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COGNITIVE AND BEHAVIOURAL IMPULSIVITY AMONG
PRISONERS AND COMPARISON GROUPS

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SUMMARY

The purpose of the research was to investigate the extent to which childhood hyperactive impulse disorder is related to adult criminal behaviour.

Hyperkinetic impulse disorder (H.I.D. or hyperkinesis) has been considered a disorder limited to childhood. Hyperkinesis is a term used to describe a behavioural syndrome of childhood that has trait like characteristics. Hyperkinetic children on average exhibit normal intelligence but are impulsive, overactive, excitable and have poor psychomotor control and short attention span.

The hyperkinetic child syndrome is one of the most common behaviour problems of childhood. Estimates of its prevalence in the Australian preadolescent population are around six percent. Children diagnosed as H.I.D. usually demonstrate abnormal behaviour patterns very early in life. Signs of hyperkinesis can be traced to infancy in the majority of cases and histories of feeding and sleeping problems are common.

There is strong evidence that suggests that hyperkinesis is a biological trait. A result of the H.I.D. child's poor interaction with his environment is the development of secondary characteristics of poor self-esteem, impulsive behaviour and poor school performance. They have a long history of difficulties with parents, teachers and peers.

Most authorities have agreed that impulsiveness is a primary symptom in H.I.D. with hyperkinetic children being more impulsive than controls.

Follow-up studies of hyperkinetic children show that these children may become less active and impulsive by adolescence. However, a number of longitudinal studies suggest that H.I.D. may persist into adult life. In adolescence they continue to be more impulsive and aggressive than age and sex matched controls and an inordinate proportion develop antisocial behaviour. Typically H.I.D. children have behaviour problems in school, start to fall behind, truant and come under notice of educational and child care authorities. Entanglements with courts, probation officers and police follow. They have been reported to have a history of frequent offenses of a non-violent nature.

It has been suggested that impulsiveness could either initiate or disinhibit violence and other forms of criminal behaviour. Measures of impulsiveness would have trait-like properties of robustness and be resistant to simple instructional manipulation.

In order to investigate the relationship between hyperkinesis and adult criminal behaviour a sample of prisoners were tested. In addition to the test battery, biographical information on the prisoners were obtained. This made possible an examination of prisoners history of contact with the police and law authorities. It was predicted that prisoners would be significantly more impulsive on performance tests than comparison

groups and that impulsiveness would be related to early and frequent contact with the law, mainly for non-violent type offenses.

Two comparison groups with an institutional setting were selected. They were samples of police cadets in their final stages of training and first year university students. This made possible control for the effects of institutionalization. However, differences in population setting were likely to influence results.

The two measures of cognitive style of responding that were used were a refined automated version of the Matching Familiar Figures Test (MFFT) and the Porteus Mazes.

Kagan's MFFT has achieved wide acceptance as a measure of cognitive impulsiveness. It has been devised as a measure of how individuals trade-off speed against accuracy. The test appears to have met acceptable criteria of reliability and validity. While the original paper and pencil version has mainly been used with children, the test has been recently refined so that it is available in an automated version that provides a precise measure of impulsiveness in adults.

Porteus developed a series of mazes which have been widely used in research with prisoners as measures of impulsiveness. Two relatively independent scores relating to intelligence and impulse control are derived from maze test performance.

It was predicted that there would be a positive significant correlation between impulsive performance on the MFFT and Porteus' measures of impulse control.

In addition, the MFFT was re-administered to the prisoners under varying degrees of task instruction and feedback on performance in order to examine the trait-like properties of the measure. It was predicted that the MFFT would be a robust measure and little change in the prisoners' performance would occur.

A high correlation has been reported between impulsiveness and intelligence. In order to control for the effect of intelligence the Peabody Picture Vocabulary Test (PPVT) a measure of verbal intelligence, was included in the study.

A theoretical link can be established between impulsiveness and locus of control. It has been suggested that impulsive behaviour is determined by immediate extrinsic motivators. Individuals who have poor impulse control are likely to perceive their behaviour as being determined by external environmental forces. They tend to hold external locus of control beliefs.

As the study was concerned with groups who have extensive and varied contact with authorities, an experimental scale designed to measure attitude towards authority was included in the test battery. The scale has been widely used among prisoners and students in South Australia and an extensive data base was available for comparison with the data from the samples in this study.

Comparison of prisoners with other groups indicated that prisoners were significantly more impulsive. They took

less time to select alternatives and made more errors on the MFFT. Prisoners have significantly poorer planning, foresight and motor control on the Porteus mazes.

The predicted relationships between impulsiveness, intelligence and locus of control were confirmed for prisoners. Factor analysis of their results produced a general factor with the characteristics of hasty responsiveness, many errors, poor planning ability and foresight, poor psychomotor performance and external locus of control. These were related to low intelligence and poor education level. Collectively the measures appeared to be successful in identifying among prisoners those who had poor impulse control.

The predicted relationship between impulsiveness, intelligence and locus of control were not confirmed for either the student or police cadet populations. Factor analysis of their results produced factors which appeared to correspond to each of the measures. For all groups there was no relationship between attitude towards authority and impulsiveness.

The predicted relationships between impulsiveness and prisoners' record of criminal behaviour were not confirmed. Among prisoners impulsive responding on the MFFT and Porteus mazes was not associated with any of the biographical measures. This result was in part due to the incompleteness of the prisoner biographical data.

For prisoners who had biographical data available, those who came into contact with the law at an early age had a low

level of schooling, engaged in frequent juvenile crime and were incarcerated at a relatively early age. The MFFT appeared to be a very robust measure. Providing feedback to the subject on his performance by providing positive and negative tones for respectively accurate and inaccurate responding had no effect on MFFT performance. The effect of altering instruction set was to induce subjects to go slower without a corresponding reduction in the number of errors they made. It appears that error performance on the MFFT has trait properties. Errors were resistant to both changes in instruction and the provision of feedback on performance. This suggests that the MFFT measures a general trait and errors are the most important component of MFFT performance.

The pattern of correlation among the tests for all subjects confirmed that MFFT errors related better to other measures than either MFFT latency or the impulsiveness univariates. MFFT errors significantly correlated with Porteus maze performance and PPVT intelligence. In contrast MFFT latency showed little external validity and substantially reduced the correlations for the MFFT impulsiveness univariate.

For prisoners there was a significant correlation between the MFFT measures and performance on the Porteus mazes. The correlations between MFFT errors and Porteus mental age and Q score were respectively $-.38$ and $.38$. Prisoners who had both difficulties in solving the mazes and high Q scores made more

errors on the MFFT.

It was expected that the correlation between MFFT errors and maze test age would have been substantially reduced by controlling for PPVT IQ. Controlling for intelligence by a partial correlation analysis substantially increased the correlation between MFFT errors and Porteus mental age ($r = -.47$). This indicated that the Porteus mental age scores may be more than a simple index of intelligence. The correlation between Porteus mental age and PPVT IQ was .32. It appears that they are not measuring the same aspect of intelligence. Controlling for PPVT intelligence had little effect on the significant correlation between MFFT errors and Porteus Q score.

