CHAPTER SIX

RESULTS

Overall Treatment Outcome

Of the total 106 patients who completed the treatment programme, adequate outcome data are available for 103 (97 percent) at three months following discharge. Adequate followup records extend to 12 months for 100 patients (94 percent). Of the six excluded subjects, three were deceased and three remained untraced despite continued attempts to contact them. Of the 28 patients who left treatment against advice, 27 were contacted at three months. Twenty-four were located at 12 months.

Subsequent analyses are, in most instances, confined to two of the samples described, namely (1) those subjects who completed therapy and who were traced at three months (N = 103), and (2) those who completed therapy and who were traced at 12 months.

Of the 103 therapy completers who were traced at three months following discharge, 28 percent had relapsed, 16 percent had a markedly reduced or controlled intake, and 56 percent were abstinent.

1. 'Adequate' in this instance means either a report by the patient on his or her drinking situation at the time of followup, corroborated by a minimum of one referee or health professional report, or, similar information from two or more independent referees and/or health professionals.
The percentages of the 100 patients traced at 12 months who fell into these categories were respectively 48, 14, and 38. These results suggest a more optimistic prognosis for alcoholics than do those of a number of previous outcome studies (Cronkite and Moos, 1978). However, this high success rate is deflated somewhat when the outcomes of the premature terminators are considered. I.e., of the 27 ex-patients in this category traced at three months, 67 percent had relapsed to previous 'alcoholic' levels of consumption. At 12 months, 71 percent fell into the relapsed category.

Data analyses

The data analyses conducted to address the major hypotheses listed at the end of the last chapter are outlined in three sections.

The first section includes summary descriptive statistics for male and female subjects for the major measures included in the study. A principal components analysis of these data was conducted and is also described in the first section. This analysis was run as a preliminary investigation of the relation of the major variables to one another and to assist in the task of selecting a more economical list of measures for inclusion in later analyses. Where suitable data are available from nonalcoholic groups, comparisons are made between the performance of alcoholics and nonalcoholics on the cognitive
changes on the cognitive measures from the first to the second testing are also described and analysed in a variety of ways.

In the second major section, treatment outcome is related to the various independent variables incorporated within the present study. The major forms of analysis used here are contingency table analyses, step-wise multiple linear (and non-linear) regression, discriminant function analysis, and step-wise discriminant function analysis.

In the third section, demographic, drinking-related, and cognitive indices are considered in relation to the systems model outlined earlier. With the exception of drinking outcome, the concern in this section of the analysis is with sets of independent and dependent variables. Because the situation here involves the consideration of relationships between multiple measures on both the independent and dependent side, canonical correlation analysis is employed. Canonical correlations are calculated between sets of variables that are viewed as sequentially influencing cognitive functioning, treatment participation, and treatment outcome. In part, these analyses are conducted to explicate in greater detail the causal paths by which the cognitive and sociodemographic measures addressed in the second part of the analysis section mediate treatment outcome.
Section One

The performance of the male and female subjects on the cognitive tests, both at the start and near the end of their stay in hospital, is summarized in Table 1. The subjects included in this summary are the 71 males and 32 females who were traced at three months following discharge. All subjects completed the PCIT, BRFT, IE, and DRLC. Four subjects (three males and one female) failed to complete the Time Reference Inventory on the first test occasion, hence the reduced sample sizes for the summary scores derived from this test, namely: Past Extension, Future Extension, and Temporal Orientation. At the second testing, five males and one female failed adequately to complete this test. All subjects provided scorable responses to the Future Events Test and the Religiosity Questionnaire at the first testing. One male subject did not answer all of the questions on these two tests at the second testing.

With respect to gender differences on the cognitive measures, strong predictions could not be made from the available literature. One study reviewed in Chapter Four however, did suggest that female alcoholics might be more external than males on generalized locus of control (IE). It was also expected that female alcoholics would indicate a greater acceptance of religious belief. This expectation was based on an extrapolation from sociological observations of greater involvement by women in religious activities in New Zealand society.
Table 1

Cognitive Test Performance of Males and Females

<table>
<thead>
<tr>
<th>Measure</th>
<th>First Administration</th>
<th>Second Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>PCIT</td>
<td>-1.33 (1.10)</td>
<td>-1.62 (1.35)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>BRFT</td>
<td>12.35 (8.45)</td>
<td>17.82 (12.45)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>IE</td>
<td>9.24 (3.98)</td>
<td>8.63 (3.63)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>ORLC (total)</td>
<td>6.56 (4.69)</td>
<td>8.50 (4.89)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>Past Extension</td>
<td>13.48 (10.56)</td>
<td>15.25 (10.78)</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>Future Extension</td>
<td>7.05 (10.66)</td>
<td>4.33 (5.68)</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>Temporal Orientation</td>
<td>-3.48 (9.97)</td>
<td>-7.01 (7.76)</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>Future Events</td>
<td>1.86 (2.28)</td>
<td>1.52 (1.55)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>Religiosity Factor 1</td>
<td>20.63 (6.02)</td>
<td>22.00 (5.05)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
<tr>
<td>Religiosity Factor 2</td>
<td>-2.77 (3.72)</td>
<td>-3.56 (3.82)</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>32</td>
</tr>
</tbody>
</table>

Note: The summary statistics listed here are derived from the test performances of subjects who completed the therapy programme and were traced three months after discharge. Means, Standard Deviations (in brackets) and sample sizes are listed in order.
It also appeared likely, given the visuo-spatial nature of the BAFT test, that females may evidence inferior performance on this measure. Male versus female differences on these measures were assessed by $t$-tests. Because the variances in Table 1 are unequal, these tests of significance must be regarded as approximations. Post hoc gender contrasts were similarly performed on the other cognitive measures.

Of the gender contrasts proposed apriori, only one, BAFT on the first testing, reached the .05 level of significance ($t(101) = 2.26$). In the case of religiousity, there was a difference in the predicted direction. However, neither this difference or the IE gender difference was significant at the .05 level.

None of the post hoc gender contrasts on the remaining measures were significant.

Although nonalcoholic controls were not included in the present study, for some of the measures, data exist in the literature that are relevant to the question of the performance of alcoholics versus nonalcoholics. There are also data from other studies with alcoholics that have used some of the cognitive tests employed in this thesis. Consequently, where possible, comparison of scores obtained by alcoholics in the present study are made with other alcoholic and nonalcoholic groups.

Gregson and Taylor (1974), in the PCIT Manual,
provide normative data for male alcoholics and nonalcoholic controls. The descriptive statistics for these groups appear below:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcoholics</td>
<td>-2.38</td>
<td>1.23</td>
<td>56</td>
</tr>
<tr>
<td>Controls</td>
<td>-0.44</td>
<td>0.69</td>
<td>48</td>
</tr>
</tbody>
</table>

Although there were age differences between these two groups, the slight effects of both age and vocabulary level upon performance were partialled out by covariance analysis. The summary statistics listed above are based on these adjusted scores.

A further sample of alcoholics was tested by Gregson and Taylor (1977). Ninety subjects were included. Their mean PCIT score was -1.66 (SD 1.30). The present study obtained mean scores of -1.33 (SD 1.10) for males and -1.62 (SD 1.35) for females.

All three of the studies described above employed the same vector of discriminant weights in the derivation of each subject's summary score from their original test responses. These discriminant weights were originally derived using a covariance adjustment for the effects of age and vocabulary level upon each component score. The three samples of alcoholics were also drawn from the same institution by the use of similar selection procedures.

The PCIT results described above suggest an
improvement in performance among male alcoholics resident in Queen Mary Hospital in the last two years compared with the performance of those in residence five years ago. This shift is also evident from a consideration of the score distribution of alcoholics tested in 1973 relative to controls tested at the same time, and the distribution of the present alcoholic sample relative to the 1973 control group. In the 1973 sample, 56 percent of the alcoholics scored lower than any of the observed controls (Gregson & Taylor, 1974). In the present sample, only 25 percent of the male alcoholics and 47 percent of the female alcoholics scored lower than the worst control subject (see Table 2).

_t-tests for unrelated measures indicated that the difference between the first Gregson and Taylor alcoholic group and the present male sample was significant, _t(125) = 5.0, p<.01. Although in the same direction, the difference between the second Gregson and Taylor group and the present male sample reached only marginal significance, _t(159) = 1.74, p<.10.

Although apparently not as impaired on the PCIT as were earlier populations of alcoholics at Queen Mary Hospital, both the male and female groups included in the present study were significantly more impaired than the Gregson and Taylor (1974) control group ( _t(117)
Figure 2: PCIT score distributions of male and female alcoholics in the present study and control groups from the PCIT manual.

INSTITUTIONALIZED MALE ALCOHOLICS (Gregson & Taylor, 1975)
N = 12

MALE NONALCOHOLIC CONTROLS (Gregson & Taylor, 1975)
N = 48

ALCOHOLICS N = 103
- MALES N = 71
- FEMALES N = 32
= 5.56, p < .01, and \( t(78) = 4.59, p < .01 \) respectively).

The distributions displayed graphically in Figure 2 show more clearly the relative performance of the groups discussed in the preceding paragraph. Note that the score distribution of the alcoholic sample has some overlap with a sample of institutionalized chronic alcoholics (considered by Gregson and Taylor to be of the deteriorated 'skid row' type), spans the score range intermediate between this group and the nonalcoholic controls, and shows maximal overlap with this latter group.

Little is known of the performance of nonalcoholics on the BRFT. Only two small samples of nonalcoholics have been tested on this measure (see Appendices 1 and 2). Both were male groups. One consisted of nine Scott Base personnel wintering over in the Antarctic. This group obtained a mean score of 9.4 (SD 5.5). The second sample was comprised of 11 hospital employees (M = 9.6, SD 5.4). It is uncertain how representative these two groups are of the nonalcoholic male population. It is interesting, however, that the summary statistics derived from these two groups are almost identical and that they contrast, in the predicted direction, with the performance of the male and female alcoholic groups in the present study (see Table 1).

The differences between the combined nonalcoholic groups and the male alcoholic sample in the present
study on BAFT were tested for significance by $t$-tests. Because it was predicted that alcoholics would evidence higher mean rotation scores than nonalcoholics, the tests were one-tailed. On the first testing, the alcoholics were found to be significantly more impaired than the nonalcoholics, $t(89) = 2.84, p < .05$. On the second testing, the difference, although in the predicted direction, failed to reach the .05 level of significance. The female alcoholics were more impaired than the normals on both testing occasions. These differences were not tested for significance as it is difficult to know what to make of these findings without information on the performance of nonalcoholic females.

Summary statistics for locus of control (IE) performance among adults surveyed from two New Zealand city neighbourhoods are listed below:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reefton Field Survey Respondents</td>
<td>M</td>
<td>9.43</td>
<td>3.88</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>10.35</td>
<td>3.51</td>
</tr>
<tr>
<td>Newlands Field Survey Respondents</td>
<td>M</td>
<td>9.08</td>
<td>4.45</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>10.48</td>
<td>3.99</td>
</tr>
<tr>
<td>Combined</td>
<td>M</td>
<td>9.25</td>
<td>4.17</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>10.43</td>
<td>3.80</td>
</tr>
</tbody>
</table>

Overall mean age = 41.4 (SD 10.1)

The above data were collected by P. Housely (Note 8). They are given for comparison with the IE performance of alcoholics in the present study. The corresponding data for the alcoholics are located in Table 1.
The two survey populations yielded very similar IE scores. In both areas, females were slightly more external than the males. The male and female alcoholic groups described in Table 1 are more internal on both test occasions than their corresponding gender groups in the community samples. \( t \)-tests computed to assess the significance of the differences between the combined community samples and the alcoholic groups yielded the following results:

1. Males
   Combined community group versus alcoholics (assessment 1) - non significant.
   Combined community group versus alcoholics (assessment 2) - \( t(165) = 2.29, p<.05 \).

2. Females
   Combined community group versus alcoholics (assessment 1) - \( t(260) = 2.42, p<.05 \).
   Combined community group versus alcoholics (assessment 2) - \( t(260) = 4.33, p<.01 \).

The alcoholic subjects are of similar age to the community respondents, with the male alcoholics having a mean age of 42 years (SD 13) and the females having a mean age of 46 years (SD 12). It is not known how well matched these groups are on other demographic variables. For this reason, strong conclusions cannot be drawn from these results. They are included here because there is a paucity of data bearing on this issue and because the majority of previous studies have used highly inappropriate control groups (e.g. college students tested 10 to 15 years before the assessment of the alcoholic group). Although caution is warranted, the
results reported here appear to corroborate the view that alcoholics as a group tend to be more internal than nonalcoholics of a similar age, particularly in the case of females, and particularly near the end of a period of inpatient treatment.

Comparisons between alcoholics and nonalcoholics on the DRLC scale and measures of time perspective are not made here. Findings from the extant literature were described in Chapter Four and will be discussed in relation to the present findings in the next chapter.

Only one other study has used the religiosity questionnaire employed in the present study (Rawlings, 1971). As this was an unpublished work, the score distributions from the groups tested therein are summarized here for the purpose of comparison. Table 2 shows the means and standard deviations for three groups surveyed in the study at point. The corresponding statistics from the alcoholic groups described previously in Table 1 are also included for ease of comparison.

From Table 2, it is evident that the alcoholic samples most resemble the group of Anglican parishioners. They also show a spread of opinion on the two religiosity dimensions that is similar in extent to that of the Anglicans. These points and the relation of alcoholics to the other two groups are seen
Table 2

Descriptive Statistics for Alcoholic and Nonalcoholic Groups on the Religiosity Questionnaire

<table>
<thead>
<tr>
<th>Group</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanists and Rationalists</td>
<td>9.17</td>
<td>2.83</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>(2.82)</td>
<td>(4.80)</td>
<td></td>
</tr>
<tr>
<td>Anglicans (Church Attenders)</td>
<td>21.06</td>
<td>-1.69</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>(5.57)</td>
<td>(3.48)</td>
<td></td>
</tr>
<tr>
<td>Pentecostals</td>
<td>28.82</td>
<td>-6.53</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>(1.33)</td>
<td>(2.65)</td>
<td></td>
</tr>
<tr>
<td>Alcoholic Males (Assessment 1)</td>
<td>20.63</td>
<td>-2.77</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>(6.02)</td>
<td>(3.72)</td>
<td></td>
</tr>
<tr>
<td>Alcoholic Males (Assessment 2)</td>
<td>21.76</td>
<td>-3.83</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>(6.58)</td>
<td>(3.95)</td>
<td></td>
</tr>
<tr>
<td>Alcoholic Females (Assessment 1)</td>
<td>22.0</td>
<td>-3.82</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>(5.05)</td>
<td>(3.82)</td>
<td></td>
</tr>
<tr>
<td>Alcoholic Females (Assessment 2)</td>
<td>23.16</td>
<td>-4.44</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>(4.93)</td>
<td>(3.09)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Means are listed with Standard Deviations in brackets.
more clearly in Figure 3. Because gender differences on the religiousity questionnaire were nonsignificant, the male and female alcoholic groups are combined.

From both of the data representations referred to in the last paragraph, it appears that the alcoholics show a slight shift in the direction of the Pentecostal group from the first to the second test occasion.

A factor analysis was performed on the measures listed in Table 3. The 41 variables include the majority of the sociodemographic, drinking-related, and cognitive indices assessed in the present study. One outcome measure (time to first drink) is also included. The sample consisted of the 81 subjects in the group of 84 alcoholics tested from April to July 1977 who were subsequently located 12 months after discharge. The analysis in question was a principal components with subsequent varimax rotation, taking as components for rotation those eigenvalues greater than 0.97.

The results of the factor analysis are given in Appendix 13. Fifteen factors, accounting for 78 percent of the total variance, were extracted. These factors and the items with loadings of greater than 0.4 are listed in Table 4. Application of the Burt-Banks formula (Burt & Banks, 1947) indicates that for this analysis, loadings of 0.29 are significant at the .01
Figure 3: A comparison of alcoholic and nonalcoholic groups on the two religiosity factors

KEY
H Humanists/Rationalists
AN Anglicans
A1 Alcoholics - first assessment
A2 Alcoholics - second assessment
P Pentecostals

NOTE
Group means are defined by the intercept of the horizontal and vertical axes. The axes show the score distributions ±50 either side of the mean.
### Table 3
Variables Included in the Factor Analysis

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
</tr>
<tr>
<td>2</td>
<td>Gender</td>
</tr>
<tr>
<td>3</td>
<td>Education Level (1-6 Scale)*</td>
</tr>
<tr>
<td>4</td>
<td>Time Since Last Worshipped (1-5 Scale)</td>
</tr>
<tr>
<td>5</td>
<td>Years of Problem Drinking (Self Assessed)</td>
</tr>
<tr>
<td>6</td>
<td>Amount of Alcohol Consumed on a Typical Drinking Day (Grams of Ethanol)</td>
</tr>
<tr>
<td>7</td>
<td>Drinking Behaviour**</td>
</tr>
<tr>
<td>8</td>
<td>Drinking-Related Psychological and Physiological Symptoms**</td>
</tr>
<tr>
<td>9</td>
<td>Self-Rating of Drinking Problem Severity (1-5 Scale)</td>
</tr>
<tr>
<td>10</td>
<td>Frequency of Drinking in Previous Month (1-5 Scale)</td>
</tr>
<tr>
<td>11</td>
<td>Number of Previous Admissions for Alcoholism</td>
</tr>
<tr>
<td>12</td>
<td>Social Functioning**</td>
</tr>
<tr>
<td>13</td>
<td>Psychological Functioning**</td>
</tr>
<tr>
<td>14</td>
<td>AA Attendance in Past (Yes/No)</td>
</tr>
<tr>
<td>15</td>
<td>PCIT</td>
</tr>
<tr>
<td>16</td>
<td>BRFT (First Testing)</td>
</tr>
<tr>
<td>17</td>
<td>BRFT (Second Testing)</td>
</tr>
<tr>
<td>18</td>
<td>Locus of Control (IE Scale) (First Assessment)</td>
</tr>
<tr>
<td>19</td>
<td>Locus of Control (IE Scale) (Second Assessment)</td>
</tr>
<tr>
<td>20</td>
<td>DRLC - Factor 1 (First Assessment)</td>
</tr>
<tr>
<td>21</td>
<td>DRLC - Factor 2 (First Assessment)</td>
</tr>
<tr>
<td>22</td>
<td>DRLC - Factor 3 (First Assessment)</td>
</tr>
<tr>
<td>23</td>
<td>TRI - Past Events (First Assessment)</td>
</tr>
<tr>
<td>24</td>
<td>TRI - Present Events (First Assessment)</td>
</tr>
<tr>
<td>25</td>
<td>TRI - Future Events (First Assessment)</td>
</tr>
<tr>
<td>26</td>
<td>TRI - Past Extension (First Assessment)</td>
</tr>
<tr>
<td>27</td>
<td>TRI - Future Extension (First Assessment)</td>
</tr>
<tr>
<td>28</td>
<td>TRI - Temporal Orientation (First Assessment)</td>
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</table>
Table 3 Ctd.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>TRI - Past Events (Second Assessment)</td>
</tr>
<tr>
<td>30</td>
<td>TRI - Present Events (Second Assessment)</td>
</tr>
<tr>
<td>31</td>
<td>TRI - Future Events (Second Assessment)</td>
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<tr>
<td>32</td>
<td>TRI - Past Extension (Second Assessment)</td>
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<td>33</td>
<td>TRI - Future Extension (Second Assessment)</td>
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<td>34</td>
<td>TRI - Temporal Orientation (Second Assessment)</td>
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<td>35</td>
<td>Future Events Test (First Assessment)</td>
</tr>
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<td>36</td>
<td>Future Events Test (Second Assessment)</td>
</tr>
<tr>
<td>37</td>
<td>Religiosity Questionnaire - Factor 1 (First Assessment)</td>
</tr>
<tr>
<td>38</td>
<td>Religiosity Questionnaire - Factor 2 (First Assessment)</td>
</tr>
<tr>
<td>39</td>
<td>Religiosity Questionnaire - Factor 1 (Second Assessment)</td>
</tr>
<tr>
<td>40</td>
<td>Religiosity Questionnaire - Factor 2 (Second Assessment)</td>
</tr>
<tr>
<td>41</td>
<td>Time in Weeks to First Drink</td>
</tr>
</tbody>
</table>

* Education level is derived from a scale indexed as follows: 1 = Non High School; 2 = Some High School; 3 = School Certificate; 4 = University Entrance; 5 = Advanced Technical or Incomplete Degree; 6 = Degree and/or Professional Examination.

** Composite score from a series of scales on the Background Information Form (see Appendix 3).
### Table 4

Variables with Loadings Greater than 0.4 on the Fifteen Factors Extracted from Socio-Demographic, Drinking-Related, and Cognitive Test Data

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor</th>
<th>Variable Description</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>23</td>
<td>TRI - Past Events (1st Assmt.)</td>
<td>.760</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>TRI - Future Events (1st Assmt.)</td>
<td>-.467</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>TRI - Past Extension (1st Assmt.)</td>
<td>.648</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>TRI - Future Extension (1st assmt.)</td>
<td>-.401</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>TRI - Temporal Orientation (1st assmt.)</td>
<td>-.852</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>TRI - Past Events (2nd Assmt.)</td>
<td>.749</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>TRI - Past Extension (2nd Assmt.)</td>
<td>.615</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>TRI - Temporal Orientation (2nd assmt.)</td>
<td>-.828</td>
</tr>
<tr>
<td>II</td>
<td>5</td>
<td>Years of Problem Drinking (Self Assessed)</td>
<td>-.417</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Drinking Behaviour</td>
<td>-.826</td>
</tr>
<tr>
<td></td>
<td>8</td>
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<td>Years of Problem Drinking (Self Assessed)</td>
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<td></td>
<td>Years of Problem Drinking (Self Assessed)</td>
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<td>Number of Previous Admissions for Alcoholism</td>
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<td>AA Attendance in Past (Yes/No)</td>
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Table 4 Ctd.

<table>
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<th>Factor No.</th>
<th>Variable Description</th>
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<td>XV</td>
<td>2 Gender</td>
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</table>

Note: N = 81
level on the first factor. Each subsequent factor requires a higher loading to meet this level of significance. For Factor 15, a loading of 0.36 is necessary for significance at the .01 level. Consequently, taking the 0.4 loading as the cut-off for inclusion constitutes a conservative estimate of item significance, particularly in the case of the first few factors.

The 15 factors, in the main, have fairly straightforward psychological meaning. It is also evident from this analysis that the major cognitive measures included in the data structure have a considerable degree of independence (orthogonality) from each other.

Inspection of Table 4 gives the 'flavour' of each of the factors. With reference to Table 4 we find:

Factor 1. Variables 23, 25, 26, 27, 28, 29, 32, and 34 have high loadings on this factor. Consequently, this appears to be a fairly clear-cut time perspective factor, loading on the majority of measures derived from the TRI at both testing occasions. The highest loadings are on the two temporal orientation measures. The lowest loadings are found on measures relating to future time perspective. Although not included in Table 4, age also shows a moderate loading on this factor (0.327, p<.01). This provides some corroboration for the
hypothesis that age is positively correlated with the presence of a past-oriented temporal orientation.

Factor 2. The two highest loadings are on variables 7 and 10. Both of these are measures that index the extent or severity of drinking behaviour in the month prior to admission. The loading of -.417 of variable 5, years of problem drinking, suggests that the longer that subjects had been engaging in problem drinking, the more severe their pattern of problem drinking immediately prior to admission. The moderate loading of variable 8 on this factor provides construct validity for the interpretation that the symptoms listed in this subtest of the BIF (e.g. shakes, sleeping difficulties, memory lapses, vague fears) are sequelae of problem drinking.

Factor 3. This factor is clearly reflecting degree of expressed commitment to religious dogma with loadings greater than .73 on the two summary scores derived from the religiosity questionnaire on both testing occasions. The .437 loading of variable 4 (Time Since Last Worshipped) on this factor, indicates that acceptance of religious dogma shows a moderate relationship to religious practice. Failure of gender to appear in this factor provides a further contradiction to the hypothesis of increased religiosity amongst female alcoholics.
Factor 4. The two items loading most heavily on this factor (35 and 36) are the summary scores from the Future Events Test on both testing occasions. This suggests that the factor represents another dimension of time perspective, in this instance one of self-aware future extension measured in years. The negative loading of education level on this factor indicates that future extension as measured by FET is inversely correlated with amount of formal education.

Factor 5. Variables 20, 21, and 22, the three scores derived from the DRLC Scale, have the highest loadings on this factor. Although there is a little overlap with generalized locus of control when the two tests are administered on the same test occasion (i.e., a loading of .224 by item 18 on Factor 5), the emergence of this factor indicates that expectancies of control related to drinking behaviour have some autonomy from generalized expectancies of control in other life areas. The loading of variable 5, Years of Problem Drinking, on this factor (-.422), indicates that feelings of a lack of personal control over drinking behaviour in the first two weeks of admission, are positively related to increased experience of problem drinking. Self-rating of the severity of problem drinking (variable 9) also shows a moderate correlation with this factor (.364). This suggests that the more severe an individual's perception of his or her drinking behaviour, the less control that individual considers he or she has over drinking behaviours.
Factor 6. The only variables with high loadings on this factor are the BAFT scores from both test occasions (variables 16 and 17). The failure of PCIT to load significantly on this factor supports the expectation that the BAFT would tap a different area of cognitive functioning from that assessed by the PCIT. The moderate loadings of variable 3 (−.361) on Factor 6 indicates that higher education level is associated with a better performance on the BAFT.

Factor 7. Dominant loadings are found on Items 24 and 25 with a moderate loading on Item 8. Thus, this appears to be yet another time perspective factor, in this instance associated with present and future time perspective as measured by the TRI on the first test occasion. The moderate loading of variable 8 on this factor suggests that the more severe an individual's pattern of drinking-related psychological and physiological symptoms in the month prior to admission, the more constricted that individual's future time perspective during the early part of the treatment period.

