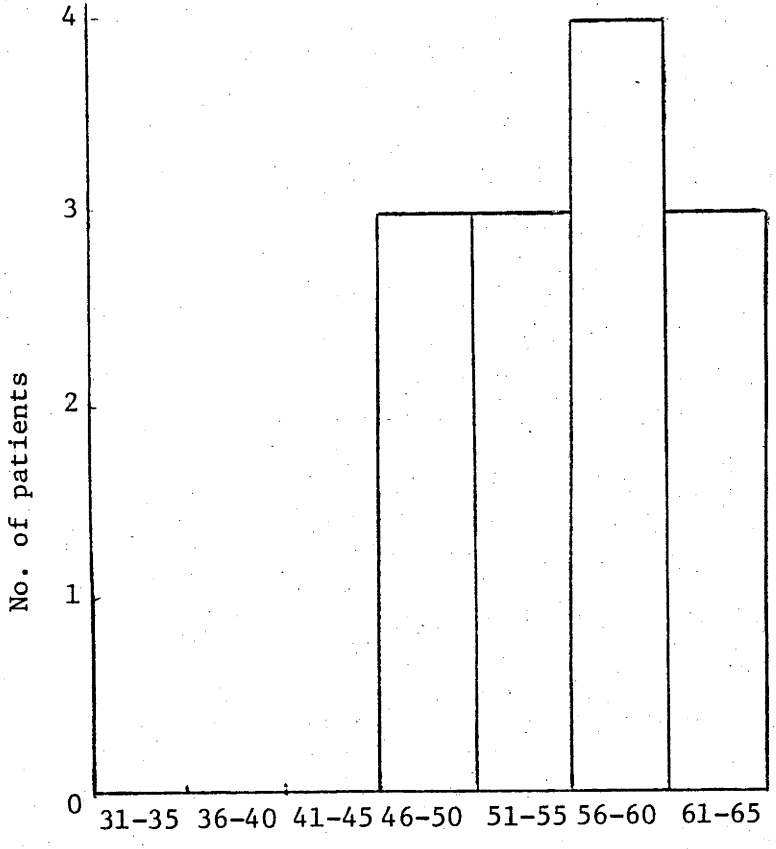
However, it seems likely that the illness behaviour difference between those aged 52 and those aged 55 would be minimal. Thus it seems unlikely that the indications observed in the pattern of illness behaviour for those who did not fully return to work were due to age differences.

It is reasonable to postulate that the chance of fully returning to work depends partially on the nature of the patient's work before his illness. Thus it is possible that the effect of the nature of the patient's work swamps any effect of illness behaviour on the chance of a patient fully returning to work.

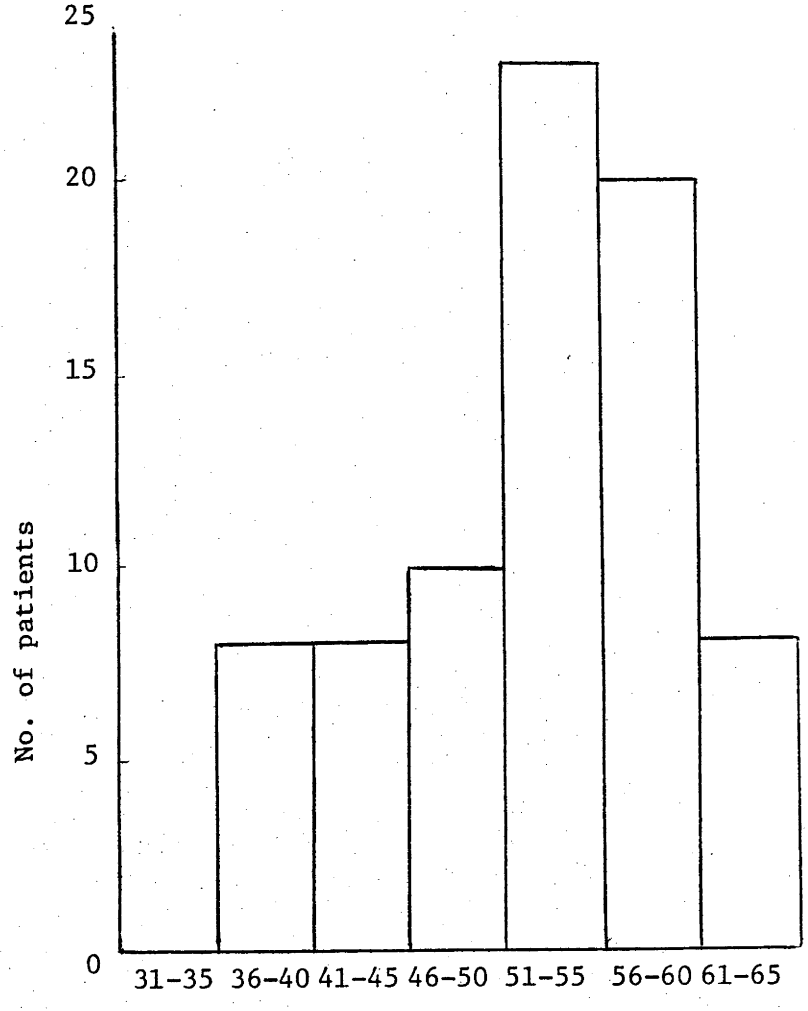
Thus a multivariate analysis of variance was performed to see if patients with different levels of the fully return to work attribute had different illness behaviour levels after blocking on a nature of work variable. The nature of work variable used had 3 levels namely,

A ≡ sedentary

GRAPH 1.



Histogram of ages for patients who did not fully return to work.



Histogram of ages for patients who did fully return to work.

B ≡ light physical

C ≡ moderate-heavy physical.

The levels were determined from the patient's own opinion at the original survey of the nature of his work. Persons who had commital responses in the nature of work variable and fully returned to work attribute, and had answered the IBQ questionnaire fully were included in the analysis.

The model used for the multivariate analysis of variance was,

$$\underset{\sim}{y}_{ijk} = \underset{\sim}{\alpha}_i + \underset{\sim}{\beta}_j + \underset{\sim}{\varepsilon}_{ijk}$$

where

$\underset{\sim}{y}_{ijk}$ is the vector of factors for the k-th patient with j-level of the return to work attribute and i-level of the nature of work variable,

$$\underset{\sim}{\alpha}_i,\ \underset{\sim}{\beta}_j;\quad i = A,B,C,\quad j = A,B$$

are vectors of parameters and $\underset{\sim}{\varepsilon}_{ijk}$ are distributed independently $N(\underset{\sim}{0},\underset{\sim}{\Sigma})$ for some unknown $\underset{\sim}{\Sigma}$. Box-Cox transformations as described in chapter 2 were used to improve the validity of the model, before the multivariate analysis of variance was performed. Testing if the illness behaviour factors are different for those who do not fully return to work after the nature of work is taken into account (i.e. after blocking on nature of work) is achieved by testing if

$$\underset{\sim}{\beta}_j = 0;\quad j = A,B.$$

The theory needed for performing this test is given by Morrison (1976, pp.170-179). In his notation,

$$g = 1,\quad u = 8,\quad N = 88,\quad r = 4$$

and hence s = 1, m = 3, n = 37.5. As s = 1, if the null hypothesis is true and if we denote the trace of a matrix by tr then $\frac{n+1}{m+1}$ tr (HE^{-1}) has an F distribution with 2m+2 and 2n+2 degrees of freedom. Thus if the factors have the same average values for each level of the fully return to work rehabilitation attribute after blocking on nature of work, then

$$\frac{38.5}{4} \text{tr}(HE^{-1}) \sim F_{8,77}.$$

The matrices H and E were calculated differently in the computing of this test to the method described in Morrison. Let $\underset{\sim}{Y}^* = (\underset{\sim}{y}_1^*,\ldots,\underset{\sim}{y}_{88}^*)'$ where $\underset{\sim}{y}_i^*$ is the random vector of factors for the i-th patient and let $\underset{\sim}{\beta}^* = (\underset{\sim}{\alpha}_A,\underset{\sim}{\alpha}_\beta,\underset{\sim}{\alpha}_C,\underset{\sim}{\beta}_A,\underset{\sim}{\beta}_A)'$. Then if $E[\underset{\sim}{Y}^*] = \underset{\sim}{X}\underset{\sim}{\beta}^*$ under the assumed model and $\underset{\sim}{X}$ is partitioned into $[\underset{\sim}{X}_1 : \underset{\sim}{X}_2]$ where $\underset{\sim}{X}_1$ is N × 3 and $\underset{\sim}{X}_2$ is N × 2, then

$$H = \underset{\sim}{Y}^{*\prime}(\underset{\sim}{X}'(\underset{\sim}{X}'\underset{\sim}{X})^{-}\underset{\sim}{X} - \underset{\sim}{X}_1'(\underset{\sim}{X}_1'\underset{\sim}{X}_1)^{-}\underset{\sim}{X}_1)\underset{\sim}{Y}^*$$

and

$$E = \underset{\sim}{Y}^{*\prime}(\underset{\sim}{I}_{88} - \underset{\sim}{X}(\underset{\sim}{X}'\underset{\sim}{X})^{-}\underset{\sim}{X}')\underset{\sim}{Y}^*$$

$\underset{\sim}{X}$ is easily obtained by considering the model assumed for each patient used for the test.

The results obtained were,

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	< -5.0	< 1.91	> 168.44	-	-5
2	- .2	7.18	8.95	(-.8,.3)	0
3	.5	31.52	45.17	(-.2,1.3)	.5
4	- .2	29.16	48.60	(-1.0,.6)	0
5	-1.5	20.54	64.02	(-2.3,-.7)	-1
6	- .6	23.15	58.75	(-1.4,.1)	-.5
7	-4.3	4.83	127.70	$(-\infty,-2.9)$	-4
8	3.5	8.44	103.18	(2.2,5.0)	4

$$H = \begin{bmatrix} .056 & & & & & & & \\ .14 & .34 & & & & & & \\ .0005 & .0013 & .0002 & & & & & \\ .16 & .39 & .0015 & .45 & & & & \\ -.048 & -.12 & -.0005 & -.14 & .041 & & & \\ -.061 & -.15 & -.0006 & -.17 & .052 & .066 & & \\ -.23 & -.57 & -.0022 & -.65 & .19 & .25 & .93 & \\ 2.2 & 5.5 & 2.1 & 6.2 & -1.9 & -2.4 & -9.0 & 86 \end{bmatrix}$$

$$E = \begin{bmatrix} 11 & & & & & & & \\ -1.1 & 22 & & & & & & \\ -2.5 & 2.0 & 4.8 & & & & & \\ -.53 & 1.8 & -.50 & 13 & & & & \\ 1.6 & -1.3 & -.48 & -.33 & 5.6 & & & \\ .40 & -.49 & -1.1 & -.25 & -.024 & 1.8 & & \\ 3.3 & 1.2 & -1.7 & -.096 & 2.0 & 1.4 & 13 & \\ -17 & 5.6 & 15 & -14 & .48 & 1.1 & -6.8 & 324 \end{bmatrix}$$

$$tr(HE^{-1}) = 1.9836$$

$$F = \frac{38.5}{4} \quad 1.9836 = 1.909$$

This is still not significant at the 0.05 level although it is significant at the 0.1 level. Thus, blocking on the nature of work has not increased the significance of the attribute being considered.

To investigate this further the following contingency table is presented for the patients who were considered in the above analysis

Type of work	Did not fully return to work	Fully returned to work	Totals
Sedentary	5	31	36
Light Physical	6	29	35
Moderate-Heavy Physical	2	15	17
Totals	13	75	

Thus the estimated probabilities of patients not fully returning to work in each nature of work category are,

sedentary: 5/36 = .139

light physical: 6/35 = .171

moderate-heavy physical: 2/17 = .118

An assymptotic maximum likelihood χ^2 test was then used to test if the chance of a patient fully returning to work depended on the nature of work. The result was $X^2 = .302$ on 2 degrees of freedom. Under the null hypothesis X^2 is assymptotically distributed χ^2_2. Thus the test is not significant at any reasonable level.

Hence there is no evidence that persons whose nature of work before their illness differ, have different chances of fully returning to work. This might explain why the blocking did not increase the significance in the case being considered, since the effect of nature of work could not swamp the effect of the factors on the chance of fully returning to work if no nature of work effect was present.