In contrast to prisoners, there was no relationship between the two impulsiveness measures for students. Students' MFFT performance did not significantly correlate with their performance on the Porteus mazes. However, the students were a much more homogeneous group than prisoners on the Porteus mental age measures. In addition, there was a very significant correlation between Porteus mental age and Q score ($r = -.52$). This may have indicated a ceiling effect for students on the mazes; the mazes did not appear to be of sufficient difficulty to provide a wide range of performance. This would have limited the predictability from students' maze test results to performance on other related tasks and is probably the reason why the correlations for students between maze test age, Q score and PPVT intelligence were not significant. The results cast doubt on the usefulness of the Porteus maze test among students.

The use of assigning weights to compute Q score could not be justified by the results of this study. The Q score could be accurately estimated from the unweighted items. Factor analysis of the Q score component items indicated that Porteus mental age was a measure of planning ability while Q was a measure of both intelligence and psychomotor control.

The simplified Q measure was internally consistent, mainly independent of planning ability, did not lead to any loss of information and refined the Q score as a measure of psychomotor control. Its relation to impulsiveness requires further investigation.

The Rotter I-E locus of control scale was found to be an internally consistent reliable measure. For students, two distinct factors relating to personal and political control beliefs were extracted. This factor structure was stable over a considerable period of time.

It appeared that students were consistently making a distinction between beliefs concerning the importance an individual places on his own and the action of others in determining the events in their lives and the control they have over political institutions and world affairs.

The two factor structure provided justification that for students the political control items should be kept separate from the general control items especially of a researcher is interested in the political efficacy aspect of internal versus external control.

The two factor structure was not replicated in either the prisoner or police cadet populations. The factor structure of the three populations were very different. It is possible that there are so few items in the Rotter scale and they sample from so many settings that for prisoners and police cadets there is not enough items to show up in any reliable subscale. The factor structure of the Rotter scale has also been found to vary with item content and method of administration. These results cast doubt on the generality of the two factor structure in the general population. While the total score may be masking different components of locus of control and thereby lose specific predictive ability it is suggested that for the general population it is the most appropriate score derived from the present scale format.

A review of the mean locus of control scores for Australian students confirmed that they were scoring higher than the American norms. There had been a consistent secular change towards more external control beliefs among Australian students. It is possible that the American norms established by Rotter in the mid sixties are no longer applicable to either Australian or American samples.

Evidence was found that changes in beliefs such as locus of control and attitude towards authority were not stable over time and may be dependent on social influences.

Prisoners and students in the study held more favourable attitudes towards authority than comparable groups tested in the early seventies. If disparate groups such as these reflect

more favourable attitudes towards authority it seems reasonable to assume that within the Australian population there has also been a change towards more conservative beliefs.

There appeared to be marked differences in expectations in complying to the request to participate in the study between the populations. These were related to population context. For prisoners, boredom or relief from work duties appeared to be factors in volunteering. In contrast students complied as participation was a notional requirement of their course while police cadets volunteered en masse. The study may not have had many genuine volunteers among students and police cadets as few availed themselves of the opportunity to follow up results.

The selection method resulted in populations that were highly selected and restricted. Even though anonymity was guaranteed the results may have been influenced by faking of responses. Both prisoners and police cadets had strong reasons to portray more favourable responses. Among these groups self-report measures may not be valid measures.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of my knowledge and belief, it contains no material previously published or written by another person, except when due reference is made in the text.

Signed _____

R.V. Lange

March 1982

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CHAPTER 1.

INTRODUCTION1.1 CHILDHOOD HYPERKINETIC IMPULSE DISORDER1.1.1 Introduction

Hyperkinetic impulse disorder (H.I.D. or hyperkinesis) is one of the most common behaviour problems of childhood. Children diagnosed as H.I.D. usually demonstrate different behaviour patterns very early in life. Signs of hyperkinesis can be traced to infancy in the majority of cases and histories of feeding and sleeping problems are common. This indicates that H.I.D. is in part biologically determined.

A theory proposed by Glow and Glow (1979) is that H.I.D. is a developmental disorder of intrinsic motivation. The main characteristic of H.I.D. children is that they have poor appreciation of the relationship between their own behaviour and environmental events. In H.I.D. children feedback to the child about his effects on the environment is restricted. The child is less likely to engage in behaviour that will control his environment. Thus, intrinsic motivation to control the environment diminishes or fails to develop. The H.I.D. child comes to accept the world as largely unconnected with his own efforts. In a world that appears unresponsive to his own efforts the H.I.D. child is likely to seek immediate gratification and behaviour becomes determined by extrinsic factors. The motivational theory of H.I.D. proposed by Glow and Glow (1979) suggests

" The H.I.D. child, unable and unmotivated to analyse contingencies, accepts the world as largely unconnected

with his own efforts. This, if left unmodified becomes an enduring characteristic, and his behavior is then determined by immediate extrinsic motivators, such as rewards or punishments. The child's best strategy in such an apparently unresponsive world is to maximize immediate gratification. Parents and teachers see this behavior as impulsive, impersistent, and immature. Furthermore the child's behavior engenders chaos in the classroom, where persistent effort is required, and interferes with the child's ability to learn. Learned ineffectiveness accounts for the symptoms of hyperkinetic impulse disorder, such as over-activity, impersistence, attention difficulties, and impulsivity.

The H.I.D. child's difficulties with learning are independent of poor intelligence, but referable to his dependence on immediate extrinsic motivators. This characteristic makes it difficult for the child to succeed on tasks which demand the appreciation of complex contingencies, feedback from performance, or persistent effort with delayed reward. Academic, psychomotor, and social skills are all affected, and the child is thus at risk for underachievement at school and for juvenile delinquency, social inadequacy, and adult psychopathology." (Glow & Glow, 1979, p. 162).

1.1.2 Characteristics of H.I.D.

A result of the H.I.D. child's poor interaction with the environment is that he is unable to engage in persistent effort. Douglas (1972), Sykes (1969), Sykes, Douglas, Weiss and Minde (1971), Sykes, Douglas and Morgenstern (1972) all reported that attention is impaired in H.I.D. children. On attention tasks

requiring continuous performance H.I.D. children had considerable difficulty in continuing to respond over a prolonged period of time. Similarly, Kaspar, Millichap, Backus, Child and Schulman (1971) and Rosenthal and Allen (1978) found that hyperkinetics performed poorly on vigilance tasks, detected fewer error signals and produced more false responses than controls.

By being impersistent and inattentive H.I.D. children are seen by their parents and teachers as impulsive. Cantwell (1977) and Werry (1972) emphasized that there was high consistency across observers who found that the behavioural characteristics of hyperactive children included overactivity, impulsivity, inattention, distractibility and clumsiness. In the classroom H.I.D. children engaged in disruptive behaviour and had long history of difficulties with parents, teachers and peers (Campbell & Paulauskas, 1979; Laufer & Denhoff, 1957; Stewart, Pitts, Craig & Dieruf, 1966). At school H.I.D. children are at a double disadvantage when facing the demands of the classroom. They are more likely to respond immediately without evaluating the correctness of the response and are more likely to be influenced by the less relevant components of the stimulus field. As a result H.I.D. children have poor school performance and develop inadequate social skills.