Factor 8. This factor is identified by the high loadings of items 12 (Social Functioning) and 13 (Psychological Functioning). Both of these items are derived from series of self-ratings from the BIF covering involvement in social activities and general feelings of psychological well-being for the month prior to admission. The moderate loading of Item 8 on this factor indicates that
high scores in these two areas are associated with less severe drinking-related psychological and physiological symptoms. The significant loading of Item 22 suggests that externality on Factor 1 of the DRLC Scale is not only influenced by long-term exposure to problem drinking, but that unlike the other two subscales derived from the DRLC, it is also influenced by recent drinking-related experiences and psychological and social maladjustment more generally.

Factor 9. Only two items, 18 and 19, load significantly on this factor. Thus, it would appear to be a fairly clear-cut index of generalized locus of control as measured by the I-E Scale on both testing occasions.

Factor 10. PCIT has the highest loading on this factor. The moderate negative loadings of Items 1 (Age) and 5 (Years of Problem Drinking) support the hypothesis that these two variables will correlate positively with degree of cognitive dysfunction as measured by the PCIT. The only other variable to load significantly on this factor is Item 32 (TRI Past Extension - Second Testing). The interpretation of this loading is not obvious. However, because the first-order correlation between age and Item 32 is .56 compared with .19 for Years Problem Drinking x Item 32 and -.33 for PCIT x Item 32, it would seem that its presence in this factor primarily reflects the tendency, as predicted, for
chronological age to show a significant positive correlation with past extension. It is interesting that past extension as measured in the first two weeks of treatment does not figure so prominently (factor loading = -.254).

Factor 11. Only variable 41, Time in Weeks to First Drink, shows a high loading on this measure. This suggests that none of the other variables included in the analysis have a powerful predictive relationship with this outcome measure. The highest independent variable loadings are found on variables 27 (.323), 9 (.265), 3 (-.239), 23 (.233), 4 (.205), 12 (.178), 30 (.178), 5 (.175), 8 (-.173), and 22 (.171). See Table 3 for the identification of these items. These minor loadings are listed because a major concern of the present study is the identification of predictors of drinking outcome.

Factor 12. The item with the dominant loading on this factor is The Amount of Alcohol Consumed on a Typical Drinking Day (Item 6). It is interesting that this aspect of drinking behaviour emerges as a separate dimension from the other indices of drinking behaviour included in the analysis (see Factor 2). The presence of Time Since Last Worshipped (Item 4, loading = -.503) as the only other item loading significantly on this factor does not lend itself to an obvious interpretation.

Factor 13. All three items loading significantly on
this factor (Items 30, 31, and 33) are measures derived from the TRI on the second testing occasion. It appears to be a present and future oriented time perspective factor that is similar in content to Factor 7. It differs primarily in that it relates to the second test occasion rather than the first and in that it does not have minor loadings from measures indexing drinking behaviour in the month prior to admission.

Factor 14. The items showing significant loadings on this factor are 11 (Number of Previous Admissions for Alcoholism) and 14 (AA Attendance in the Past). Thus, this appears to be an exposure to previous treatment factor. The association of items 11 and 14 is hardly surprising given that the majority of treatment programmes for alcoholism in this country are strongly AA in their orientation. Item 9 (Self Rating of Drinking Problem Severity) shows the next highest loading on this factor (0.304, p<.05). The presence of this item suggests that exposure to previous therapy increases the likelihood that patients will consider that their drinking problem is serious.

Factor 15. Gender (Item 2) is the only variable to show a high loading on this factor. This suggests that in this population, gender is not an important determinant of performance on the measures included in the analysis. This was demonstrated earlier in the Chapter with regard to the cognitive tests.
Each individual in the sample of 103 patients who completed therapy and who were traced three months after discharge had a 'shift score' calculated for each of the major summary scores derived from the cognitive tests that were administered on the two test occasions. These shift or change scores were calculated by subtracting the score obtained on each measure at the first test occasion from that obtained at the second.

Summary statistics for the change scores are given on Table 5. Insight ratings made by staff at the beginning and end of the therapy period are also included. Because gender was not found to be an important determinant of cognitive test performance in the earlier analyses, the male and female data are combined. On Table 5, the overall shift scores for each measure have been converted into standard deviate form (z-scores) by the following formula: 
\[ \frac{\text{\(m \text{ shift} \)}}{\sigma \text{ shift}} \]

z scores greater than 1.96 are significant at the .05 level. Although the factor analysis in the previous section indicated that a number of these measures show appreciable orthogonality, the scales are not entirely independent. Consequently, this method of testing the significance of shifts on individual measures is only an approximation.

Significant shifts in the predicted direction (see hypothesis 6, page 240) are found on all of the locus of control indices and on the second religiosity.
### Table 5

Changes in Cognitive Test Performance and Insight Level Over the Course of Therapy

<table>
<thead>
<tr>
<th>Measure</th>
<th>Change Score</th>
<th>Z-Score (Shift)</th>
<th>N</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>BRFT</td>
<td>-2.7</td>
<td>8.6</td>
<td>103</td>
</tr>
<tr>
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<td>-1.5</td>
<td>3.1</td>
<td>103</td>
</tr>
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<td>2.7</td>
<td>103</td>
</tr>
<tr>
<td>DRLC (Factor 2)</td>
<td>-2.0</td>
<td>2.2</td>
<td>103</td>
</tr>
<tr>
<td>DRLC (Factor 3)</td>
<td>-0.4</td>
<td>1.0</td>
<td>103</td>
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<tr>
<td>DRLC (Total)</td>
<td>-5.1</td>
<td>4.8</td>
<td>103</td>
</tr>
<tr>
<td>Past Extension</td>
<td>-1.3</td>
<td>7.7</td>
<td>97</td>
</tr>
<tr>
<td>Future Extension</td>
<td>-1.2</td>
<td>7.6</td>
<td>97</td>
</tr>
<tr>
<td>Temporal Orientation</td>
<td>0.7</td>
<td>6.1</td>
<td>97</td>
</tr>
<tr>
<td>Future Events</td>
<td>-0.3</td>
<td>3.1</td>
<td>102</td>
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<tr>
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<td>102</td>
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<tr>
<td>Religiosity Factor 2</td>
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<td>102</td>
</tr>
<tr>
<td>Insight Rating</td>
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<td>1.4</td>
<td>97</td>
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* Z-Score (Shift) > 1.96 (p < .05)
The shifts on the scores derived from the TRI suggest a slight overall movement in the direction of a less past-oriented temporal orientation with an accompanying constriction of both past and future extension. These changes are nonsignificant however, and could merely be an expression of the regression toward the mean phenomenon. Nonsignificant shifts are also evident on the Future Events Test and the first summary score of the Religiosity Questionnaire. On the latter measure however, the change is in the predicted direction. Insight rating changes are miniscule.

To investigate the relationships between the various sets of change scores, a factor analysis was performed on the shift data described above and summarized in Table 5. With the exception of DRLe (total), the measures included in this analysis were the same as those listed in Table 5. DRLe (total) was excluded because it is a composite score derived from the three DRLe subscales. The decision to include the three component scores rather than the overall index was based on the desire to gather further information on the behaviour of these subscores over time - in relation to one another and to other measures, particularly the IE scale.

In the factor analysis of the shift scores and in subsequent analyses reported in this thesis, the data from males and females are combined. The justification for this pooling of data lies in the failure to demonstrate significant gender differences in the sociodemographic,
drinking-related, cognitive (with the exception of BRFT-time 1), and outcome measures addressed in the earlier analyses. Because of the increased sample size, the inclusion of a larger number of variables in the subsequent multivariate analyses is facilitated.

The results of the factor analysis of the shift scores are given in Table 6. From an inspection of the factor loadings, it appears that changes on most of the cognitive tests occur independently of changes on the other cognitive measures. In particular, Factor I indicates that the three subscales of the DRLC change in association with each other and separately from the other cognitive changes, including IE performance. A similar situation pertains to the two religiosity subtests (see Factor IV). Two of the indices derived from the TRI, Future Extension and Temporal Orientation, also appear to change together over time (loadings of .74 and .76 respectively on Factor II). These changes occur independently of both Past Extension shifts (the other time perspective index derived from the TRI) and changes on the other cognitive tests. Past Extension also shows autonomy from shifts on the other cognitive measures (see Factor VI), as does BRFT (Factor V).

The only exception to the observation of shift autonomy on the cognitive tests is evident in Factor III. The high loadings on IE (-.76) and Future Events (.75) indicates that increased internality on the IE scale is associated with an increase in future extension as
Table 6
Varimax Rotated Principal-Components Analysis of the
Cognitive and Insight Shift Scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Component</th>
<th>Factor I</th>
<th>Factor II</th>
<th>Factor III</th>
<th>Factor IV</th>
<th>Factor V</th>
<th>Factor VI</th>
<th>λ²</th>
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<td>.74</td>
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<td>-.01</td>
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<td>-.14</td>
<td>.08</td>
<td>.77</td>
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<td>0</td>
<td>.01</td>
<td>.33</td>
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<td>.05</td>
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<td>.76</td>
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<td>-.05</td>
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<td>.73</td>
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<td>-.07</td>
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<td>.70</td>
<td>.05</td>
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<td>.68</td>
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<td>-.14</td>
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<td>-.11</td>
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<td>.62</td>
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<td>10</td>
<td>11</td>
<td>9</td>
<td>9</td>
<td>67</td>
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</table>

Note. N = 103. Numbers underlined (items with loadings greater than .40) identify the meaning of each factor.
measured by the FET. It is of interest that as with the factor analysis of the stationary measures where FET was independent of the other time perspective measures, its autonomy from these indices is also apparent when changes over time are considered.

Another interesting feature of the factor analysis results summarized in Table 6 is the finding that insight rating changes load significantly on two of the factors discussed above (Factors II and V). This indicates that increases in insight level over the course of treatment are associated with increases in future temporal orientation (as measured by TRI) and improved BAFT performance.

Section Two: Predictors of Treatment Outcome.

Contingency table, stepwise regression, and ordinary and stepwise discriminant function analyses were performed to establish the relationship between a range of independent variables and treatment outcome.

1. Contingency Table Analyses. These analyses were performed to assess the relationship between a number of the major cognitive measures included in the present study and drinking behaviour at both three and 12 months after discharge. Three outcome categories were used: abstinent, controlled, and relapsed. These categories were defined above (page 237). Contingency table
analyses were confined to the two cognitive 'process' measures (PCIT and BRrT) and to the locus of control measures (IE and DRLC).

2. Stepwise Multiple Regression Analyses. In contrast to the more qualitative categorization used in the contingency table analyses, the dependent variable used in the first regression analysis was quantitative and similar to that used in the Gregson and Taylor (1977) study. Here, outcome was defined in terms of the number of weeks between the time of leaving hospital and the time of the first drink. The follow-up period extended to 12 months. The independent variables used in this and the other regression analysis are listed in Table 7.

One of the measures (Time Perspective), is a composite index based on the results of the factor analysis (Table 4) that was run to help identify relatively independent dimensions within the complex set of predictor variables. Other independent variables are first-order interaction terms (cross products) formed from pairs of predictors after consideration of the results of the factor analysis and Chi Square tests on the contingency tables.

A further regression analysis was run. This analysis used a four-way classification placed in the order of (1) abstinence, (2) reduced intake/controlled drinking, (3) relapsed but no alcohol in the last month, and (4) relapsed. This scale rests on the somewhat
Table 7

Independent Variables used in the Stepwise Regression Analyses

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>No.</th>
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<td>Gender</td>
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<td>BRFT (First Testing)</td>
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<td>3</td>
<td>Marital Status</td>
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<td>Highest Occupation Attained**</td>
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</tr>
<tr>
<td>6</td>
<td>Present Occupation**</td>
<td>24</td>
<td>Religiosity Questionnaire - Factor 1 (Second Assessment)</td>
</tr>
<tr>
<td>7</td>
<td>Religious Denomination</td>
<td>25</td>
<td>Religiosity Questionnaire - Factor 2 (Second Assessment)</td>
</tr>
<tr>
<td>8</td>
<td>Time Since Last Worshipped (1-5 Scale)</td>
<td>26</td>
<td>Interaction Term (19 x 21)</td>
</tr>
<tr>
<td>9</td>
<td>Years of Problem Drinking</td>
<td>27</td>
<td>Interaction Term (19 x 23)</td>
</tr>
<tr>
<td>10</td>
<td>Amount Consumed on a Typical Drinking Day</td>
<td>28</td>
<td>Interaction Term (21 x 23)</td>
</tr>
<tr>
<td>11</td>
<td>Drinking Behaviour (Questionnaire Score)</td>
<td>29</td>
<td>Composite Time Perspective Score (23 - 28 + 29 - 34)</td>
</tr>
<tr>
<td>12</td>
<td>Drinking-Related Psychological and Physiological Symptoms (Questionnaire Score)</td>
<td>30</td>
<td>Temporal Orientation Change Score</td>
</tr>
<tr>
<td>13</td>
<td>Self-Rating of Drinking Problem Severity (1-5 Scale)</td>
<td>31</td>
<td>Frequency of Drinking in Previous Month (1-5 Scale)</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>32</td>
<td>Number of Previous Admissions for Alcoholism</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>33</td>
<td>Alcoholism</td>
</tr>
<tr>
<td>16</td>
<td>Social Functioning (Questionnaire Score)</td>
<td>34</td>
<td>Religiosity Questionnaire - Factor 1 (Change Score)</td>
</tr>
<tr>
<td>17</td>
<td>Psychological Functioning (Questionnaire Score)</td>
<td>35</td>
<td>Religiosity Questionnaire - Factor 2 (Change Score)</td>
</tr>
<tr>
<td>18</td>
<td>AA Attendance in Past (Yes/No)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Education level is derived from the scale described in Table 3, p.258.

** Index derived from the Davis Occupation Ranking Scale (Note 9).

* Variable numbers refer to items listed in Table 4, p.268.
dubious assumption that it is meaningful to order these outcome categories in terms of adequacy or desirability of treatment outcome.

3. Discriminant Function Analyses. These analyses used the same set of categories as the contingency tables. Stepwise discriminant functions were conducted to identify an economical set of predictors that would maximally separate the three post-treatment groups at three and 12 months after discharge. Because of the small sample size of the controlled drinking group, the number of predictor measures used was, of necessity, fewer than the number employed in the regression analyses. For this reason, a selection was made, based in part upon the results of preceding analyses. With the exception of two cross-product terms, the cognitive measures included within these analyses were assessed during the first two weeks of admission - the reason for this being that there is practical gain expected from being able to predict ultimate treatment outcome early in the treatment period. Because of the unequal size of group membership, prior probabilities based on group size were taken into account in some of the analyses.

Contingency Table Analyses.

Tables 8, 9, and 10 show how performance on PCIT and BRAFT (at the second testing) relates to treatment outcome at three and 12 months following discharge. The
same scores as employed by Gregson and Taylor (1977) were used to define the groups, namely: low, -6.71 to -2.55; medium, -2.50 to -1.00; high, -1.06 to 1.12. A further division was formed by a two-way split based on BRFT scores at the second test occasion, with subjects having scores ≤10 degrees rotation in the low group and those with scores >10 in the high group. This division was chosen a priori, based on an earlier analysis suggesting that a score of 10 marks a cut-off point between two subpopulations, one which changes on this measure over time in treatment, the other which is stable (see Appendix One). In contrast to PCIT, a high score on BRFT indicates a poor performance.

Three-way Chi Square Analyses conducted on the results displayed in Tables 8 and 9 showed that performance on these two measures bears a significant predictive relationship with outcome at both three ($\chi^2(4) = 24.76, p < .001, \phi^2 = .24$) and 12 months ($\chi^2(4) = 12.81, p < .02, \phi^2 = .13$).

Considering PCIT alone in relation to relapse, it appears from Table 10 that this measure, as in the earlier Gregson and Taylor study, is a significant predictor. At three months, the percentages of subjects who had relapsed in the high score range was 20, in the medium range, 26, and in the low range, 48. A 2 x 3 Chi Square analysis conducted on PCIT in relation to relapse at three months (i.e., abstinent + controlled
### Table 8
PCIT and BRFT(2) in Relation to Outcome at three months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRFT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>18</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(12.6)</td>
<td>(3.5)</td>
<td>(6.3)</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(10.5)</td>
<td>(2.9)</td>
<td>(5.3)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 24.8, \text{ 4 df, } p < .001 \]

### Table 9
PCIT and BRFT(2) in Relation to Outcome at 12 months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRFT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>15</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>(10.6)</td>
<td>(3.1)</td>
<td>(8.4)</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(8.6)</td>
<td>(2.5)</td>
<td>(6.8)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 12.8, \text{ 4 df, } p < .02 \]

**Note.**  
A = Abstinent  
C = Controlled  
R = Relapsed  
Expected cell frequencies are given in brackets
Table 10
Probability of Relapse at three and 12 months 
as a Function of PCIT and BRFT(2)

A. 3 months

<table>
<thead>
<tr>
<th></th>
<th>PCIT</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>BRFT</td>
<td>Low</td>
<td>.21</td>
</tr>
<tr>
<td>BRFT</td>
<td>High</td>
<td>.15</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. 12 months

<table>
<thead>
<tr>
<th></th>
<th>PCIT</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>BRFT</td>
<td>Low</td>
<td>.29</td>
</tr>
<tr>
<td>BRFT</td>
<td>High</td>
<td>.50</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
categories combined versus relapsed subjects) yielded the following statistics: $\chi^2 (2) = 6.06, \ p < .05, \ \phi^2 = .06$.

The corresponding analysis at 12 months gave the following results: $\chi^2 (2) = 1.05, \ NS, \ \phi^2 = .01$.

Twenty-one percent of the low scorers on BRFT(2) at three months, and 31 percent at 12 months, had relapsed relative to 36 and 47 percent of high scorers on the same two occasions. Although suggesting a relationship between BRFT performance and subsequent outcome, chi square analyses failed to reach the .05 level of significance.

Although PCIT predicts post-hospitalization outcome at three months, it is evident from Tables 8, 9, and 10, and from the three-way chi square results, that predictive power is enhanced when both of the cognitive tests are considered together in relation to outcome. The major contributions to the significant Chi Square values at both three and 12 months come from a representation greater than expected of abstinent subjects in the high PCIT - low BRFT category and a representation greater than expected of relapsed drinkers in the low PCIT - high BRFT group. That is to say, a good performance on both measures together carries the best prognosis, and a poor performance on both, carries the worst.

Tables 11, 12, and 13 show the relationship between BRFT (at the second testing), IE, and treatment outcome at three and 12 months following discharge. The IE score
Table 11
IE(2) and BRFT(2) in Relation to Outcome at three months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>C</td>
<td>R</td>
</tr>
<tr>
<td>Low</td>
<td>12</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>BRFT</td>
<td>(9.8)</td>
<td>(2.7)</td>
<td>(4.9)</td>
</tr>
<tr>
<td>High</td>
<td>8</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(8.2)</td>
<td>(2.3)</td>
<td>(4.1)</td>
</tr>
</tbody>
</table>

N = 103

χ² = 12.81, 4 df, p < .02, φ² = .12

Table 12
IE(2) and BRFT(2) in Relation to Outcome at 12 months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>C</td>
<td>R</td>
</tr>
<tr>
<td>Low</td>
<td>11</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>BRFT</td>
<td>(8.2)</td>
<td>(2.4)</td>
<td>(6.5)</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(6.7)</td>
<td>(2.0)</td>
<td>(5.3)</td>
</tr>
</tbody>
</table>

N = 100

χ² = 13.85, 4 df, p < .01, φ² = .14
Table 13
Probability of Relapse at three and 12 months
as a Function of IE(2) and BRFT(2)

A. 3 months

<table>
<thead>
<tr>
<th>IE</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>.20</td>
<td>.21</td>
<td>.25</td>
<td>.21</td>
</tr>
<tr>
<td>High</td>
<td>.33</td>
<td>.50</td>
<td>.26</td>
<td>.36</td>
</tr>
<tr>
<td>Totals</td>
<td>.25</td>
<td>.33</td>
<td>.28</td>
<td></td>
</tr>
</tbody>
</table>

N = 103

B. 12 months

<table>
<thead>
<tr>
<th>IE</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>.40</td>
<td>.22</td>
<td>.33</td>
<td>.31</td>
</tr>
<tr>
<td>High</td>
<td>.45</td>
<td>.56</td>
<td>.39</td>
<td>.47</td>
</tr>
<tr>
<td>Totals</td>
<td>.42</td>
<td>.36</td>
<td>.37</td>
<td></td>
</tr>
</tbody>
</table>

N = 100
distribution was trichotomized to give three approximately equal sized groups: internals (low scores, viz. 0 - 4), intermediates (5 - 10), and externals (high scores, viz. 11 - 21). This three-way division was employed to test the hypothesis that locus of control might bear a non linear relationship to treatment outcome.

Inspection of Tables 11, 12, and 13 suggests that interpretation of the three-way relationship between these sets of measures is not as straight-forward as was the case with the previous sets of contingency tables. Earlier, it was noted that BRFT alone did not significantly predict outcome. Three (IE) x three (drinking outcome) Chi Squares also indicated that IE on its own was a poor predictor of outcome (at both three and 12 months $p > .05$, $\phi^2 > .02$).

The most obvious feature of the three month data (Tables 11 and 13a) is the poorer treatment outcome among the intermediate IE - high BRFT group. The same relationship appears to pertain at 12 months (Tables 12 and 13b). Another feature of the 12 month data is the tendency for intermediate IE scorers with better (i.e. lower) BRFT scores to evidence superior treatment outcomes to patients in the other five groups. Thus, within the more functional BRFT group, there is some support for one of the two hypothesized relationships between IE and treatment outcome - namely, that intermediate scorers carry a better prognosis than those at either extreme.
There is no support for this relationship at three months however, and for those in the high BRFT category, the results suggest the opposite relationship at both three and 12 months. At no point is there evidence corroborating the view that internality carries with it a better treatment outcome.

A similar three-way split to that used with IE is employed in the case of DRLC which is also evaluated in relation to BRFT and three-way treatment outcome at three and 12 months. The score ranges defining the three DRLC groups are as follows: internals (0), intermediates (1 and 2), and externals (+2). The results of these analyses are given in Tables 14, 15, and 16.

Again the three-way relationship is significant and, at 12 months, of moderate strength ($\phi^2 = .20$). As with IE, DRLC on its own does not bear a statistically significant relationship to treatment outcome. Collapsing the rows of Tables 14 and 15 (removing the effects of BRFT) and calculating Chi Squares yielded $\chi^2$s of (4) 3.24 and (4) 8.01 for three and 12 months respectively. Although nonsignificant, the relationship is in the direction of an association between internality and an abstinent outcome. The strength of the DRLC effects are greater than those obtained with IE ($\phi^2$s = .03 and .08).

Although DRLC internality on its own does not show a statistically significant association with successful outcomes, inspection of Tables 14, 15, and 16
### Table 14
DRLC(2) and BRFT(2) in Relation to Outcome at three months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>C</td>
<td>R</td>
</tr>
<tr>
<td>Low</td>
<td>15</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>BRFT</td>
<td>(11.0) (3.0) (5.5)</td>
<td>(8.6) (2.4) (4.3)</td>
<td>(11.9) (3.3) (6.0)</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>BRFT</td>
<td>(9.3) (2.6) (4.6)</td>
<td>(7.2) (2.0) (3.6)</td>
<td>(10.0) (2.8) (5.0)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 12.18, \text{ 4 df, } p < .02, \phi^2 = .12 \]

### Table 15
DRLC(2) and BRFT(2) in Relation to Outcome at 12 months

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>C</td>
<td>R</td>
</tr>
<tr>
<td>Low</td>
<td>15</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>BRFT</td>
<td>(9.2) (2.7) (7.3)</td>
<td>(6.9) (2.0) (5.4)</td>
<td>(10.3) (3.0) (8.2)</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>BRFT</td>
<td>(7.6) (2.2) (6.0)</td>
<td>(5.6) (1.6) (4.5)</td>
<td>(8.4) (2.5) (6.7)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 19.84, \text{ 4 df, } p < .001, \phi^2 = .20 \]
Table 16
Probability of Relapse at three and 12 months as a Function of DRLC(2) and BRFT(2)

A. 3 months

<table>
<thead>
<tr>
<th>DRLC</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Low</td>
<td>.13</td>
</tr>
<tr>
<td>High</td>
<td>.33</td>
</tr>
<tr>
<td>Totals</td>
<td>.19</td>
</tr>
</tbody>
</table>

N = 103

B. 12 months

<table>
<thead>
<tr>
<th>DRLC</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Low</td>
<td>.21</td>
</tr>
<tr>
<td>High</td>
<td>.36</td>
</tr>
<tr>
<td>Totals</td>
<td>.30</td>
</tr>
</tbody>
</table>

N = 100
suggests that in the case of patients with lower (i.e. better) BRFT scores, this association is stronger.

Three (DRLC) x three (drinking outcome) Chi Squares conducted on low BRFT subjects at three and 12 months indicated that on the latter test occasion, the association was significant ($\chi^2(4) = 11.85, p < .02, \phi^2 = .12$). In the case of the three month low BRFT group and the high BRFT groups on both followup occasions, the relationship between DRLC and three-way outcome was nonsignificant ($p > .05$).

From Table 14 it is apparent that the significant overall Chi Square at three months resulted primarily from an over-representation of controlled and abstinent outcomes in the low BRFT - low DRLC cell, an under-representation of abstinent outcomes in the low BRFT - external DRLC cell, and an over-representation of relapsed drinkers in the high BRFT - external DRLC cell. The relationship between the two cognitive measures and drinking outcome is seen more clearly in Table 16a. There it is evident that the best prognosis at three months is associated with an internal or intermediate score on the DRLC (score range 0 - 2) coupled with a low score (better performance) on the BAFT. The same relationship holds at 12 months (see Table 16b).

Regression Analyses

Thirty-five independent variables monitoring important aspects of the subjects' sociodemographic
background, drinking pattern and drinking-related symptoms at intake, and a number of cognitive measures from one or both of the testing periods during treatment, were included in the stepwise regression analysis.