In other studies (Croog and Levine 1978) evidence has been found that myocardial infarction patients with different types of work before their illness have different chances of returning to work. It is likely that the only reason no effect has been found here is the small sample size. Another possible reason might be that Canberra is a city whose population have a relatively homogeneous nature of work.

The samples used for the remaining return to work attributes in this section only considered those patients who gave a fully returned to work response on the previous attribute. This was to ensure consistency of the results and to make them more meaningful.

The next attribute considered was whether the patient had returned to the same job. The outcome levels were,

A ≡ did not return to the same job.

B ≡ did return to the same job.

A Hotelling's T^2 test and t-tests were again used for testing for differences in the 8 factors for patients with different levels of the attribute. The results obtained were,

No. of patients with level A: 9

No. of patients with level B: 67

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	$L(\lambda)$	95% C.I.	Take λ as
1	<-5.0	<1.64	>145.70	-	-5
2	- .3	58.54	9.92	(-1.0,.2)	-.5
3	.6	26.58	39.92	(-.2,1.4)	.5
4	- .6	23.81	44.10	(-1.5,.3)	-.5
5	-1.7	16.99	56.92	(-2.7,-.8)	-2
6	-1.0	18.70	53.28	(-1.8,-.1)	-1
7	<-5.0	<2.89	>124.21	-	-5
8	2.9	7.90	86.03	(1.6,4.4)	3

Factor	Mean for level A	Mean for level B
1	.808	.798
2	.722	.783
3	1.381	1.289
4	.824	.846
5	.812	.661
6	.831	.733
7	.689	.770
8	6.633	5.499

$$S = \begin{bmatrix} .14 & & & & & & & \\ .0025 & .036 & & & & & & \\ -.029 & -.0056 & .055 & & & & & \\ .0031 & .0000 & .0047 & .026 & & & & \\ .029 & .0096 & -.012 & .0010 & .14 & & & \\ .0035 & .0022 & -.025 & .0016 & .0001 & .061 & & \\ .040 & -.0019 & -.024 & .0033 & .044 & .031 & .16 & \\ -.13 & -.0053 & .10 & .013 & -.054 & -.012 & -.0028 & 7.6 \end{bmatrix}$$

Hotelling's T^2 Test.

$T^2 = 10.947$ $F = 1.239$ d.o.f.: 8,67

Significance: None

t-test: d.o.f.: 74

Factor	t	Sig.
1	.08	-
2	-.91	-
3	1.11	-
4	-.38	-
5	1.14	-
6	1.12	-
7	-.57	-
8	1.16	-

There are no indications of any differences in the mean values of the factors for patients with the two different levels of the attribute. It should be noted, however, that we are dealing with a smaller sample than with the fully return to work attribute.

Whether the patient found it easy to return to work was then considered. The attribute levels were,

A ≡ did not find it easy to return to work.

B ≡ found it easy to return to work.

Similar statistical tests were performed. The results were,

No. of patients with level A: 17

No. of patients with level B: 55

Transformation Table:

Factor	$\hat{\lambda}$	Res. S. S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.52	>138.95	-	-5
2	- .3	55.39	9.44	(-.9,.3)	-.5
3	.4	25.35	37.58	(-.4,1.2)	.5
4	- .7	22.15	42.43	(-1.7,.2)	-1
5	-1.8	14.54	57.59	(-2.8,-.8)	-2
6	-1.0	16.47	53.10	(-1.9,-.2)	-1
7	<-5.0	<1.92	>130.54	-	-5
8	3	7.72	80.37	(1.7,4.6)	3

Factor	Mean for level A	Mean for level B
1	.793	.803
2	.771	.774
3	1.311	1.284
4	.708	.752
5	.640	.702
6	.638	.784
7	.686	.817
8	5.453	5.751

$$s = \begin{bmatrix} .14 & & & & & & & \\ .0029 & .035 & & & & & & \\ -.028 & -.0048 & .056 & & & & & \\ .011 & -.0022 & .0063 & .072 & & & & \\ .025 & .0052 & -.0028 & -.0054 & .13 & & & \\ -.0005 & .0014 & -.023 & .0052 & -.0031 & .058 & & \\ .037 & -.0060 & -.018 & .0032 & .025 & .027 & .15 & \\ -.097 & -.023 & .096 & -.010 & -.052 & .034 & -.015 & 7.8 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 5.991$ F = .674 d.o.f.: 8, 63

Significance: none.

t-tests. d.o.f.: 70

Factor	t	Sig.
1	- .09	-
2	- .05	-
3	.42	-
4	- .59	-
5	- .60	-
6	-2.18*	.05
7	-1.22	-
8	- .38	-

Thus there is some indication, that of those persons who fully return to work, those who do not find it easy to return to work have more subjective tension.

Finally the patient's time off work was looked at. The levels of this attribute first chosen were,

A ≡ <1 month off work after hospital

B ≡ >1 month off work after hospital

The results obtained were,

No. of patients with level A: 10

No. of patients with level B: 64

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.31	> 149.02	-	-5
2	- .3	58.01	9.01	(-.9, .3)	-.5
3	.5	26.35	38.21	(-.4,1.3)	.5
4	- .6	22.89	43.42	(-1.5,.3)	-.5
5	-1.8	14.86	59.40	(-2.8,-.8)	-2
6	-1.1	16.22	56.16	(-2.1,-.3)	-1
7	<-5.0	<2.09	> 132.04	-	-5
8	3.0	7.49	84.75	(1.6,4.5)	3

Factor	Mean for level A	Mean for level B
1	.726	.832
2	.848	.756
3	1.257	1.297
4	.770	.853
5	.772	.672
6	.733	.765
7	.819	.775
8	6.070	5.598

$$s = \begin{bmatrix} .13 & & & & & & & \\ .0058 & .035 & & & & & & \\ -.028 & -.0061 & .057 & & & & & \\ .0029 & .0006 & .0028 & .025 & & & & \\ .019 & .0091 & -.0064 & -.0012 & .14 & & & \\ -.0031 & .0039 & -.024 & .0024 & -.0042 & .060 & & \\ .027 & .0004 & -.023 & .0047 & .030 & .024 & .15 & \\ -.15 & -.014 & .096 & .0038 & -.080 & .0039 & -.038 & 7.5 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 7.232$ F = .816 d.o.f.: 8, 67

Significance: none.

t-tests. d.o.f.: 72

Factor	t	Sig.
1	.85	-
2	1.45	-
3	- .49	-
4	-1.54	-
5	.79	-
6	- .38	-
7	.33	-
8	.51	-

The levels next considered were,

A ≡ <3 months off work after hospital.

B ≡ >3 months off work after hospital.

Results obtained were,

No. of patients with level A: 64

No. of patients with level B: 10

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5	<1.32	>148.93	-	-5
2	- .3	55.38	10.72	(-.9,.3)	-.5
3	.5	26.43	38.09	(-.4,1.3)	.5
4	- .6	23.63	42.23	(-1.5,.3)	-.5
5	-1.8	14.94	59.21	(-2.8,-.8)	-2
6	-1.1	16.19	56.23	(-2.1,-.3)	-1
7	<-5.0	<2.08	>132.13	-	-5
8	3.1	7.28	85.81	(1.7,4.6)	3

Factor	Mean for level A	Mean for level B
1	.830	.738
2	.788	.640
3	1.290	1.302
4	.842	.840
5	.676	.743
6	.766	.722
7	.790	.720
8	5.472	6.878

$$s = \begin{bmatrix} .13 & & & & & & & \\ .0030 & .033 & & & & & & \\ -.028 & -.0064 & .057 & & & & & \\ .0040 & .0003 & .0032 & .026 & & & & \\ .018 & .011 & -.0070 & -.0022 & .14 & & & \\ -.0031 & .0028 & -.023 & .0027 & -.0043 & .060 & & \\ .025 & -.0003 & -.023 & .0043 & .031 & .024 & .15 & \\ -.14 & .016 & .092 & -.0052 & -.086 & .0096 & -.023 & 7.3 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 11.122$ F = 1.255 d.o.f.: 8, 67

Significance: none

t-tests. d.o.f.: 72

Factor	t	Sig.
1	.74	-
2	2.39*	.05 (easily)
3	- .14	-
4	.04	-
5	- .53	-
6	.53	-
7	.53	-
8	-1.53	-

Due to the lack of significance it was thought highly unlikely that any new information would be obtained if levels of the attribute were divided further. Thus this was not done.

There is some indication, that of those patients who fully return to work in the first 8 months after hospital, those who take more than 3 months to return to work have more psychosocial precipitants.

Thus, from the results in this chapter, there seems to be no convincing evidence that persons with different levels of work rehabilitation attributes have different illness behaviour patterns before leaving hospital. However, there are several indications of differences, which would warrant further investigation.

CHAPTER 5

ILLNESS BEHAVIOUR AND RECURRENCE OF HEART TROUBLE

This chapter investigates if patients who have a recurrence of heart trouble in the first 8 months after discharge from hospital, have different illness behaviour patterns as measured in the first interview.

In the 8 month follow up interview the patients were asked two relevant questions, namely, a) have you had a recurrence of heart trouble requiring hospitalisation? and b) have you had a recurrence of heart trouble requiring an unroutine doctor's visit? A search of death lists done by the Registrar of Births, Deaths and Marriages was also carried out. Seven patients died, all of further heart trouble, in the intervening period. The recurrence of heart trouble attributes used in this chapter were formed from the information obtained from the answers to these two questions and the search of death lists.

All patients who had answered the IBQ questionnaire correctly and for whom committal information was available on the attribute being considered, were included in the analysis with that attribute. Box-Cox transformations on the appropriate model, as described in chapter 2 with $c = 1$, were used to remove skewness before hypothesis testing was attempted.

The first attribute used had levels,

A $\equiv$ had no recurrence of heart trouble requiring hospitalisation.

B ≡ had recurrence of heart trouble requiring hospitalisation.

With this particular attribute only patients who had survived to the 8 month follow up survey and had participated in the follow up survey were considered.

As with the attributes used in the previous chapter, a Hotelling's T^2 Test and t-tests on individual factors were performed. The results obtained were,

No. of patients with level A: 75

No. of patients with level B: 20

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.78	>188.93	-	-5
2	- .4	73.60	12.12	(-.9,.2)	-.5
3	.4	34.43	48.21	(-.3,1.1)	.5
4	0	34.69	47.86	(-.8,.8)	0
5	-1.6	22.65	68.09	(-2.5,-.8)	-2
6	- .5	27.17	59.45	(-1.3, .2)	-.5
7	-4.8	4.69	142.89	(-∞,-3.4)	-5
8	3.7	8.98	112.01	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.844	.728
2	.790	.723
3	1.280	1.349
4	.400	.549
5	.661	.718
6	.832	.838
7	.723	.769
8	11.291	10.932

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0050 & .036 & & & & & & \\ -.029 & -.010 & .057 & & & & & \\ .0001 & -.0037 & -.0062 & .16 & & & & \\ .026 & .013 & -.017 & -.0066 & .14 & & & \\ .0034 & .0025 & -.013 & -.0087 & .0028 & .022 & & \\ .040 & .0003 & -.023 & -.0065 & .042 & .019 & .18 & \\ -.13 & .0045 & .090 & -.046 & .0046 & -.033 & -.17 & 38 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 8.326$ F = .962 d.o.f.: 8, 86

Significance: none

t-tests. d.o.f: 93

Factor	t	Sig.
1	1.28	-
2	1.41	-
3	-1.14	-
4	-1.49	-
5	- .60	-
6	- .15	-
7	- .44	-
8	.07	-

Thus no differences in the mean factor scores were observed for patients with different levels of this attribute.

The persons who had a recurrence requiring hospitalisation were then combined with those who died in the intervening period to obtain the levels,

A ≡ no recurrence of heart trouble causing death or hospitalisation

B ≡ recurrence of heart trouble causing death or hospitalisation.