In H.I.D. children impulsiveness should be apparent as a single major characteristic. Cohen, Weiss and Minde (1972) reported that H.I.D. children used an impulsive rather than a reflective cognitive style. On tests of cognitive impulsivity H.I.D. children were faster, made more errors and were more field dependent.

Several studies have factor analysed various elements of hyperkinesis but the results have been equivocal. Langhorne, Loney, Paternite and Bechtoldt (1976) and Paine, Werry and Quay (1968) used variables from sources such as parents, teachers, psychiatrists and medical chart raters. They identified factors corresponding to the source ratings and concluded that factor analysis of hyperkinetic syndrome features would invariably generate source rather than symptom related factors. In contrast, Glow (1979) reported that several principal components of H.I.D. could be identified and that items relating to inattention and impulsiveness best corresponded to the H.I.D. syndrome.

A large proportion of H.I.D. children develop antisocial behaviour (Huessey & Metoyer, 1973; Mendelson, Johnson & Stewart, 1971; Weiss, Minde, Werry, Douglas & Nemeth, 1971). Typically H.I.D. children have behaviour problems in school, start to fall behind, truant and come under notice of educational and child care authorities. Entanglements with courts, probation officers and police at an early age follow.

1.1.3 Incidence of H.I.D.

Estimates of the prevalence of hyperkinesis in the pre-adolescent population have varied from an estimated 1-10 per cent depending on the study methodology and the diagnostic criteria used (Chess, 1960; Huessey, 1967; Miller, Palkes & Stewart, 1973; Rutter, Tizzard & Whitmore, 1970). The broader the criteria used in categorising children as having characteristics related to H.I.D. the more classified. For example Lapouse and Monk (1958) reported that more than 50 percent of parents in an unselected

population considered their sons to be overactive. Using both parent and teacher ratings Glow (1979) estimated the prevalence of H.I.D. in a large Australian sample at six percent.

1.1.4 Hyperactive children as adults

H.I.D. has long been considered a disorder limited to childhood that disappears as the child matures into adolescence (Laufer & Denhoff, 1957; Lytton & Knobel, 1958). However, a number of longitudinal studies suggest that H.I.D. may persist into adult life (Borland & Heckman, 1976; Hechtman, Weiss, Finklestein, Warren & Benn, 1976; Shelley & Reister, 1972). Cohen, Weiss and Minde (1972), Hopkins, Perlman, Hechtman and Weiss (1979) reported that hyperactive children as adults had continued difficulty in reflection. On the MFFT they continued to make significantly more errors and had faster latencies.

Several studies have also reported that adults who were diagnosed as hyperactive children and who still manifested characteristics of hyperkinesis obtained substantial benefit from the same medication given to hyperkinetic children (Campbell, Douglas & Morgenstein, 1971; Wood, Reimherr, Wender & Johnson, 1976). The continued response to drugs further suggests the persistence of hyperkinesis into adulthood.

1.1.5 Summary

Hyperkinetic impulse disorder is a common developmental disorder in children. In H.I.D. children there is a poor appreciation of the relationship between their own behaviour and environmental events. This in turn predisposes H.I.D. children to

rely on extrinsic motivators. The main characteristics of H.I.D. are overactivity, impulsivity, impersistence and inattention. These lead to underachievement at school and failure to develop adequate social skills. Problems of attention and impulse control in childhood contribute significantly to the risk of pathological and anti-social behaviour. As a result H.I.D. children are likely to have major psychological and behavioural problems in adulthood.

1.2 H.I.D. AND ITS RELATION TO CRIMINAL BEHAVIOUR

Problem behaviour in childhood has been found to relate to later criminal involvement (Mitchell & Rosa, 1981; Taylor & Watt, 1977; Wadsworth, 1979; West, 1969; West & Farrington, 1977). Parents' perceptions of their children's behaviour as 'overactive', 'nervous' or 'aggressive', nail biting, stammering and general fidgetiness may ante-date any subsequent involvement in criminal activity. Minde, Lewin, Weiss and Mendelson (1972), Weiss, Kruger, Danielson and Elman (1975) and Weiss, Minde, Werry, Douglas and Nemeth (1971) followed up into adolescence groups of non-psychotic children of normal intelligence who had five years earlier been reported to be overactive at home and at school. Over 90 percent of the subjects were boys and there was a 12 percent attrition rate from the original sample. In their teens 80 percent of these children had failed at school at least once, were doing poorly on most subjects, were aware of their failure and had low expectations for the future. One-quarter of the sample were judged to be antisocial.

Congor and Miller (1965, 1966) presented evidence that impulsiveness was related to criminal behaviour and that it developed at an early age. As subjects they used the entire tenth grade of all high schools in a large American city. Personality test data and teacher ratings were available for all subjects for various ages from kindergarten to ninth grade. Each delinquent youth was matched with a non-delinquent peer of the same age, sex, IQ, socioeconomic status, residence area, ethnic group membership, educational background and school environment. Two matched groups of 384 boys and 170 girls were obtained.

For the boys the overall differences between delinquents and non-delinquents in personality characteristics and social behaviour began to emerge in the early school years. By the end of the third grade, future delinquents were already viewed by their teachers as more poorly adapted than their classmates. They appeared less considerate and fair in dealing with others, less friendly, less responsible, more impulsive and more antagonistic to authority.

By the end of the ninth grade, the delinquents manifested differences from their non-delinquent peers in virtually every area of personality functioning and behaviour. In their academic activities the delinquents continued

"to have greater difficulty than their nondelinquent matches. Their work habits were significantly poorer; they were more careless in their work, appeared more often to be working below their capabilities, and needed much more supervision from teachers. Attendance

was more often a problem among these youths." (1966, p. 187).

Congor and Miller reported that the delinquents appeared to be more distractible, manifested much less capacity for sustained attention, daydreamed more, and tended to give up when challenged academically. All are characteristics thought to be related to impulsiveness.

A number of studies have followed up H.I.D. children and found that H.I.D. appears to be a precursor to involvement in criminal activity. Menkes, Rowe and Menkes (1967) followed up 18 patients who had been evaluated 24 years previously as having had hyperkinetic symptoms and learning difficulties. At follow up the group had done poorly as only 8 were self supporting, four were institutionalised as psychotic and two were retarded. Of the 8 who were self supporting four had spent some time in institutions. However, Menkes' sample may have been biased as he included subjects with very low IQ's (four less than 80 and three between 80 and 90) and all had had prominent conduct disorder. The poor follow up results from this group may have come from low IQ and conduct disorders rather than hyperkinesis.

Laufer (1971) examined data from old clinical records and reported that hyperkinetic children still had syndrome characteristics as adults. Again there were methodological problems as only 66 percent of initial subjects responded to the follow up. It is likely that hyperkinetic children who did not manifest hyperkinetic characteristics as adults were not included.

Huessey and Metoyer (1973) followed up 75 out of an original sample of 84 who had been diagnosed 8-10 years before as hyperactive. They reported that 80 percent of these still had symptoms commonly seen in hyperkinetic children. At follow up 15 had been imprisoned or arrested and 22 had required institutional care.