A preliminary analysis using 81 subjects (those located at 12 months from the sample tested in 1977) and excluding the interaction terms and change scores (i.e., variables 26 - 35 listed in Table 7) yielded a multiple correlation coefficient ($R$) of .49, accounting for only 24.5 of the total variance. With the additional measures included, the predictive capability of the regression model was substantially increased with $R = .65$, explaining 43 percent of the dependent variable variance (Abbott & Gregson, 1979).

The first analysis reported here (see Table 17), used the same set of independent variables employed in the latter analysis and the same dependent variable (time to relapse in weeks). It differed by the inclusion of the total 100 subjects who were traced at 12 months. On this occasion, $R = .62$ ($R^2 = .38$). Table 17 shows those variables which had $t$-values greater than .17 ($p < .10$). Note that only the first six had $t$-values greater than 2.0 ($p < .05$). As predicted, cognitive measures of the process and content type were represented among the most significant predictors of time to first drink. Intercorrelations between the variables listed in Table 17 are displayed in Appendix 14.
### Table 17

Results of Regression Analysis of Weeks to Relapse excluding Predictor Variables with Non-significant $t$-values

<table>
<thead>
<tr>
<th>Variable</th>
<th>mean</th>
<th>percent variance</th>
<th>$t$ value</th>
<th>Regression coefficient ($\pm$ SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-rating of drinking problem</td>
<td>4.1</td>
<td>3.0</td>
<td>2.29</td>
<td>4.20 ± 2.29</td>
</tr>
<tr>
<td>PCIT x BRFT(2)</td>
<td>-13.2</td>
<td>2.0</td>
<td>2.28</td>
<td>0.37 ± 0.16</td>
</tr>
<tr>
<td>Education Level</td>
<td>2.6</td>
<td>3.0</td>
<td>-2.15</td>
<td>-3.68 ± 1.72</td>
</tr>
<tr>
<td>BRFT(2) x IE(2)</td>
<td>64.6</td>
<td>2.0</td>
<td>-2.09</td>
<td>0.08 ± 0.04</td>
</tr>
<tr>
<td>Social Functioning (Questionnaire Score)</td>
<td>11.0</td>
<td>1.0</td>
<td>-2.08</td>
<td>-1.13 ± 0.55</td>
</tr>
<tr>
<td>Highest Occupation Attained</td>
<td>4.7</td>
<td>3.0</td>
<td>-2.02</td>
<td>-2.90 ± 1.44</td>
</tr>
<tr>
<td>Composite Time Perspective</td>
<td>17.6</td>
<td>2.0</td>
<td>1.97</td>
<td>0.23 ± 0.12</td>
</tr>
<tr>
<td>Drinking-related Psyc. and Physiological Symptoms (Questionnaire Score)</td>
<td>25.1</td>
<td>2.0</td>
<td>1.87</td>
<td>-0.39 ± 0.30</td>
</tr>
<tr>
<td>Psychological Functioning (Questionnaire Score)</td>
<td>13.4</td>
<td>2.0</td>
<td>1.87</td>
<td>0.79 ± 0.42</td>
</tr>
<tr>
<td>Religiosity Questionnaire - Factor 1 (Change Score)</td>
<td>1.0</td>
<td>3.0</td>
<td>1.71</td>
<td>1.15 ± 0.61</td>
</tr>
</tbody>
</table>

$N = 100$

---

**a** With 60 df, a $t$ value of 2.00 is significant at the .05 level, a value of 1.67 at the .10 level.

**b** Percentages are rounded to whole numbers.

**Note:** Variables are listed in order of $t$ values.
The other stepwise multiple regression analysis reported here (Table 18) used the same set of predictors as the previous analysis but differed in that it employed a four-point drinking outcome scale (see page 276). As indicated earlier, the legitimacy of this ordinal scale is suspect. Nevertheless, the results are given, acknowledging that caution is required in their interpretation. Analysis is confined to the 100 subjects traced 12 months after discharge.

The analysis reported in Table 18 yielded a multiple correlation coefficient of .62, the total cumulative proportion of variance being 38 percent. These results are of the same magnitude as those of the previous step-wise regression. Again, two cognitive process measures emerge among the small group of predictors significant at the .05 level. The cross-product term PCIT x BRFT(2) is again the dominant cognitive measure, this time accounting for six percent of the outcome variance. In contrast to the earlier analysis, but consistent with the earlier Gregson and Taylor study, PCIT on its own is found among the major predictors. BRFT(2) on its own also comes into the picture in this analysis, accounting for three percent of the total variance.

Of the other cognitive indices (those of the 'content' type), only religiosity measures are found as significant predictors in both analyses. In the first analysis, but not in the second, the composite time perspective measure
Table 18
Results of Regression Analysis of three-way Drinking Outcome at 12 months excluding Predictor Variables with Non-significant t-values

<table>
<thead>
<tr>
<th>Variable</th>
<th>mean</th>
<th>percent variance</th>
<th>t value</th>
<th>Regression coefficient (+ SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIT x BRFT(2)</td>
<td>-13.2</td>
<td>6.0</td>
<td>-3.12</td>
<td>-0.03 + 0.01</td>
</tr>
<tr>
<td>Self-rating of drinking problem</td>
<td>4.1</td>
<td>3.0</td>
<td>-2.93</td>
<td>-0.33 + 0.11</td>
</tr>
<tr>
<td>Marital Status</td>
<td>2.5</td>
<td>3.0</td>
<td>2.46</td>
<td>0.23 + 0.05</td>
</tr>
<tr>
<td>PCIT</td>
<td>-1.4</td>
<td>3.0</td>
<td>2.23</td>
<td>0.30 + 0.14</td>
</tr>
<tr>
<td>Religiosity Questionnaire - Factor 1 (Second Assessment)</td>
<td>21.8</td>
<td>1.0</td>
<td>-2.18</td>
<td>-0.06 + 0.04</td>
</tr>
<tr>
<td>Drinking Behaviour (Questionnaire Score)</td>
<td>18.6</td>
<td>5.0</td>
<td>1.98</td>
<td>0.04 + 1.94</td>
</tr>
<tr>
<td>BRFT (Second Testing)</td>
<td>11.5</td>
<td>3.0</td>
<td>1.89</td>
<td>-0.04 + 0.04</td>
</tr>
<tr>
<td>Social Functioning (Questionnaire Score)</td>
<td>11.0</td>
<td>1.0</td>
<td>1.80</td>
<td>0.06 + 0.04</td>
</tr>
<tr>
<td>Psychological Functioning (Questionnaire Score)</td>
<td>13.4</td>
<td>1.0</td>
<td>-1.74</td>
<td>-0.05 + 0.04</td>
</tr>
<tr>
<td>ORNC Change Score</td>
<td>-5.1</td>
<td>2.0</td>
<td>-1.73</td>
<td>-0.05 + 0.04</td>
</tr>
<tr>
<td>Time Since Last Worshipped (1 - 5 Scale)</td>
<td>3.3</td>
<td>1.0</td>
<td>-1.71</td>
<td>-0.15 + 0.04</td>
</tr>
</tbody>
</table>

N = 100

a With 60 df, a t value of 2.00 is significant at the .05 level, a value of 1.67 at the .10 level.

b Percentages are rounded to whole numbers.

Note: Variables are listed in order of t values.
is found among the significant predictors. In the second analysis but not in the first, DRLC (Change) emerged as a predictor of borderline significance. None of the generalized locus of control measures (IE test occasion 1, IE test occasion 2, and IE change) predicted outcome in either of the analyses. Taken in conjunction with BRFT however, IE as part of the cross-product term $BRFT(2) \times IE(2)$, formed one of the dominant predictors in the first regression analysis. In the second analysis, this term bore only a minor and nonsignificant relationship to outcome.

Discriminant Function Analyses.

Two ordinary discriminant function analyses and three step-wise discriminant function analyses were run. The outcome categories were the same as those described earlier for the contingency tables. Because of the small sample size in the controlled drinking group, only a limited number of independent variables could be included in the analyses. The selection used and their respective means and standard deviations in each of the three outcome groups at three and 12 months are given in Table 19.

The two ordinary discriminant function analyses used all of the independent variables listed in Table 19. Prior probabilities were assigned as being equal for the three groups. The first analysis applied to the three outcome groups three months after discharge. This
### Table 19

Variables included in the Discriminant Function Analyses with the Means and Standard Deviations for the three Outcome Groups at both Three and Twelve Months

<table>
<thead>
<tr>
<th>Variable Ref. No.</th>
<th>Three Month M and SD</th>
<th>Twelve Month M and SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>D</td>
</tr>
<tr>
<td>1</td>
<td>1.3 (0.5)</td>
<td>1.4 (0.5)</td>
</tr>
<tr>
<td>2</td>
<td>2.5 (1.2)</td>
<td>2.4 (1.6)</td>
</tr>
<tr>
<td>3</td>
<td>5.4 (2.1)</td>
<td>5.8 (2.5)</td>
</tr>
<tr>
<td>4</td>
<td>3.6 (1.8)</td>
<td>3.0 (1.6)</td>
</tr>
<tr>
<td>5</td>
<td>16.8 (7.5)</td>
<td>22.5 (4.5)</td>
</tr>
<tr>
<td>6</td>
<td>4.2 (1.1)</td>
<td>4.0 (1.3)</td>
</tr>
<tr>
<td>7</td>
<td>-10.2 (17.3)</td>
<td>-19.8 (23.0)</td>
</tr>
<tr>
<td>8</td>
<td>56.0 (74.8)</td>
<td>71.0 (62.5)</td>
</tr>
<tr>
<td>9</td>
<td>13.3 (8.5)</td>
<td>17.5 (13.0)</td>
</tr>
<tr>
<td>10</td>
<td>9.1 (4.0)</td>
<td>8.1 (4.0)</td>
</tr>
<tr>
<td>11</td>
<td>7.1 (4.6)</td>
<td>8.6 (4.7)</td>
</tr>
<tr>
<td>12</td>
<td>-5.0 (9.8)</td>
<td>-5.0 (8.1)</td>
</tr>
<tr>
<td>13</td>
<td>20.6 (6.1)</td>
<td>22.1 (4.7)</td>
</tr>
</tbody>
</table>

**Key to Variables**

1. Gender
Table 19 ctd.

2. Education Level
3. Present Occupation
4. Time Since Last Worshipped (1-5 scale)
5. Drinking Behaviour (Composite score from BIF scales)
6. Self-Rating of Drinking Problem Severity
7. PCIT x BRFT(2)
8. BRFT(2) x IE(2)
9. BRFT(1)
10. IE(1)
11. DRLC-Total (1)
12. TRI - Temporal Orientation (1)
13. Religiosity Questionnaire - Factor 1 (1)

**Note**

A = Abstinent  
D = Relapsed  
C = Controlled

(1) = test administered on the first test occasion.  
(2) = test administered on the second test occasion.
analysis correctly classified 55 percent of the subjects and yielded a generalized Mahalanobis D-Square of 40.58 ($p < .05$), confirming that a significant separation of the multivariate means of the three groups had occurred. At 12 months, 58 percent of the subjects were correctly classified with a D-Square of 39.83 ($p < .05$). The more detailed results of these analyses, including the discriminant functions, are given in Appendix 15. Although the separations afforded by these analyses are of only moderate proportion, they indicate that the selection of measures used in these analyses have some value in predicting ultimate group membership. The strongest prediction is found in the relapsed category at 12 months where 68 percent were correctly allocated a priori. The worst predictions applied to the controlled drinkers with 56 and 50 percent correctly classified at three and 12 months respectively.

To identify which of the 13 measures employed in the discriminant function analyses were the most useful for predictive purposes, three step-wise discriminant function analyses were run using the data described above. For these analyses, the BMD07M programme for stepwise analyses was used, employing the greatest-$f$-to-enter as the selection criterion for each step.

In the first step-wise analysis, the 12 month data were addressed. Prior probabilities were set equal for the three groups. The results of this analysis are given in Table 20.
Table 20

Summary of the Stepwise Discriminant Function Analysis
Performed on the 12 Month Outcome Data

A.

<table>
<thead>
<tr>
<th>Step Number</th>
<th>Variables in Order of Entry</th>
<th>Approximate F ratio</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11 DRLC(1)</td>
<td>4.70</td>
<td>2, 97</td>
</tr>
<tr>
<td>2</td>
<td>9 BRFT(1)</td>
<td>3.83</td>
<td>4, 192</td>
</tr>
<tr>
<td>3</td>
<td>5 Drinking Behaviour (from BIF)</td>
<td>3.41</td>
<td>6, 190</td>
</tr>
<tr>
<td>4</td>
<td>6 Self-Rating of Drinking Problem</td>
<td>3.26</td>
<td>8, 188</td>
</tr>
<tr>
<td>5</td>
<td>10 IE(1)</td>
<td>2.97</td>
<td>10, 186</td>
</tr>
<tr>
<td>6</td>
<td>7 PCIT x BRFT(2)</td>
<td>2.56</td>
<td>12, 184</td>
</tr>
<tr>
<td>7</td>
<td>3 Present Occupation</td>
<td>2.28</td>
<td>14, 182</td>
</tr>
<tr>
<td>8</td>
<td>13 Religiosity - Factor 1 (1)</td>
<td>2.05</td>
<td>16, 180</td>
</tr>
<tr>
<td>9</td>
<td>1 Gender</td>
<td>1.86</td>
<td>18, 178</td>
</tr>
<tr>
<td>10</td>
<td>4 Time Since Last Worshipped</td>
<td>1.69</td>
<td>20, 176</td>
</tr>
<tr>
<td>11</td>
<td>12 TRI - Temporal Orientation(1)</td>
<td>1.56</td>
<td>22, 174</td>
</tr>
<tr>
<td>12</td>
<td>2 Education Level</td>
<td>1.43</td>
<td>24, 172</td>
</tr>
<tr>
<td>13</td>
<td>8 BRFT(2) x IE(2)</td>
<td>1.31</td>
<td>26, 170</td>
</tr>
</tbody>
</table>

B.

Separation Using the First Five Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>Allocation to</th>
<th>Group</th>
<th>Allocation to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;A&quot;</td>
<td>&quot;D&quot;</td>
<td>&quot;C&quot;</td>
</tr>
<tr>
<td>A</td>
<td>24</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

52 percent correctly classified

C.

Separation Using the Total 13 Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>Allocation to</th>
<th>Group</th>
<th>Allocation to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;A&quot;</td>
<td>&quot;D&quot;</td>
<td>&quot;C&quot;</td>
</tr>
<tr>
<td>A</td>
<td>25</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>D</td>
<td>7</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

58 percent correctly classified
The three discriminant functions derived from the analysis summarized in Table 20 are the same as those generated by the ordinary discriminant analysis of the same data (see Appendix 15). Consequently, the allocations to groups are also the same, correctly classifying 58 percent of the subjects when all 13 variables are used (refer to Table 20). The stepwise analysis indicated that the most powerful discriminators were the first five variables listed in Table 20. As shown in this table, these five measures taken on their own correctly classify 52 percent of the subjects. It is of interest that although the addition of the other eight variables improves the identification of relapsed (0) patients, their addition reduces the number correctly allocated to the controlled drinking (C) group.

DRLC(1) was not used in any of the earlier analyses reported in this thesis. It is of interest that of the present set of variables, it was the best discriminator at 12 months after discharge. BRFT(1) and IE(1) are also considered in relation to this three-way outcome classification for the first time. Both are found to rank amongst the best discriminators.

A further interesting finding of this discriminant function analysis is that subjects in the abstinent and relapsed groups, when misclassified, are equally likely to be placed in either of the remaining two categories (see Table 20, C). Controlled drinkers, on the other
hand, are more likely to be misclassified as abstinent. An inspection of the mean scores of the five dominant discriminators (variables 11, 9, 5, 6, and 10) listed for the three groups in Table 19, suggests that this is because subjects in the abstinent and controlled groups resemble one another on these measures and contrast with the performance of the relapsed subjects.

The next two stepwise discriminant function analyses have prior probabilities assigned that are proportional to the sizes of the outcome groups. The allocations to groups in the previous analyses were derived from probabilities of group membership based on the assumption of a multivariate normal distribution. A Bayesian adjustment to these probabilities was made because the outcome groups in fact vary quite considerably in size. Thus, failure to incorporate the prior knowledge of group size could be expected to result in a higher rate of misclassification than might otherwise be obtained, particularly in the largest group (i.e., abstainers).

The first stepwise analysis with priors included is yet another analysis of the 12 month data. This analysis gives identical discriminant weights to the other two discriminant analyses conducted with these data. The constant terms differ however, because of the inclusion of the prior probabilities (see Appendix 15). The classifications of subjects based on these revised discriminant functions are given in Table 21A.
### Table 21
Predictions of Group Membership Based on the Discriminant Functions with Bayesian Adjustments for Group Size

**A. 12 Month Outcome Groups.**

a) Separation Using the First Five Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>&quot;A&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>37</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>14</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>11</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

61 percent correctly classified

b) Separation Using the Total 13 Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>&quot;A&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>37</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>15</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>9</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

62 percent correctly classified

**B. Three Month Outcome Groups.**

a) Separation Using the First Five Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>&quot;A&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>49</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>14</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>14</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

61 percent correctly classified

b) Separation Using the Total 13 Measures

<table>
<thead>
<tr>
<th>Group</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>49</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>13</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>11</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

64 percent correctly classified
As expected, the incorporation of priors into the discriminant functions resulted in both an increase in the number of subjects correctly classified as abstinent and an overall increase in the accuracy of prediction. The adjustment had little effect on the numbers correctly classified as relapsed at 12 months. The most marked effect was in the controlled group. Here, the capacity to predict outcome dropped sharply with the majority being assigned to the abstinent group. Again the utility of the five dominant predictors was apparent with 61 percent of the subjects correctly classified by the use of these measures relative to 62 percent when all 13 variables were included.

The second stepwise analysis is addressed to the three month outcome data (Table 22). As in the preceding analysis, a set of five variables is identified that does almost as well in discriminating between the groups as the total 13 measures (Table 21B). BRFT(1) and two of the drinking-related measures again appear within this group. As in the regression analyses, PCIT x BRFT(2) emerges as an important predictor. Temporal Orientation (1) is also found in this group. In contrast to their position in the analysis of the 12 month data, DRLC(1) and IE(1) drop in relative importance.

The major finding of this section is that at both three and 12 months, cognitive and drinking-related measures emerge as stronger discriminators between the outcome categories than the sociodemographic variables of
Table 22
Summary of the Stepwise Discriminant Function Analysis
Performed on the Three Month Outcome Data

<table>
<thead>
<tr>
<th>Step Number</th>
<th>Variables in Order of Entry</th>
<th>Approximate F ratio</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 Drinking Behaviour (from BIF)</td>
<td>7.38</td>
<td>2, 100</td>
</tr>
<tr>
<td>2</td>
<td>9 BRFT(1)</td>
<td>5.51</td>
<td>4, 198</td>
</tr>
<tr>
<td>3</td>
<td>6 Self-Rating of Drinking Problem</td>
<td>4.56</td>
<td>6, 196</td>
</tr>
<tr>
<td>4</td>
<td>7 PCIT x BRFT(2)</td>
<td>3.74</td>
<td>8, 194</td>
</tr>
<tr>
<td>5</td>
<td>12 TRI - Temporal Orientation(1)</td>
<td>3.11</td>
<td>10, 192</td>
</tr>
<tr>
<td>6</td>
<td>2 Education Level</td>
<td>2.65</td>
<td>12, 190</td>
</tr>
<tr>
<td>7</td>
<td>11 DRLC(1)</td>
<td>2.30</td>
<td>14, 188</td>
</tr>
<tr>
<td>8</td>
<td>10 IE(1)</td>
<td>2.07</td>
<td>16, 186</td>
</tr>
<tr>
<td>9</td>
<td>13 Religiosity - Factor 1 (1)</td>
<td>1.88</td>
<td>18, 184</td>
</tr>
<tr>
<td>10</td>
<td>3 Present Occupation</td>
<td>1.71</td>
<td>20, 182</td>
</tr>
<tr>
<td>11</td>
<td>8 BRFT(2) x IE(2)</td>
<td>1.57</td>
<td>22, 180</td>
</tr>
<tr>
<td>12</td>
<td>1 Gender</td>
<td>1.46</td>
<td>24, 178</td>
</tr>
<tr>
<td>13</td>
<td>4 Time Since Last Worshipped</td>
<td>1.35</td>
<td>26, 176</td>
</tr>
</tbody>
</table>

occupation, gender, education level, and time since last worshipped. In contrast to the contingency tables which used the same outcome categories, the cognitive measures used in these analyses (with the exception of PCIT x BRFT(2) and BRFT(2) x IE(2)) were assessed during the first two weeks of hospitalization.

Section Three: Canonical Correlations.

The analyses conducted in the second major results section strongly suggest that a number of sociodemographic, drinking-related, and cognitive variables influence the
drinking behaviour of patients after they leave treatment. However, these analyses do not indicate where, during the chain of events that intervene between the time of entry to treatment to the time at which followup contact is established, the effects of these variables are exerted. A start to untangle this complicated causal web is made by sequentially considering blocks of independent and dependent variables with reference to the systems model formulated previously. Because the concern lies with multivariate sets of dependent and independent variables, canonical correlations were used. This statistical procedure produces a linear combination from each of the sets of variables in such a way that the correlation between the two linear combinations of independent and dependent variables is maximized. Further canonical correlations are similarly and successively derived from the residual variance, thereby producing linear combinations of variables orthogonal with one another. The number of canonical correlations from each analysis corresponds to the smallest number of variables included in either the dependent or independent variable sets. The coefficients or 'loadings' mirror the importance of the original values in the subset forming the variates (Van de Geer, 1971).

A series of six canonical analyses was run. The variables included in these analyses are listed in Table 23.

The first analysis addressed the relationship between
Table 23

Blocks of Variables Employed in the Canonical Correlation Analyses

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Independent Variables</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age</td>
<td>9 PCIT</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>10 BRFT(1)</td>
</tr>
<tr>
<td>Sociodemographic and Drinking-Related Predictors of Cognitive State.</td>
<td>Education Level</td>
<td>11 IE(1)</td>
</tr>
<tr>
<td></td>
<td>Highest Occupation</td>
<td>12 DRLC(1)</td>
</tr>
<tr>
<td></td>
<td>Years of Problem Drinking</td>
<td>13 TRI - Temporal Orientation(1)</td>
</tr>
<tr>
<td></td>
<td>Amount Consumed on a Typical Drinking Day</td>
<td>14 Future Events(1)</td>
</tr>
<tr>
<td></td>
<td>Drinking Behaviour (from BIF)</td>
<td>15 Religiosity - Factor 1(1)</td>
</tr>
<tr>
<td></td>
<td>Time Since Last Drink (in days)</td>
<td>16 Religiosity - Factor 1 (change)</td>
</tr>
</tbody>
</table>

| 2.       | Age                   | 9 PCIT x BRFT(2)    |
| Sociodemographic and Drinking-Related Predictors of Change in Cognitive State. | Gender | 10 BRFT(2) x IE(2) |
|          | Education Level       | 11 BRFT (change)    |
|          | Highest Occupation    | 12 IE (change)      |
|          | Years of Problem Drinking | 13 DRLC (change)   |
|          | Amount Consumed on a Typical Drinking Day | 14 TRI - Temporal Orientation (change) |
|          | Drinking Behaviour    | 15 Future Events (change) |
|          | Time Since Last Drink (in days) | 16 Religiosity - Factor 1 (change) |

| 3.       | BRFT(1)               | 7 BRFT (change)     |
| Cognitive Predictors of Change in Cognitive State. | IE(1) | 8 IE (change) |
|          | DRLC(1)               | 9 DRLC (change)     |
|          | TRI - Temporal Orientation(1) | 10 TRI - Temporal Orientation (change) |
|          | Future Events(1)      | 11 Future Events (change) |
|          | Religiosity - Factor 1(1) | 12 Religiosity - Factor 1 (change) |
Table 23 Ctd.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Independent Variables</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>1. PCIT</td>
<td>8. AA Attendance</td>
</tr>
<tr>
<td></td>
<td>2. BRFT(1)</td>
<td>9. Attendance of</td>
</tr>
<tr>
<td></td>
<td>3. IE(1)</td>
<td>Religious Services</td>
</tr>
<tr>
<td></td>
<td>4. DRLC(1)</td>
<td>10. Antabuse (Yes/</td>
</tr>
<tr>
<td></td>
<td>5. TRI - Temporal</td>
<td>No)</td>
</tr>
<tr>
<td></td>
<td>Orientation(1)</td>
<td>11. Insight Rating</td>
</tr>
<tr>
<td></td>
<td>6. Future Events(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>7. Religiosity -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factor 1(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>1. PCIT × BRFT(2)</td>
<td>9. AA Attendance</td>
</tr>
<tr>
<td></td>
<td>2. BRFT(2) × IE(2)</td>
<td>10. Attendance of</td>
</tr>
<tr>
<td></td>
<td>3. BRFT (change)</td>
<td>Religious Services</td>
</tr>
<tr>
<td></td>
<td>4. IE (change)</td>
<td>11. Antabuse (Yes/</td>
</tr>
<tr>
<td></td>
<td>5. DRLC (change)</td>
<td>No)</td>
</tr>
<tr>
<td></td>
<td>6. TRI - Temporal</td>
<td>12. Insight Rating</td>
</tr>
<tr>
<td></td>
<td>Orientation (change)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>7. Future Events</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(change)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Religiosity -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factor 1 (change)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>1. AA Attendance</td>
<td>5. Time to First</td>
</tr>
<tr>
<td></td>
<td>2. Attendance of</td>
<td>Drink</td>
</tr>
<tr>
<td></td>
<td>Religious Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Antabuse (Yes/No)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Insight Rating(2)</td>
<td></td>
</tr>
</tbody>
</table>

Relationship of the Canonical Correlation Analyses to the Path Diagram (see page 220):

Analysis    Path Diagram Referents
1. Selected independent variables from Boxes 4 and 5 in relation to selected variables in Box 1 (i.e., P41, P51; Note that Box 6 is not assessed directly but inferred from measures taken in Box 1).
2. As for Analysis 1 except that the variables sampled in Box 1 include interaction terms and change across time on measures taken both near the start and near the end of treatment.
3. This analysis is confined to measures taken within Box 1. Other parts of the model are not considered.
Table 23 Ctd.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Path Diagram Referents</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Selected variables in Box 1 related to selected dependent variables in Box 2. Because the cognitive measures are taken at the start of treatment (Box 1) and the treatment participation variables (Box 2) at the end of treatment, the causal path is assumed to be P12 rather than P21.</td>
</tr>
<tr>
<td>5.</td>
<td>As for Analysis 4 except that the time lag between the two sets of variables is less. Thus, although the major direction of causal flow is expected to be P12, P21 could also be operational.</td>
</tr>
<tr>
<td>6.</td>
<td>This analysis is confined to the relationship between a block of treatment participation variables (Box 2) and a measure of treatment outcome (Box 3) via P23.</td>
</tr>
</tbody>
</table>
a set of sociodemographic and drinking-related background variables and a set reflecting cognitive state (with the exception of PCIT) during the first two weeks of therapy. The 15 variables included in this analysis were carefully chosen with reference to the factor analyses and the analyses relating cognitive functioning to treatment outcome. As a consequence, they represent in a fairly comprehensive manner the major cognitive and background dimensions tapped by the measurements taken in this study. The purpose of this analysis was to attempt to identify the major antecedent correlates of cognitive performance during the early phase of treatment.