The results of the analysis were,

No. of patients with level A: 75

No. of patients with level B: 27

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<2.68	>185.64	-	-5
2	- .2	81.58	11.39	(-.8,.3)	0
3	.5	36.53	52.37	(-.2,1.2)	.5
4	- .2	37.52	51.01	(-.9,.6)	0
5	-1.5	24.82	72.08	(-2.3,-.8)	-2
6	- .5	30.78	61.11	(-1.2,.2)	-.5
7	-4.4	5.71	147.05	($-\infty$,-3.2)	-4
8	3.6	9.91	118.90	(2.3,5)	4

Factor	Mean for level A	Mean for level B
1	.844	.692
2	.537	.769
3	1.280	1.353
4	.400	.474
5	.661	.684
6	.832	.820
7	.738	.736
8	11.291	10.851

$$s = \begin{bmatrix} .14 & & & & & & & \\ -.017 & .25 & & & & & & \\ -.031 & .027 & .056 & & & & & \\ -.0075 & .0076 & -.0052 & .16 & & & & \\ .026 & -.033 & -.015 & -.0096 & .14 & & & \\ .0066 & -.0091 & -.012 & -.0091 & .0045 & .023 & & \\ .035 & -.0017 & -.023 & -.0045 & .041 & .017 & .16 & \\ -.0078 & .0019 & .070 & -.073 & -.035 & -.011 & -.16 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 8.910$ F = 1.036 d.o.f.: 8, 93

Significance: none

t-tests. d.o.f.: 100

Factor	t	Sig.
1	1.82	.1
2	-2.08*	.05
3	-1.37	-
4	- .81	-
5	- .28	-
6	.35	-
7	.03	-
8	.32	-

Hence, there are some indications that persons who have a recurrence of heart trouble causing death or hospitalisation have more psychosocial precipitants and somatic concern.

Finally, recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit was looked at. The levels were,

A ≡ no recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit

B ≡ recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit.

A Hotelling's T^2 test was firstly performed to give,

No. of patients with level A: 58

No. of patients with level B: 44

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<2.68	>185.57	-	-5
2	- .3	74.8	15.81	(-.8,.3)	-.5
3	.5	36.43	52.50	(-.2,1.2)	.5
4	- .2	37.73	50.72	(-.9,.6)	0
5	-1.5	24.67	72.40	(-2.4,-.8)	-2
6	- .5	30.59	61.42	(-1.2,.3)	-.5
7	-4.5	5.69	147.18	($-\infty$,-3.2)	-4
8	3.6	9.91	118.89	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.861	.729
2	.823	.688
3	1.269	1.339
4	.378	.448
5	.639	.704
6	.840	.815
7	.721	.760
8	11.322	10.981

$$S = \begin{bmatrix} .14 & & & & & & & \\ .0049 & .031 & & & & & & \\ -.030 & -.0088 & .056 & & & & & \\ -.016 & -.0067 & .031 & .14 & & & & \\ .028 & .015 & -.016 & -.012 & .14 & & & \\ .0062 & .0028 & -.012 & -.056 & .0049 & .022 & & \\ .036 & .0024 & -.024 & -.044 & .040 & .017 & .16 & \\ -.0059 & -.0036 & .070 & .022 & -.031 & -.012 & -.16 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 23.576 \quad F = 2.741^{**} \quad$ d.o.f.: 8,93

Significance: .01

Thus there is strong evidence that illness behaviour is different for those who have recurrence of heart trouble causing death,

hospitalisation or unroutine doctor's visit to those who don't.

As the T^2 test was significant it was thought worthwhile testing for differences in the means of individual factors using tests that take into account the possible correlation between tests and the higher probability of some tests being significant by chance when several tests are used together. Thus differences in means of individual factors between the two levels were tested using tests based on Roy-Bose Confidence Intervals (Morrison 1976,pp.134-140).

These use the statistic,

$$T_1 = \left\{ \frac{\bar{x}_A - \bar{x}_B}{\sqrt{(1/n_A+1/n_B).s^2}} \right\}^2 \cdot \frac{n_A+n_B-p-1}{(n_A+n_B-2).p}$$

where $\bar{x}_A$, $\bar{x}_B$ are the means for level A and level B respectively of the particular factor being considered, and s^2 is the pooled sample variance over levels A and B of the particular factor. Thus in this case,

$$T_1 = \left\{ \frac{\bar{x}_A - \bar{x}_B}{\sqrt{(1/n_A+1/n_B)s^2}} \right\}^2 \cdot \frac{n_A+n_B-9}{(n_A+n_B-2)8}$$

The test is completed by referring the statistic, T_1, to an F_{p,n_A+n_B-p-1} i.e. an F_{8,n_A+n_B-9} distribution. These tests are very conservative i.e. they have a higher probability of accepting the null hypothesis than given by the significance level, and they have low power.

The results of the Roy-Bose Tests were,

Factor	T_1	Sig.
1	.37	-
2	1.71	-
3	.25	-
4	.10	-
5	.09	-
6	.09	-
7	.02	-
8	.01	-

It seems that the Roy-Bose tests are too coarse (i.e. have too low a power) to be useful.

Thus another technique based on Bonferroni Confidence Intervals (Morrison 1976, pp.134-140) was tried to test for differences in individual factors. These tests also take into account the correlation between tests and the higher probability of significance by chance as the number of tests increases. Again, they are conservative.

These tests use the same statistic as the ordinary t-test except that the significance points for an α-level Bonferroni test are the same as the significance points of an $\alpha/p = \alpha/8$ level t-test. Since .08 and .008 significance points of a Bonferroni Test correspond to the .01 and .001 signficance points of a t-test for differences in means, for convenience, .08 and .008 levels of significance were considered for the Bonferroni Tests. Two sided tests were used in the analysis.

The results were,

d.o.f.: 100

Factor	t	Sig.(Bonferroni)	Sig. (t-test)
1	1.78	-	.1
2	3.83**	.008 (easily)	.001 (easily)
3	-1.46	-	-
4	- .94	-	-
5	- .88	-	-
6	.86	-	-
7	- .48	-	-
8	.27	-	-

Thus there is very strong evidence that those patients who have a recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit have more psychosocial precipitants. Also there is some indication that they have more somatic concern.

From the results in this chapter, there is strong evidence that patients who have a recurrence of heart trouble in the first 8 months after leaving hospital have higher average values on the psycho-social precipitants factor i.e. have a greater recognition that personal, social and financial worries prior to illness might have been present. This result was unexpected, and as yet is unexplained. There are also some indications that persons who have a recurrence have more somatic concern.

CHAPTER 6

ILLNESS BEHAVIOUR AND OTHER RECOVERY AND REHABILITATION ATTRIBUTES

The remaining attributes were all obtained from the questioning at the 8 month follow-up interview. For each recovery and rehabilitation attribute, tests were performed to see if there were differences in the average values of the illness behaviour factors for the different levels of the attribute. Persons who had given committal answers to the questions relating to an attribute and had answered the IBQ questionnaire correctly were included in the analysis for that attribute. Power transformations were performed using the Box-Cox technique for the appropriate model after adding 1 to the values of each of the factors, and before the analysis of differences commenced.

a) Happiness with Progress

At the follow-up patients were asked whether they were completely happy with progress, to give the attribute levels,

A ≡ not completely happy with progress

B ≡ completely happy with progress.

The results were,

No. of patients with level A: 28

No. of patients with level B: 68

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.78	>191.47	-	-5
2	- .3	66.73	17.45	(-.8,-.2)	-.5
3	.4	35.26	48.08	(-.4,1.1)	.5
4	0	34.35	49.33	(-.8,.8)	0
5	-1.6	22.76	69.08	(-2.4,-.8)	-2
6	- .6	26.98	60.93	(-1.3,.1)	-.5
7	-4.8	4.63	145.55	(-∞,-3.5)	-5
8	3.5	9.44	111.33	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.774	.841
2	.674	.816
3	1.292	1.292
4	.340	.414
5	.598	.699
6	.856	.827
7	.737	.735
8	10.103	11.525

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0040 & .032 & & & & & & \\ -.030 & -.011 & .058 & & & & & \\ -.011 & -.0077 & .034 & .13 & & & & \\ .022 & .0092 & -.015 & -.0072 & .14 & & & \\ .0040 & .0031 & -.013 & -.054 & .0029 & .022 & & \\ .040 & -.0005 & -.023 & -.049 & .041 & .019 & .17 & \\ -.16 & -.023 & .12 & .081 & .0049 & -.042 & -.20 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 17.459$ F = 2.020 d.o.f.: 8, 87

Significance: .1 (easily)

t-tests. d.o.f.: 94

Factor	t	Sig.
1	- .83	-
2	-3.54***	.001
3	.02	-
4	- .90	-
5	-1.20	-
6	.86	-
7	.03	-
8	-1.02	-

Thus there is an indication that persons who are not completely happy with progress have different patterns of illness behaviour. There are strong indications that this is primarily due to persons who are not completely happy with progress having more psychosocial precipitants. This result ties in with the evidence obtained in the previous chapter that persons who have a recurrence of heart trouble have more psychosocial precipitants.

b) Particular Difficulties

Participants in the study were asked if in their first 8 months of recovery they had any of the following particular difficulties:

1. Slowing down
2. Irritability
3. Depression
4. Sleep disturbance
5. Over-protected
6. Quitting or reducing smoking
7. Moderation
8. Sexual
9. Other difficulties.

Attributes were formed from the first four types of difficulty. Not enough persons had difficulties 5 to 8 to warrant an analysis of differences in the factor levels for persons with those difficulties.

The results obtained were,

1. A ≡ have particular difficulty of slowing down

   B ≡ don't have this particular difficulty

   No. of patients with level A: 47

   No. of patients with level B: 49

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.78	>191.29	-	-5
2	- .3	75.62	11.46	(-.9,.2)	-.5
3	.4	35.25	48.10	(-.4,1.1)	.5
4	0	34.74	48.79	(-.8,.8)	0
5	-1.6	23.05	68.49	(-2.4,-.8)	-2
6	- .6	27.02	60.85	(-1.3,.1)	-.5
7	-4.8	4.53	146.59	($-\infty$,-3.5)	-5
8	3.5	9.51	110.96	(2.3,4.9)	4

Factor	Mean for level A	Mean for level B
1	.844	.800
2	.767	.781
3	1.296	1.287
4	.421	.365
5	.646	.692
6	.824	.846
7	.673	.795
8	11.457	10.778

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0062 & .036 & & & & & & \\ -.030 & -.011 & .058 & & & & & \\ -.010 & -.0052 & .034 & .14 & & & & \\ .024 & .012 & -.015 & -.0049 & .14 & & & \\ .0039 & .0021 & -.013 & -.055 & .0020 & .022 & & \\ .041 & -.001 & -.023 & -.047 & .039 & .018 & .17 & \\ -.15 & .022 & .11 & .094 & .043 & -.047 & -.18 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 3.764$ F = .435 d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	.59	-
2	- .35	-
3	.20	-
4	.75	-
5	- .60	-
6	- .74	-
7	-1.44	-
8	.53	-

Conclusion:

There are no indications that persons who have particular difficulty of slowing down have different patterns of illness behaviour.

2. A ≡ have particular difficulty of irritability

B ≡ don't have this particular difficulty

No. of patients with level A: 21

No. of patients with level B: 75

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.79	>191.25	-	-5
2	- .3	75.42	11.58	(-.9,.2)	-.5
3	.4	34.78	48.74	(-.3,1.1)	.5
4	0	34.98	48.46	(-.8,.9)	0
5	-1.5	22.83	68.94	(-2.4,-.8)	-2
6	- .6	27.03	60.82	(-1.3,.1)	-.5
7	-4.8	4.63	145.56	($-\infty$,-3.5)	-5
8	3.5	9.49	111.05	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.785	.832
2	.753	.780
3	1.346	1.276
4	.451	.376
5	.745	.648
6	.814	.841
7	.726	.738
8	10.281	11.343

$$s = \begin{bmatrix} .13 & & & & & & & \\ .0058 & .036 & & & & & & \\ -.029 & -.010 & .057 & & & & & \\ -.0089 & -.0051 & .033 & .14 & & & & \\ .025 & .013 & -.016 & -.0068 & .14 & & & \\ .0034 & .0021 & -.013 & -.055 & .0027 & .022 & & \\ .039 & -.0006 & -.023 & -.048 & .041 & .019 & .17 & \\ -.015 & .014 & .13 & .12 & .053 & -.056 & -.21 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 5.149$ F = .596 d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	- .52	-
2	- .59	-
3	1.17	-
4	.83	-
5	1.04	-
6	- .74	-
7	- .12	-
8	- .69	-

Conclusion:

No indications have been found that persons who have particular difficulty of irritability have different illness behaviour.