Mendelson, Johnson and Stewart (1971) studied 83 children between the ages of 12 and 16 who had been diagnosed two to five years earlier as having been hyperactive. While half had improved, most of the children still had trouble with the major symptoms being overactive, distractible, impulsive and irritable. These had resulted in poor performance in school and a low self esteem.

They found a high association with delinquent behaviour. Eighteen of the children had long histories of lying, stealing, fighting, destructiveness and other antisocial behaviour. Fifty-nine percent had had some contact with the police and 23 percent had been taken to the police station one or more times. Eighteen percent had been before juvenile courts and 17 percent had been involved with the police three or more times. They concluded that given the percentage of the normal population who became delinquents the number of children in their study who engaged in delinquent activity was abnormally high.

Hyperactivity has also been reported to be related to certain types of criminal behaviour. Vinson (1977) made comparisons among persons who had been convicted of either violent or property crimes. He reported that property offenders in comparison to violent offenders had significantly more previous crime and were more hyperactive. From his results it appeared that impulsiveness

could either initiate or disinhibit violence and other forms of criminality.

In summary, hyperactive children have been found to have difficulties in impulse control and attention and these in turn lead to problem behaviour at school and subsequent academic failure. Hyperkinetic children do not simply outgrow their problems and have their symptoms disappear in the teens. Having left school H.I.D. children no longer become problems for the school authorities but become problems for the juvenile, police and law authorities. The research work which follows up hyperactives as adults has been virtually ignored yet all have agreed that they are predisposed to juvenile and later adult criminal activity.

1.3 POPULATIONS

In order to investigate the relationship between hyperactivity, impulse disorder and adult criminal behaviour a sample of prisoners at Yatala Gaol in South Australia was tested (N = 61). It was expected that among prisoners there would be a substantial subgroup who had characteristics similar to hyperactive children. They would have difficulties in attention and an impulsive cognitive style of responding. This would result in prisoners, in comparison to others, being significantly more impulsive.

In addition to the test battery, biographical information on the prisoners was obtained from their files kept by the Department of Correctional Services. This made possible an examination of prisoners' history of contact with the police and law authorities. Information was gathered relating to age of first offence, type

and number of juvenile and adult offenses, the level of education reached and the number of primary and secondary schools attended.

It was predicted that an examination of prisoners' records of offences would show impulsiveness to be related to early and frequent contact with the law, a tendency to engage in non-violent minor crimes such as property offences and a low level of education.

A factor to be considered in investigating impulsiveness among prisoners is their institutional setting. It is possible that the prisoners' setting may lead to impulsive performance. Two comparison groups with an institutional setting were selected. They were police cadets in their final stage of training at the Police Academy at Fort Largs in South Australia (N = 46) and first year psychology students at the University of Adelaide (N = 38). While the three groups were not equivalent they did provide partial control for the effects of institutionalization.

The context of the populations were different. The prisoners were in a closed system with a very authoritarian setting. The police cadets lived at the academy but had only a semi-closed system with an authoritarian setting. The students had an open system with a liberal setting. It was likely that the different population contexts would lead to differences in test-taking and possible faking of responses, especially on the self-report measures. To reduced the possible effects of faking of responses all subjects were guaranteed anonymity.

Only volunteers were asked to participate in the study. However, the population context could have created differences in complying.

An indication of the significance of volunteering could be obtained from the number of subjects who requested information on their performance. A genuine volunteer might be expected to have enough interest to follow up both his performance and the results of the study.

1.4 TRAIT IMPULSIVENESS

A model of H.I.D. has been described which views hyperkinesis as a developmental defect. Impulsiveness is a very important part of the symptom complex of H.I.D. The problems and characteristics of H.I.D. children appear to be resistant to maturation and these children continue to have difficulties in impulse control as adults. This provides strong evidence that impulsiveness is a general biological trait.

It could be expected that measures of impulsiveness would have trait-like properties of robustness and be resistant to simple instructional manipulation.

1.5. MEASURES

1.5.1 Impulsiveness

The two measures of cognitive style of responding that were used were a refined automated version of the Matching Familiar Figures Test (MFFT) (Kagan, Rosman, Day, Albert & Phillips, 1964) and the Porteus Mazes (Porteus, 1963, 1965).

Kagan's MFFT has achieved wide acceptance as a measure of cognitive impulsiveness. The MFFT is an individually administered matching-to-sample perceptual recognition task in which the subject

is simultaneously presented with a standard stimulus and an array of highly similar variants plus an alternative which is identical with the standard. The subject is asked to choose the alternative which exactly matches the standard. The latency of the first response to each of the twelve items and the total number of errors made before the subject makes the correct choice are the two measures from which reflectivity-impulsivity is computed. Impulsives are subjects who respond quickly making many errors while reflectives delay responding and make few errors. In addition two univariate scores of reflectivity-impulsivity and efficiency-inefficiency are computed from the standardized latency and error scores. Impulsivity is Z error minus Z latency and inefficiency is Z errors plus Z latency. While the original paper and pencil version has mainly been used with children, Glow, Lange, Glow and Barnett (1981, Appendix D) have refined the test so that it is available in an automated version that provides a precise measure of cognitive impulsivity in adults.

Porteus developed a series of mazes of increasing difficulty which have been widely used as measures of impulsiveness. Two relatively independent scores are derived from subjects' performance on these tests. A quantitative score (TA), which relates to the ability to solve the mazes, and a qualitative (Q) score which relates to impulse control. The Porteus Mazes have been frequently used in research with prisoners and comparisons of offenders with non-offenders have found offenders to have significantly higher Q scores.

The MFFT and the Porteus Mazes both purport to measure impulsiveness. It was predicted that there would be a high positive correlation between impulsive responding on the MFFT and maze Q scores. In addition to a standardised presentation of a test battery including the automated version of the MFFT, it was considered desirable to conduct an enquiry to test the trait-like properties of the impulsiveness construct. The MFFT was re-administered to a random sample of prisoners under varying degrees of task instruction and feedback on performance. The prisoner sample was selected as it had been predicted that impulsiveness would be more prevalent in this group. If impulsiveness is a biological trait and the MFFT is a valid measure of impulsiveness it was predicted that the MFFT would be robust and little change in prisoners' performance would have occurred as a result of manipulation of task instruction.

1.5.2 Intelligence

A consistent moderate negative relationship has been found between impulsiveness and intelligence (Messer, 1976; Ward, 1968). In view of this relationship it would be appropriate to control for the effect of intelligence when investigating trait impulsiveness.

An automated version of the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1965) was used to assess the relationship between style of response and intelligence. The PPVT is a widely used measure of verbal intelligence constructed with multiple choice items. It has both similar format and task requirements as the MFFT.

1.5.3 Locus of Control

The internal-external control construct (Rotter, 1966) is conceptualized as a generalized expectancy relating to the causality of events. At one extreme are externals who perceive the reinforcement they receive as a function of external forces such as fate, chance, luck or powerful others. At the other extreme are internals who perceive the reinforcement they receive as a function of their own actions or characteristics.