The results of the canonical correlation analyses are given in Appendix 16, A to F. The results of the first analysis are located at 16A. They show that a moderate percentage of the total variance is accounted for by the correlation between the first pair of variates ($R = .60$, $R^2 = .37$, $p < .001$). The relative sizes of the coefficients indicate that the strongest independent-dependent variable linkages are between age - temporal orientation and age - PCIT. I.e., as predicted, increased age is associated with a less future-oriented temporal orientation and worse PCIT performance. These associations were also brought out above in the first factor analysis.

The next three canonical correlations in the analysis recorded in Appendix 16A take up 27, 12, and 11 percent of the remaining variance respectively. The dominant but not
exclusive causal paths between variables in each of these variate pairs are as follows:

Canonical Correlation 2

(7) Drinking Behaviour \rightarrow (12) DRLC(1) \rightarrow (14) Future Events(1)

In other words, the more severe the pattern of problem drinking during the month before admission, the less control subjects consider that they have over their drinking behaviour (external on DRLC) and the less future-oriented they are on the FET.

Canonical Correlation 3

(3) Education Level \rightarrow (15) Religiosity - Factor 1(1) \rightarrow (10) BAFT(1)

These linkages suggest that higher levels of formal education are associated with less commitment to religious dogma and better performance on the BAFT.

Canonical Correlation 4

(4) Highest Occupation \rightarrow (11) IE(1)

I.e., externality is inversely related to highest occupation attained.

Although only accounting for four percent of the total variance between the variate pairs, the fifth canonical correlation is of theoretical interest in that it suggest the following causal paths:

(5) Years of Problem Drinking \rightarrow (9) PCIT
(8) Time Since Last Drink

This pattern supports the construct validity of the
PCIT by showing an association between chronic alcohol consumption and cognitive dysfunction. It also suggests that at least one parameter of recent drinking behaviour can influence PCIT performance, albeit weakly.

The second canonical correlation analysis was run to establish whether changes in cognitive state from the first to the second test occasion could be predicted from the same set of background variables that was employed in the first analysis. Although not change measures, the cross-product terms PCIT x BAFT(2) and BAFT(2) x IE(2) were also included in the set of dependent variables. These terms have prognostic relevance. They were assessed at the same time as the second testing of the other cognitive measures and are included here because information regarding their antecedent correlates was sought. The results of this analysis are given in Appendix 16B.

The first canonical correlation of the second analysis had an $R$ of $0.53$ ($R^2 = 0.28, p < 0.05$). This

1. A technical point needs to be raised here. It has been shown that after the first K variates are removed, the method built into the program used here (BMD - O7M) for the derivation of subsequent approximations of the $X^2$ is invalid (Harris, 1975). Consequently, only the $X^2$ on the first canonical correlation can be legitimately tested for significance (Harris, 1975). A consideration of the size of the eigenvalues ($= R^2$) however, gives an indication of the strength of the association between variate pairs. Apart from the case ctd.
correlation primarily reflects a relationship between age and PCIT x BRFT(2), indicating that the older the subject, the more impairment there tends to be in performance as measured by the cross-product formed from the two cognitive 'process' measures.

The next five canonical correlations accounted for the following percentages of total variance: 15, 13, 10, 9, and 2. The two remaining correlations were miniscule. The dominant causal paths, defined by linkages between variables with coefficients greater than ± 0.5 on the first six pairs of variates, are given in Figure 4. Figure 4A identifies the paths that impinge on the interaction terms. Figure 4B gives the dominant paths linking background variables to cognitive changes.

Not surprisingly, given the antecedent correlates of their component scores, the cross-product terms appear to be influenced by a mixture of sociodemographic and drinking-related variables.

The results displayed in Figure 4B suggest that degree of change on IE is influenced by education level. As with initial temporal orientation performance, capacity for change on this measure also appears to be compromised

1 Ctd.

of the first canonical correlation in each analysis, the linkages suggested between independent and dependent variables are given for their theoretical interest and for the possibilities they raise for further research, rather than because of their demonstrated statistical significance.
**Figure 4**: Canonical Correlation 2: dominant causal paths.

### A. Dominant causal paths impinging on the cross-product terms.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Path</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
<td>CC1 PCIT x BRFT(2)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>CC5</td>
</tr>
<tr>
<td>Education Level</td>
<td>3</td>
<td>CC4 BRFT(2) x IE(2)</td>
</tr>
<tr>
<td>Highest Occupation</td>
<td>4</td>
<td>CC4 CC6</td>
</tr>
<tr>
<td>Years of Problem Drinking</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### B. Dominant causal paths relating to change in cognitive state.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Path</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
<td>11 BRFT (change)</td>
</tr>
<tr>
<td>Gender</td>
<td>2</td>
<td>12 IE (change)</td>
</tr>
<tr>
<td>Education Level</td>
<td>3</td>
<td>13 DRLC (change)</td>
</tr>
<tr>
<td>Highest Occupation</td>
<td>4</td>
<td>14 TRI - Temporal Orientation (change)</td>
</tr>
<tr>
<td>Years of Problem Drinking</td>
<td>5</td>
<td>15 Future Events (change)</td>
</tr>
<tr>
<td>Amount Consumed on a T.D.D.</td>
<td>6</td>
<td>16 Religiosity - Factor 1 (change)</td>
</tr>
<tr>
<td>Drinking Behaviour (from BIF)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Time Since Last Drink (in days)</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

*Note. CC = Canonical Correlation*
by years of problem drinking prior to hospitalization. DRlC change, like initial DRlC performance, is influenced by the preceding pattern of drinking behaviour. Gender also seems to play a part in determining the amount of change that occurs on DRlC. Strong antecedent correlates for BRfT (change), Future Events (change), and Religiosity (change) are not identified within the set of predictor measures employed in this analysis.

The third canonical correlation analysis was conducted to attempt to establish to what extent change on the cognitive measures could be predicted from initial performance on the same measures. This analysis is summarized in Appendix 16C. Unlike the earlier analyses, all of the canonical correlations in the present instance accounted for appreciable, although variable, amounts of variance.

The largest canonical correlation explains 70 percent of the variance shared by the first two linear combinations of independent and dependent variables ($R = .84, p < .001$). Almost all of this variance is a reflection of the strong relationship between DRlC (total) at the start of treatment and change on this same measure (first-order correlation = -.80). This indicates that the more external subjects are initially, the more they change (in the internal direction) over the course of therapy. It is of interest that DRlC and IE are independent of each other in this analysis as well as in the factor analyses of both the stationary locus of
control measures and the change scores. Although related conceptually, psychometrically they evidence considerable autonomy in their performance vis-à-vis one another. DRLC also shows considerable autonomy from the other measures included in the present analysis. I.e., initial DRLC scores strongly predict DRLC changes and show a lack of association with changes on the other measures.

To a lesser degree, the pattern of initial scores on a given measure predicting change on that measure rather than predicting change on other indices, holds for all of the tests included in this analysis. The second canonical correlation, for example ($R = .70, R^2 = .49$), defines causal links between Future Events(1) and Future Events (change) and BRFT(1) and BRFT (change). The first-order correlations between the tests within these two pairs are both -.59. The third canonical correlation suggests that predictive relationships hold between: BRFT(1) - BRFT (change) (as in the second correlation), TRI Temporal Orientation(1) - TRI Temporal Orientation (change), and Future Events(1) - Future Events (change). The first-order correlations for these pairs are .59, .46, and .59 respectively. The fourth canonical correlation reiterates the relationship between Future Events(1) - Future Events (change). The final correlations establish similar relationships between IE(1) - IE (change) and Religiosity (1) - Religiosity (change). The respective first-order correlations are -.32 and -.25.
The fourth and fifth canonical correlations relate each of the two blocks of cognitive indices employed in the previous analyses to therapy participation as measured by a composite of four indices (see Table 23). The results of the first of these two analyses are given in Appendix 16D and the results of the second in Appendix 16E.

From Appendix 16D, it is apparent that the first canonical correlation of the fourth analysis accounts for only a moderate amount of the total variance \( R = .45, R^2 = .21 \) and fails to reach conventional significance levels. The remaining correlations are weaker. Although weak, the dominant causal paths suggested for each canonical correlation are given in Figure 5.

**Figure 5:** Canonical Correlation 4: dominant causal paths.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Path</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIT</td>
<td>1</td>
<td>CC2</td>
</tr>
<tr>
<td>BRFT(1)</td>
<td>2</td>
<td>CC2</td>
</tr>
<tr>
<td>IE(1)</td>
<td>3</td>
<td>CC2, CC1</td>
</tr>
<tr>
<td>DRLC(1)</td>
<td>4</td>
<td>CC2</td>
</tr>
<tr>
<td>TRI - Temporal</td>
<td>5</td>
<td>CC4</td>
</tr>
<tr>
<td>Orientation(1)</td>
<td></td>
<td>CC3</td>
</tr>
<tr>
<td>Future Events</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Religiosity Factor 1(1)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>AA Attendance</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Attendance of Religious Services</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Antabuse (Yes/No)</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Insight Rating(2)</td>
</tr>
</tbody>
</table>

Note. CC = Canonical Correlation.
As predicted, higher expressed acceptance of religious dogma was associated with increased frequency of voluntary attendance of religious services during the hospitalization period (path 7 - 9; first-order correlation = .28, p<.05). Contrary to prediction, religiosity, as indexed by the first factor of the religiosity questionnaire, failed to predict both voluntary attendance of AA during treatment and insight ratings at the end of treatment. AA attendance was however influenced by locus of control (IE(1)) and TRI temporal orientation (first-order correlations -.15 and .14 respectively). These relationships are of course very weak.

A more extended time perspective as measured by the Future Events test at the start of treatment appears to show a slight effect on the decision to take antabuse (path 6 - 10; first-order correlation = -.16). Insight ratings were influenced by both of the locus of control measures. Internality on the DRLC scale predicted higher insight levels (r = .29, p<.05) as did IE internality (r = .15, NS).

From the results of the canonical correlations and a consideration of the first-order correlations pertaining to the causal paths defined by the multivariate analysis, it is evident that the major cognitive indices included in this study had only a slight influence on measures of treatment participation. The modest effects identified applied only to the cognitive 'content'
variables. The cognitive 'process' measures were conspicuous by their inability to predict treatment participation.

As with the fourth canonical correlation analysis, the first canonical correlation of the fifth analysis also failed to reach conventional significance levels. The three remaining canonical correlations from this analysis also accounted for meagre amounts of variance. This indicates that both the cross-product terms and the cognitive change scores had very little effect upon the four measures of treatment participation.

The sixth canonical correlation analysis was conducted to assess the effects of the four measures of treatment participation upon treatment outcome. Only one dependent variable (time to first drink) was employed in this analysis. The resulting multiple correlation coefficient was .53 ($R^2 = .28, p < .001$). The coefficients of the four independent variables (see Appendix 16F) indicate that the dominant predictor of drinking outcome was frequency of attendance at voluntary AA meetings during treatment.

Because the number of variables involved in the fifth analysis was small, the relationships between measures of treatment participation and outcome, as well as between the measures of treatment participation per se, can also be meaningfully assessed by inspection of their first-order intercorrelations (Table 24).
Table 24

Intercorrelations Between the Measures Used in the Fifth Canonical Correlation with their Means and Standard Deviations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AA Attendance</td>
<td>3.0</td>
<td>1.5</td>
<td>.43*</td>
<td>-.35*</td>
<td>-.35*</td>
<td>.51*</td>
</tr>
<tr>
<td>2 Attendance of Religious Services</td>
<td>2.8</td>
<td>1.7</td>
<td>-.05</td>
<td>-.45*</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>3 Antabuse (Yes/No)</td>
<td>1.4</td>
<td>0.5</td>
<td>.11</td>
<td>-.31*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Insight Rating</td>
<td>2.2</td>
<td>1.1</td>
<td>-.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Time to First Drink</td>
<td>20.0</td>
<td>20.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .01
* * p < .001

N = 77

The results given in Table 24 reiterate the importance of attendance of voluntary AA, relative to the other treatment participation measures, as a predictor of treatment outcome. The moderate correlations between AA attendance and the other three independent variables, coupled with the slight correlation of each of these variables (in the predicted direction) with the outcome measure, suggests that a part of the apparent influence of AA attendance upon outcome is mediated via the effects of the other variables.

Three of the independent variables (1, 2, and 4) show intercorrelations of ± .35, indicating that they possess a moderate amount of common variance. In other
words, subjects who attend AA frequently while in hospital also tend to engage in worship more often and are more likely to be considered by staff to possess higher levels of insight. Whether or not patients take antabuse, the remaining treatment participation measure, has the second highest coefficient on the canonical correlation. Consistent with this, it is the only other treatment participation measure to show a statistically significant predictive relationship to treatment outcome ($r = -.31, p < .05$). Although it shares some variance with AA attendance ($r = -.35$), this measure is largely orthogonal to the other treatment participation indices. To determine whether it has the capacity to predict treatment participation on its own, the effects of AA attendance were partialled out, giving a correlation of $r_{35.1} = -.16$. Thus, although the taking of antabuse has an independent effect upon the time taken to relapse following discharge, this effect is minor and nonsignificant.
"In heading this section 'Context-Dependent Stochastologicals', I mean to emphasize the aspect of this problem that seems to me most frustrating to our theoretical interests, namely, that the statistical dependencies we observe are always somewhat, and often strongly, dependent on the institution-cum-population setting in which the measurements were obtained."

Paul E. Meehl (1978)
CHAPTER SEVEN
DISCUSSION OF THE RESULTS

Cognitive Dysfunction.

As predicted (hypothesis 1, p 239), male alcoholics were more impaired cognitively (as measured by the PCIT, and BRFT on the first test occasion) than nonalcoholic control subjects assessed previously with these tests. On the second testing however, following six weeks of enforced abstinence, mean BRFT performance was closer to that observed among nonalcoholics. It is not known whether this shift was due to improvement associated with abstinence or other events, or whether it was simply a consequence of practice effects. A lack of suitable normative data for females precluded similar comparisons for this group.

In comparison with the males, female alcoholics were significantly more impaired on the first administration of the BRFT but not on the second. Gender differences on this test were not unexpected given the visuo-spatial nature of the task demands, an area where gender difference among nonalcoholics have been demonstrated previously (e.g. Guilford, 1967). Although the difference was nonsignificant on the second test occasion, it was still in the same direction.

The statistical alienation evident between PCIT and BRFT suggests that they tap different cognitive
functions. The results of the multivariate analyses also suggest that they have different antecedent correlates. The first factor analysis and canonical correlation analysis both yield results indicating that poor PCIT performance is associated with increased chronological age and years of problem drinking. This finding provides corroboration for hypothesis 2 (p. 239) and suggests that aging and long-term exposure to excessive alcohol intake independently contribute to impaired performance on this test battery. It should not be inferred however that because they both appear to be antecedent to overall performance deficits, this means that they mediate performance deficits in an identical manner. A more fine-grained analysis of the relationship of these two variables to the component scores of the PCIT could be expected to shed further light on this matter.

The first canonical correlation analysis suggests that the strongest antecedent correlate of BRFT was education level. This association was very weak however (first-order r = -.13). In contrast to the situation with PCIT, alcohol-related measures and age showed only minor correlation with BRFT. Failure to identify strong predictors of BRFT performance raises the question of the etiology of impairment on this measure among alcoholics. As appears to be the case with RFT field dependence, is it possible that some deterioration precedes the onset of alcoholic drinking?
The most important aspect of the present investigation was the replication of the Gregson and Taylor finding that cognitive dysfunction is an important predictor of post-hospitalization drinking outcome among chronic alcoholics. Although PCIT per se did not emerge as such a strong predictor in the present study, its capacity to predict outcome was evident from the contingency table analysis of the three month outcome data where 48 percent of subjects in the low PCIT category had relapsed relative to 20 and 26 percent in the high and medium categories respectively. PCIT also emerged as a significant predictor of drinking outcome at twelve months in the second stepwise regression analysis. In this instance it accounted for three percent of the outcome variance.

The reduction in the predictive power of PCIT may in part be explained by the finding that there were fewer alcoholics in the most impaired category than in the earlier study. It is in this score range that PCIT performance appears to be most important in influencing relapse processes (see Table 10). Consequently, a reduction in the size of this group might be expected to influence the relative importance of cognitive dysfunction in relation to treatment outcome. Related to this is the overall reduction in PCIT variance in the present study. If the variance of a predictor variable is diminished, then necessarily its covariance with dependent variables must be diminished,
unless the total regression structure is changed.

The decline in numbers of more impaired patients may be due to the trend towards earlier diagnosis and treatment today than four years ago when the previous study was conducted. There has also been a change in admission policy with the effect that multiple recidivists are less likely to be accepted into the main treatment programme. Whatever the reason, the view that the present population is less advanced in the alcoholic deterioration process is lent some support by the finding that the mean number of previous admissions for alcoholism was 2.9 in the earlier Gregson and Taylor study, compared with 0.6 in the present investigation.

With respect to the regression analyses, another reason why PCIT shows a weaker relationship with relapse, lies in the inclusion of BRFT in the present study. Although BRFT per se did not relate significantly to outcome in the regression analyses, it did have an important influence by interacting with other measures, one of which was PCIT. Indeed, the statistical significance attached to the PCIT x BRFT(2) - outcome relationship was higher than that associated with PCIT alone - in all analyses which included the two terms. In the second regression analysis, PCIT x BRFT(2) was the dominant predictor of outcome, accounting for six percent of the total outcome variance. Because PCIT
and PCIT x BRFT(2) share a moderate amount of common variance (31 percent), the entry of the cross-product term into the regression analysis before PCIT removed this shared variance from PCIT, thus deflating its overall variance contribution. This could happen with any pair of correlated predictors; the extant literature is not sufficiently detailed for us to know when this type of obfuscation has occurred undetected in the work of other investigators.

In both the contingency table and regression analyses, BRFT on its own failed to predict drinking outcome at a statistically significant level. However, in the second regression analysis, BRFT(2) did show borderline significance and accounted for three percent of the dependent variable variance. In addition, in the stepwise discriminant function analyses, BRFT(1) was the second best discriminator between the three drinking outcome categories at both three and 12 months. In these analyses, PCIT x BRFT(2) was relatively less useful as a discriminator, particularly at 12 months, than it was as a predictor of outcome as defined in the contingency tables and regression analyses. BRFT also exerted an influence on outcome by interacting with measures of locus of control.

Although there are limitations to making inferences about the relative contributions of intercorrelated subject characteristics from regression analyses, the emergence of the two cognitive process measures within
the small group of significant predictors in both regression analyses, corroborates the view that these are important trait dimensions that play a significant role in mediating relapse. Their importance is further underlined by a consideration of the results of a recent project by Cronkite and Moos (1978). This study related four outcome measures to a very wide range of predictor variables. In addition to the social background and intake symptoms included in the present study, they also included measures of programme participation, treatment experiences, and patient perceptions of the treatment environment. From multiple linear regression analyses, they managed to account for between 18 to 27 percent of the outcome variance. As the authors pointed out, this was a larger proportion of overall variance than that accounted for in most similar studies. In contrast to this, the present study, which employed a less comprehensive range of predictors but included a variety of cognitive measures, accounted for 38 percent of the overall variance in treatment outcome in both regression analyses. Although studies have used different dependent variables, making comparison difficult, it would seem that their failure to build stronger predictive models of outcome has in part stemmed from a failure to include measures of cognitive dysfunction, cognitive 'content', and to consider non-linear combinations of such variables.

One question which remains is why the inconsistency in results of studies relating cognitive functioning to
treatment outcome? The finding of the present study that the relationship between cognitive dysfunction and outcome held when different outcome measures were used, different follow-up times sampled, and different statistical procedures followed, suggests that these factors may not be very important in accounting for the differences between the studies. A more likely reason for the discrepancy lies in the nature of the tests used.

The two studies at Queen Mary Hospital have included PCIT. This test battery was designed specifically to detect the subtle types of cognitive dysfunction that characterize a large percentage of chronic alcoholics. The overall score is a composite of separate indices weighted on the basis of a discriminant function analysis that showed maximal discrimination between alcoholics and normals. Because cognitive deficits among alcoholics are both selective in nature and predominantly lie between those of normals and more clearly brain-damaged groups (see Chapter Two), it could be expected that tests developed to discriminate between normals and brain-damaged patients may not be sufficiently sensitive to the intermediate patterns of dysfunction found among alcoholics. This view is indirectly supported by the only other study that has found a cognitive dysfunction - outcome relationship (Berglund et al, 1977). These workers failed to find a relation between any of the individual 'organic' tests used and subsequent outcome. A relationship only emerged from a composite index
derived from all of the tests in the battery. In addition, all three of these studies administered tests after at least three weeks following detoxification. Thus, cognitive performance was more likely to be relatively stable and to exert an influence on behaviour after the patients left treatment.

Cognitive Content Measures.

A novel feature of the research conducted in this thesis is the inclusion of a variety of cognitive 'content' measures, tapping an area of psychological functioning that has been little investigated previously in alcoholic populations.

A factor analysis indicated that each of the cognitive tests (namely the IE Scale, the DRLC Scale, the TRI, the FET, and the Religiosity Questionnaire) were relatively independent of one another.

The mean scores for the two locus of control measures, the IE Scale and the DRLC Scale, were of a similar magnitude to those obtained in recent studies of alcoholic populations in the USA (see Rohsenow & O'Leary, 1978; Note 5). There was no support for the hypothesis of higher scores (i.e. increased externality) among female alcoholics relative to males. As found in some other studies (see Chapter Four), significant shifts in the internal direction on the IE Scale over the course of treatment were observed. This phenomenon
has been noted in other patient groups undergoing therapy and is generally attributed to an increase in the control individuals perceive that they have over their life situations. Such changes have also been linked to decreases in overt psychopathology (Brannigan, 1977). There was no evidence to support O'Leary et al's (1976) finding that alcoholics who were initially more internal became more internal whereas external subjects remained the same. Indeed, to the contrary, it was shown in one of the canonical correlation analyses that the more external patients were initially, the greater their shift (in the internal direction) over the course of therapy. This finding applied to both the IE and the DRLC scales. One suspects that this may, in part, have been a consequence of ceiling effects - i.e. externals, with their higher scores, had more room to move.

The present study appears to be the first to demonstrate that DRLC scores become more internal over a course of inpatient treatment. These changes were of massive proportion and can probably be interpreted at face value. In other words, the majority of patients over the course of therapy, came to believe that they were able to cope in the types of drinking-related situations described in this questionnaire.

One implication of the findings described above is that in evaluating the performance of alcoholics on
measures of locus of control, especially where comparisons are sought between alcoholic groups or between alcoholics and other populations, a careful note needs to be made of the time after admission that the tests were administered. Much of the confusion in this area has probably arisen from a failure to do this.

The data summarized in this thesis do not support the view that alcoholics as a group tend to be more external than nonalcoholics. The findings, in fact, point in the opposite direction. Not too much can be made of this however as it is not clear how well matched the alcoholic and nonalcoholic groups were on relevant dimensions. Perhaps it should be noted however that in the author's opinion, this type of exercise is somewhat futile. Does it really matter that this or that alcoholic sample is, on average, slightly (albeit 'significantly') more internal or external than this group or that? Even if there are moderate mean differences in some instances, their score distributions are likely to show considerable overlap. Surely the more relevant question is what are the implications for therapy or treatment outcome of a given score or score range.

It was hypothesized (hypothesis 4, p. 239) that severity of chronic alcohol consumption patterns and increased age would predict externality on both of the locus of control measures. Some corroboration
was obtained for this hypothesis in the case of DRLC. The first canonical correlation indicated a link between severity of the pattern of problem drinking in the month prior to admission and externality on the DRLC Scale. The first-order correlation here was $r = .31$, $p < .01$. This, coupled with the failure of DRLC to link with age or measures of long-term alcohol abuse, suggests that unlike PCIT, the belief that one has little control over alcohol and alcohol-related phenomena is more closely linked to recent drinking behaviour. Consequently, this cognitive state should be more ephemeral - an interpretation borne out by the lability noted on this measure over the course of therapy.