3. A ≡ have particular difficulty of depression

B ≡ don't have this particular difficulty

No. of patients with level A: 29

No. of patients with level B: 67

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.72	>192.79	-	-5
2	- .3	74.95	11.98	(-.9,.2)	-.5
3	.4	35.22	48.14	(-.4,1.1)	.5
4	0	34.27	49.45	(-.8,.7)	0
5	-1.6	23.12	68.33	(-2.4,-.8)	-2
6	- .6	26.81	61.23	(-1.3,.1)	-.5
7	-4.8	4.63	145.56	($-\infty$,-3.5)	-5
8	3.5	9.54	110.81	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.715	.868
2	.744	.787
3	1.304	1.286
4	.450	.368
5	.674	.667
6	.809	.846
7	.745	.731
8	11.081	11.123

$$S = \begin{bmatrix} .12 & & & & & & & \\ .0047 & .036 & & & & & & \\ -.030 & -.010 & .058 & & & & & \\ -.0068 & -.0047 & .034 & .13 & & & & \\ .024 & .012 & -.015 & -.0057 & .14 & & & \\ .0024 & .0019 & -.013 & -.054 & .0023 & .022 & & \\ .040 & -.0004 & -.023 & -.049 & .041 & .019 & .17 & \\ -.14 & .019 & .12 & .10 & .035 & -.051 & -.20 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 10.127$ F = 1.172 d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	-1.92	.1 (easily)
2	-1.02	-
3	.32	-
4	1.00	-
5	.08	-
6	-1.12	-
7	.15	-
8	- .03	-

Conclusion:

There is some indication that patients who have particular difficulty of depression have more somatic concern. This is not surprising since it is likely that somatic concern and depression are related.

4. A ≡ have particular difficulty of sleep disturbance

   B ≡ don't have this particular difficulty.

   No. of patients with level A: 22

   No. of patients with level B: 74

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.72	>192.97	-	-5
2	- .3	74.95	11.88	(-.9,.2)	-.5
3	.4	35.22	48.14	(-.4,1.1)	.5
4	0	34.27	49.45	(-.8,.7)	0
5	-1.6	23.12	68.33	(-2.4,-.8)	-2
6	- .6	26.81	61.23	(-1.3,.1)	-.5
7	-4.8	4.63	145.56	$(-\infty,-3.5)$	-5
8	3.5	9.54	110.81	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.916	.793
2	.710	.794
3	1.309	1.286
4	.520	.355
5	.603	.689
6	.784	.851
7	.670	.755
8	11.328	11.046

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0079 & .035 & & & & & & \\ -.031 & -.010 & .058 & & & & & \\ -.013 & -.0029 & -.034 & .13 & & & & \\ .026 & .011 & -.015 & -.0030 & .14 & & & \\ .0051 & .0012 & -.013 & -.053 & .0012 & .021 & & \\ .041 & -.0018 & -.023 & -.046 & .039 & .018 & .17 & \\ -.15 & .024 & .12 & .095 & .040 & -.048 & -.20 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 11.502$ $F = 1.331$ d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	1.40	-
2	-1.85	.1
3	.38	-
4	1.88	.1
5	- .94	-
6	-1.88	.1
7	- .84	-
8	.19	-

Conclusion:

There are some indications that persons who have difficulty of sleep distrubance have more psychosocial precipitants, affective inhibition and subjective tension.

c) Changes in Pattern of Life

Patients were asked if their pattern of life had changed since their illness, to form an attribute with levels,

A ≡ pattern of life not changed

B ≡ pattern of life had changed.

It was found that the Hotelling's T^2 Test for differences in the illness behaviour factors between the two levels was significant

at the usual .05 level. Hence, Bonferroni tests as well as the t-tests were used to find differences for the individual illness behaviour factors. The results which were obtained are,

No. of patients with level A: 22

No. of patients with level B: 74.

Transformation Table:

Factor	$\hat{\lambda}$	Res.S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.71	>193.30	-	-5
2	- .3	74.21	12.36	(-.9,.2)	-.5
3	.3	31.05	54.18	(-.4,1.0)	.5
4	0	35.34	47.96	(-.8,.8)	0
5	-1.6	23.11	68.36	(-2.4,-.8)	-2
6	- .6	27.12	60.67	(-1.3,.1)	-.5
7	-4.8	4.63	145.58	($-\infty$,-3.5)	-5
8	3.6	9.48	111.15	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.961	.780
2	.823	.760
3	1.140	1.336
4	.362	.402
5	.650	.675
6	.848	.831
7	.717	.741
8	12.104	10.815

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0040 & .036 & & & & & & \\ -.024 & -.0083 & .051 & & & & & \\ -.0082 & -.0050 & .033 & .14 & & & & \\ .025 & .013 & -.016 & -.0057 & .14 & & & \\ .0031 & .0020 & -.013 & -.055 & .0024 & .022 & & \\ .040 & -.0003 & -.024 & -.049 & .041 & .019 & .17 & \\ -.19 & .0048 & .16 & .11 & .041 & -.055 & -.20 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 20.295$ $F = 2.348^*$ d.o.f.: 8, 87

Signficance: .05

Bonferroni and t-tests. d.o.f.: 94

Factor	t	Sig. (Bonferroni)	Sig. (t-test)
1	2.09	-	.05
2	1.37	-	-
3	-4.10^{***}	.001 (about)	Any reasonable level
4	- .44	-	-
5	- .27	-	-
6	.45	-	-
7	- .24	-	-
8	- .85	-	-

Thus there is evidence that persons whose pattern of life had changed have different illness behaviour to others. There is very strong evidence that this is mainly due to persons whose pattern of life has changed having more affective disruption. There is also some indication that those persons have more somatic concern.

Those patients who said their pattern of life had changed were asked whether it was different in any of the following ways:

1. Don't/Can't do as much
2. Go out less, socially
3. Need more rest/sleep
4. Drink less
5. Enjoy things less
6. Quit smoking
7. Had to drop some sport
8. Am less worried, more relaxed.

The results of the question used in the previous attribute and patient's answers to the first four types of differences were used to form the attributes used in the remaining part of this section of the chapter. The other four types of differences in pattern of life were not used to form attributes since only a few patients had their pattern of life changed in these ways.

The results obtained were,

1. A ≡ pattern of life is different because don't/can't do as much

   B ≡ pattern of life has not changed in this way

   No. of patients with level A: 50

   No. of patients with level B: 46

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.77	>191.72	-	-5
2	- .3	69.24	15.69	(-.8,.2)	-.5
3	.4	35.00	48.46	(-.3,1.1)	.5
4	0	35.35	47.95	(-.8,.8)	0
5	-1.6	23.05	68.49	(-2.4,-.8)	-2
6	- .6	27.16	60.61	(-1.3,.1)	-.5
7	-4.9	4.63	145.56	($-\infty$,-3.5)	-5
8	3.5	9.53	110.89	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.783	.864
2	.722	.831
3	1.312	1.269
4	.382	.405
5	.651	.690
6	.839	.831
7	.742	.728
8	11.314	10.889

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0038 & .033 & & & & & & \\ -.029 & -.0093 & .058 & & & & & \\ -.010 & -.0061 & .034 & .14 & & & & \\ .023 & .011 & -.015 & -.0058 & .14 & & & \\ .0038 & .0025 & -.014 & -.055 & .0024 & .022 & & \\ .040 & -.0001 & -.023 & -.048 & .041 & .019 & .17 & \\ -.14 & .031 & .11 & .11 & .040 & -.052 & -.20 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 10.150$ $F = 1.174$ d.o.f.: 8, 87

Significance: none.

t-tests. d.o.f.: 94

Factor	t	Sig.
1	-1.09	-
2	-2.93**	.01
3	.89	-
4	- .31	-
5	- .51	-
6	.29	-
7	.16	-
8	.33	-

Conclusion:

There is a strong indication that those patients who don't/can't do as much have more psychosocial precipitants at time of leaving hospital. This can be related to the previous evidence that persons who have a recurrence of heart trouble have more psychosocial precipitants.

2. A ≡ pattern of life is different because go out less, socially

B ≡ pattern of life has not changed in this way

No. of patients with level A: 24

No. of patients with level B: 72

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.76	>191.94	-	-5
2	- .3	75.30	11.66	(-.8,.2)	-.5
3	.4	34.41	49.25	(-.3,1.1)	.5
4	0	35.47	47.80	(-.8,.8)	0
5	-1.6	23.01	68.56	(-2.4,-.8)	-2
6	- .5	26.82	61.21	(-1.3,.2)	-.5
7	-4.8	4.61	145.76	($-\infty$,-3.5)	-5
8	3.6	9.52	110.92	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.742	.848
2	.752	.782
3	1.356	1.270
4	.477	.365
5	.715	.654
6	.805	.845
7	.688	.751
8	10.555	11.296

$$s = \begin{bmatrix} .13 & & & & & & & \\ .0054 & .036 & & & & & & \\ -.028 & -.010 & .057 & & & & & \\ -.0072 & .0048 & .032 & .13 & & & & \\ .025 & .013 & -.016 & -.0069 & .14 & & & \\ .0028 & .0020 & -.013 & -.054 & .0028 & .022 & & \\ .038 & -.0009 & -.022 & -.047 & .041 & .018 & .17 & \\ -.16 & .015 & .13 & .12 & .044 & -.057 & -.21 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 8.862$ $F = 1.025$ d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	-1.26	-
2	- .68	-
3	1.53	-
4	1.30	-
5	.69	-
6	-1.15	-
7	- .64	-
8	.50	-

Conclusion:

There are no indications that those who go out less, socially have different illness behaviour to others.

3. A ≡ pattern of life is different because need more rest/sleep

   B ≡ pattern of life has not changed in this way

   No. of patients with level A: 19

   No. of patients with level B: 77

Transformation Table

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	< -5.0	< 1.79	> 191.12	-	-5
2	- .3	75.39	11.60	(-.9,.2)	-.5
3	.4	33.85	50.04	(-.4,1.1)	.5
4	0	34.80	48.71	(-.8,.7)	0
5	-1.6	23.01	68.57	(-2.4,-.8)	-2
6	- .6	27.16	60.61	(-1.3,.1)	-.5
7	-4.8	4.59	145.93	(-∞,-3.5)	-5
8	3.6	9.29	112.12	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.813	.824
2	.748	.781
3	1.387	1.268
4	.371	.398
5	.621	.681
6	.845	.833
7	.810	.717
8	9.015	11.628

$$s = \begin{bmatrix} .13 & & & & & & & \\ .0060 & .036 & & & & & & \\ -.030 & -.0099 & .056 & & & & & \\ -.0095 & -.0056 & .035 & .14 & & & & \\ .024 & .012 & -.014 & -.0058 & .14 & & & \\ .0036 & .0023 & -.014 & -.055 & .0024 & .022 & & \\ .040 & .0000 & -.025 & -.048 & .042 & .019 & .17 & \\ -.15 & .0053 & .17 & .092 & .0099 & -.046 & -.16 & 38 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 10.672$ F = 1.235 d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	- .12	-
2	- .68	-
3	1.97	.1
4	- .29	-
5	- .62	-
6	.31	-
7	.87	-
8	-1.66	-

Conclusion:

There is some indication that persons who need more rest/sleep have more affective disruption.