Glow and Glow (1979) postulate a theoretical link between impulsiveness and locus of control for H.I.D. children. They suggest that the amount of control H.I.D. children have over their environment is limited as feedback from the environment is attenuated. The world is seen as largely unconnected with their own efforts and their behaviour becomes determined by immediate extrinsic motivators. H.I.D. children, and adults who displayed similar impulsive characteristics, would tend therefore to hold external locus of control beliefs.

The Rotter internal-external locus of control scale was included in the study to investigate this postulated relationship between impulsiveness and locus of control beliefs.

1.5.4 Attitude Towards Authority

In addition to the above four measures an experimental scale designed to measure attitudes towards various authority figures was included in the test battery. The attitude towards authority scale developed by Rigby (1975) has been widely used among prisoners and students in South Australia. This has provided an extensive data base on which it is possible to evaluate the

predictability of the measure. As the study was concerned with groups which had extensive and varied contact with the authorities it was believed there was adequate empirical and conceptual justification for including the scale.

The conceptual framework of this study suggests that prisoners who displayed impulsive characteristics similar to hyperactive children would have had frequent negative contacts with school, welfare, police and law officials at an early age. It could be expected that they would develop very unfavourable attitudes towards authority.

1.6 SECULAR CHANGES

The two self-report inventories used in the study, the Rotter I-E locus of control scale and the attitude towards authority inventory, are designed to measure an individual's attitudes and beliefs. It is possible that these attitudes may vary in the general population according to the prevailing economic climate or current social and political issues.

Both scales were developed in the late sixties or early seventies and norms were provided from that era. This was generally a time of student political unrest and economic stability. The current climate is one of student conservatism and economic instability.

If changes in beliefs such as locus of control and attitudes towards authority are distinguishable over time, the results on these measures in this study should vary from the expected norms.

1.7 SOCIAL AND POLITICAL CONTEXT OF THE RESEARCH

The social and political context of the research conducted in South Australia needs to be put in perspective. While in Britain or the United States there has been a tradition of psychologists and social scientists having access to prison populations for the purpose of rehabilitation and research, this is not the case in South Australia. There are psychologists attached to the prison services, but they carry out virtually no research role and there is no system of support for any research worker who wishes to investigate the psychological or social characteristics of prisoners. The present research, therefore, had to rely very much on its own resources. The tests used had to be devised or imported by the researcher. There were no additional test data available for collation with the tests used in this particular study. The obtained data base was not great. What biographical information was available was subjective and unstructured. Therefore, the final extent of the data analysed and interpreted may be small by comparison with that available from a similar investigation elsewhere.

The social and political climate in South Australia can be regarded as somewhat inimical to innovation and research. In that state authorities are reluctant to accept justification for this type of research. This acts to retard the introduction of researchers into the institutions. The difficulties of social experimentation in the area of criminal behaviour, referred to by Cook, Fremming and Tyler (1981), are somewhat greater in South Australia than in other parts of the world where at least the

ideas of assessment and evaluation are considered worthy of attention.

In South Australia it appears that the overriding set of sentiments of the people who administer these institutions was for researchers not to intrude or violate their domain.

1.8 STATEMENT OF AIMS

The research was designed to answer the following questions:

1. Within a penal population is there a substantial subgroup who have the same cognitive style and motivational characteristics as hyperkinetic children?
2. Do these individuals have a history of early and frequent contact with the juvenile, police and law authorities?
3. Do impulsivity measures differentiate adjudged male criminal offenders from male non-offenders?
4. Do measures of impulsiveness possess trait-like properties?
5. Are there consistencies in style of responding across tasks purporting to measure impulsiveness?
6. Does cognitive impulsiveness correlate with locus of control and attitude towards authorities?
7. For what practical purposes, in terms of assessment and research with male criminal offenders are impulsivity measures likely to be most suited?

1.9 HYPOTHESES

It is predicted that:

1. A sample of prisoners, in comparison to non-offenders, will respond significantly more impulsively on tasks of cognitive style.
2. Prisoners who have an impulsive style of responding, in comparison with reflectives, will have a significantly:
 - (i) lower age of contact with the police.
 - (ii) more juvenile offences.
 - (iii) more adult offences.
 - (iv) more non-violent minor offences.
3. There will be little change in prisoners' style of responding on the MFFT where instructional set is changed and additional feedback given.
4. There will be a significant positive correlation between impulsive performance on the MFFT and Porteus Q score.
5. Individuals with an impulsive style of responding will have external locus of control beliefs and unfavourable attitudes towards authority.

CHAPTER 2.

MEASURES REVIEW2.1 KAGAN'S MATCHING FAMILIAR FIGURES TEST (MFFT)2.1.1 Introduction

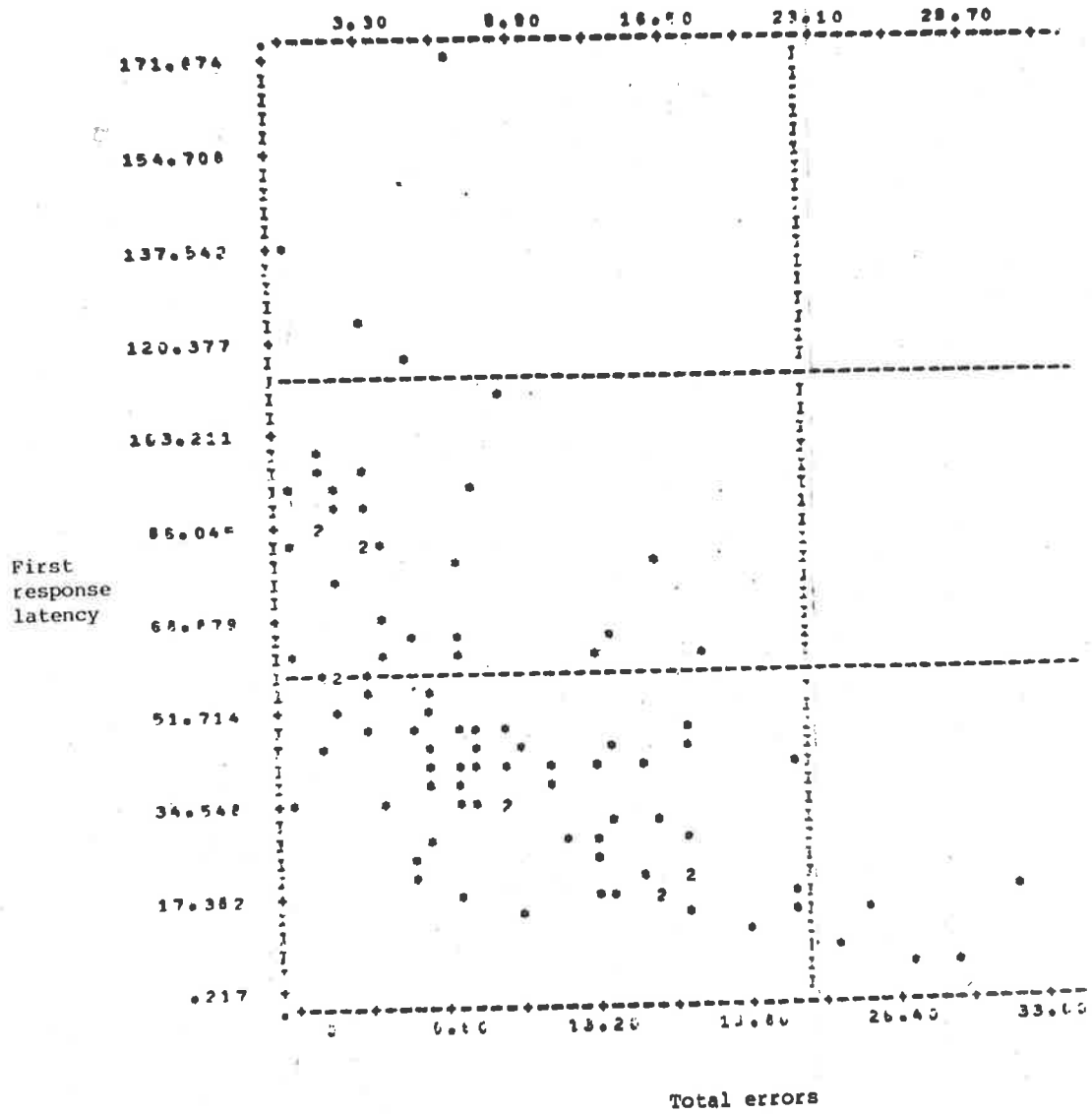
Kagan's Matching Familiar Figures Test (MFFT) (Kagan, Rosman, Day, Albert & Phillips, 1964), has achieved wide acceptance as a measure of cognitive impulsiveness. The MFFT is an individually administered matching-to-sample perceptual recognition task in which the subject is simultaneously presented with a standard stimulus and an array of highly similar variants plus an alternative which is identical with the standard. The latency of the first response to each of the twelve items and the total number of errors made before the subject makes each correct choice are the two data from which reflectivity-impulsivity is computed.