IE performance was not associated with any of the antecedent measures of drinking behaviour, either acute or chronic. Neither was it associated with age. Of the set of predictors, only one, highest level of occupation attained, bore a significant relationship to performance on this measure ($r = .26$, $p < .01$). Thus, it would seem occupational status has some influence upon the amount of control individuals consider that they have over their environments generally. Drinking-related experiences do not appear to have such a general effect on control expectancies although, as indicated, they seem to have some effect on expectancies of control related to alcohol.
The results of the factor analysis suggest that in the population studied, the two tests of time perspective were measuring different aspects of this cognitive domain. Performance on both measures appears to be consistent with earlier work (see Chapter Four) indicating that alcoholics have truncated future time perspectives relative to nonalcoholic groups. This was particularly evident near the end of the treatment period where, contrary to prediction (hypothesis 6, p. 240), alcoholics evidenced even less extended future time perspectives than during the first two weeks of treatment. At this second testing, males had a mean future extension score (TRI) of 4.5 years and females a mean score of 3.0 years. These scores compare with Roos and Albers' (1965) median scores of 3.5 for a mixed group of alcoholics on the same measure. In their study, a matched group of social drinkers obtained a median score of 9.1.

Why there was a tendency (of borderline significance) for the alcoholics in the present sample to become less future extended over the course of therapy is uncertain. It might be that the emphasis put on the AA concept of "living one day at a time" over the latter part of the programme reinforced the already existing tendency toward a predominantly present-oriented time perspective. It is not known whether similar shifts occur in other alcoholic populations in treatment. Indeed, the two studies reviewed in Chapter Four omitted to mention how long after admission the testing was
conducted.

As predicted, older alcoholics tended to have more past-oriented temporal orientation scores on the TRI ($r = -.36, p < .001$). Using a different method of assessing time perspective, Smart (1968) found a similar relationship between age and future extension in a group of alcoholics ($r = -.43, p < .001$). He failed to obtain this association in a group of matched social drinkers. Smart considered that this relationship arose in the alcoholic group because age reflected the number of years that they had been drinking. He postulated that amongst alcoholics, as their drinking gets increasingly out of control and unpleasant personal and social consequences associated with alcoholic drinking accumulate, they anticipate such a bleak future that they tend to refrain for extending it, focussing more on the past and the present.

In the present study however, years of problem drinking (self assessed) did not in itself predict TRI temporal orientation. Further, in the case of the FET, neither age or chronic drinking behaviour showed a significant relationship with future extension. The strongest antecedent correlate of performance on this test was severity of drinking pattern in the month prior to admission. Even this association was weak however ($r = -.15$). Thus, little light has been shed on the possible origins of the severely truncated future time perspectives of many of the alcoholics in the present study other than that the experience of hospitalization per se appears to accentuate this tendency on both of
the tests of time perspective used. Age does
play a part on one test but, inconsistent with
Wallace's suggestion, it does not appear to mediate
its effects through years of problem drinking.

Alcoholics in the present study expressed
religious attitudes that placed them, as a group, near
to the position occupied by a sample of regular
church-going Anglican Parishoners assessed seven years
previously. Why this group of alcoholics should
possess this degree of commitment to religious dogma
is uncertain, particularly when it is realized that
the majority were not regular church-goers. This is
an area that requires further investigation. One
possibility is that those patients who dropped out
of treatment prematurely, and who were not included in
the present sample, might have showed substantially
less commitment. Indeed, if the strongly AA-oriented
programme was perceived by non-believers as having
a Christian emphasis, this form of attrition would be
expected.

Over the course of therapy, significant change on
one of the dimensions of the religiosity questionnaire
and near-significant change on the other, placed the
group in a position intermediate between Anglican
parishoners and Pentecostals. Because of the nature
of the treatment programme, shifts towards increased
religiosity were anticipated (hypothesis 6, p.240).
The comparisons between alcoholics and other groups and consideration of changes on the different measures over the course of therapy are of some interest, however, they do not represent the major concern of this investigation. Further, a lack of suitable nonalcoholic groups for comparison and the failure to incorporate controls for practice effects in the research design, weaken any conclusions that can be drawn in these respects. The more important question that is addressed is the extent to which performance and change on these cognitive measures predict subsequent treatment outcome (i.e. Path 13, Figure 1, page 220).

It is evident from the two regression analyses that although they are generally weaker predictors of drinking outcome than PCIT and BRFT (particularly in the form of the cross product term PCIT x BRFT(2)), measures of the cognitive content type do figure among the dominant predictors. Indeed, in the first regression analyses, considered together, three of these measures account for 10 percent of the outcome variance. One of these measures is a cross product term which includes a cognitive process indice (BRFT(2) x IE(2)). Although investigation of the interaction of cognitive process and content measures in relation to outcome was confined to BRFT(2), IE(2), and DRLC(2), the results of these analyses are of interest and suggest that there might be value in considering non-linear relationships between other psychological indices when attempts are made to build predictive models of
treatment participation and outcome.

In all of the analyses in which it was included, generalized (IE) locus of control was found to be of little prognostic value. This generalization holds when this measure is considered in relation to a variety of measures of drinking outcome at various times after discharge and when the IE scale is administered at the start of treatment, the end of treatment, and when change scores from the first to the second test occasion are addressed. The only exception, as indicated above, was when IE(2) and BRFT(2) were considered together in relation to outcome. Thus, in the first regression analysis, BRFT(2) x IE(2) was one of the six measures significant at the .05 level. This term did not however emerge as a dominant predictor or discriminator when it was employed in the second regression analysis and in the stepwise discriminant function analyses.

When IE scores were trichotomized in the contingency tables to address hypotheses 9 and 10 (p. 241), it was found that neither of the hypotheses were corroborated. I.e., locus of control per se showed only minor and nonsignificant relationship to three-way drinking outcome. However, as with the first regression analysis, when cognitive dysfunction as measured by BRFT(2) was taken into account, some significant results emerged. Some support was found for hypothesis 10 - namely, that both extreme externality and internality
carry a worse prognosis. However, this was only the case with the less cognitively dysfunctional subjects when outcome at 12 months was considered. Interestingly, at both three and 12 months, this relationship was reversed in the dysfunctional group. I.e., the worst prognosis in these instances went to the intermediate IE group. This pattern of results is complicated and because existing knowledge is limited with regard to the meaning of different scores on these two psychological measures with alcoholics, no attempt at post hoc explanation will be advanced here. These findings have been reported simply to make the point that although locus of control per se has limited prognostic relevance, this does not mean that performance on this type of task is irrelevant to an understanding of treatment and relapse phenomena. They suggest further that a consideration of the interaction of IE with other measures such as neuropsychological indices might prove more fruitful than looking at main effects of locus of control on outcome. These results also support the value of considering the entire score range rather than limiting consideration to a median split or to extreme groups.

As predicted (hypothesis 11, p.241), drinking related locus of control fared better as a predictor of drinking outcome than did generalized locus of control. In addition, the results of the three-way contingency table analyses provided some corroboration
for the hypothesis (hypothesis 9, p. 241) that increased internality would be associated with more successful outcome. This association was strongest in the low BRFT(2) group at the 12 month followup. These results indicate that there is a tendency (of borderline significance) for internal or intermediate scorers on the DRLC Scale (score of 0 - 2) near the end of the treatment period, to have a better prognosis than external scorers. This relationship is greatly enhanced however, if they are also 'intact' cognitively (as measured by BRFT(2)).

The above findings are interesting because they suggest that in the case of the more neuropsychologically intact subjects, self-evaluations of the amount of control that they consider that they will have over their drinking behaviour and over drinking-related intra- and interpersonal environmental hazards, appear to be borne out in their subsequent post-hospitalization behaviour. Self evaluations in this area by cognitively dysfunctional subjects, on the other hand, are less likely to be translated into reality. In neither group is there support for the view (see hypothesis 10, p. 241) that extreme internals on this measure are more prone to relapse than other subjects because they are making an unrealistic appraisal of their situation.

DRLC change scores were the only measures from
this test to be included in the regression analyses. In the second of these analyses, this measure emerged as a predictor of borderline significance, accounting for two percent of the outcome variance. DRLC scores from the first two weeks of treatment were included in only one set of analyses, the discriminant function analyses. Here, DRLC(1) was found to be the strongest discriminator between the three outcome groups at 12 months. The mean scores of the groups were 6.3, 9.1, and 6.0 for the abstainers, relapsed drinkers, and controlled drinkers respectively. The capacity of DRLC(1) to discriminate between these groups at three months after discharge was weaker, the group means being (in the same order as above) 7.1, 8.6, and 6.4.

In conclusion, the DRLC scale appears to have potential as a predictor of long-term drinking outcome, even, perhaps particularly, when it is administered early in the treatment period. Although drinking-related locus of control comes out as a better predictor of drinking outcome than generalized locus of control, this should not be taken to imply that the same situation would apply if other measures of treatment outcome were employed, for example amount of psychiatric symptomatology or work adjustment. Rotter (1975) argues that although domain-specific tests of locus of control are likely to enable stronger predictions to be made in the domain for which a given test was designed, outside of that domain, such tests are expected to be of limited value. The IE Questionnaire, on the other hand,
was designed to provide low level prediction across a wide range of specific domains. Social learning theory suggests that in situations where strong domain-specific expectancies are operating, generalized control expectancies will be of limited predictive value. It would seem that for alcoholics, drinking behaviour comes into this category.

Although they did not consistently emerge as dominant predictors of treatment outcome, religiousness and temporal orientation appeared as minor contributors in some of the multivariate analyses. In particular, change scores on Factor One of the Religiousness Questionnaire accounted for three percent of the dependent variable variance in the first regression analysis. Performance on this factor at the second testing constituted one of the five significant predictors in the second regression analysis.

A composite time perspective measure derived from the first factor analysis came seventh in the list of predictors identified by the first stepwise regression analysis. On this occasion, it accounted for two percent of the outcome variance. A closely related measure, temporal orientation on the first test occasion, also figured in one of the stepwise discriminant function analyses.

Although the effects of this latter group of
measures upon treatment outcome were a), not strong, and b), not present in all analyses, when they appeared, they were in the direction postulated (hypotheses 12 and 13, p. 241). I.e., both change in the direction of increased religiosity and greater acceptance of religious dogma at the end of therapy carried better prognoses than less change and less religious commitment. More future-oriented temporal orientations were also associated with better treatment outcomes.

In conclusion, the measures considered in this section to be of the cognitive 'content' type, seem to offer promise in the extension of our understanding of the psychological factors involved in mediating the treatment outcome of alcoholics. They certainly warrant further investigation and look as if they have more relevance than the multitude of personality indices that have been addressed by numerous investigators.

Of the measures considered here, generalized locus of control appears to have least relevance to drinking outcome. This is in contrast with the speculations of others (e.g. Query, 1972). At this point, firm assertions cannot be made. It may be, as suggested in the findings reported here, that locus of control has an effect on outcome through interacting with other variables. One such group of variables worthy of investigation would seem to be treatment type. Work with other patient groups, for
example, has suggested that internals respond more favourably to relatively unstructured therapy whereas externals do better with more directive interventions (e.g. Friedman & Dies, 1974). Consequently, the results obtained in the present study may be in large part a function of the particular setting in which the study was conducted. This is the point made by Meehl in the quote given at the start of this chapter. Many findings in the so-called 'soft' areas of psychology are strongly context-dependent. As implied above, a partial solution to this lies in attempting to assess the context itself and drawing it into our theory-building and our analyses.

In contrast to the generalized locus of control findings, drinking-related locus of control appears to be particularly fruitful as a predictor of outcome. Whether this finding too is context dependent will need to be settled by further investigation in other treatment settings. However, because the situations included in the questionnaire are those that have been shown to be hazards for many alcoholics (see Chapter Four), the findings of the present study may have wider cross-situational generality.

Measures of time perspective and religiosity also seem to hold some promise. It would be interesting to see whether the changes noted on these measures over the course of therapy occur in programmes
that do not have a religious or an AA emphasis. Given that future-oriented time perspectives appear to carry a better long-term prognosis, the question arises as to whether or not it might be desirable to develop programmes that extend future time perspectives rather than shorten them. It may be of course that for some people this goal is unrealistic in the short-term and that programmes like AA that emphasize living one day at a time have more value.

Other Predictors of Treatment Outcome.

A wide variety of patient characteristics have previously been studied in relation to treatment outcome. As stated in earlier chapters, measures of cognitive dysfunction and measures of the cognitive 'content' type have, in the main, been ignored. Personality indices have generally proven to be poor predictors and, partly for this reason, they were not included in the present investigation.

Sociodemographic background variables and intake symptoms (e.g. alcohol consumption or psychiatric symptomatology at intake) have fared better as prognostic indices. There is a lack of consensus however regarding their importance relative to each other (Armor et al, 1976). There are also difficulties regarding their cross cultural generality.

The two regression analyses in the present study
included a wide range of sociodemographic and intake measures (to address path 43 of Figure 1). In these analyses, measures from both categories were found amongst the strongest predictors of drinking outcome. Higher levels of education, higher socioeconomic status, and married as opposed to non-married status emerged as significant predictors. In no case however, did one of these measures appear in both of the regression analyses. These sociodemographic measures have frequently emerged as important predictors in previous studies (Cronkite & Moos, 1978). Why each of these measures was significant in only one analysis and failed to reach even borderline significance when a different measure of drinking outcome was employed is not known.

Self-ratings of time since last worshipped also appeared in one of the regression analyses as a minor contributor to outcome prediction. A similar measure was a dominant predictor in the Gregson and Taylor study. To some extent, the weaker effect in the present investigation was a consequence of the moderate amount of variance that this measure shared with indices of commitment to religious dogma. Because measures of the latter type were entered into the step-wise regression analyses prior to time since last worshipped (because they had higher correlations with the dependent variables), the variance they shared with the self ratings was removed, thus weakening the predictive power of this measure in relation to outcome.
It needs to be noted that although the four sociodemographic variables discussed above had some predictive value in relation to either time to first drink or the four-way drinking outcome scale at 12 months, the sociodemographic variables included in the discriminant function analyses (education level, present occupation, and time since last worshipped) had virtually no capacity to discriminate between the three outcome categories defined in these analyses at three and 12 months. Age (included in the regression analyses) and gender (included in both the regression and the discriminant function analyses) proved to have only weak, nonsignificant effects on outcome in the present study.

The strongest and most consistent predictor of outcome across all analyses (apart from PCIT x BRFT(2)) was the patients' self-rating of the severity of their drinking problem. Self-ratings were not included in the earlier Gregson and Taylor study although their role in the prediction of relapse has been reported in the literature (Cahalan, 1970). It is somewhat humbling to recognize that the patient's assessment of his or her own situation fares so well as a predictor alongside of sophisticated psychological assessment backed by computer technology, although any self-description may act as a self-fulfilling prophecy. It might be that there are gains to be made from a greater concentration on our alcoholic patients' views of their situation.
The final group of independent variables to figure prominently in the analyses conducted in the research reported here consisted of intake measures describing aspects of the patients' behaviour in the month prior to admission. In the discriminant function analyses and one of the regression analyses, the severity of the patients' drinking pattern immediately prior to admission was a major factor in determining their treatment outcome - the more extreme their drinking pattern, the worse their prognosis. In the analysis where this measure was not important, a closely related measure, drinking-related psychological and physiological symptoms, had an effect on outcome. Two further measures in this category included: (1) psychological functioning (a series of items assessing anxiety and depressive symptoms) and (2) social functioning (a measure of involvement in social and recreational activities).

Both social and psychological functioning were included in the regression analyses where they emerged as either significant ($p < .05$) or near significant ($p < .10$) predictors of outcome. In other words, the more psychological distress present, the less full and varied the patients' social lives, the worse their outcome.

The above results suggest that in the alcoholic population studied, although the widely accepted notion that alcoholics must reach "rock bottom" before they seek
treatment is not necessarily refuted, this notion does not hold with regard to their subsequent outcome. On all indices (cognitive functioning, both at the 'process' and 'content' levels; sociodemographic status; drinking behaviour; drinking-related symptomatology; psychological disturbance; and social functioning) the more highly functional the individual shortly before and during treatment, the better their long-term prognosis. These findings support the recently popularized views regarding the need to induce individuals with drinking problems to accept treatment at an early stage, well before they reach "rock bottom". Indeed, it is possible that the AA "rock bottom" concept has been a particularly dangerous myth, keeping individuals who appear to have the best chance of recovery away from treatment.

One other implication of the above results needs stating. Because a wide variety of factors influence outcome, attempts at effective intervention will probably need to be equally multifaceted if long-term changes in drinking behaviour are to be realized. The AA and illness models have reinforced the view that alcohol is the only problem and that this should be the primary (if not the only) focus of treatment. The assumption made is that if changes are made here, other aspects of life will fall into place on their own. Not many of the indices that predicted outcome in the present research however showed a strong correlation with drinking behaviour, suggesting that their origins and the social and psychological contingencies that
reinforce them may in part, if not in the main, be unrelated to alcohol abuse. If these suggestions have validity, then the 'traditional' approach is seriously in error.

**Controlled Drinking.**

One aim of the present study was to attempt to identify those subjects who subsequently became 'controlled' drinkers. Because only a small percentage of the total sample fell into this category at three and twelve months after discharge, the number of variables that could justifiably be entered into the discriminant function analyses was limited. With the selection of measures used, it was evident that as a group, the social drinkers showed greater resemblance to the abstainers than they did to the relapsed drinkers. In other words, they came from the group that had less severe drinking patterns and functioned better psychologically.

The social drinkers differed slightly from the abstainers on only two measures, self-ratings of the severity of their drinking problem and temporal orientation. I.e., they rated their drinking problem as being less severe and they were less past-oriented. Those in the controlled group at three months also showed a tendency to consider themselves to be more in control of their drinking behaviour (more internal on the DRLC) at the start of treatment.
The indication that successful controlled drinkers are those patients who have less severe drinking problems has been reported previously (e.g. Smart, 1978). It needs to be appreciated however, that the patients in the present study had been through an abstinence-oriented programme. The same subject characteristics may not be as important in programmes designed with controlled drinking as the treatment goal. It now needs to be established whether the same results hold for other types of programme. If they do, then it might be appropriate to offer controlled drinking as an initial treatment goal for those with less severe drinking problems and a better psychological state. One likely consequence of this would be that people with alcohol and alcohol-related problems will more readily accept treatment. As already indicated, the sooner intervention is initiated the better. If more severe patterns develop, implicating neuropsychological deterioration, then, as already discussed, it is probable that no treatment programme will be particularly effective. This should not be taken to imply that cognitively impaired alcoholics are untreatable. As shown in the present study, a number of patients with very poor PCIT x BRFT(2) scores do sustain a satisfactory treatment outcome. It might be expected that treatment effectiveness for this group could even be enhanced if treatment were tailored more to their particular needs.

Treatment Participation.

Canonical correlations between sets of cognitive...
measures and a composite of treatment participation variables failed to corroborate hypotheses five and seven (p. 239-240). In other words, although a number of cognitive measures of both the process and content type were found to be strong predictors of treatment outcome, measures of this kind had only a minor influence upon treatment participation as measured in this study. The strongest links between individual cognitive measures and indices of treatment participation involved acceptance of religious dogma - attendance at voluntary religious services, and DRLC internality - insight levels. Contrary to prediction, acceptance of religious dogma did not relate significantly to attendance at AA meetings. None of the measures of cognitive dysfunction showed anything other than very minor predictive relationships with treatment participation.

As predicted (hypothesis 8, p.240), the four measures of treatment participation had a fairly strong effect on time to relapse ($R = .53$, $R^2 = .28$, $p < .001$). By far the strongest of these predictors was the frequency with which patients attended voluntary AA meetings while they were in hospital ($r = .51$). The strength of this effect is comparable to the effect of AA attendance after discharge on time to relapse in Gregson and Taylors' study. It may well be, in the light of this correspondence, that voluntary AA attendance during treatment has its major effect on subsequent outcome through increasing the probability that patients will subsequently attend AA after discharge.
From the foregoing discussion, it appears that therapy involvement does influence treatment outcome (Path 23, Figure 1). It also appears that cognitive dysfunction and cognitive state more generally, do not exert their effect on treatment outcome by modifying treatment involvement and therapeutic change (Path 12). This conclusion is tentative however because it is possible that cognitive factors compromise response to treatment on dimensions not tapped in the present study. Tentatively again, the author concludes that cognitive dysfunction and cognitive content measures exert their major influence on drinking outcome through their effects on the patients' lives after they leave hospital rather than indirectly through behaviour changes that occur during treatment (Path 13).

The results of the present study do not indicate whether or not some of the noncognitive outcome predictors influence therapy involvement and change. Because the major focus of the study was on cognitive functioning, relationships between sociodemographic factors and treatment participation (Path 42, Figure 1) were not investigated. It may well be that measures such as patient self ratings of the severity of their drinking problem and education level have a strong influence on treatment variables. As in Gregson and Taylors' study, behavioural as opposed to attitudinal measures of religiosity might predict AA attendance. As indicated earlier, the need to identify such predictors is a pressing one if we are to improve treatment effectiveness.
by matching patients to programmes that are most suited to their particular characteristics and therapy needs.
Summary.

Evidence was brought together in the first chapter that challenged the traditional unitary model of alcoholism and its treatment. Following from this and the more complex model that emerged, literature was reviewed indicating that alcoholics frequently possess selective neurological and neuropsychological impairment. Much of this impairment appears to be a consequence of prolonged alcohol abuse rather than an antecedent. Given the nature of the deficits, it was assumed that they would compromise response to treatment. It was noted that there was a dearth of literature bearing on this question. Literature reviewing the performance of alcoholics on a variety of attitudinal or 'content' cognitive measures was also addressed.

It was predicted that indices of cognitive dysfunction and cognitive 'content' would in part mediate the drinking outcome of alcoholics who pass through a treatment programme. This issue was approached in relation to a systems model based on the assumption that response to treatment has a multicausal basis. The model specified causal pathways between measures of cognitive functioning, sociodemographic variables, drinking behaviour, and indices of treatment participation and outcome.

Male and female alcoholics were assessed on a variety
of relevant measures: both near the start and the end of their stay in a hospital treatment programme. Therapy participation was assessed at the time of discharge and treatment outcome was monitored at both three and 12 months from this date.

With the exception of BRFT performance, only minor gender differences were observed on the independent and dependent measures. Certain of the sociodemographic variables and drinking-related measures had significant predictive relationships with drinking outcome. Cognitive dysfunction and some of the cognitive content measures were found to be strong predictors of outcome. More specifically, good treatment outcomes (i.e., abstinence or controlled drinking) were associated with better performance on PCIT and BRFT, the two measures of cognitive dysfunction, and internal scores on the DRLC. In some of the analyses, higher levels of acceptance of religious dogma and less past-oriented time perspectives predicted better treatment outcomes. IE locus of control, the remaining cognitive content measure, did not, contrary to the untested speculations of other investigators, predict outcome. A self evaluation of a less severe drinking problem was also a strong predictor of a favourable drinking outcome.

Attempts to predict differentially the outcome with respect to abstinent or controlled drinking were not very successful. Both groups appear to be made up of subjects with less severe drinking problems and a better psychological and neuropsychological status at the time of treatment.
One interesting implication of this set of analyses arises with regard to the inclusion of prior probabilities based upon the size of the outcome groups. As indicated in the last chapter, with the inclusion of priors, the percentage of controlled drinkers correctly allocated by the discriminant functions dropped virtually to zero. This suggests that claims by a number of clinicians that this type of treatment outcome does not exist may not be a consequence of distorted perceptions stemming from allegiance to the AA or unitary disease model, denial, or mendacity. Rather, it may be, more parsimoniously, that in making their predictions, they operate as quasi-Bayesians?

Of the treatment participation measures, voluntary attendance at 'outside' (i.e. non-hospital) AA meetings was the strongest predictor of drinking outcome. It was shown that cognitive process and content measures did not exert their influence upon drinking outcome via this or the other treatment participation indices. It was also suggested that this participation measure influenced outcome by reflecting subsequent attendance at AA meetings - after the patients left hospital. Contrary to prediction, measures of religiosity were not found to be strong predictors of voluntary AA attendance although participation in the treatment programme was associated with an increased acceptance of religious dogma. Although untested, it might be that the treatment dropouts excluded from the analyses were less religious. If so, had they been included, religiosity
might have been more strongly associated with both AA attendance and subsequent drinking outcome.

**Implications for Future Research.**

Cognitive process and content measures were found to be important predictors of treatment outcome. Further, they were, in the main, orthogonal to other indices more typically included in similar studies. Consequently, a major implication of the present study is the possibility that previous attempts to build strong predictive models of treatment outcome may have foundered because they omitted both neuropsychological measures that are sensitive to the types of impairment typical of many alcoholics and cognitive content measures. Patient self evaluations were also identified as important predictors. As suggested earlier, although not investigated directly, post-treatment variables such as AA attendance, social involvements, social skills, and exposure to environmental hazards, also appear to be important in the mediation of long-term drinking outcome. Thus, it is suggested that future research endeavours should address these types of measures in multivariate designs. This type of enterprise is not merely an academic one. Rather, such efforts carry with them important implications for future improvements in treatment efficacy with this large patient group.

Future research could usefully focus on the interaction of these various trait variables with
treatment type and post-treatment environmental contingencies, with the long-term aim of identifying subtypes of alcoholics who do best in particular programmes and post-treatment settings. In addition, by identifying important dimensions along which alcoholics differ and which predict outcome, treatments might be designed which are capable of inducing maximal improvement on such dimensions, with the assumption that such programmes will carry with them better treatment results. The findings of the present study suggest that neuropsychological integrity and drinking-related locus of control are dimensions of this type. With regard to the latter measure, it might be expected that a broad-based behavioural intervention could be particularly effective in inducing more internal DRLC scores. Longer stays in treatment and/or more gradual phasing back into the community might be helpful in improving the prognosis of the more cognitively impaired patients.

Given the finding of the present study that poor PCIT and BRFT performance predicts a poor treatment outcome, particularly when deficiencies on these measures occur together, the question arises as to how such deficits mediate relapse. Contrary to prediction, part of this effect does not appear to arise from the inhibition of treatment participation or insight. Although the finding that level of impairment on the cognitive process tests did not effect whether or not patients took antabuse, attended AA or religious
meetings is perhaps not too surprising, the finding that insight level at the end of therapy was not affected was unexpected. It may be however that insight ratings by staff are based more on the patient's capacity verbally to articulate treatment ideology rather than on their ability to translate this knowledge into day-to-day behaviour after they leave hospital.