4. A ≡ pattern of life is different because drink less

B ≡ pattern of life has not changed in this way

No. of patients with level A: 15

No. of patients with level B: 81

Transformation Table:

Factor	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
1	<-5.0	<1.78	>191.43	-	-5
2	- .3	74.58	12.12	(-.9,.2)	-.5
3	.4	34.50	49.12	(-.4,1.1)	.5
4	0	35.19	48.17	(-.8,.8)	0
5	-1.6	23.08	68.42	(-2.4,-.8)	-2
6	- .6	26.34	62.08	(-1.4,.1)	-.5
7	-4.8	4.62	145.59	(-∞,-3.5)	-5
8	3.6	9.51	110.96	(2.3,5.0)	4

Factor	Mean for level A	Mean for level B
1	.754	.834
2	.721	.784
3	1.372	1.276
4	.529	.368
5	.628	.677
6	.776	.846
7	.708	.741
8	10.246	11.270

$$S = \begin{bmatrix} .13 & & & & & & & \\ .0054 & .036 & & & & & & \\ -.029 & -.0097 & .057 & & & & & \\ -.0077 & -.0041 & .032 & .13 & & & & \\ .023 & .012 & -.014 & -.0045 & .14 & & & \\ .0029 & .0016 & -.013 & -.053 & .0018 & .022 & & \\ .039 & -.0008 & -.023 & -.048 & .040 & .019 & .17 & \\ -.15 & .011 & .13 & .13 & .029 & -.061 & -.21 & 39 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 9.798$ F = 1.134 d.o.f.: 8, 87

Significance: none

t-tests. d.o.f.: 94

Factor	t	Sig.
1	- .79	-
2	-1.19	-
3	1.43	-
4	1.58	-
5	- .46	-
6	-1.71	.1
7	- .28	-
8	- .58	-

Conclusion:

There is some indication that those patients whose pattern of life has changed through drinking less have more subjective tension.

CHAPTER 7

MEASUREMENT OF ANXIETY

a) Introduction

As mentioned in the introductory chapter, anxiety is thought to be a very important attribute of illness behaviour after serious illness. Thus it seems worthwhile to look at differences in average values of measures of anxiety for different levels of recovery and rehabilitation attributes.

Anxiety is thought to exist as both state anxiety and trait anxiety (Martin and Sroufe 1970). State anxiety is a person's anxiety at a given time. After a crisis a person might react with a certain level of state anxiety. Trait anxiety is a person's predisposition to anxiety if a crisis presents itself i.e. a person's previous position to respond to a situation in a neurotic manner.

Both measures of state and trait anxiety will be considered in the ensuing analysis.

b) State Anxiety

State anxiety can manifest itself in various forms. Thus each patient who had suffered a myocardial infarction was asked to give an indication of the levels of his feelings of the following emotional states at the time of the initial interview:

1. Concern
2. Fear
3. Worry
4. Anxiety
5. Tension

These emotional states are all indications of state anxiety.

The patient's indications were measured by using a 10 centimetre line anchored at each end by extreme statements of feeling of that emotional state. The patient was asked to place a mark on the line indicating his level of feeling of the emotional state. A numerical value between 0 and 10 was given to the patient's response by measuring how far along the line (in centimetres) his mark was placed. The distances were measured to the nearest centimetre. A copy of the form used to obtain these "visual analogue scales" is given in Appendix B. This type of scale was used to try and reduce bimodality in the sample distribution of the measures of state anxiety.

The following sample correlation matrix for the visual analogue scales was obtained by Byrne (1979).

	Concern	Fear	Worry	Anxiety	Tension
Concern	1.000				
Fear	.661	1.000			
Worry	.740	.784	1.000		
Anxiety	.699	.688	.785	1.000	
Tension	.566	.674	.665	.527	1.000

Correlation matrix of state anxiety measures for survivors of a myocardial infarction.

This matrix shows that the 5 state anxiety measures have large positive correlations. Hence they are closely related.

It should be noted that the distribution of all the visual analogue scales were hightly skewed and slightly bimodal. However, the biomodality was thought sufficiently small to ignore in the following analysis.

c) Trait Anxiety

At the interview patients were asked to complete the Eysenck Personality Inventory (EPI, Eysenck and Eysenck, 1964). This consists of 57 questions each requiring a yes/no answer. From this three scores are obtained, namely Neurotocism, Lie and Extrovert. These are measures of how neurotic, how much a person lies and how extroverted a person is, respectively.

It is most likely that for the patients being studied the Neuroticism scale provides a stable measure of trait anxiety which predates the myocardial infaction (Byrne, 1979). Thus the EPI-Neuroticism scale will be used as a measure of the patient's trait anxiety.

The trait anxiety scores obtained were integral values in the range 1 to 21. The sample distribution of scores was not highly skewed.

Further discussion of the measures of state and trait anxiety and some analysis of the scores obtained in this sample is presented in Byrne (1979).

CHAPTER 8

THE RELATIONSHIP BETWEEN ANXIETY AND ILLNESS BEHAVIOUR

Byrne and Whyte (1979b) produced the following table of sample correlations between the measures of trait and state anxiety, and the illness behaviour factors.

	Trait Anxiety	State Anxiety				
	EPI(N)	CONCERN	FEAR	WORRY	ANXIETY	TENSION
FACTORS 1	.073	.044	.103	.159	.158	.111
2	.116	.092	.065	.095	.061	.095
3	.370	.067	.211	.194	.215	.117
4	.064	.061	.183	.139	.092	.092
5	.161	.365	.328	.280	.366	.323
6	.385	.003	.067	.026	.006	.204
7	.309	.164	.189	.144	.244	.287
8	-.025	.009	.025	-.027	-.066	.041

Correlation between the 8 illness behaviour factors and the measures of trait and state anxiety.

From this table it is clear that factors 3, 6 and 7 (i.e. affective disruption, subjective tension and sick role acceptance) have the largest correlations with the trait anxiety measure and factor 5 (illness recognition) has the largest correlations with the measures of state anxiety.

From chapters 4, 5 and 6 there are several indications that there are differences in the average values of factors 3, 6 and 7 between

different levels of recovery and rehabilitation attributes. On the other hand, there are no indications of differences for factor 5. This might lead us to speculate that trait anxiety has a stronger effect on recovery and rehabilitation than state anxiety.

For completeness, the following table of sample correlations between the EPI(N) score and the measures of state anxiety calculated by Byrne (1979) is presented.

EPI(N) WITH	
CONCERN	.211
FEAR	.183
WORRY	.227
ANXIETY	.239
TENSION	.189

Correlations between measures of state anxiety (visual analogue scales) and trait anxiety (EPI(N))

All the correlations are positive, although modest in size.

CHAPTER 9

TRAIT ANXIETY AND RECOVERY

One sided two sample t-tests were used to test for differences in the average values of the trait anxiety measure for the two different levels of most of the recovery and rehabilitation attributes used in chapters 4, 5 and 6. One sided tests were used since it was thought highly unlikely apriori that persons with a poorer recovery or rehabilitation would have lower trait anxiety. As the scores were not highly skewed the data was not transformed before the t-tests were carried out.

This chapter presents the results of the t-tests used with the trait anxiety measure. All patients who had correctly completed the EPI questionnaire and had a committal level on the attribute being used were included in the t-test for that attribute.

a) Return to Work

The first attribute used had levels,

A ≡ have not fully returned to work

B ≡ have fully returned to work.

The results obtained were,

	No. of Patients	Mean	Standard Deviation (S.D.)
Level A	12	11.583	4.06
Level B	76	11.724	5.27

t = -.09 d.o.f.: 86 Sig.: none

With the remaining attributes in this section, only those patients who had fully returned to work were considered. The results which were obtained are,

A ≡ did not return to the same job

B ≡ did return to the same job

	No. of Patients	Mean	S.D.
Level A	9	13.889	5.04
Level B	66	11.470	5.30

t = 1.29 d.o.f.: 73 Sig.: .1 (just)

****

A ≡ did not find it easy to return to work

B ≡ found it easy to return to work

	No. of Patients	Mean	S.D.
Level A	17	12.235	5.48
Level B	54	11.463	5.19

t = .53 d.o.f.: 69 Sig.: none

****

A ≡ <1 month off work after hospital

B ≡ >1 month off work after hospital

	No. of Patients	Mean	S.D.
Level A	10	11.700	5.29
Level B	63	11.556	5.36

t = .08 d.o.f.: 71 Sig.: none

****

A ≡ <3 months off work after hospital

B ≡ >3 months off work after hospital

	No. of Patients	Mean	S.D.
Level A	63	11.476	5.20
Level B	10	12.200	6.27

t = -.40 d.o.f.: 71 Sig.: none

There is some indication that of those patients who fully return to work, those who did not return to the same job had more trait anxiety. However, this is only a weak indication.

b) Recurrence of Heart Trouble

The results of the tests for recurrence of heart trouble attributes were,

A ≡ no recurrence of heart trouble causing death or hospitalisation.

B ≡ recurrence of heart trouble causing death or hospitalisation.

	No. of Patients	Mean	S.D.
Level A	74	11.743	4.88
Level B	26	11.808	5.63

t = -.06 d.o.f.: 98 Sig.: none

****

A ≡ no recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit

B ≡ recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit.

	No. of Patients	Mean	S.D.
Level A	58	11.776	4.48
Level B	42	11.738	5.82

t = .04 d.o.f.: 98 Sig.: none

There are no indications that patients who have a recurrence of heart trouble have more trait anxiety.

c) Other Recovery and Rehabilitation Attributes

The results obtained for the happiness with progress attribute were,

A ≡ not completely happy with progress

B ≡ completely happy with progress

	No. of Patients	Mean	S.D.
Level A	27	10.741	4.57
Level B	68	11.971	5.20

t = -1.07 d.o.f.: 93 Sig.: none

The results for the particular difficulties attributes were,

A ≡ have particular difficulty of slowing down.

B ≡ don't have this particular difficulty

	No. of Patients	Mean	S.D.
Level A	46	11.587	5.38
Level B	49	11.653	4.76

t = -.06 d.o.f.: 93 Sig.: none

****

A ≡ have particular difficulty of irritability

B ≡ don't have this particular difficulty

	No. of Patients	Mean	S.D.
Level A	21	14.000	3.65
Level B	74	10.946	5.19

$t = 2.52^{**}$ d.o.f.: 93 sig.: .01

****

A ≡ have particular difficulty of depression

B ≡ don't have this particular difficulty

	No. of Patients	Mean	S.D.
Level A	27	11.778	4.34
Level B	68	11.556	5.32

t = .19 d.o.f.: 93 Sig.: none

****

A ≡ have particular difficulty of sleep disturbance

B ≡ don't have this particular difficulty

	No. of Patients	Mean	S.D.
Level A	21	11.571	5.10
Level B	74	11.635	5.06

t = -.05 d.o.f.: 93 Sig.: none

There is evidence that survivors who have irritability difficulty have generally more trait anxiety. This is not surprising as it is believed by many psychologists that anxiety and irritability are related.

The results for changes in pattern of life attributes were,

A ≡ pattern of life not changed

B ≡ pattern of life had changed

	No. of Patients	Mean	S.D.
Level A	23	11.696	5.70
Level B	72	11.597	4.85

t = .08 d.o.f.: 93 Sig.: none

****

A ≡ pattern of life is different because don't/can't do as much

B ≡ pattern of life has not changed in this way

	No. of Patients	Mean	S.D.
Level A	48	11.458	5.19
Level B	47	11.787	4.93

t = -.32 d.o.f.: 93 Sig.: none

****

A ≡ pattern of life is different because go out less, socially

B ≡ pattern of life has not changed in this way

	No. of Patients	Mean	S.D.
Level A	24	11.208	5.53
Level B	71	11.761	4.90

t = -.46 d.o.f.: 93 Sig.: none

****

A ≡ pattern of life is different because need more rest/sleep

B ≡ pattern of life has not changed in this way

	No. of Patients	Mean	S.D.
Level A	19	11.368	4.40
Level B	76	11.684	5.21

t = -.24 d.o.f.: 93 Sig.: none

****

A ≡ pattern of life is different because drink less

B ≡ pattern of life has not changed in this way

	No. of Patients	Mean	S.D.
Level A	14	13.071	3.89
Level B	81	11.370	5.19

t = 1.17 d.o.f.: 93 Sig.: none

There are no indications that those patients whose pattern of life is different in any of the ways considered have more trait anxiety.

Thus, from this data, there is very little indication that trait anxiety has an effect on recovery and rehabilitation.

CHAPTER 10

STATE ANXIETY AND RETURN TO WORK

In the next 3 chapters tests for differences in average values of the measures of state anxiety for the different levels of all the recovery and rehabilitation attributes used in chapter 9 will be performed. Similar techniques will be used as was used for the illness behaviour factors in chapters 4, 5 and 6 i.e. will use Hotelling's T^2 tests, t-tests and, where appropriate, Bonferroni tests.