2.1.2 Psychometric properties

The latency and error measures are related. For adults the correlation was found to be $-.61$ (Glow, Lange, Glow & Barnett, 1981, see Appendix D). A plot of their MFFT first response latency and error measures is shown in Figure 1.

The early studies of MFFT performance were restricted to school children and subjects were assigned, on the basis of performance, to one of the cells in a fourfold table, each of the two measures (latency and errors) being split at the median. Impulsive subjects were those scoring below median latency and above median errors, while reflective subjects were those scoring

FIGURE 1. Correlation between MFFT first response latency and total errors.



above median latency and below median errors. These two groups comprised about one-third each of subjects. The remaining two groups, about one-sixth of subjects each, who fell either above or below the median for both latency and errors were designated slow-inaccurate and fast-accurate. They were usually discarded from the analysis.

Use of the double median split method for classifying subjects in the MFFT severely limits the generalizability of results from one study to another. For example, McKinney (1973) found that for second grade children the mean first response latency was 6.69 seconds and the total errors 20.97. For a similar age sample Campbell (1973) found mean latency and mean total errors to be respectively 8.63 seconds and 16.80. Ault, Mitchell and Hartmann (1976) found that 24 percent of cases were differently categorised on retest. Such results cast doubt on the reliability of assignment of subjects by the double median split procedure. In addition, Salkind, Kajima and Zelniker (1977) pointed out that differences in latency and error scores across studies and on retest presented problems for providing norms for the MFFT.

A scoring method which overcomes the problems of the latency and error measures is the use of two univariate scores of reflectivity-impulsivity and efficiency-inefficiency (Salkind & Wright, 1977; Wright & Vlietstra, 1977).

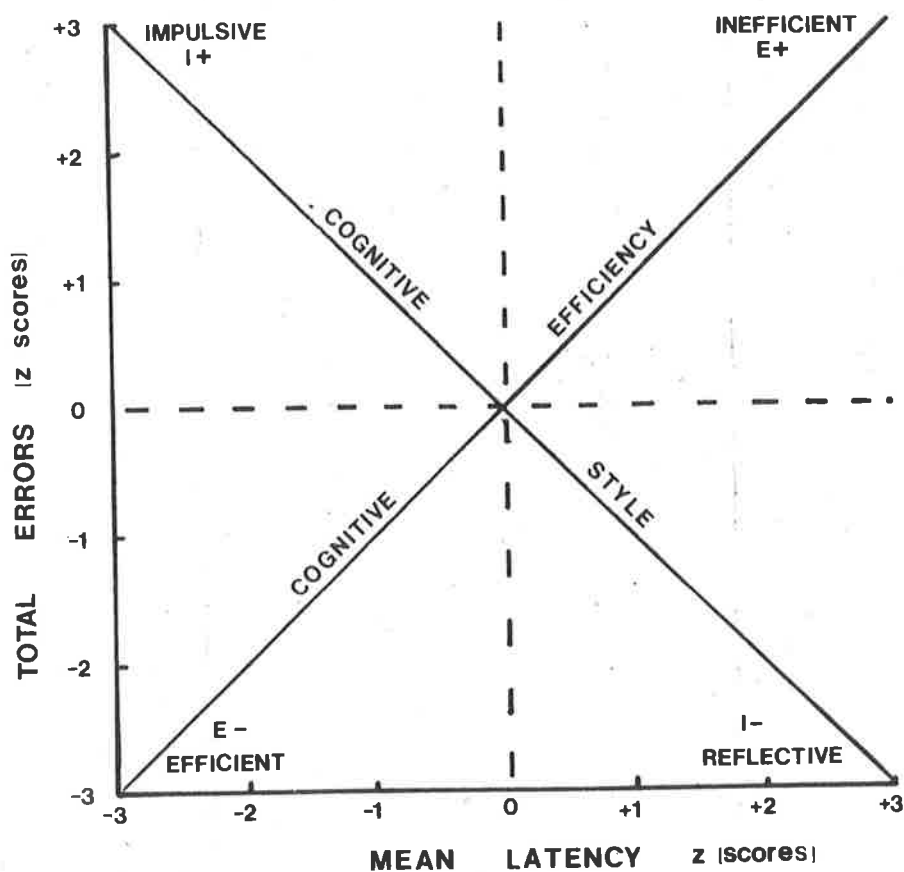
Impulsivity is defined as a dimension of individual differences in conceptual tempo ranging from slow-accurate to fast-inaccurate performance. Efficiency is defined as a

dimension conceptually orthogonal to impulsivity, along which individual differences range from fast accurate to slow inaccurate performance. The reflectivity-impulsivity and efficiency-inefficiency scores are computed from the standardized latency and error scores. Impulsivity is Z errors minus Z latency and inefficiency is Z errors plus Z latency. These computed scores are superior to the bivariate score since they are orthogonal, continuously measured and allow for the use of all subjects in all analyses. A schematic conceptualization of the two univariate scores is shown in Figure 2.