In chapters two and three, it was noted that overlearned skills and verbal behaviour are little influenced by the types of neuropsychological impairment characteristic of many alcoholics. In marked contrast, ability to make adaptive adjustments to the environment, particularly to environmental changes, is affected by this type of impairment. More specifically, frontal lobe damage seems to reduce the capacity of individuals verbally to control ongoing behaviour, to disrupt what Luria terms the 'second signalling system'. In other words, frontal damage, the most common type of brain pathology found among alcoholics, may be responsible for the discrepancy between the apparent insight that alcoholics display and their actual post-treatment behaviour. This interpretation contrasts with widespread speculations in clinical circles that this characteristic is a consequence of a 'death wish' or some physiological mechanism, as yet unidentified, that is peculiar to alcoholics.

Although PCIT and BRFT were designed to tap the
types of deficits that previous research suggested was commonly found among alcoholics, and although they have demonstrated relevance to the task of predicting both short and long-term drinking outcome, their relationship to specific types of neurological impairment and more commonly used neuropsychological tests has yet to be investigated. Work along these lines should help to clarify the neuropsychological mechanisms that underlie their association with relapse. If future research indicates that they do reflect frontal impairment, then the suggestions made in the last paragraph will be given more substance.

If these lines of thought are subsequently corroborated, then the validity of the insight-oriented approaches to the treatment of alcoholics, particularly those who are more severely dysfunctional cognitively, will be seriously in doubt. This is because this form of intervention is based on the assumption that attitudinal and cognitive-emotional changes induced in structured treatment settings will generalize to behaviour outside of such settings. Behaviourally inclined therapists have questioned this assumption more generally. It may be expected however that their comments are particularly pertinent to individuals with deficient 'second signalling systems'.

The above considerations may have some relevance to the finding that although the more control that patients
came to believe they had over their drinking behaviour and situations associated with relapse (i.e. internal DRLC scores), the better their outcome, this relationship was much weaker in the case of the more cognitively impaired subjects (i.e. high BAFT scores). If BAFT performance does reflect an important aspect of neuropsychological deterioration typical of many alcoholics, then it might be that the failure of this group to behave in accordance with their expectations arose as a consequence of the factors discussed in the last paragraph.

In general, there is a need to study in more detail the learning capacity of alcoholics. A major feature of this patient group appears to be their inability to learn from experience. Their lives are often characterized by incomplete apprenticeships, failed marriages, and repeated relapses in spite of the increasing aversiveness of the consequences of this behaviour. Although personality factors probably play a part, it seems that the longer the process continues, the more difficult their task of breaking out of the pattern. It would appear that cognitive impairment may play a significant part in this process, probably both directly by reducing further their capacity to learn from experience and indirectly, as suggested in chapter three, by avoidance conditioning whereby potentially more adaptive but new behaviours that tax their limited neuropsychological capabilities are avoided because of fear of failure.
In conclusion, the results of the present study are clearly complex. But then so too is the condition! Many factors play a part in mediating the treatment outcome of alcoholics, just as many factors appear to be implicated in the genesis of this group of problems in living. The most important aspect of the present investigation is the demonstration that a range of previously ignored cognitive variables are relevant to the task of furthering our knowledge of treatment and relapse processes. The findings also suggest that increased emphasis on the alcoholics' own definitions of their situation, and a consideration of the interaction between cognitive and environmental variables, might be other areas worthy of investigation.
Abstract

A booklet form of Rod and Frame test is described; a theory of score distributions under different behavioural hypotheses is set up to generate a scoring process. Specimen data analysed include a bimodal distribution on 52 chronic alcoholics; it is shown that high scorers can show shifts downwards over time, on retesting, which are not simply a multivariate regression (James-Stein) effect. Implications for diagnostic decisions are noted.
The construct of field dependence-independence as operationalized by tests such as Embedded Figures, Rod and Frame, and Body Adjustment, has been particularly fruitful in generating research across a broad front in experimental and clinical psychology. Performance on these measures is said to differentiate individuals in terms of their capacity to make accurate perceptual judgements divorced from the contextual cues of the perceptual field, and has been related to a wide range of personality and cognitive processes. Although productive conceptually and in stimulating the accumulation of empirical data, there are a number of short comings in present methods of assessing field dependency.

One difficulty lies in the practicality of employing bulky and fixed apparatus, such as that used in the Rod and Frame test, for routine clinical purposes as opposed to experimental investigation. A further problem lies with the simplistic scoring and analysis of subject performance employed in current measures. Average scores over trials are typically reported. This practice fails fully to describe the perceptual dynamics and information
FOOTNOTE TO PAGE 1

1This work was supported by grant RG291 to the first author from the New Zealand Neurological Foundation, Inc.
processing that appear to underly these mean values (Pitblado, 1977; Donovan et al, 1976; O'Leary, Note 1).

In the clinical domain, alcoholism appears to be the broad class of psychopathology most intensively investigated in terms of field dependent behaviour (Witkin, 1965; McWilliams et al, 1975). Studies largely based on the Witkin's rod-and-frame (RFT) had consistently shown alcoholics to be more field dependent than nonalcoholic controls (e.g. Bailey et al, 1961; Goldstein & Chotlos, 1967; Jacobson, 1968; Goldstein & Shelly, 1971; Jacobson, 1974; Donovan et al, 1976). These findings coupled with Witkin et al's (1962) conclusion from the wider field dependence literature that performance on the RFT is "resistant to change by experimental means and ...appears to be a stable characteristic of a person" (p.373), were interpreted to support the view that field dependency is a stable characteristic of alcoholics throughout their lives. Further, it was taken as suggesting that this trait in some way predisposed alcoholics to follow their particular 'career' path (Witkin et al, 1959; Karp et al, 1965a, 1965b; Karp & Konstadt, 1965).

More recently, this earlier position has been eroded as investigators have become aware of a wide heterogeneity of responses, even in some populations tending to bimodal distributions (Goldstein & Chotlos, 1965), and by the demonstration of change in mean field dependency scores
towards field independence following a short period of alcohol abstinence (Goldstein & Chotlos, 1966; Chess et al, 1971; Smith & Layden, 1972; McWilliams et al, 1975). Although it is now clear that such shifts occur, it is not clear why they occur - i.e., what processes underlie the changes. Neither is it clear what are the implications of the presence of field dependency, or of shifts in this dependency during time within treatment programs for a subgroup of alcoholics. Changes may arise from interaction with environmental events that constitute the therapy situation and with the post-hospital milieu that contributes to relapse.

The task of clarifying the perceptual and cognitive processes that might underlie shifts in field dependency is made somewhat more confusing by the demonstration that the two most commonly used field dependency tests, the RFT and embedded figures, appear to be operationalizing rather different constructs. The common variance shared by these measures is approximately 20% (Adevai et al., 1968; Gross & Moore, 1970; Witkin et al., 1971). Additionally, in alcoholic populations they relate in different ways to cognitive and personality measures. 'Field dependency', as measured by embedded figures, covaries with the degree of performance decrement on a number of tasks shown to be particularly sensitive to cognitive deterioration in alcoholics (Donovan et al, 1976; O'Leary et al, 1977). RFT
performance, on the other hand, appears to be defining a factor that is relatively independent from other measures of cognitive functioning (Elliot, 1961; Goldstein & Shelly, 1971). Rather than relating in a straightforward way to cognitive dysfunction, RFT has been shown also to covary with variables that are typically seen as constituting measures of personality, namely, locus of control (Chess et al, 1971) and inner directedness (McWilliams et al, 1975).

From the above considerations, it seems reasonable to postulate that whereas shifts on embedded figures may result from improvement in cognitive processes such as abstract reasoning, perceptual-motor functioning, and short-term visual-spatial memory, movement on the RFT may rest more heavily on an increased awareness of bodily cues, sensations, and internal thoughts that can be expected to accompany decreases in state anxiety and exposure to group and individual therapy.

METHOD

As part of an ongoing research program investigating the relations between cognitive factors and variables in both the treatment and post-hospitalization environment of chronic alcoholics, a booklet version of the RFT was developed, reducing cost and increasing portability when compared to earlier methods. Computer scoring was incorporated, facilitating both more rapid and more sophisticated analysis than that afforded by conventional
methods. The RFT was used in preference to the embedded figures tests because the latter appear to be tapping processes that are already implicated in performance on readily available neuropsychological batteries. For our purposes, we sought a measure that, although sharing some common variance with the P.C.I.T. (Gregson and Taylor 1974, 1977), an instrument designed to measure aspects of cognitive dysfunction in alcoholics, would in large part be both orthogonal to it and relate to attitudinal and other process variables that can be more directly tied to the therapy process. Current research strongly suggests that RFT is a better candidate for the "bridging" function than other measures of field dependency.

Measurements: Problems

The measure of the amount of field dependency in a Rod and Frame test is an error of alignment, expressed in degrees of arc. This error is claimed to be (Goldstein & Shelly, 1971; Goldstein, Newringer & Klappersack, 1970; Witkin et al, 1959) generally but not invariably greater in alcoholics than in normals, so its presence and extent are potentially diagnostic for some subjects. However, published findings give average scores over trials with no indication of the possible perceptual dynamics underlying these mean values; consequently some of the reported performance deterioration in field dependency-prone tasks could be the direct consequence of an increase in the intertrial error variance of reproduction of
alignments; other deterioration the consequence of
shifts in mean errors, but with the assumption that the
process is psychometrically homogeneous over trials or
stimulus configurations.

For convenience in administration it was decided
to develop a booklet version of 26 items of the Rod and
Frame test; instead of physical apparatus presenting
some problems in cost and portability, pictures of
inclined straight lines enclosed in tilted frames were
produced, 35 x 20 cms. The pictures varied both in
the angles of inclination of lines and frames and in the
amount of extraneous bordering material which tends
to act as visual 'noise'. For the general principle,
see Fig 1.

[Fig. 1 about here]

The two angles of inclination are $\theta_0$, the absolute angle
of the enclosed line AB to the horizontal CD, and $\phi$, the
minimum angle through which the enclosing frame DEFG
would have to be rotated to make it horizontal.
Obviously $\theta_0$ could range from $-90^\circ$ to $90^\circ$, and $\phi$ from
$-45^\circ$ to $+45^\circ$. The basic task employed here involves
presenting some variant of Fig 1 involving one tilted
line inside one tilted frame, then turning over the
booklet page to show a blank area for 10 secs.,
followed by presenting a ray bundle as in Fig 2.

[Fig 2 about here]

The subject is then asked to point to the line in the bundle which has the same slope as the original enclosed line. If there is complete field independence the line with inclination $\theta_o$ will be selected. This is a comparatively common response, but on some trials wide departures can occur. The next requirement is to go further and set up a model to predict what should be the response, either under some definable strategy or by induction after observing behaviour on a subset of the trials. In extreme cases this can be readily done, as follows:

Hypothesis 1:

The completely field dependent response will replace the absolute inclination $\theta_o$ by the same inclination, but relative to the frame side which is adjacent to the angle $\phi$, of minimum rotation necessary for the frame's sides to be re-oriented horizontal-vertical, which is $(\theta_o + \phi)$.

From hypothesis 1 a continuum of response can be deduced, which is diagrammatically shown in Fig 3.

[Fig 3 about here]
The expected responses generated over a series of trials have a distribution $g(\theta)$, which centres on $(\theta_0 + \phi')$ where $\phi'$ is the mean angular field dependency (and $\phi'/\phi$ is the mean proportionate, or dimensionless, field dependency).

This distribution is likely to be skew centrally-tending, to a first approximation however we take

$$g(\theta) \sim N(\theta_0 + \phi, \sigma^2) \tag{1}$$

on the argument that the accuracy of reproduction of $\theta$ is perturbed by a Gaussian white noise in the perceptual recall process. The posterior log likelihood of any observed distribution of responses, $x(\theta)$, is given by

$$\Lambda(x|g) = \Sigma \ln[(1/(2\pi\sigma^2)^{1/2}),-1/2,\exp[g(\theta) - x(\theta)]^2/\sigma^2]}$$

The objective is to fit the best $g(\theta)$ to the $x(\theta)$ by minimising $\Lambda(x|g)$. In fact there are three models for any subject's behaviour which are of special interest.

H2: The field independent subject's responses are distributed as

$$g(\theta|FI) \sim N(\theta_0, \sigma^2) \tag{3}$$

where $\sigma$ increases with the degree of memory disorder in the subject, which can have components independent of
field dependency. In other words, the model reflects two sorts of error, which could arise from diverse psychological or neurological causes.

H3: The partially field dependent subjects' responses are distributed as

\[ g(\theta | \text{PFD}) \sim N(\varphi', \sigma^2) \]  \[ (4) \]

where again \( \sigma \) increases with collateral memory defect;
and \( \theta_0 < \varphi' < (\theta_0 + \varphi) \)

H4: The last case worth distinguishing is the completely field dependent subject for whom

\[ g(\theta | \text{CFD}) \sim N((\theta_0 + \varphi), \sigma^2) \]  \[ (5) \]

and again \( \sigma \) increases with collateral memory defect.

In the groups studied here no case of H4 has been found, and consequently we have no evidence of their existence if such subjects do actually exist. However, in practice it becomes difficult to distinguish these cases as soon as \( \sigma \) is not negligible, partly because the s.e. on \( \varphi' \) increases with \( \sigma \), and \( \sigma \) appears to be positively correlated with \( \varphi' \). A computer program FELDEP was written by the first author in BASIC for BDP 11/10, to calculate for each subject the posterior log likelihoods

\[ \log \Lambda (\theta = x) g(\theta | \text{FI}) \]
\[ \log \Lambda (\theta = x) g(\theta | \text{PFD}) \]

and

\[ \log \Lambda (\theta = x) g(\theta | \text{CFD}) \]
for a range of $\sigma^2$ values from 0.5 to 225 degrees. The descriptive model which maximises $\log \Lambda$ for the smallest associated $\sigma$ was then accepted as a best description. The likelihood ratio

$$\frac{\Lambda(\theta = x|g(\theta|\text{PFD}))}{\Lambda(\theta = x|g(\theta|\text{FI}))} = \Lambda_{\text{fd}}$$

is of particular interest; unless $\Lambda_{\text{fd}}$ exceeds 10 it is not reasonable to assert, on the evidence provided by one subject's record alone, that field dependence exists. If prior contextual information exists, from the group in which the individual is located, the situation is more complex. If estimates are available prior probabilities on PFD and FI have to be combined with [6] by Baye's theorem. Our second example later will show this.

As the minimisation condition on $\sigma$ is taken as pre-emptive, the actual $\sigma$ values in [6] are not necessarily the same for numerator and denominator, and the decision as to which of PFD and FI to choose may have to be made solely by minimising $\sigma$ as $\lambda$ approaches 1.

Another descriptive statistic, which is $\sigma$ and the subject's mean $(\theta_0 + \phi')$ expressed in terms of probability distribution segments, is the split in response proportions between under-dependency, the dependent range $\theta_0$ to $\theta_0 + \phi$, and over-dependency. This presentation is useful for a rapid inspection of how a subject may centre and contract or dilate his
distribution of responses with time, or for spotting aberrant response patterns. This feature is consequently built into the FELDEP program, but not used for decisions.

RESULTS

1. Pilot Study in Antarctica

In October 1977 10 male personnel stationed at Scott Base, Ross Dependency, about 1300 km from the South Pole, were tested after they had spent a year in Antarctica, wintering over.¹

It is not to be expected that these men would show field dependency, rather the contrary. Men selected for service in Antarctica are selected by test, interview and performance in field camp for the stability and robustness of their personality. Hence it could be reasonably predicted, if selection were valid, that personnel will be strongly field independent and with relatively small inter- or intrasubject variance.

Results are summarised in Table 1, which is abstracted from unpublished data on the Antarctic project concerned (see Gregson in preparation, 1978). #1, 7 and 8 show some slight field dependency.

The key to the column headings is: (a) subject reference number
(b) proportion of overdependent responses \(x < \theta_0\).

(compare Fig 3.)
1The booklet was administered, to the authors' procedural specifications, by Professor A.J.W. Taylor of Victoria University, Wellington, to whom thanks are due for this help.
(c) proportion of responses in the field dependent range \( \theta_0 < x < (\theta_0 + \phi) \)

(d) proportion of responses which are overdependent \( (x > (\theta_0 + \phi)) \)

(e) mean, \( \theta_0 \), expressed as degrees rotation in the predicted dependent direction, \( \theta_0 \) and \( \phi \) both taken as positive

(f) mean dependency under the maximum likelihood solution chosen for [6], rounded off.

(g) The minimum \( \sigma^2 \) value associated with the best model.

2. Chronic Hospitalized Alcoholics

A group of alcoholics, with a possible common factor of implicated neurological damage (O'Leary et al 1977), but heterogeneous in socioeconomic variables, has been tested on a variety of measures in an ongoing study by the second author in early 1977. These patients were referred for residential treatment precisely because they had all presented, for some time, a picture of socially inappropriate behaviour which is believed to be associated with inadequate personality and high field dependency.

Fifty-two male alcoholics, hospitalized for full time treatment, were each tested twice, first within the two weeks of beginning treatment, and second about four or five weeks later.

There was some individual variation in these times,
and as such variability could be a critical factor confounding the valid assessment of lasting side effects after detoxification, it will be examined in a separate analysis elsewhere. Here the data are examined simply for their distribution properties and their stability in time.

For each subject we have four measures; $\theta_1$ = mean field dependency in degrees rotation on the first testing, $\text{var}(\theta_1)$ = associated variance across 26 trials of the test, $\theta_2$ = mean field dependency on the second testing, $\text{var}(\theta_2)$ = associated variance for $\theta_2$.

Previous research using rod and frame tests with alcoholics suggests that the majority of alcoholics would be field dependent, but that a minority would not be. Precise quantification of this split depends obviously and critically on whether or not one accepts that it is sensible to dichotomise a continuum of dependency, and if one does then on what cut-off is taken, on $\theta$, as the limit of the normal range of test behaviour by field-independent subjects. As the test form here developed is slightly different from previous rod and frame tests the cut-off has to be decided de novo by examination of the internal statistics of the data distributions.

[Table 2 about here]
Table 2 gives between-subject parameters of variability in the four scores. It should be emphasised the distributions are not asymptotically normal, and hence the bivariate statistics and the credibility intervals on correlations should be taken with reserve. The average reduction in field dependency over all subjects, with time, should be noted. It implies that individual changes over time are not simply regression to the mean.

[Table 3 about here]

Table 3 gives the intercorrelations of the four measures; in virtually all cases a high field dependency score is associated with a high intertrial intrasubject variability. This means that the field dependency can be thought of as a sort of response bias generated by the noise, and consequent loss of accuracy in recall of absolute inclination, in the effective memory which subjects exhibit within the duration of a trial in the test. This can also be expressed by noting that if the intertrial distribution of $\theta$ for a subject is log-normal then an increase in variance will be accompanied by an increase in mean.

Table 4 gives the parameters of linear regression of the pairs of measures which are interesting. The slopes are expressed in the units of the variables and are consequently not to be compared with one another for significance. All the regression trends are outside
chance limits, but are not necessarily directly interbretable for reasons which will become apparent later.

The most interesting relationship for our purposes is that of \( \theta_2 \) on \( \theta_1 \), the regression equation from table 4 is

\[
\theta_2 = 5.11 + 0.417\theta_1
\]  

which implies that if \( \theta_1 > 9.1 \) then there is a diminution in field dependency from the first to the second session. Examination of the actual scatter plot also shows that subjects with \( \theta_1 < 10 \) show negligible change (for one reason, there is little room for them to improve) and so as a rule-of-thumb if \( \theta_1 < 10^\circ \) then we may categorise a subject as field independent, on this test with this set of 26 items. Using the strategy that independence should be assumed, unless evidence is sufficiently strong to require that the shift in \( \theta_2 - \theta_1 \) from its expectation of zero is not the consequence of intratrial randomness, this is a safe rule.

The mean var \( \theta_1 \) associated with \( \theta_1 = 10 \) is given by

\[
\text{var} (\theta_1) = 17.76 + 6.856\theta_1
\]  

[8]
or \[ \text{var} (\theta_1) = 60.8, \text{ (s.d. } \theta_1 = 7.7) \]

and intertrial variability below this level is not taken as diagnostic by itself of field dependency.

It transpires that, interestingly, it is easier to predict the reduction in \( \theta \) from \( \theta_1 \) to \( \theta_2 \), say \( \theta^* \), from \( \theta_1 \) than it is to predict \( \theta_2 \) from \( \theta_1 \):

the regression of \( \theta^* \) on \( \theta_1 \) is

\[
\theta^* = -5.11 + .583 \theta_1
\]

with \( \theta^* \) having mean = 3.38, s.d. = 9.16, and \( r_{\theta^*\theta_1} = .721 \) (.95 limits: .702, .738).

The regression [9] implies that subjects with large \( \theta_1 \) decrease to \( \theta_2 \), whereas those with very small \( \theta_1 \) tend to increase to \( \theta_2 \) slightly, and the value of \( \theta_1 \) for which no change, or \( \theta^* = 0 \) is predicted, is 8.8°. Again as a rule-of-thumb, a positive shift (reduction in field dependency) will occur if \( \theta_1 > 10^\circ \).

This, from the actual distribution of \( \theta^* \), means that about two-thirds of alcoholics can show apparent improvement on retest. However, it is preferable to try and separate subjects into those showing real and those showing apparent change.

The distribution of \( \theta_1 \) is so scattered, with a suggestion of a tendency to a U-shape, that it is better to treat it as the superimposition of two discrete groups, each with approximately normally-distributed scores.
This dichotomization is readily achieved by successive approximations to yield parameters of

Field independent subjects:
\[ m(\theta_1) = 7.39, \sigma(\theta_1) = 3.5, N = 32, \]

Field dependent subjects:
\[ m(\theta_1) = 25.98, \sigma(\theta_1) = 10.2, N = 20. \]

This is a split which is hypothetical in the sense that it is conservative in allocating subjects to the field dependent group. This latter group is of greatest interest, as it comprises the subjects more susceptible to meaningful shifts in \( \theta \).

For this group of 20 subjects alone the regression of \( \theta_2 \) on \( \theta_1 \) is

\[ \theta_2 = 9.11 + .29\theta_1 \]  \[\text{[10]}\]

with \( \theta_2 \) mean = 16.7, s.d. = 9.07, and \( r_{\theta_1\theta_2} = .331 \)

For regression of shifts \( \theta^* \) on \( \theta_1 \) we have

\[ \theta^* = -9.11 + .709\theta_1 \]  \[\text{[11]}\]

with \( r_{\theta^*\theta_1} = .650 \) (.95 limits .612, .688), with \( \theta^* \) mean = 9.32, s.d. = 11.27.
Of these 20 subjects, only four showed an increase in θ* from θ₁ to θ₂; these four values were 2.9°, 0.8°, 5.0°, and 13.5°. The first three of these are second-order when compared with var (θ*).

As the θ₂ and the θ₁ values are sets of means, the appropriate method for predicting any single θ₂ value from its corresponding θ₁, under the hypothesis of stability, requires a James-Stein analysis (Stein, 1962, Efron and Morris, 1975). Any shrinkage in the variance of the set {θ₂} from the variance of the predictor set {θ₁} must be greater than estimated from the James-Stein analysis in order to be taken as evidence of a real therapeutic effect arising from abstinence, apart from the shift already noted in the overall mean from 14.54 to 11.16.

The root-mean-square error in prediction for each θ, in each of the two subsets separated above (by a cutoff at θ₁ = 14), was estimated using the version of the James-Stein prediction due to Lindley (see the published discussion in Stein's 1962 paper, and citation by Efron and Morris, 1975). This is

\[ js(θ₂) = \frac{m(θ₁) + (1-(k-3)/V) \cdot (θ₁ - m(θ₁))}{} \]  

Where \( js(θ₂) \) is the James-Stein predicted value for a given subject on the second testing, \( m(θ₁) \) is the mean of all subjects within the homogeneous group, with a
plausible prior distribution of normality for $\theta_1$, $k = \text{the number of means in the group}$, and $V = \sum (\theta_1 - m(\theta_1))^2$. It is because [12] requires that all subjects be drawn from a homogeneous prior population that it cannot sensibly be applied to all the 52 means pooled, after we have tentatively distinguished two subgroups, but must treat each subgroup as a separate estimation problem.

The points about [12] which are relatively novel in psychometric practice are, that it is uniformly better than maximum likelihood prediction, and that it uses information on $(k-1)$ other means to predict the shift of one individual mean score on retesting.

[Table 5 about here]

The values in Table 5 show a slight improvement consequent upon using $js(\theta_2)$ instead of $\theta_1$ to predict each $\theta_2$. If, additionally, we use the shift in overall means, $m(\theta^*) = \delta$, and centre the new predictions about $m(\theta_2)$, instead of about $m(\theta_1)$, the marked advantage of $js(\theta_2|\delta)$ becomes apparent in this field dependent group, but of negligible value in the field independent group.

It is concluded that the shrinkage in intersubject scatter in the field dependent subjects is consistent with James-Stein predictions and consequently not of
clinical import, but that there is a real shift, (a reduction) in the mean θ for that subgroup.

DISCUSSION

The booklet version of the RFT is different from other versions in that it facilitates the introduction of perceptual noise, to attenuate response accuracy, by employing a time delay between display of the stimulus and the elicited response. Unlike the original RFT procedure which depends on the method of production, our test rests on the method of estimation. There is ample psychophysical evidence (Guilford, 1954) that these two methods can yield quantitatively different results. Also, because the task is in booklet form it comes nearer in some ways to the embedded figures test (EFT) in the situational demands it places upon the subject.