As the distributions of all the state anxiety measures were highly skewed, they were transformed using the Box-Cox techniques described in chapter 2, for each attribute. In all cases in the next three chapters we have a model of the form given in the second last paragraph of chapter 2. The constants 1, 2, 5 and 10 were tried for c in an ad hoc manner, on a few attributes. Making c = 1 seemed to generally give the largest values of $\max_{\lambda} L_{max}(\lambda)$, and hence the largest possible likelihoods. Hence c was taken as 1. In obtaining the residual sums of squares $s(\lambda, z^{(\lambda)})$ and $L_{max}(\lambda)$ for various values of λ, for aesthetic reasons in producing the transformation tables, y_i+1 was replaced by $\frac{y_i+1}{5}$. This increased $L_{max}(\lambda)$ (and hence $L(\lambda)$) by exactly $\frac{N}{2}$ log 25 and decreased the residual sums of squares by exactly a factor of 25. It has no effect on $\hat{\lambda}$ and the confidence intervals obtained.

It should be noted that all the transformations chosen were to a negative power. Hence the ordering of the anxiety measures is in

all cases reversed. This is important to remember in the subsequent analysis.

With the t-tests and Bonferroni tests used for testing differences in the individual state anxiety measures, using one sided tests was considered, since it seemed highly unlikely apriori that persons with levels of attributes giving a poorer recovery or rehabilitation would have lower levels of state anxiety. However, using one sided tests would be inconsistent with using a Hotelling's T^2 test and so two-sided tests were used.

Whether a patient had fully returned to work was first considered. The attribute levels were,

A ≡ have not fully returned to work

B ≡ have fully returned to work.

As the Hotelling's T^2 test for differences in the anxiety measures was significant at the .05 level, Bonferroni tests as well as t-tests were used.

The results obtained were

No. of patients with level A: 12

No. of patients with level B: 76

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	$L(\lambda)$	95% C.I.	Take λ as
Concern	- .4	18.58	68.42	(-.7,0)	-.5
Fear	-1.3	4.19	133.99	(-1.9,-.9)	-1
Worry	- .5	10.83	92.17	(-.9,-.2)	-.5
Anxiety	- .6	9.10	99.85	(-1.0,-.2)	-.5
Tension	-1.0	5.50	122.00	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.732	.698
Fear	.632	.762
Worry	.590	.758
Anxiety	.738	.751
Tension	.592	.708

$$S = \begin{bmatrix} .088 & & & & \\ .080 & .14 & & & \\ .065 & .078 & .074 & & \\ .056 & .076 & .050 & .073 & \\ .075 & .11 & .069 & .070 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 15.483$ $F = 2.953^*$ d.o.f.: 5, 82 Significance: .05

Bonferroni and t-tests. d.o.f.: 5, 82

Measure	t	Sig. (Bonferroni)	Sig. (t-test)
Concern	.36	-	-
Fear	-1.11	-	-
Worry	-1.99	-	.1
Anxiety	- .16	-	-
Tension	-1.01	-	-

There is evidence that persons who do not fully return to work have different average levels of state anxiety when released from hospital. There is an indication that they experience more worry.

With the remaining work rehabilitation attributes in this chapter only patients who fully teturned to work were considered. The results for these attributes were,

A ≡ did not return to the same job

B ≡ did return to the same job

No. of patients with level A: 9

No. of patients with level B: 66

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	15.76	58.51	(-.7,.1)	.5
Fear	-1.5	2.64	125.44	(-2.1,-1.0)	-2
Worry	- .7	6.94	89.26	(-1.1,-.3)	-.5
Anxiety	- .5	7.01	88.89	(-1.0,-.1)	-.5
Tension	-1.1	3.78	112.01	(-1.6,-.6)	-1

Measure	Mean for level A	Mean for level B
Concern	.673	.697
Fear	.576	.723
Worry	.675	.765
Anxiety	.680	.756
Tension	.541	.727

$$s = \begin{bmatrix} .085 & & & & \\ .089 & .19 & & & \\ .067 & .086 & .071 & & \\ .051 & .084 & .046 & .068 & \\ .069 & .12 & .067 & .067 & .13 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 3.862$ F = .730 d.o.f.: 5, 69

Signficance : none

t-tests d.o.f.: 73

Measure	t	Sig.
Concern	- .23	-
Fear	- .95	-
Worry	- .96	-
Anxiety	- .82	-
Tension	-1.44	-

Conclusion:

There are no indications that, of those who fully return to work, those who return to different jobs have different state anxiety. This might possibly only be due to sample size since all the measures have a lower transformed sample mean and hence a larger untransformed sample mean for those who do not return to the same job.

****

A ≡ did not find it easy to return to work

B ≡ found it easy to return to work

No. of patients with level A: 17

No. of patients with level B: 54

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .4	11.78	63.77	(-.8,0)	-.5
Fear	-1.9	1.52	136.37	(-2.6,-1.3)	-2
Worry	- .9	4.75	96.00	(-1.4,-.4)	-1
Anxiety	- .7	4.92	94.74	(-1.2,-.2)	-.5
Tension	-1.3	2.68	116.34	(-1.9,-.7)	-1

Measure	Mean for level A	Mean for level B
Concern	.735	.708
Fear	.782	.731
Worry	.650	.681
Anxiety	.799	.763
Tension	.712	.736

$$S = \begin{bmatrix} .082 & & & & \\ .080 & .17 & & & \\ .092 & .11 & .13 & & \\ .047 & .076 & .059 & .065 & \\ .063 & .11 & .087 & .063 & .13 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 2.901$ F = .547 d.o.f.: 5, 65

Significance: none

t-tests. d.o.f.: 69

Measure	t	Sig.
Concern	.34	-
Fear	.45	-
Worry	-.34	-
Anxiety	.51	-
Tension	-.24	-

Conclusion:

There are no indications that, of those patients who fully return to work, those who don't find it easy have different levels of state anxiety.

****

A ≡ <1 month off work after hospital

B ≡ >1 month off work after hosptial

No. of patients with level A: 10

No. of patients with level B: 63

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	13.74	60.95	(-.7,.1)	-.5
Fear	-1.7	2.01	131.19	(-2.4,-1.2)	-2
Worry	- .8	5.86	92.06	(-1.2,-.3)	-1
Anxiety	- .7	5.34	95.43	(-1.2,-.2)	-.5
Tension	-1.3	3.17	114.45	(-1.7,-.7)	-1

Measure	Mean for level A	Mean for level B
Concern	.781	.691
Fear	.813	.710
Worry	.763	.635
Anxiety	.849	.753
Tension	.778	.709

$$s = \begin{bmatrix} .083 & & & & \\ .084 & .18 & & & \\ .091 & .11 & .14 & & \\ .050 & .081 & .063 & .065 & \\ .065 & .12 & .088 & .066 & .13 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 1.663$ F = .314 d.o.f.: 5, 67 Significance: none

t-tests. d.o.f.: 71

Measure	t	Sig.
Concern	.91	-
Fear	.71	-
Worry	1.01	-
Anxiety	1.11	-
Tension	.56	-

Conclusion:

There are no real indications that, of the patients who fully returned to work, those who take more than one month have different state anxiety. However, it is worth noting that those who take more than one month have lower transformed (i.e. higher untransformed) sample means on all the state anxiety measures.

****

A ≡ <3 months off work after hospital

B ≡ >3 months off work after hospital

No. of patients with level A: 63

No. of patients with level B: 10

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	13.88	60.60	(-.7,.1)	-.5
Fear	-1.7	2.00	131.23	(-2.4,-1.2)	-2
Worry	- .8	5.79	92.48	(-1.2,-.3)	-1
Anxiety	- .7	5.19	96.50	(-1.2,-.2)	-.5
Tension	-1.2	3.11	115.19	(-1.7,-.7)	-1

Measure	Mean for level A	Mean for level B
Concern	.709	.672
Fear	.739	.631
Worry	.676	.506
Anxiety	.787	.632
Tension	.741	.579

$$s = \begin{bmatrix} .084 & & & & \\ .085 & .18 & & & \\ .092 & .11 & .14 & & \\ .050 & .080 & .061 & .063 & \\ .065 & .12 & .086 & .064 & .13 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 8.884$ $F = 1.677$ d.o.f.: 5, 67

Signficance: none

t-tests. d.o.f.: 71

Measure	t	Sig.
Concern	.37	-
Fear	.74	-
Worry	1.35	-
Anxiety	1.82	.1
Tension	1.33	-

Conclusion:

There is some indication that, of those who fully return to work, those who take more than 3 months have a higher value of the untransformed anxiety measure. Also, there is an indication that they have higher anxiety levels generally, since their average values for the transformed measures are consistently lower.

****

The results in this chapter seem to give some indication that persons who have lower levels of state anxiety have a better work rehabilitation. Certainly, there is no convincing evidence to this effect. However, it might be worth investigating further.

CHAPTER 11

STATE ANXIETY AND RECURRENCE OF HEART TROUBLE

The results of the tests for differences in state anxiety for different levels of recurrence of heart trouble attributes were,

A ≡ no recurrence of heart trouble causing death or hospitalisation

B ≡ recurrence of heart trouble causing death or hospitalisation

No. of patients with level A: 74

No. of patients with level B: 26

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	22.10	75.48	(-.6,0)	-.5
Fear	-1.3	5.67	143.50	(-1.7,-.8)	-1
Worry	- .5	13.63	99.64	(-.9,-.2)	-.5
Anxiety	- .5	11.91	106.38	(-.9,-.2)	-.5
Tension	- .8	8.05	125.97	(-1.2,-.4)	-1

Measure	Mean for level A	Mean for level B
Concern	.679	.739
Fear	.728	.732
Worry	.713	.766
Anxiety	.727	.766
Tension	.686	.631

$$S = \begin{bmatrix} .087 & & & & \\ .077 & .15 & & & \\ .062 & .082 & .076 & & \\ .056 & .079 & .053 & .075 & \\ .078 & .11 & .072 & .071 & .15 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 5.066$ F = .972 d.o.f.: 5, 94

Significance: none

t-tests. d.o.f.: 98

Measure	t	Sig
Concern	-.898	-
Fear	-.046	-
Worry	-.840	-
Anxiety	-.627	-
Tension	.627	-

****

A ≡ no recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit

B ≡ recurrence of heart trouble causing death, hospitalisation or unroutine doctor's visit

No. of patients with level A: 58

No. of patients with level B: 42

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	22.24	75.16	(-.6,0)	-.5
Fear	-1.3	5.67	143.51	(-1.7,-.8)	-1
Worry	- .5	13.71	99.35	(-.9,-.2)	-.5
Anxiety	- .5	11.92	106.36	(-.9,-.2)	-.5
Tension	- .8	8.05	125.97	(-1.2,-.4)	-1

Measure	Mean for level A	Mean for level B
Concern	.704	.682
Fear	.725	.734
Worry	.735	.715
Anxiety	.751	.718
Tension	.692	.644

$$s = \begin{bmatrix} .087 & & & & \\ .077 & .15 & & & \\ .063 & .082 & .077 & & \\ .056 & .079 & .053 & .075 & \\ .077 & .11 & .071 & .071 & .15 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 1.757$ F = .337 d.o.f.: 5, 94

Significance: none

t-tests. d.o.f.: 98

Measure	t	Sig.
Concern	.354	-
Fear	-.118	-
Worry	.365	-
Anxiety	.585	-
Tension	.609	-

From the results for these two attributes, there are no indications that patients who have a recurrence of heart trouble have different levels of state anxiety at release from hospital.