Large positive scores on the reflectivity-impulsivity dimension indicate impulsivity, and large negative scores indicate reflectivity. Large positive scores on the efficiency-inefficiency dimension indicate inefficiency and large negative scores indicate efficiency. Although the new scoring procedure does not itself avoid the dependency of the data on sample generated statistics it underscores the original definition of reflectivity-impulsivity in situations of response uncertainty in that it is equally determined by the two criteria of latency and errors. Whether each contributes equally to the reflectivity-impulsivity dimension warrants further investigation. Moreover, it provides a meaningful score of assessing the information processing efficiency of every individual instead of discarding them and it should aid in simplifying the process of standardizing MFFT results.

The importance of latency and errors in the speed and accuracy trade-off on the MFFT has led to controversy among researchers. Kagan and Messer (1975) stressed that both errors

FIGURE 2. Schematic conceptualization of the reflectivity-impulsivity and efficiency-inefficiency univariates.¹



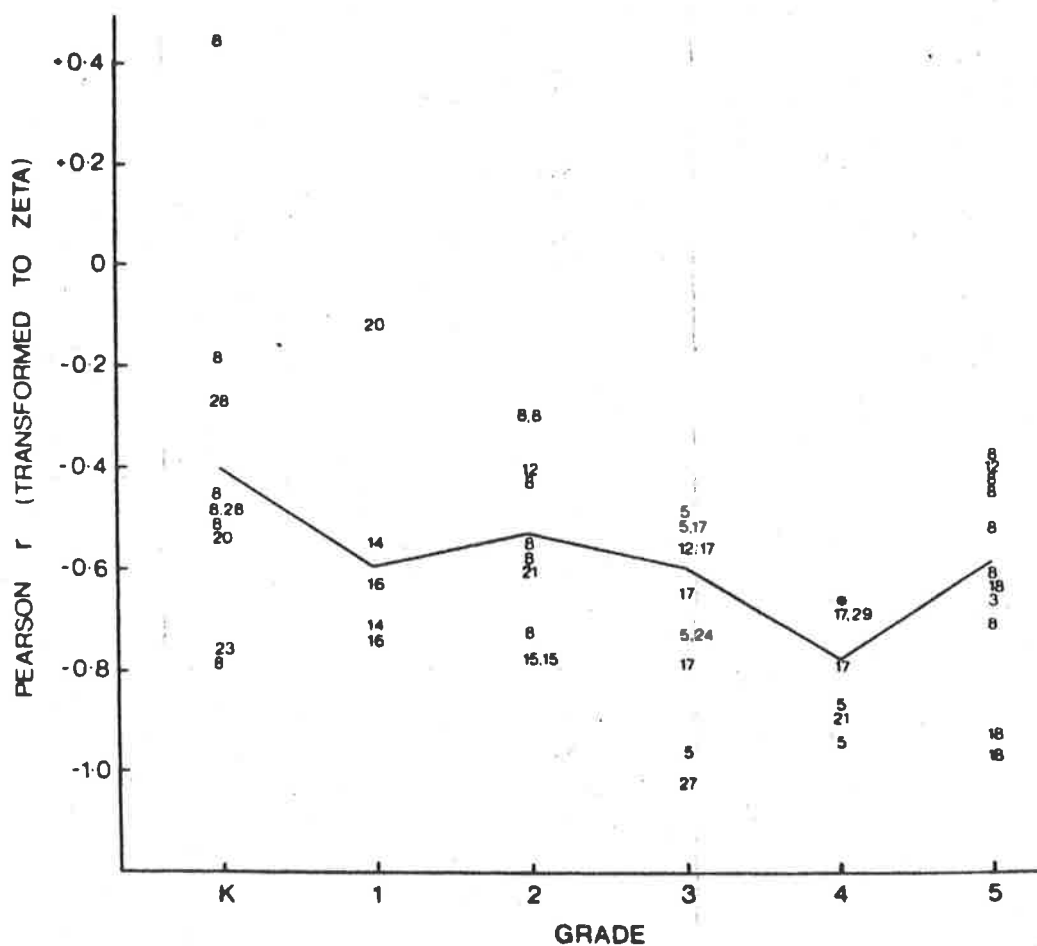
NOTE 1. A similar diagram appears in WRIGHT, J.C., & VLIETSTRA, A.G. "Reflection-impulsivity and information processing from three to nine years of age." In M.J. Fine (Ed.), *Principals and techniques of intervention with hyperactive children*. Illinois: Charles Thomas, 1977, p.216.

and latency were important measures of cognitive tempo. Block, Block and Harrington (1975) and Bush and Dweck (1975) maintained that errors on the MFFT related to personality variables and performance on other tasks, while latency showed little external validity. In contrast Zelnicker and Jeffrey (1976), and Zelnicker, Bentler and Renan (1977) found a single cognitive style factor including latency but not errors. They found errors to be factorially complex and highly task specific.

There is evidence that these differences may be partly explained by age effects. Messer (1976) found that pre-school children showed moderately stable MFFT errors but not latency while for school children latency was more stable than errors. Glow et al. (1981) reviewed the studies that reported latency and error correlations for children of various ages. A plot of the studies is shown in Figure 3. They found that the mean correlation between latency and errors on the MFFT showed a trend with an increase in the correlation at each age level. For adults the trade-off between latency and errors appeared to have stabilized.

The MFFT has been shown to have moderate reliability (test-to-test) and stability ranging over periods of as much as twenty months (Kagan, 1965a). For latency the values range from .58 to .96 for elementary school children over a one to eight week period (Ault et al., 1976) and .19 for pre-school children (Block, Block & Harrington, 1974). For errors the values range from .39 to .80 for school children (Ault et al., 1976) and .21 for pre-school children (Yando & Kagan, 1968). Glow et al. (1981) found the repeated measures reliability for adults on immediate

FIGURE 3. Correlations between latency and errors: 54 data points from 17 studies and the weighted average correlation for data at each grade level.¹



NOTE 1. Reproduced from GLOW, P.H., LANGE, R.V., GLOW, R.A., & BARNETT, J.A., p.2. (See Appendix D).

3. Bentler & McClain, 1976
5. Bush & Dweck, 1975
8. Egeland & Weinberg, 1976
12. Haskins & McKinney, 1976
14. Kagan, 1965
15. Kagan, 1965
16. Kagan, Pearson & Welch, 1966
17. Kagan, Rosman, Day, Albert & Phillips, 1964
18. Kendall & Finch, 1978
20. Mann, 1971 (data kindly supplied by author)
21. Mann, 1973
23. Meichenbaum & Goodman, 1971
24. Messer, 1970
27. Stein & Prindavale, 1976
28. Toner, Holstein & Hetherington, 1977
29. Weiner & Adams, 1974
- * Barnett, 1976 (unpublished data, kindly supplied by author)

retest with parallel forms of the MFFT to be .78 for latency, .79 for errors, .83 for the reflectivity-impulsivity univariate, and .63 for the efficiency-inefficiency univariate. All were significant at the one percent level. They also found that the internal consistency of the adult form of the MFFT was .93 for latency, .79 for errors, .91 for the reflectivity-impulsivity univariate and .70 for the efficiency-inefficiency univariate. All were acceptably high and significant.

The MFFT univariate reflectivity-impulsivity score for adults has been found to be an internally consistent, reliable measure. In addition the speed-accuracy trade-off, i.e. the negative correlation between latency and errors has been found to be higher for adults than generally found for children. While the MFFT has been overwhelmingly used with children it has been found to be suitable as a test of cognitive impulsivity for adults.