Despite the differences between the booklet RFT and other procedures, which suggest it is intermediate between RFT and EFT, the score distributions of the samples described here are consistent with previous studies using RFT, but with larger average scores in the field dependent alcoholics. This supports the construct validity of the booklet RFT; the procedure can justify diagnostic decisions, and at the same time further our knowledge of the processes underlying responses in alternative variants of field dependency measures that may in fact be psychometrically heterogenous.
REFERENCE NOTE

REFERENCES


Alcoholism and psychological differentiation: Effects on achievement of sobriety on field dependence.


TABLE 1
Results from a Pilot Study in Antarctica

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<tr>
<th>(a)</th>
<th>(b) over-dependent</th>
<th>(c) dependent</th>
<th>(d) anti-dependent</th>
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Table 2
Intersubject statistics of response measures

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Table 3
Intercorrelations of response measures

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<td></td>
</tr>
<tr>
<td>( \Theta_2 )</td>
<td>.597</td>
<td>.513</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>( \text{var}(\Theta_2) )</td>
<td>.425</td>
<td>.400</td>
<td>.878</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4
Regression parameters

<table>
<thead>
<tr>
<th>variables</th>
<th>slope</th>
<th>intercept</th>
<th>.95 hdr on r</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Theta_2 ) on ( \Theta_1 )</td>
<td>.417</td>
<td>5.11</td>
<td>.572, .627</td>
</tr>
<tr>
<td>( \text{var}(\Theta_1) ) on ( \Theta_1 )</td>
<td>6.856</td>
<td>-7.76</td>
<td></td>
</tr>
<tr>
<td>( \Theta_2 ) on ( \text{var}(\Theta_1) )</td>
<td>.045</td>
<td>7.00</td>
<td></td>
</tr>
<tr>
<td>( \Theta_2 ) on ( \text{var}(\Theta_2) )</td>
<td>.086</td>
<td>4.87</td>
<td></td>
</tr>
<tr>
<td>( \text{var}(\Theta_2) ) on ( \Theta_1 )</td>
<td>3.012</td>
<td>28.85</td>
<td></td>
</tr>
<tr>
<td>( \text{var}(\Theta_2) ) on ( \text{var}(\Theta_1) )</td>
<td>.357</td>
<td>39.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Independent Subgroup</td>
<td>Field Dependent Subgroup</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>32</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>$\text{rms}(\theta_2</td>
<td>\theta_1)$</td>
<td>4.62</td>
<td>14.62</td>
</tr>
<tr>
<td>$\text{rms}(\theta_2</td>
<td>j_s \theta_2)$</td>
<td>4.51</td>
<td>14.58</td>
</tr>
<tr>
<td>$\text{rms}(\theta_2</td>
<td>\theta_1, \delta)$</td>
<td>4.66</td>
<td>21.78</td>
</tr>
<tr>
<td>$\text{rms}(\theta_2</td>
<td>j_s \theta_2, \delta)$</td>
<td>4.50</td>
<td>11.21</td>
</tr>
</tbody>
</table>
Fig. 1
General case of tilted Rod inside tilted Frame.
Fig. 2
Ray Bundle
used for Selecting
Responses
Fig. 3
Continuum of Dependency

under or antidependency

(θ₀)

Range of Degrees of F.D.

(θ₀ + φ)

field independent

x(θ)

complete field dependency

over dependency
APPENDIX TWO

THE BOOKLET ROD AND FRAME TEST (BRFT) IN RELATION TO OTHER RELEVANT CONSTRUCTS

The BRFT, a test still in the early stages of its development, is described in Appendix One. The present section is concerned with extending our knowledge of this test by exploring its relationship with a variety of other tests. This approach is taken in recognition of the view that no single estimate of the validity of a new psychological test provides satisfactory evidence as to what a new test is measuring.

Cronbach & Meehl (1955) list five types of data which might be appropriate to the task of construct validation, namely: group differences, changes in performance, correlations, internal consistency, and a study of the test-taking process. Two of these procedures, correlations and group differences, are reported here.

1. Correlations

From the performance demands of the BRFT (see Appendix One), it is predicted that this measure should covary with other tests that are claimed to operationalize the construct of field dependence. Because BRFT administration places a ten second time delay between the presentation of the stimulus material and the subject's recorded response, it is also considered probable that visual memory plays
a role in BRFT performance. To investigate this possibility, a measure of short-term visuo-spatial memory (Revised Visual Retention Test) is included in the test battery.

In addition to evidencing moderate to high correlations with measures to which they are theoretically and methodologically related, new tests should also possess the property of discriminant validity (i.e. they should show low correlation with indices of unrelated constructs). For this reason, measures of Trait Anxiety and Depression are included in the present study.

Subjects and Procedure

The BRFT was individually administered by the author to 19 male alcoholic patients resident in the Queen Mary Hospital inpatient programme for the treatment of alcoholism. All had been given a primary diagnosis of alcoholism and none had additional diagnoses of either a chronic brain syndrome or a psychosis. The subjects were randomly selected from the patient population and comprise a separate group from those reported elsewhere in this thesis. The mean age of the group was 42.7 years (13.96 S.D.) and the highest occupation attained prior to admission was a mean of 4.4 (1.3 S.D.) on a widely used version of a New Zealand standardized occupational rating scale (Note 9) which ranges from one (high) to 7 (low). Prior to testing, the subjects had a mean of
5.3 weeks (2.98 S.D.) of self-reported abstinence from alcohol.

At the time of the BRFT administration, subjects were also individually tested with the Portable Rod and Frame Test (PRFT) (Gross & Moore, 1970) and the Revised Visual Retention Test (RVRT) (Benton, 1974). The order of test administration was randomized.

Within 48 hours of the individual testing, subjects were group administered the following tests: (1) Group Embedded Figures Test (GEFT) (Oltman et al., 1971); (2) State-Trait Anxiety Inventory - Trait Form (STAI-T) (Spielberger, 1966); and (3) Beck's Depression Inventory (BDI) (Beck, 1967). The order of administration was STAI-T followed by BDI followed by GEFT. The two questionnaires were administered first as it was considered that task difficulties arising during the GEFT would alter the mood state of some subjects. Although they show some insensitivity to situational mood fluctuations, it was thought that more valid measures of relatively enduring anxiety and depressive symptoms would probably be obtained by administering these tests prior to the GEFT.

A second sample of 11 male alcoholics, resident at Mahu Villa, an inpatient alcoholism treatment centre within Sunnyside Hospital, Christchurch, were also individually administered the BRFT, the PRFT, and the
The testing procedure was the same as that employed with the first sample. The same selection criteria were also employed with this group. Testing was conducted by M. Free as a part of another study (Note 2) under the direction of the author and R.A.M. Gregson.

Where test data from both samples are available, the two groups have been pooled for purposes of analysis. Where this is not the case, only the first sample is considered. The mean age of the combined sample is 44.6 (12.25 S.D.) with a mean highest attained occupational status of 4.5 (1.3 S.D.) and a mean of 6.1 weeks (4.07 S.D.) self-reported abstinence prior to testing.

The scores derived from each of the cognitive tests for the purposes of this study are as follows: GEFT, number of correct solutions; PRFT, mean rotation from the true vertical; BRFT, mean rotation (see Appendix 1); and RVRT, number correct. High scores on the STAI-T and the BDI indicate increased symptomatology.

Descriptive statistics for each of the psychological tests are listed in Table 1. Means and standard deviations are given for both the sample tested by the author and the combined sample. The correlation coefficients for age, highest occupational status attained, GEFT, PRFT, and RVRT are given in Table 2. The correlations between BRFT and the other three cognitive tests are of particular relevance to the present study.
TABLE 1
Psychological Test Performance of Male Alcoholics: Means and Standard Deviations

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample 1 (n=19)</th>
<th>Sample 1+2 (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>GEFT</td>
<td>9.4</td>
<td>6.4</td>
</tr>
<tr>
<td>PRFT</td>
<td>4.4</td>
<td>2.7</td>
</tr>
<tr>
<td>BRFT</td>
<td>12.7</td>
<td>9.2</td>
</tr>
<tr>
<td>RVRT</td>
<td>6.8</td>
<td>1.9</td>
</tr>
<tr>
<td>BDI</td>
<td>8.1</td>
<td>6.7</td>
</tr>
<tr>
<td>STAI-T</td>
<td>44.8</td>
<td>9.7</td>
</tr>
</tbody>
</table>

TABLE 2
Intercorrelations between Age, Highest Occupational Status attained, and Cognitive Test Scores

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Age</td>
<td>-0.12</td>
<td>-0.48*</td>
<td>0.26</td>
<td>0.35*</td>
<td>-0.35*</td>
<td></td>
</tr>
<tr>
<td>2 H Occ</td>
<td></td>
<td>-0.20</td>
<td>0.21</td>
<td>-0.08</td>
<td>-0.04</td>
<td></td>
</tr>
<tr>
<td>3 GEFT</td>
<td></td>
<td></td>
<td>-0.75**</td>
<td>-0.43*</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>4 PRFT</td>
<td></td>
<td></td>
<td></td>
<td>0.13</td>
<td>-0.42*</td>
<td></td>
</tr>
<tr>
<td>5 BRFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.20</td>
<td></td>
</tr>
<tr>
<td>6 RVRT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All correlations have 28 df except those involving GEFT (df=17).
* p < 0.05 (1-tailed)
** p < 0.01 (1-tailed)

Three of the correlations between the cognitive tests displayed in Table 2 are of moderate magnitude and reach conventional significance levels. Because directional hypotheses were stated, one-tailed tests of significance are employed. The highest correlation is found to occur
between GEFT and PRFT. Both are established tests of field dependence. Nevertheless, there is evidence from other studies that although these types of tests possess some common variance (56 percent in the present instance), they relate in different ways to other measures, suggesting that they are operationalizing somewhat different constructs (Appendix 1; Donovan et al., 1976). BRFT shows a very slight relationship to both PRFT and RVRT in the predicted direction. Also in the predicted direction is its moderate correlation (-.43) with GEFT performance. PRFT is the only test which shows significant correlation with RVRT.

From Table 2, it is evident that the results discussed above are confounded by age which shows moderate correlation with all of the cognitive tests. When the variance contributed by age is partialled out, some changes are found in the size of the relationships between the cognitive measures. In particular, BRFT x GEFT reduces to a partial correlation of -.32, PRFT x RVRT reduces slightly to -.36, and the correlation between the two measures of field dependence (PRFT and GEFT) holds at -.74.

Correlations between BRFT and performance on both the BDI and the STAI-T were also conducted. These were -.01 and -.16 respectively.

From these results, the status of BRFT as a measure of field dependence is not clearly established. Although
in the predicted direction, it shows only a slight relation to PRFT. When the effects of age are partialled out, it shares only 10 percent of common variance with the GEFT. Thus, it would seem that although having something in common with the GEFT, the vast majority of BRFT variance remains unaccounted for. Although it was expected that short-term visuo-spatial memory might play a part in BRFT performance, BRFT shares only four percent of variance with the RVST, suggesting that this is not an important factor. Miniscule overlap with measures of depression and trait anxiety also make it unlikely that these aspects of psychological functioning are anything other than very minor determinants of BRFT performance.

To clarify what BRFT is measuring requires further studies with a wider range of neuropsychological tests. It should prove instructive to embed BRFT within a matrix including a wider range of field dependency measures, the WAIS subtests, and the full Halstead-Reitan battery.

2. Group Differences

Hospitalized alcoholics have frequently been demonstrated to be more 'field dependent' (particularly on measures of RFT) than nonalcoholics matched on appropriate dimensions. Consequently, if BRFT is to be regarded as a measure of field dependence, it should differentiate alcoholic populations from matched nonalcoholic populations.

In addition to 11 male alcoholics (see the previous
Free also administered the BRFT and PRFT, along with other tests (Note 2), to a sample of hospital staff matched for age and level of education. Descriptive statistics for these two samples are given in Table 3.

**TABLE 3**

Means and Standard Deviations for Alcoholics and Non Alcoholics

<table>
<thead>
<tr>
<th>Measure</th>
<th>Alcoholics M</th>
<th>Alcoholics SD</th>
<th>Non Alcoholics M</th>
<th>Non Alcoholics SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>48.0</td>
<td>8.1</td>
<td>44.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Education*</td>
<td>2.7</td>
<td>1.3</td>
<td>3.5</td>
<td>1.6</td>
</tr>
<tr>
<td>BRFT</td>
<td>15.5</td>
<td>7.6</td>
<td>9.6</td>
<td>5.4</td>
</tr>
<tr>
<td>PRFT</td>
<td>8.0</td>
<td>6.8</td>
<td>3.9</td>
<td>3.8</td>
</tr>
</tbody>
</table>

*Education level is derived from a scale indexed as follows: 1 = Non High School; 2 = Some High School; 3 = School Certificate; 4 = University Entrance; 5 = Advanced Technical or Incomplete Degree; 6 = Degree and/or Professional Examination.

The two groups do not differ significantly on either of the demographic variables, indicating that the attempt to match the groups on these criteria was successful. On the two cognitive tasks, the performance of the alcoholics was significantly worse than that of the non-alcoholics (BRFT, \( t = 2.09, p < .05 \); PRFT, \( t = 4.51, p < .01 \)). Both significance tests were one-tailed with 20 degrees of freedom.

The performance of the two groups on the BRFT closely resembles that of the alcoholic and non-alcoholic groups described in Appendix 1. The non-alcoholic group in that study had a mean score of 9.4 (5.5 SD) and the
alcoholic group had a mean score of 14.5 (11.3 S.D.) on the first test occasion. On a retest five weeks later, the alcoholic group evidenced decreased mean rotation (M = 11.2, 7.9 S.D.). This score however, is still larger than that found in either of the nonalcoholic samples.

The demonstration of higher BRFT scores among alcoholics relative to matched nonalcoholics does not in itself tell us much about BRFT in relation to field dependence. Alcoholics, as a group, have been shown to differ from nonalcoholics on measures sensitive to a variety of neuropsychological and cognitive functions, particularly those which tap aspects of visuo-spatial performance (see Chapters 2 and 3). However, failure to discriminate between the two groups would raise doubts regarding both the potential use of this new measure with alcoholics and its possible status as a index of field dependence or a related construct.

References *


* Note: Other references cited are detailed in the main bibliography or in Appendix One.
APPENDIX THREE.

BACKGROUND INFORMATION FORM

Tick ( ) or mark the scale where asked, or write in the answer to the question.

Name.................................. Sex......... Age......

Date of birth......................

At present you are:

- single ( )
- married ( )
- married but living apart ( )
- legally separated ( )
- divorced ( )
- widowed ( )
- other (e.g. defacto) ( )

How many years did you have a Secondary School? (Specify.........)

What was the highest grade you reached at school? (Specify...........)

Did you have any education beyond Secondary School? If so, how much?

- Technical Institute ( ) ......years, ......months
- Correspondence School ( ) ......years, ......months
- Night School ( ) ......years, ......months
- Teacher's Training College ( ) ......years, ......months
- University ( ) ......years, ......months

What was your first job after leaving school? ............

.................................................................

How long did you stick at your first job? ...............
In your view, what was the "best" job you have had?

a) In terms of skill required and social status? ..........

b) In terms of job satisfaction?......................

How many jobs have you held in the last 6 months?
  none (because unemployed) ( )
  none (because disabled, retired, or "homemaker") ( )
  one ( )
  two ( )
  three ( )
  four ( )
  more than four ( )

What is your present job (i.e. prior to entering hospital)?
What exactly do you do, not just what your job is called.
...........................................................................

Are you:
  a New Zealand born Maori? ( )
  a New Zealand born 'European'? ( )
  a non New Zealand born Polynesian? ( )
  a non New Zealand born European? ( )
  other? ( ) (Please specify.............................)

What religion, if any, do you think of yourself as having?
  Roman Catholic ( )
  Anglican ( )
  Methodist ( )
  Presbyterian ( )
  Atheist (Don't believe) ( )
  Agnostic (Uncertain if God exists) ( )
  Other ( ) (Specify.................................)
When did you last worship in a group of people? (service, prayer, mass, meeting):

- within the last week ( )
- within the last fortnight ( )
- within the last month ( )
- 1 to 6 months ago ( )
- over 6 months ago ( )

If you have worshipped in the last month, how often has this been?

- once ( )
- twice ( )
- three times ( )
- four times ( )
- more than four times ( ) (Specify.................................)

On a typical drinking day, how much alcohol would you usually consume?

- Beer ..... jugs (or bottles.........(give size......))
- Wine ..... bottles (or glasses.........(give size......))
- Fortified Wine (e.g. Sherry, Port) ..... bottles
- Spirits ..... bottles (or nips.........) State type of spirits usually consumed......................... .

For the following questions, tick the scale at the point which corresponds closest with your judgement. If you tick 1, this means that the statement never applies to you. If you tick the 5, this means that the statement very often applies to you. 2 means sometimes, 3 means about one half of the time, 4 means quite often.

How often in the month before you entered Queen Mary Hospital did you:

Drink in the morning

Never

1 2 3 4 Very Often

5
How often in the month before you entered Queen Mary Hospital did you:

Drink at home

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Drink on Weekends

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Drink alone

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Miss meals because of drinking

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Get drunk

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

How often did you experience the following during the month before you entered this programme?

DTs or shakes

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Memory lapses or blackouts

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Dry heaves or cold sweat

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Difficulty sleeping

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Hallucinations

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Vague fears

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Severe hangover

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>
Nervous or tense
Never Never Never Never Never
1 2 3 4 5

Upset stomach
1 2 3 4 5

Headaches
1 2 3 4 5

Dizzy spells
1 2 3 4 5

Do you see your drinking behaviour as:
No problem a very severe problem
1 2 3 4 5

During the month before entering the programme, you:
never drank ( )
drank on special occasions only ( )
drank socially ( )
had occasional binges ( )
drank daily ( )

Have you been in hospital or a treatment programme for alcoholism during the six months prior to admission?
yes ( ) (please specify........................)
no ( )

Not counting your present admission to Queen Mary Hospital, how many other previous admissions to hospitals or clinics have you had for alcohol problems?
one ( )
two ( )
three ( )
four ( )
four or more ( ) (Say how many...................)
no previous admissions ( )
How often did you engage in these activities during the month before entering this programme?

Attending parties
Never 1 2 3 4 Very Often 5

Spending time with close friends
1 2 3 4 5

Participating in sports (e.g. playing bowls)
1 2 3 4 5

Attending cultural events (e.g. going to see a film, play, or an art display)
1 2 3 4 5

Attending a sporting event (e.g. being present at a rugby or cricket match)
1 2 3 4 5

Engaging in community activities (e.g. collecting money for the blind, helping on a school or club project, membership of a club)
1 2 3 4 5

Over the month prior to entering Queen Mary Hospital, you felt:
pleased about accomplishing something
Never 1 2 3 4 Very Often 5

relaxed and comfortable
1 2 3 4 5

in control of your life
1 2 3 4 5

that you knew where you wanted to go in life
1 2 3 4 5
that you were getting all that you wanted in life

1 2 3 4 5

on top of the world

1 2 3 4 5

Before your recent admission to Queen Mary Hospital, had you ever been to an AA meeting?

yes ( )
no ( )

If you answered yes to the previous section, state how long ago you attended and approximately how many meetings or gatherings you went to..............................
....................................................................................
....................................................................................

In the past you found AA to be of

no help                        considerable help

1 2 3 4 5
INSTRUCTIONS FOR THE I-E SCALE

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief; obviously there are no right or wrong answers.

Your answers to the items on this inventory are to be recorded on a separate answer sheet which is loosely inserted in the booklet. REMOVE THIS ANSWER SHEET NOW. Print your name, age, and sex on the answer sheet, then finish reading these directions. Do not open the booklet until you are informed to do so.

Please answer these items carefully but do not spend too much time on any one item. Be sure to find an answer for every choice. Find the number of the item on the answer sheet and put a circle around the a or b - which ever you chose as the statement more true.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you're concerned. Also try to respond to each item independently when making your choice: do not be influenced by your previous choices.

If you feel that you fully understand the above instructions, open the booklet (ie. the three pages following this instruction page) and record your answers on the answer sheet you have already detached.
I-E SCALE

(NB. fill in your answers on the separate answer sheet.)

1.a. Children get into trouble because their parents punish them too much.
   b. The trouble with most children nowadays is that their parents are too easy with them.

2.a. Many of the unhappy things in people's lives are partly due to bad luck.
    b. People's misfortunes result from the mistakes they make.

3.a. One of the major reasons why we have wars is because people don't take enough interest in politics.
    b. There will always be wars, no matter how hard people try to prevent them.

4.a. In the long run people get the respect they deserve in this world.
    b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5.a. The idea that teachers are unfair to students is nonsense.
    b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6.a. Without the right breaks one cannot be an effective leader.
    b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7.a. No matter how hard you try some people just don't like you.
    b. People who can't get others to like them don't understand how to get along with others.

8.a. Heredity plays the major role in determining one's personality.
    b. It is one's experiences in life which determine what they're like.

9.a. I have often found that what is going to happen will happen.
    b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10.a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
     b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11.a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
     b. Getting a good job depends mainly on being in the right place at the right time.
12.a. The average citizen can have an influence in government decisions.
   b. This world is run by the few people in power, and there is not much the little guy can do about it.

13.a. When I make plans, I am almost certain that I can make them work.
   b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14.a. There are certain people who are just no good.
   b. There is some good in everybody.

15.a. In my case getting what I want has little or nothing to do with luck.
   b. Many times we might just as well decide what to do by flipping a coin.

16.a. Who gets to be the boss often depends on who was lucky to be in the right place first.
   b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17.a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
   b. By taking an active part in political and social affairs the people can control world events.

18.a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
   b. There really is no such thing as "luck".

19.a. One should always be willing to admit mistakes.
   b. It is usually best to cover up one's mistakes.

20.a. It is hard to know whether or not a person really likes you.
   b. How many friends you have depends upon how nice a person you are.

21.a. In the long run the bad things that happen to us are balanced by the good ones.
   b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22.a. With enough effort we can wipe out political corruption.
   b. It is difficult for people to have much control over the things politicians do in office.

23.a. Sometimes I can't understand how teachers arrive at the grades they give.
   b. There is a direct connection between how hard I study and the grades I get.

24.a. A good leader expects people to decide for themselves what they should do.
   b. A good leader makes it clear to everybody what their jobs are.
25. a. Many times I feel that I have little influence over the things that happen to me.
   b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
   b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
   b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
   b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
   b. In the long run the people are responsible for bad government on a national as well as on a local level.
This is a questionnaire to find out how you feel about alcohol and your relationship to alcohol. Please select the one statement of each pair (and only one) which you most strongly believe to be the case as far as you're concerned. Be sure to select the one that you actually believe to be the more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief; obviously there are no right or wrong answers.

Record your answer by placing a ring around the letter (a or b) of the statement you more strongly believe of each pair of statements.

Please answer these items carefully but do not spend too much time on any one item. Be sure to find an answer for every choice. In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you're concerned. Also try to respond to each item independently when making your choice. Do not be influenced by your previous choices.

If you feel that you fully understand the above instructions, you may start answering the questions on the next page.
1. a. I feel so helpless in some situations that I need a drink.
   b. Abstinence is just a matter of deciding that I no longer want to drink.

2. a. I have the strength to withstand pressures at work.
   b. Trouble at work or home drives me to drink.

3. a. Without the right breaks one cannot stay sober.
   b. Alcoholics who are not successful in curbing their drinking often have not taken advantage of help that is available.

4. a. There is no such thing as an irresistible temptation to drink.
   b. Many times there are circumstances that force you to drink.

5. a. I get so upset over small arguments, that they cause me to drink.
   b. I can usually handle arguments without taking a drink.

6. a. Successfully licking alcoholism is a matter of hard work, luck has little to do with it.
   b. Staying sober depends mainly on things going right for you.

7. a. When I see a bottle, I cannot resist taking a drink.
   b. It is no more difficult for me to resist drinking when I am near a bottle than when I am not.

8. a. The average person has an influence on whether he drinks or not.
   b. Often times, other people drive one to drink.

9. a. When I am at a party where others are drinking, I can avoid taking a drink.
   b. It is impossible for me to resist drinking if I am at a party where others are drinking.
10. a. I feel powerless to prevent myself from drinking when I am anxious or unhappy.
    b. If I really wanted to, I could stop drinking.

11. a. It is easy for me to have a good time when I am sober.
    b. I cannot feel good unless I am drinking.

12. a. As far as drinking is concerned, most of us are victims of forces we can neither understand or control.
    b. By taking an active part in our treatment programmes, we can control our drinking.

13. a. I have control over my drinking behaviour.
    b. I feel completely helpless when it comes to resisting a drink.

14. a. If someone offers me a drink, I cannot refuse him.
    b. I have the strength to refuse a drink.

15. a. Sometimes I cannot understand how people control their drinking.
    b. There is a direct connection between how hard people try and how successful they are in stopping their drinking.

16. a. I can overcome my urge to drink.
    b. Once I start to drink I can't stop.

17. a. Drink isn't necessary in order to solve my problems.
    b. I just cannot handle my problems unless I take a drink first.

18. a. Most of the time I can't understand why I continue drinking.
    b. In the long run, I am responsible for my drinking problems.

19. a. Drinking is my favourite form of entertainment.
    b. It wouldn't bother me if I could never have another drink.
APPENDIX SIX.

TIME REFERENCE INVENTORY
P. Roos (1964)

This is a brief inventory designed to estimate people's reactions in terms of past, present, and future. Please indicate for each statement below whether it most nearly refers to the past, the present, or future, by underlining the appropriate word for each statement. In the "Age" column, indicate your best guess of your age at the time to which the statement refers. In cases where a statement applies to a time in the future less than a year from now, list in the "Age" column your present age.

Two samples follow:

Sample 1: I am taking the Time Reference Inventory in the
Past Present Future Age (Your age now)

Sample 2: My death in the
Past Present Future Age: 85

In sample 1, since you are currently taking the Time Reference Inventory, you underline the word "present", and under the "Age" column you list your current age.