CHAPTER 12

STATE ANXIETY AND OTHER RECOVERY AND REHABILITATION ATTRIBUTES

a) Happiness with Progress

The happiness with progress attribute has levels,

A ≡ not completely happy with progress

B ≡ completely happy with progress

The results obtained for this attribute were,

No. of patients with level A: 27

No. of patients with level B: 68

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.40	75.47	(-.7,-.1)	-.5
Fear	-1.3	5.15	138.45	(-1.8,-.8)	-1
Worry	- .5	12.13	97.77	(-.9,-.2)	-.5
Anxiety	- .5	10.45	104.87	(-.9,-.2)	-.5
Tension	-1.0	6.04	130.90	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.635	.728
Fear	.639	.768
Worry	.624	.769
Anxiety	.697	.758
Tension	.565	.739

$$S = \begin{bmatrix} .085 & & & & \\ .075 & .14 & & & \\ .061 & .077 & .073 & & \\ .056 & .075 & .050 & .073 & \\ .071 & .10 & .067 & .069 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 8.262$ $F = 1.581$ d.o.f.: 5,89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	-1.39	-
Fear	-1.50	-
Worry	-2.37*	.05
Anxiety	-1.00	-
Tension	-2.08*	.05

All the transformed state anxiety measures have lower sample means for patients who are not completely happy with progress. Hence, as the transformations invert the ordering of the state anxiety measures, there is an indication that survivors who are not completely happy with progress have higher levels of state anxiety at discharge from hospital. In particular there are indications that they have more worry and tension.

b) Particular Difficulties

The results obtained for the particular difficulties attributes were,

A ≡ have particular difficulty of slowing down

B ≡ don't have this particular difficulty

No. of patients with level A: 46

No. of patients with level B: 49

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.79	74.52	(-.7,0)	-.5
Fear	-1.3	5.20	137.99	(-1.7,-.8)	-1
Worry	- .5	12.86	94.99	(-.9,-.1)	-.5
Anxiety	- .5	10.55	104.39	(-.9,-.2)	-.5
Tension	-1.0	6.28	129.04	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.690	.712
Fear	.779	.687
Worry	.729	.727
Anxiety	.749	.734
Tension	.660	.718

$$S = \begin{bmatrix} .087 & & & & \\ .078 & .14 & & & \\ .064 & .081 & .077 & & \\ .057 & .076 & .052 & .073 & \\ .074 & .11 & .072 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 9.442$ $F = 1.807$ d.o.f.: 5, 89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	- .37	-
Fear	1.19	-
Worry	.03	-
Anxiety	.27	-
Tension	- .75	-

Conclusion:

There are no indications that patients who have difficulty of slowing down have different average values of the state anxiety measures.

****

A ≡ have particular difficulty of irritability

B ≡ don't have this particular difficulty

No. of patients with level A: 21

No. of patients with level B: 74

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.46	75.30	(-.7,0)	-.5
Fear	-1.3	5.22	137.75	(-1.7,-.8)	-1
Worry	- .5	12.52	96.24	(-.9,-.2)	-.5
Anxiety	- .5	10.31	105.47	(-.9,-.2)	-.5
Tension	- .9	6.24	129.37	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.628	.723
Fear	.653	.754
Worry	.645	.752
Anxiety	.664	.763
Tension	.610	.712

$$s = \begin{bmatrix} .086 & & & & \\ .076 & .14 & & & \\ .062 & .079 & .075 & & \\ .055 & .075 & .050 & .072 & \\ .072 & .11 & .070 & .069 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 3.072$ F = .588 d.o.f.: 5, 89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	-1.31	-
Fear	-1.07	-
Worry	-1.58	-
Anxiety	-1.48	-
Tension	-1.10	-

Conclusion:

There are no indications from the hypothesis tests that patients who have difficulty of irritability have different state anxiety. However, there is some indication that those patients who have difficulty of irritability have generally more state anxiety since their transformed means are consistently lower. This indication is not unexpected.

****

A ≡ have particular difficulty of depression

B ≡ don't have this particular difficulty.

No. of patients with level A: 27

No. of patients with level B: 68

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.36	75.55	(-.7,0)	-.5
Fear	-1.3	5.22	137.99	(-1.7,-.8)	-1
Worry	- .5	11.96	98.42	(-.9,-.1)	-.5
Anxiety	- .5	10.50	104.62	(-.9,-.1)	-.5
Tension	-1.0	6.18	129.83	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.634	.728
Fear	.661	.759
Worry	.613	.774
Anxiety	.710	.753
Tension	.601	.725

$$s = \begin{bmatrix} .085 & & & & \\ .076 & .14 & & & \\ .061 & .078 & .072 & & \\ .056 & .076 & .050 & .073 & \\ .072 & .11 & .068 & .070 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 10.580$ $F = 2.025$ d.o.f.: 5, 89

Significance: .1

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	-1.41	-
Fear	-1.13	-
Worry	-2.64**	.01
Anxiety	- .71	-
Tension	-1.46	-

Conclusion:

There are indications that patients who suffer from depression difficulty have more state anxiety. In particular there is a strong indication that they have more worry. These indications are not surprising since it is thought that anxiety and depression are related (Garside, Kay, Roy and Beamish, 1970).

****

A ≡ have particular difficulty of sleep disturbance

B ≡ don't have this particular difficulty.

No. of patients with level A: 21

No. of patients with level B: 74

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.79	74.51	(-.7,0)	-.5
Fear	-1.3	5.28	137.24	(-1.7,-.8)	-1
Worry	- .5	12.67	95.70	(-.9,-.1)	-.5
Anxiety	- .5	10.55	104.38	(-.9,-.2)	-.5
Tension	- .9	6.31	128.79	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.684	.707
Fear	.729	.732
Worry	.665	.746
Anxiety	.752	.738
Tension	.674	.694

$$s = \begin{bmatrix} .087 & & & & \\ .078 & .15 & & & \\ .064 & .081 & .076 & & \\ .057 & .077 & .052 & .073 & \\ .075 & .11 & .072 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 4.329$ F = .829 d.o.f.: 5, 89 Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	- .31	-
Fear	- .04	-
Worry	-1.18	-
Anxiety	.20	-
Tension	- .22	-

Conclusion:

There are no indications that survivors who have difficulty of sleep disturbance have different levels of state anxiety on release from hospital.

c) Changes in Pattern of Life

The first attribute considered in this category has levels,

A ≡ pattern of life not changed

B ≡ pattern of life had changed

The results obtained for this attribute were,

No. of patients with level A: 23

No. of patients with level B: 72

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.26	75.81	(-.7,0)	-.5
Fear	-1.3	5.28	137.30	(-1.7,-.7)	-1
Worry	- .5	12.86	94.99	(-.9,-.1)	-.5
Anxiety	- .6	10.51	104.57	(-1.0,-.2)	-.5
Tension	- .9	6.31	128.84	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.613	.730
Fear	.710	.738
Worry	.733	.726
Anxiety	.710	.751
Tension	.716	.681

$$S = \begin{bmatrix} .085 & & & & \\ .077 & .15 & & & \\ .064 & .081 & .077 & & \\ .056 & .076 & .052 & .073 & \\ .075 & .11 & .072 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 10.959$ F = 2.098 d.o.f.: 5, 89

Significance: .1

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	-1.68	.1
Fear	- .30	-
Worry	.11	-
Anxiety	- .64	-
Tension	.38	-

Thus there is some indication that those patients whose pattern of life has not changed have a different state anxiety pattern and in particular more concern. However, it seems that these indications may occur just by chance since;

1) As the anxiety measures are fairly highly correlated, it would be most likely that if a difference existed each measure would have its highest sample mean on the same level of the attribute. However, no such pattern is observed.

2) From a physical point of view, it seems highly unlikely that patients whose pattern of life has not changed would have more concern when leaving hospital.

3) Significance for both the Hotelling's T^2 test and the t-test for concern is only just obtained at .1 level. This is not really a satisfactory level of significance.

The results for the remaining changes in pattern of life attributes were,

A ≡ pattern of life is different because don't/can't do as much

B ≡ pattern of life has not changed in this way.

No. of patients with level A: 48

No. of patients with level B: 47

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.77	74.56	(-.7,0)	-.5
Fear	-1.3	5.27	137.36	(-1.7,-.8)	-1
Worry	- .5	12.72	95.51	(-.9,-.1)	-.5
Anxiety	- .5	10.56	104.36	(-.9,-.2)	-.5
Tension	- .9	6.25	129.26	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.716	.687
Fear	.709	.754
Worry	.700	.757
Anxiety	.742	.740
Tension	.652	.728

$$s = \begin{bmatrix} .087 & & & & \\ .078 & .14 & & & \\ .065 & .080 & .076 & & \\ .057 & .076 & .052 & .073 & \\ .075 & .11 & .071 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 7.106$ F = 1.360 d.o.f.: 5, 89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	.457	-
Fear	- .577	-
Worry	-1.014	-
Anxiety	.038	-
Tension	- .975	-

****

A ≡ pattern of life is different because go out less, socially

B ≡ pattern of life has not changed in this way

No. of patients with level A: 24

No. of patients with level B: 71

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.74	74.64	(-.7,0)	-.5
Fear	-1.3	5.28	137.28	(-1.7,-.8)	-1
Worry	- .5	12.80	95.20	(-.9,-.2)	-.5
Anxiety	- .5	10.54	104.44	(-.9,-.2)	-.5
Tension	- .9	6.28	129.00	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.725	.694
Fear	.725	.733
Worry	.716	.732
Anxiety	.702	.754
Tension	.663	.699

$$s = \begin{bmatrix} .087 & & & & \\ .078 & .15 & & & \\ .064 & .081 & .077 & & \\ .057 & .077 & .052 & .073 & \\ .075 & .11 & .072 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 3.591$ F = .687 d.o.f.: 5, 89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	.44	-
Fear	-.10	-
Worry	-.25	-
Anxiety	-.82	-
Tension	-.41	-

****

A ≡ pattern of life is different because need more rest/sleep

B ≡ pattern of life has not changed in this way

No. of patients with level A: 19

No. of patients with level B: 76

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.74	74.64	(-.7,0)	-.5
Fear	-1.3	5.28	137.28	(-1.7,-.8)	-1
Worry	- .5	12.80	95.20	(-.9,-.2)	-.5
Anxiety	- .5	10.54	104.44	(-.9,-.2)	-.5
Tension	- .9	6.28	129.00	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.738	.693
Fear	.754	.725
Worry	.692	.737
Anxiety	.763	.735
Tension	.743	.676

$$s = \begin{bmatrix} .087 & & & & \\ .078 & .15 & & & \\ .064 & .081 & .077 & & \\ .057 & .076 & .052 & .073 & \\ .074 & .11 & .073 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 5.077$ F = .972 d.o.f.: 5, 89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	.59	-
Fear	.30	-
Worry	-.64	-
Anxiety	.40	-
Tension	.68	-

****

A ≡ pattern of life is different because drink less

B ≡ pattern of life has not changed in this way

No. of patients with level A: 14

No. of patients with level B: 81

Transformation Table:

Measure	$\hat{\lambda}$	Res. S.S.	L(λ)	95% C.I.	Take λ as
Concern	- .3	19.56	75.08	(-.7,0)	-.5
Fear	-1.3	5.27	137.36	(-1.7,-.8)	-1
Worry	- .5	12.69	95.60	(-.9,-.2)	-.5
Anxiety	- .5	10.53	104.48	(-.9,-.2)	-.5
Tension	- .9	6.32	128.76	(-1.4,-.5)	-1

Measure	Mean for level A	Mean for level B
Concern	.785	.687
Fear	.774	.724
Worry	.803	.715
Anxiety	.773	.735
Tension	.690	.690

$$S = \begin{bmatrix} .086 & & & & \\ .077 & .15 & & & \\ .063 & .080 & .076 & & \\ .056 & .076 & .051 & .073 & \\ .075 & .11 & .072 & .071 & .14 \end{bmatrix}$$

Hotelling's T^2 Test:

$T^2 = 3.043$ $F = .582$ d.o.f.: 5,89

Significance: none

t-tests. d.o.f.: 93

Measure	t	Sig.
Concern	1.15	-
Fear	.46	-
Worry	1.10	-
Anxiety	.49	-
Tension	.00	-

From these results, there are no indications that patients whose pattern of life has changed in any of the ways considered have different levels of state anxiety at the time of release from hospital.

CHAPTER 13

FURTHER ANALYSIS

In this chapter we will briefly discuss some analysis which could be carried out in the future, as a sequel to the analysis given in this thesis. Some possibilities are:

a) With the test for differences in the means of the state anxiety measures between the two different levels of various attributes, it might be better to test if the five anxiety measures are higher generally on the poorer rehabilitation or recovery level. Let the poorer recovery level be level 1 and the other level be level 2.

To do this test we need to make the assumption that either all the anxiety measures in level 2 have the same means as in level 1, or they all have strictly lower means. These two possibilities correspond to the physical situations of patients in both levels having the same average level of state anxiety, and patients in level 1 having higher state anxiety generally than patients in level 2, respectively. We must also make the multivariate normality with common covariance matrix assumptions, as used in the previous analysis.