In sample 2, you expect to die when you are older, and hence you underline the word "future". Your guess is that you will die at the age of 85, and therefore you write '85' in the "Age" column.

Please complete every statement below, even though you may have to make wild guesses. Be sure to list an age
for every item, and be sure that ages listed for “future” items are greater than your present age, and that the ages listed for "past" items are less than your present age. List a single age for each item, not an age range or age span.

1. The saddest time of my life is in the Past Present Future Age:

2. The time of my life with the most troubles is in the Past Present Future Age:

3. The most frightening time of my life is in the Past Present Future Age:

4. The time of my life that’s not very important is in the Past Present Future Age:

5. The time of my life that I don’t like to talk about is in the Past Present Future Age:

6. The most important time of my life is in the Past Present Future Age:

7. The happiest time of my life is in the Past Present Future Age:

8. The time in my life with the fewest troubles is in the Past Present Future Age:

9. The time in my life that I like to talk about most is in the Past Present Future Age:

10. The time in my life that I like to think about most is in the Past Present Future Age:

11. The time in my life that I usually dream about is in the Past Present Future Age:

12. My period of greatest activity is in the Past Present Future Age:
APPENDIX SEVEN.

FUTURE EVENTS TEST
Stein and Craik (1965)

Here is a list of 25 events that may happen to you in the future. Choose any 10 from the list and state how old you expect to be when each happens. Remember, answer only 10 items.

How old will you be when you...

1. buy or trade a car
2. take a long holiday
3. get married
4. get a promotion
5. have enough time for your favourite sport or hobby
6. buy or build a house
7. have your first child
8. have economic security
9. find or change jobs
10. move to another town or city
11. achieve highest skill in your work
12. improve your body build
13. win lots of money
14. have your last child
15. get more education
16. have emotional security
17. your youngest child gets married
18. achieve your major goal
19. buy something you have always wanted
20. pay off your debts
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>21.</td>
<td>improve your physical health</td>
</tr>
<tr>
<td>22.</td>
<td>get a divorce</td>
</tr>
<tr>
<td>23.</td>
<td>become an officer in a club or organization</td>
</tr>
<tr>
<td>24.</td>
<td>visit out of town relatives</td>
</tr>
<tr>
<td>25.</td>
<td>move to another house or flat</td>
</tr>
</tbody>
</table>
APPENDIX EIGHT

QUESTIONNAIRE ON RELIGION

This questionnaire is an attempt to get your opinion on some aspects of your belief about God and Religion. Please read every statement and respond to it in terms of your personal agreement or disagreement according to the following plan: Strongly agree (SA), Agree (A), Uncertain (U), Disagree (D), and Strongly Disagree (SD).

1. God has a definite plan or purpose which he is working out in the world.

2. Christ's death upon the cross has made forgiveness of sins possible.

3. Without belief in God life is meaningless.

4. The only benefit one receives from prayer is psychological.

5. A disbelief in God is ruinous to morals.

6. God is the only true way and as long as people neglect this the world will be beset by war and other social evils.

7. Christians have a duty to suppress ungodly literature which can poison the minds of innocent children.

8. The reason people seek escape in sex and drugs is because they haven't discovered the satisfaction of God's way.

9. A person can drink and gamble and still be a good Christian.

10. A divorced Christian has just as much right to remarry in the Christian Church as does any other Christian.

11. Those people to whom "God has revealed himself" have been subject to delusions.

12. In the view of the demonstrated failure of religion to solve our social problems we ought to build up a scientific approach on an atheistic basis.

13. Some sort of Religious instruction is a necessary part of our education.


15. A turning back to God is the only way to ensure the survival of civilization.
APPENDIX NINE.

INSIGHT LEVELS.

1. Name of Patient
2. Date of rating

3. Rating made in capacity of: M.O. / Group Leader (please delete one)

4. From your total knowledge of the patient, how important is his psychiatric adjustment in considering future sobriety?  Please circle the item most applicable.

   (i) Psychiatric aspects are of greatest importance.
   (ii) Psychiatric aspects are of some importance.
   (iii) Psychiatric aspects are of little importance.

5. In your opinion, how do you assess the patient's insight at this point in time?  Please circle the item which is most appropriate.

   Grade 1, Grade 2, Grade 3, Grade 4, Grade 5.

INSIGHT:

Grade 1. Sees need for active participation in making adjustments in addition to stopping drinking.  (Accepts - volunteers - being an alcoholic; sees this diagnosis as involving more than just drinking behaviour.  Has strong desire for continuing abstinence: recognises need for this and actively seeks help to achieve it - i.e. does not regard goal as easily achieved.  Sees need for changes in outlook as essential for stable sobriety and actively participates in the process of change.  Accepts full responsibility for actions and takes active steps to repair past damage to others.)

Grade 2. Sees need for other adjustments but does not appreciate his part in this.  (Prepared to admit being an alcoholic and is willing to have treatment - i.e. to be treated as opposed to active participation.  Passive rather than active co-operation/participation in treatment.  Sees that continuing abstinence might require changes in outlook; agrees this but takes no active steps to achievement.  Fear of consequences of drinking is mainstay of continuing sobriety.)

Grade 3. Sees alcohol as the only problem.  (Recognises drink as harmful but does not see himself as an alcoholic.  prepared to accept and may ask for sanctions - e.g. Antabuse - because cannot visualize not drinking without them.  Undergoes treatment expecting some "magical" solution - "rabbit out of a hat" attitude to therapist.  Tends to consider possibility of controlled drinking and wishes this could be achieved.

Grade 4. Alcohol regarded as a problem, but accepts treatment only as a consequence of external pressures.  "I am not an alcoholic, but I am not going to drink in any case."
(Only superficial awareness of drink as a problem, as the cause of his coming to hospital - e.g. as evasion of difficulties at home (wife, rent, writs etc.) or under compulsion (probation orders, etc.) Seeking material help and stops drinking for this purpose - "con man".  Bewildered by and/or rejecting of other aspects of treatment.)

Grade 5. Denial of alcohol as a problem.
(Absolutely no reason to stop drinking.)
APPENDIX TEN.

TREATMENT EXPERIENCES PARTICIPATION.

During his/her stay at Queen Mary Hospital, the patient:

1. Attended voluntary AA meetings

   Never 1 2 3 4 5
   Often

2. Attended Sunday Worship

   Never 1 2 3 4 5
   Often

3. Attended Worship during the week

   Never 1 2 3 4 5
   Often

4. Did the patient take antabuse?

   Yes ( )
   No ( )

   If yes, was the choice

   Due to considerable staff persuasion
   Entirely initiated by the patient

5. Did the patient enter Stage 3?

   Yes ( )
   No ( )

   If yes, for how long? .........................

6. Did members of the patient's family visit during family week?

   Yes ( )
   No ( )

   If yes, for how long? .........................

7. While in treatment, did the patient receive:

   anti-anxiety medication yes ( )
   no ( )

   sedatives yes ( )
   no ( )

   vitamins yes ( )
   no ( )

   other medication yes ( )
   no ( )
8. What, in your opinion, was the patient's degree of cognitive deterioration? (consider such things as the patient's difficulty in remembering names of staff and patients, appointments, where personal items had been left. Also disorientation and ability to follow group discussions)

   a) None ( )
   b) Mild ( )
   c) Moderate ( )
   d) Severe ( )
Dear Psychology Department,

30 April, 1979

I hope that things have gone well for you since our last correspondence nine months ago.

Once again I would be grateful if you would complete the enclosed questionnaire and send it back to me in the stamped envelope provided. Accurate information on how you have been since I last contacted you is crucial if I am to complete the work I have been conducting over the past three years into ways to improve treatment programmes for people with alcohol problems.

Thank you for your help in this important research. All the best for the future.

Yours sincerely,

Max Abbott
Psychologist
The purpose of this questionnaire is to obtain a full and accurate picture of how you have managed since leaving Queen Mary Hospital.

This information is needed for me to complete my research into how the Hanmer treatment programme works and how alcoholism treatment might be improved. The information you have already given to me is of only limited use unless I find out how it relates to how you have done since leaving. Please answer the questions as fully and accurately as you can.

It is understandable that you might be concerned about what happens to the information about you. Could you please fill in your name on the first page only. It will be removed when you return the completed questionnaire and your answers will be coded so they remain strictly private.

Please do not show this questionnaire to other people after you have filled in any part of it. However, you can get a social worker, nurse or school teacher friend to help you fill it in if you want to.

Name .....................................................

Today's Date ..............................
Instructions:

Tick ( ) where asked, or write in the answer to the question. You have answered some of these questions previously in relation to your time before coming into Queen Mary Hospital. The questions this time refer to how you have managed since leaving.

For the following questions, place a tick in the box next to the item that applies to you.

1. Right now you are living in:
   a rented house ( )
   your own home ( )
   an ownership flat ( )
   a rented flat ( )
   a hostel (eg. Y.M.C.A.) ( )
   private board ( )
   a boarding house ( )
   other (specify.............) ( )

2. Was the place you marked in 1 the same place you lived at before coming to Queen Mary Hospital?
   Yes ( )
   No ( )

3. How long have you lived at your present place?
   less than 4 weeks ( )
   1 month - 3 months ( )
   3 months - 12 months ( )
   1 year - 2 years ( )
   over 2 years ( )
4. Did you return to the same job that you had prior to leaving hospital?
   Yes ( )
   No ( )

5. How many jobs have you held since leaving hospital?
   none (because unemployed) ( )
   none (because disabled or retired) ( )
   housewife full-time ( )
   one ( )
   two ( )
   three ( )
   more than three (state number......) ( )

6. What is your present job? (What exactly do you do, not just what your job is called?)
   .................................................................
   .................................................................

7. What religion, if any, do you now think of yourself as having?
   Roman Catholic ( )
   Anglican (Church of England) ( )
   Methodist ( )
   Presbyterian ( )
   Atheist (Don't believe) ( )
   Agnostic (Uncertain God exists) ( )
   Other (Specify..............) ( )
8. When did you last worship in a group of people? 
(service, prayer, mass, religious meeting)
- Within the last week ( )
- Within the last fortnight ( )
- Within the last month ( )
- 1 to 6 months ago ( )
- Over 6 months ago ( )

9. At the moment you are:
- single ( )
- married ( )
- married but living apart ( )
- legally separated ( )
- divorced ( )
- widowed ( )
- de facto (ie. living with someone) ( )
- other (specify .................) ( )

The next group of questions concern your use of alcohol since leaving hospital. Remember that your answers to all questions are strictly confidential - they do not go beyond me!

10. After leaving Queen Mary Hospital, you:
- have not had an alcoholic drink ( )
- have had an alcoholic drink ( )

11. If you have had a drink after leaving Queen Mary Hospital, when did you have your first?
- The day of discharge ( )
- Within the first week ( )
- Within the second week ( )
- Within the third or fourth week ( )
- Within the second month ( )
- Within the third month ( )
- Sometime after the third month (please specify when
  ......................)
12. Do you feel happy with the way you have either:
   a) avoided drinking   Yes ( )
                   No  ( )
   b) managed to drink   Yes ( )
                   No  ( )

For the following questions, tick the scale at the point which corresponds closest with your judgment. If you tick 1, this means that the statement never applies to you. If you tick the 5, this means that the statement very often applies to you. 2 means sometimes, 3 means a bit more often than 2, and 4 means quite often.

13. How often in the last month did you:
   Drink in the morning:

   Never   1  2  3  4  5
   Very Often

   Drink at home:

   1  2  3  4  5

   Drink on weekends:

   1  2  3  4  5

   Drink alone:

   1  2  3  4  5

   Miss meals because of drinking:

   1  2  3  4  5
Get drunk:
Never 1 2 3 4 5

Very Often

14. How often in the last month have you experienced the following?

DT's or shakes:
Never 1 2 3 4 5

Very Often

Memory lapses or blackouts:

1 2 3 4 5

Dry heaves or cold sweat:

1 2 3 4 5

Difficulty sleeping:

1 2 3 4 5

Hallucinations:

1 2 3 4 5

Vague fears:

1 2 3 4 5
Severe hangover:

Never                      Very Often
1  2  3  4  5

Nervous or tense:
1  2  3  4  5

Upset stomach
1  2  3  4  5

Headaches:
1  2  3  4  5

Dizzy Spells:
1  2  3  4  5

15. Do you see your present drinking behaviour as:

No problem                      a very severe problem
1  2  3  4  5

16. How often have you engaged in the following activities during the last month?

Attending parties:

Never                      Very Often
1  2  3  4  5
Spending time with close friends:

<table>
<thead>
<tr>
<th>Never</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
</tr>
</thead>
</table>

Participating in sports (eg. playing bowls)

| 1     | 2 | 3 | 4 | 5 |

Attending cultural events, (eg. going to see a film, play, or an art display)

| 1     | 2 | 3 | 4 | 5 |

Attending a sporting event, (eg, being present at a rugby or cricket match)

| 1     | 2 | 3 | 4 | 5 |

Engaging in community activities, (eg. collecting money for the blind, helping on a school or club project, membership of a club)

| 1     | 2 | 3 | 4 | 5 |

17. Over the past month, you have felt:

Pleased about accomplishing something:

| 1     | 2 | 3 | 4 | 5 |

Relaxed and comfortable:

| 1     | 2 | 3 | 4 | 5 |
In control of your life:

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
<th>5</th>
</tr>
</thead>
</table>

That you knew where you wanted to go in life:

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
<th>5</th>
</tr>
</thead>
</table>

That you were getting all that you wanted in life:

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
<th>5</th>
</tr>
</thead>
</table>

On top of the world:

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
<th>5</th>
</tr>
</thead>
</table>

The next few questions are about A.A.

18. Did you attend the voluntary (outside) A.A. meetings while you were at Queen Mary?

<table>
<thead>
<tr>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Often</th>
<th>5</th>
</tr>
</thead>
</table>

19. Is there an A.A. group within travelling distance from your present place of residence?

Yes ( ) how far away? ..........miles or ......kilometres

No ( ) how far away? ..........miles or ......kilometres
20. Have you attended A.A. since you left hospital?
   Yes ( ) how many times? ...........
   No ( )

21. At the moment, to what extent do you think it can help you control your alcohol problem (if you have one)?
   Not at all ( )
   To some extent ( )
   To a moderate extent ( )
   To a considerable extent ( )
   Totally ( )

22. Have you attended any other support group or received counselling or therapy since leaving Hanmer, (eg. N.S.A.D., admission to another treatment programme)?
   Yes ( )
   No ( )
   If yes, please specify..................................................

   If a residential treatment programme, (ie. you live in), state the date you entered and left treatment)
   .................................................................
Dear

Over the past three years I have been conducting research at Queen Mary Hospital, Hanmer Springs. This work is funded by the New Zealand Neurological Foundation. We are interested in the effects of treatment and how future treatment can be improved. Little work has been done on this in New Zealand although it is very important if advances are to be made in helping people with alcohol problems.

You have been contacted because upon leaving hospital, a previous patient, gave me your name as a trustworthy and concerned person who knows him/her and who could give an honest account of his/her present drinking behaviour. By filling out the enclosed questionnaire, you will be providing information that is essential for the completion of the research project. A stamped, addressed, envelope is included for your convenience in returning the completed questionnaire.

Although a write-up of the study will be available on completion of the project, if there is anything at all that you would like to know at this stage, do not hesitate to contact me.

Thank you for your time and effort.

Yours faithfully,

Max Abbott
Psychologist
1979 Follow-up Questionnaire to Referees

Check with a (✓) where appropriate, or fill in the required information.

Name of patient: ..........................................

Discharged from Q.M.H.

Date questionnaire completed: ............... 

Status of reporter: (e.g. wife, parent, social worker, doctor, etc.) 

..........................................

1. The ex-patient presently lives:

   at home with others/family ( )
   at home alone ( )
   flat ( )
   boarding house ( )
   institution (specify 
   ........................................ ) ( )

2. The ex-patient has:

   a job ( )
   no job ( )

   if in work, the job has been held
   for..............weeks/months.

3. Since discharge, the patient has had
   an alcoholic drink

   Yes ( )
   No ( )

P.T.O.
4. Amount of alcohol intake (if any):
   beer (quart bottles per week) ......
   spirits (bottles per week) ......
   wine (bottles per week) ......
   other (specify amount per week) ......

   If the quantity is unknown, but the patient is known to be drinking, is it:
   slight ( )
   heavy ( )
   incapacitating for work ( )

5. To the best of your knowledge, how soon after discharge from Queen Mary did the patient start drinking:
   1 day ( )
   within first week ( )
   within second week ( )
   within third or fourth week ( )
   within second month ( )
   within third month ( )
   after three months ( )
   has not had a drink at all ( )

   [When: ........]

Just fill in as much of the above as you can. Most important is whether or not the patient is presently drinking. The next most important is when the patient started.

If you have any other comments on the patient's progress which you feel are relevant, you may note them below:

Many thanks for your effort and co-operation.
## APPENDIX 13

### ROTATED FACTOR MATRIX (15 FACTORS)

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<thead>
<tr>
<th>VARIABLE 1</th>
<th>VARIABLE 2</th>
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Appendix 14: Intercorrelations Between the Variables Listed in Tables 17 and 18.

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Key to Variables.

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</tr>
<tr>
<td>11</td>
<td>Drinking Behaviour</td>
</tr>
<tr>
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<td>Psychological Functioning</td>
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<tr>
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<td>Composite Time Perspective</td>
</tr>
<tr>
<td>37</td>
<td>Religiosity - Factor One, Change Score</td>
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<td>Religiosity - Factor One(2)</td>
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Appendix 15: Discriminant Function Analyses.

A. Three Month Outcome Data.

Generalized Mahalanobis D-Square 40.58 (df = 26)

Discriminant Function 1.

<table>
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<tr>
<th>Constant Coefficients</th>
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Discriminant Function 2.

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Discriminant Function 3.

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B. Twelve Month Outcome Data.

Generalized Mahalanobis D-Square 39.83 (df = 26)

Discriminant Function 1.

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Discriminant Function 2.

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Discriminant Function 3.

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Appendix 15 Ctd.

C. Constant Terms for the Stepwise Discriminant Function Analyses with assigned Priors.

Twelve Month Outcome Data.
Constants: (1) -40.599  (2) -41.439  (3) -42.541

Three Month Outcome Data.
Constants: (1) -41.699  (2) -45.457  (3) -41.435
<table>
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<th>CHI-SQUARE</th>
<th>DEGREES</th>
<th>FREEDOM</th>
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<td>CORRELATION</td>
<td>LAMBDA</td>
<td>VALUE</td>
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**CANONICAL CORRELATION** 0.60454

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.19491
- 0.08413
- 0.18076

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- -0.76533
- 0.18076
- 0.35069

---

**CANONICAL CORRELATION** 0.51508

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.66760
- 0.00413
- 0.09532

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- -0.11502
- 0.00413
- 0.09532

---

**CANONICAL CORRELATION** 0.33254

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.57034
- 0.19136
- 0.24144

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.04021
- 0.07832
- -0.20141

---

**CANONICAL CORRELATION** 0.19918

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.48345
- 0.30830
- 0.13885

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.49702
- 0.10270
- 0.13885

---

**CANONICAL CORRELATION** 0.17156

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.37919
- 0.48345
- 0.08020

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.42317
- 0.06017
- 0.06017

---

**CANONICAL CORRELATION** 0.07222

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.00790
- 0.01391
- 0.00790

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.72844
- 0.30850
- 0.13166
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</table>

**Canonical Correlation**

- For Left Hand Variables:
  - 0.52739
  - 0.47514
  - 0.46144
  - 0.4368
  - 0.4099

- For Right Hand Variables:
  - 0.04889
  - 0.06695
  - 0.16237
  - 0.24406
  - 0.00761
  - 0.01613
  - 0.35286

- For Left Hand Variables:
  - 0.39349
  - 0.36143
  - 0.14564
  - 0.17806
  - 0.33850

- For Right Hand Variables:
  - 0.39608
  - 0.35172
  - 0.17866
  - 0.23335
  - 0.26664

- For Left Hand Variables:
  - 0.30908
  - 0.34246
  - 0.14706
  - 0.13318

- For Right Hand Variables:
  - 0.0914
  - 0.10005
  - 0.11708
  - 0.22643

- For Left Hand Variables:
  - 0.3204
  - 0.35185
  - 0.17095
  - 0.19629

- For Right Hand Variables:
  - 0.0914
  - 0.10005
  - 0.11708
  - 0.22643

**Canonical Correlation**

- For Left Hand Variables:
  - 0.0091
  - 0.03652
  - 0.11037
  - 0.20406

- For Right Hand Variables:
  - 0.5204
  - 0.3288
  - 0.1208
  - 0.35875

- For Left Hand Variables:
  - 0.13209
  - 0.13481
  - 0.02636
  - 0.70193

- For Right Hand Variables:
  - 0.13209
  - 0.13481
  - 0.02636
  - 0.70193
### APPENDIX 16C

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**CANONICAL CORRELATION 0.83811**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

-0.29014  0.10974  0.99940  0.20244  -0.10553  0.03472

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

-0.14370  0.33995  0.28160  -0.08645  0.06471  0.05346

**CANONICAL CORRELATION 0.69795**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

0.62528  -0.29326  0.03770  0.06115  0.72636  -0.04850

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

-0.14370  0.33995  0.28160  -0.08645  0.06471  0.05346

**CANONICAL CORRELATION 0.57926**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

-0.68980  -0.29561  0.15458  -0.53245  0.67462  0.10018

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

0.57498  0.09812  0.27176  0.54753  -0.50992  0.16159

**CANONICAL CORRELATION 0.44836**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

0.42353  0.24439  0.17108  0.85658  0.02099  0.03613

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

0.42353  0.24439  0.17108  0.85658  0.02099  0.03613

**CANONICAL CORRELATION 0.30847**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

0.09706  0.18997  0.09038  -0.34366  -0.42651

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

0.17553  0.72641  0.02384  0.13122  0.45527  0.44952

**CANONICAL CORRELATION 0.21342**

**COEFFICIENTS FOR LEFT HAND VARIABLES**

0.59235  0.19186  0.22090  0.25916  0.90041

**COEFFICIENTS FOR RIGHT HAND VARIABLES**

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Canonical Correlation: 0.45983

Coefficients for Left Hand Variables:

-0.12303 0.35551 -0.15354 0.00214 0.07775 0.00104 0.64604

Coefficients for Right Hand Variables:

-0.59362 0.73725 0.12460 -0.29743

Canonical Correlation: 0.39788

Coefficients for Left Hand Variables:

-0.09381 -0.39453 -0.64786 -0.32643 0.57098 -0.23392 0.02150

Coefficients for Right Hand Variables:

0.73717 -0.23378 -0.23956 -0.58737

Canonical Correlation: 0.23332

Coefficients for Left Hand Variables:

0.23499 -0.15207 -0.07573 -0.14486 -0.30276 0.00097 0.01509

Coefficients for Right Hand Variables:

0.16005 0.34901 -0.91647 0.05399

Canonical Correlation: 0.12000

Coefficients for Left Hand Variables:

-0.12940 0.23068 0.43785 -0.57231 0.28618 0.15564 -0.09897

Coefficients for Right Hand Variables:

0.42162 0.54954 0.18603 0.69676
### APPENDIX 16E

<table>
<thead>
<tr>
<th>NUMBER OF COMPONENTS REMOVED</th>
<th>NUMBER OF LARGEST EIGENVALUES REMAINING</th>
<th>CORRESPONDING LARGEST CANONICAL CORRELATION</th>
<th>CANONICAL CORRELATION</th>
<th>COEFFICIENTS FOR LEFT HAND VARIABLES</th>
<th>COEFFICIENTS FOR RIGHT HAND VARIABLES</th>
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<td>0.20509</td>
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<td>0.09802</td>
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**CANONICAL CORRELATION 0.5066**

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.34735
- 0.20509
- 0.47807
- 0.09802
- 0.40459

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.34735
- 0.20509
- 0.47807
- 0.09802
- 0.40459

**CANONICAL CORRELATION 0.33440**

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.12287
- 0.02761
- 0.00673
- 0.25318
- 0.23581

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.12287
- 0.02761
- 0.00673
- 0.25318
- 0.23581

**CANONICAL CORRELATION 0.20391**

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.14785
- 0.69639
- 0.57357
- 0.00572
- 0.67795
- 0.03932
- 0.54108
- 0.22214

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.14785
- 0.69639
- 0.57357
- 0.00572
- 0.67795
- 0.03932
- 0.54108
- 0.22214

**CANONICAL CORRELATION 0.08703**

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.30409
- 0.20458
- 0.19997
- 0.06145
- 0.23061

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.30409
- 0.20458
- 0.19997
- 0.06145
- 0.23061

**CANONICAL CORRELATION 0.08703**

**COEFFICIENTS FOR LEFT HAND VARIABLES**
- 0.30409
- 0.20458
- 0.19997
- 0.06145
- 0.23061

**COEFFICIENTS FOR RIGHT HAND VARIABLES**
- 0.30409
- 0.20458
- 0.19997
- 0.06145
- 0.23061
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<td>-0.3063</td>
<td>-0.1518</td>
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<table>
<thead>
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<td>0.1996</td>
<td>-0.3063</td>
<td>-0.1518</td>
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</table>

**Standard Deviations**

- 2.98701
- 2.84416
- 1.37662
- 2.18182
- 20.03896
- 1.49992
- 1.72493
- 0.48772
- 1.12071
- 20.53201

**Correlation Coefficients**

- 0.43148
- 0.50630
- 0.44799
- 0.11300

**Largest Corresponding Eigenvalues**

- 3.71646
- 0.49655
- 0.46716
- 0.40132
- 0.33791

**Canonical Correlation Coefficients**

- 0.88150
- 0.99682
- 0.30633
- 0.15185
- 1.00000

**Eigenvector Coefficients for Left Hand Variables**

- 0.88150
- 0.99682
- 0.30633
- 0.15185

**Eigenvector Coefficients for Right Hand Variables**

- 1.00000
REFERENCE NOTES


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