Then if x_{ijh} is the value of the h-th anxiety measure for the j-th person with level i, then the test statistic is (Morrison, p.156, 1976),

$$t = \frac{\bar{y}_1 - \bar{y}_2}{\sqrt{\dfrac{\sum_{j=1}^{N_1} (\bar{y}_{1j} - \bar{y}_1)^2 + \sum_{j=2}^{N_2} (\bar{y}_{2j} - \bar{y}_2)^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

where $y_{ij} = \sum_{h=1}^{5} x_{ijh}$

$$\bar{y}_i = \frac{1}{N_i} \sum_{j=1}^{N_i} \sum_{h=1}^{5} x_{ijh}$$

and N_i is the number of patients with level i of the attribute.

Under the null hypothesis that the means for both levels are the same, the statistic has a t distribution with $N_1 + N_2 - 2$ degrees of freedom. Since it is assumed that the measures for level 2 are not higher than for level 1 a one-sided test should be used.

In giving this test, Morrison also assumes that the differences in the means between the two levels, for each anxiety measure, are equal. However, the test is still valid for the assumptions given above.

b) The data from the second follow up survey, at two years after discharge from hospital, could be analysed in a similar manner to the analysis produced in this thesis. This is intended.

c) In this thesis evidence was found that persons who have further heart trouble have more psychosocial precipitants. This can be investigated further by considering the number of major life events occuring before the myocardial infarction and between release from hospital and the follow up survey. This data is available.

d) The stability of state anxiety after the illness needs to be investigated further. This could be done in further surveys.

e) Larger studies to investigate further the indications of differences in illness behaviour and anxiety for the different levels of various recovery and rehabilitation attributes should be carried out. Dr. D.G. Byrne is at present planning such a study.

CHAPTER 14

CONCLUSION

There is strong evidence that survivors of the first myocardial infarction who have a recurrence of heart trouble in the first eight months after release from hospital have more psychosocial precipitants at the time of illness i.e. have a greater recognition that they have problems and worries in their life not caused by their illness. The evidence was reinforced by several attributes, which would be expected to be related to recurrence of heart trouble, having indications of differences in the psychosocial precipitant factor between the levels of the attribute. This effect was surprising and has not yet been explained.

Evidence was also found that patients whose pattern of life had changed after release from hospital had more affective disruption. However, there was no specific evidence of what changes in patients' pattern of life caused this effect.

There were several other indications, from the results for the illness behaviour factors, that certain forms of illness behaviour affected various aspects of rehabilitation. These indications need to be investigated further.

Although there was no convincing evidence that state anxiety affects recovery and rehabilitation, there were quite strong indications that persons who have poorer levels on various rehabilitation attributes have more state anxiety at discharge from hospital.

These indications were observed for both return to work and other rehabilitation attributes.

There are very few indications that patients with different levels of recovery and rehabilitation attributes, have different levels of trait anxiety.

Overall, we have found indications and some evidence to postulate that certain forms of illness behaviour of patients suffering from first myocardial infarction affect the patient's recovery and rehabilitation. Further investigation to reinforce these findings still needs to be done before they can be put to use. However, there is little doubt that there are sufficient indications and evidence to warrant further investigation.

REFERENCES

Box, G.E.P. and Cox, D.R. (1964). An analysis of transformations. *J. Roy. Stat. Soc. B*, 26, 211-243.

Byrne, D.G. (1978). In the Report of the National Health and Medical Research Council Social Psychiatry Research Unit, Australian National University.

Byrne, D.G. (1979). Anxiety as state and trait following survived myocardial infarction. *British J. Social and Clinical Psychology*, in press.

Byrne, D.G. and Whyte, H.M. (1978). Dimensions of illness behaviour in survivors of myocardial infarction. *J. Psychosomatic Research*, 22, 485-491.

Byrne, D.G. and Whyte, H.M. (1979a). Severity of illness and illness behaviour: A compariative study of coronary care patients. *J. Psychosomatic Research*, 23, 57-63.

Byrne, D.G. and Whyte, H.M. (1979b). State and trait anxiety correlates of illness behaviour in survivors of myocardial infarction. *J. Psychosomatic Research*, in press.

Byrne, D.G., Whyte, H.M., and Lance, G.N. (1979). A typology of responses to illness in survivors of myocardial infarction. *International J. Psychiatry in Medicine*, 9, 135-145.

Croog, S.H. and Levine, S. (1978). *The heart patient recovers.* Human Science Press, New York.

Eysenck, H.J. and Eysenck, S.B.G. (1964). *Manual of the Eysenck Personality Inventory.* University of London Press, London.

Garside, R.F., Kay, D.W.K., Roy, J.R. and Beamish, P. (1970). EPI scores and systems of depression. *British J. Psychiatry*, 116, 429-432.

Lipowski, Z.J. (1975). Physical illness, the patient and his environment. In S. Arieti (ed.) *American Handbook of Psychiatry*, Basic Books, New York.

Martin, B. and Sroufe, A.L. (1970). Anxiety. In C.G. Costello (ed.), *Symptons of Psychopathology*, Wiley, New York.

Morrison, D.F. (1976). *Multivariate Statistical Methods*, (2nd edition). McGraw-Hill, Tokyo.

Pilowsky, I., Chapman, C.R. and Bonica, J.J. (1977). Pain, depression and illness behaviour in a pain clinic population. *Pain*, 4, 183-

Pilowsky, I. and Spence, N.D. (1975). Patterns of illness behaviour in patients with intractable pain. *J. Psychosomatic Research*, 19, 279-287.

APPENDIX A

ILLNESS BEHAVIOUR QUESTIONNAIRE

Here are some questions about you and your illness. Circle either YES or NO to indicate your answer to each question.

1.	Do you worry a lot about your health?	YES	NO
2.	Do you think there is something seriously wrong with your body?	YES	NO
3.	Does your illness interfere with your life a great deal?	YES	NO
4.	Are you easy to get on with when you are ill?	YES	NO
5.	Does your family have a history of illness?	YES	NO
6.	Do you think you are more liable to illness than other people?	YES	NO
7.	If the doctor told you that he could find nothing wrong with you, would you believe him?	YES	NO
8.	Is it easy for you to forget about yourself and think about all sorts of other things?	YES	NO
9.	If you feel ill and someone tells you that you are looking better, do you become annoyed?	YES	NO
10.	Do you find that you are often aware of various things happening in your body?	YES	NO
11.	Do you ever think of your illness as a punishment for something you have done wrong in the past?	YES	NO
12.	Do you have trouble with your nerves?	YES	NO
13.	If you feel ill or worried, can you be easily cheered up by the doctor?	YES	NO
14.	Do you think that other people realise what its like to be sick?	YES	NO
15.	Does it upset you to talk to the doctor about your illness?	YES	NO

16. Are you bothered by many pains and aches? YES NO

17. Does your illness affect the way you get on with your family and friends a great deal? YES NO

18. Do you find that you get anxious easily? YES NO

19. Do you know anybody who has had the same illness as you? YES NO

20. Are you more sensitive to pain than other people? YES NO

21. Are you afraid of illness? YES NO

22. Can you express your personal feelings easily to other people? YES NO

23. Do people feel sorry for you when you are ill? YES NO

24. Do you think that you worry about your health more than most people? YES NO

25. Do you find that your illness affects your sexual relations? YES NO

26. Do you experience a lot of pain with your illness? YES NO

27. Except for your illness, do you have any problems in your life? YES NO

28. Do you care whether or not people realise you are sick? YES NO

29. Do you find you get jealous of other people's good health? YES NO

30. Do you ever have silly thoughts about your health which you can't get out of your mind, no matter how hard you try? YES NO

31. Do you have financial problems? YES NO

32. Are you upset by the way people take your illness? YES NO

33. Is it hard for you to believe the doctor when he tells you there is nothing for you to worry about? YES NO

34. Do you often worry about the possibility that you have got a serious illness? YES NO

35. Are you sleeping well? YES NO

36. When you are angry, do you tend to bottle up your feelings? YES NO

37.	Do you often think that you might suddenly fall ill?	YES	NO
38.	If a disease is brought to your attention (through the radio, television, newspapers or someone you know) do you worry about getting it yourself?	YES	NO
39.	Do you get the feeling that people are not taking your illness seriously enough?	YES	NO
40.	Are you upset by the appearance of your face or body?	YES	NO
41.	Do you find that you are bothered by many different symptoms?	YES	NO
42.	Do you frequently try to explain to others how you are feeling?	YES	NO
43.	Do you have any family problems?	YES	NO
44.	Do you think there is something the matter with your mind?	YES	NO
45.	Are you eating well?	YES	NO
46.	Is your bad health the biggest difficulty of your life?	YES	NO
47.	Do you find that you get sad easily?	YES	NO
48.	Do you worry or fuss over small details that seem unimportant to others?	YES	NO
49.	Are you always a co-operative patient?	YES	NO
50.	Do you often have the symptoms of a very serious disease?	YES	NO
51.	Do you find that you get angry easily?	YES	NO
52.	Do you have any work problems?	YES	NO
53.	Do you prefer to keep your feelings to yourself?	YES	NO
54.	Do you find that you often get depressed?	YES	NO
55.	Would all your worries be over if you were physically healthy?	YES	NO
56.	Are you more irritable towards other people?	YES	NO
57.	Do you think that your symptoms may be caused by worry?	YES	NO

58.	Is it easy for you to let people know when you are cross with them?	YES	NO
59.	Is it hard for you to relax?	YES	NO
60.	Do you have personal worries which are not caused by physical illness?	YES	NO
61.	Do you often find that you lose patience with other people?	YES	NO
62.	Is it hard for you to show people your personal feelings?	YES	NO

APPENDIX B

FORM USED TO OBTAIN VISUAL ANALOGUE SCALES OF STATE ANXIETY

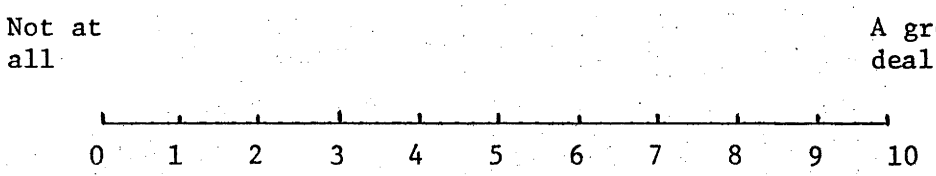
PATIENT _____

DATE _____

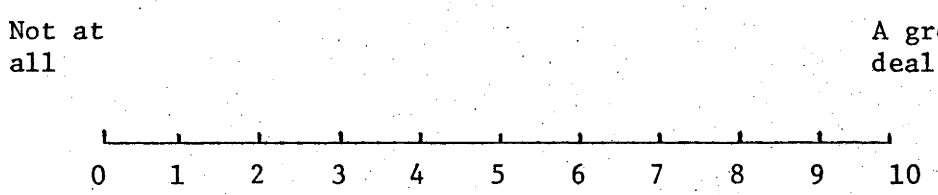
I A S

We would like you to tell us something of how you are feeling right now. When you answer these questions please make sure you tell us about your feelings not last week or last month, but at this point in time.

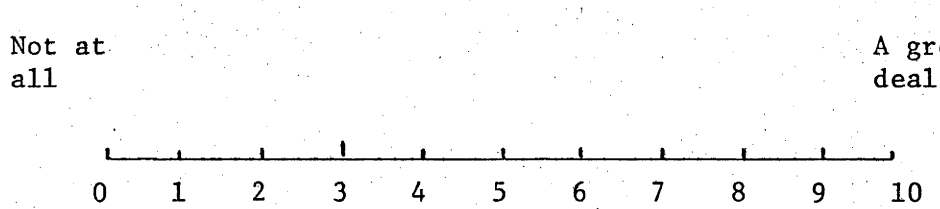
1. Do you feel CONCERNED right now?



2. Do you feel AFRAID right now?

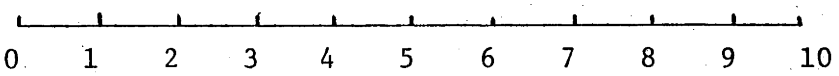


3. Do you feel WORRIED right now?



4. Do you feel ANXIOUS right now?

Not at all — A great deal



5. Do you feel TENSE right now?

Not at all — A great deal