2.1.3 Construct validity

Kagan has offered considerable evidence to support the generality of reflective and impulsive styles. Kagan and Messer (1975) suggested that impulsiveness had broad correlates in the personality field and several studies by Kagan have been reported which related performance on the MFFT to performance on other types of cognitive tasks. Kagan, Pearson and Welch (1967) found response latency on the MFFT to be negatively correlated with errors on three inductive reasoning tasks. Kagan (1965c) reported that reflective children made fewer reading errors than impulsive children and Kagan (1966b) found

that impulsives had more incorrect words than reflectives in a serial learning task. Impulsives have been found to be more socially responsive (Farley & Farley, 1970; Ruble & Nakamura, 1972; Strommen, 1973) and either more or less anxious than reflectives, depending upon whether one assesses respectively generalized anxiety or fear of failure (Campbell & Douglas, 1972; Chiu, 1972; Kagan, 1965b, 1966c; Messer, 1970; Reali & Hall, 1970).

It appears that an individual's tendency to be either reflective or impulsive extends to many tasks and influences the quality of their performance on these tasks. However examination of the literature reveals limited evidence that MFFT performance has trait-like properties additional to that of general intelligence.

The relationship between MFFT performance and intelligence has been well established. Block et al. (1974) scanned studies that reported correlations between MFFT latency errors and IQ and reported a median correlation between MFFT latency and IQ of .17. The median correlation between MFFT errors and IQ was -.32. It appears that conceptual tempo is related to IQ and the relationship is higher for errors than latency.

Ward (1968) administered the MFFT, the Peabody Picture Vocabulary Test (PPVT) and a "Dots" test to kindergarten children. He found consistencies in response latency on all the tests used. MFFT errors had a low negative correlation with PPVT IQ while first response latency was unrelated to verbal IQ.

Messer (1976) also found that the correlation between IQ and MFFT performance was higher when the format of the intelligence test was multiple choice. It is not surprising that MFFT performance relates more highly to IQ where the intelligence test has both similar format and task requirements.

Several studies have found that impulsives tend not to perform as well as reflectives in both intellectual ability and educational achievement (Block et al., 1974; Coop & Siegel, 1971; Kagan, 1965a, 1965c; Keogh & Donlon, 1972; Plomin & Buss, 1973; Messer & Damarim, 1970; Siegelman, 1969). Impulsives are poorer on intellectual ability tasks such as discrimination learning (Henry, 1973; Massari & Schack, 1972; and Odom, McIntyre & Neale, 1971), reasoning (Kagan et al., 1964; McKinney, 1972; Yando & Kagan, 1970), and memory (Messer & Damarim, 1964; Siegel, Kirasic & Kilburg, 1973).

In his review Messer (1976) concludes that:

"A prudent course to follow for future studies would be to control at least for verbal IQ, especially when MFFT errors are included in combination with response time as a predictor." (p. 1036)

Evidence supporting the construct validity of impulsiveness has come from studies investigating the relationship between cognitive styles.

There is a consistent moderate relationship between reflectivity-impulsivity and field dependence-independence as measured by the Embedded Figures Test. Reflectives have been found to be significantly more field independent than impulsives (Campbell & Douglas, 1972; Keogh & Donlan, 1972; Massari, 1975;

Massari & Massari, 1973; Neimark, 1975; Schleifer & Douglas, 1973).

Bentler and McClain (1976) examined the relationship between self ratings, peer ratings and teacher ratings of impulsiveness and the personality variables of extraversion, academic achievement motivation and test anxiety. They found that the case for construct validity of impulsiveness was strong as there was a high positive relationship between the self, peer and teacher ratings of impulsiveness. However, impulsiveness was not related to any of their three personality variables.

Saunders, Reppucci and Sarata (1973) in a study comparing delinquent and non-delinquent youth examined the relationships among measures that had been traditionally used to measure impulsiveness. They found that two self-report measures of impulsiveness were related ($r = .45, p < .01$). They were the Barratt Impulsivity Scale (Barratt, 1959) and the Hirschfield Scale (Hirschfield, 1965). Two performance measures of impulsiveness, the MFFT and the Arrow Dot Test (Dombrose & Slobin, 1958) were also related ($r = .36, p < .01$). However, there was no relationship between the self-report and performance measures of impulsiveness.

Glow, Lange, Glow & Barnett (1980, see Appendix E) examined whether reflective-impulsive performance on the MFFT could be characterised in general trait terms. MFFT performance was compared with subjects' self descriptions on items traditionally used to measure impulsiveness. Fast-inaccurate responders on the MFFT were found to agree with description of

themselves as risk-taking, lively and impulsive. However, these relationships were not strong, were partly due to a response acquiescence set and were about as great for MFFT errors as MFFT impulsivity.

It appears that only a very moderate relationship exists between performance and self-report measures of impulsiveness. There is evidence that in their performance some individuals are characterised by hastiness, lack of deliberation and a tendency to commit errors.

2.1.4 Summary

Kagan's MFFT is a widely used measure of cognitive impulsiveness. It examines the way in which individuals trade off speed against accuracy. Impulsive performance in the MFFT is characterised by short response latencies accompanied by many errors. Reflectives have longer response latencies and fewer errors.

The test appears to meet acceptable criteria of reliability and validity. While the original paper and pencil version has been mainly used with children, the test has recently been refined so that it is now available in an automated version that provides an accurate measure of a cognitive dimension of reflectivity-impulsivity in adults.

The MFFT was chosen for three main reasons. Firstly, it best appears to tap the cognitive qualities of hasty responsiveness and impatience which are characteristics of an impulsive style of responding. Secondly, it has been proved to be a reliable measure with adults and thirdly, because it is one of the few available measures which does not depend on reading and writing abilities. Roman (1957) pointed out that some prisoners have not mastered these skills and high rates of reading retardation are associated with antisocial behaviour.

2.2 EYSENCK PERSONALITY QUESTIONNAIRE

Eysenck and Eysenck (1975) in their conceptualization of the personality sphere, outlined dimensions of personality consisting of psychoticism, neuroticism, extraversion and lie. Eysenck and Eysenck (1977) added items that had been traditionally used to measure impulsiveness to the Eysenck Personality Questionnaire (E.P.Q.). They proposed that impulsiveness in a broad sense constituted four factors of narrow impulsiveness, risk taking, non-planning and liveliness. They presented evidence that they were replicable from sample to sample and from males to females. By differentiating between various types of impulsiveness, Eysenck and Eysenck (1977) challenged the commonly held view of impulsiveness as a broad concept. Their broadly defined impulsiveness correlated highly with sociability while narrow impulsiveness referred to hasty responsiveness and correlated highly with pathological variables.

As yet no literature is available on the validity of the Eysenck impulsiveness measure. The measure was used in the reliability study on the MFFT (Glow et al., 1980, see Appendix E) and in the pilot study. As there was only a low moderate correlation between MFFT impulsivity and impulsive scores on the Eysenck measure, the Eysenck measure was not used further.

2.3 PORTEUS MAZE TEST

2.3.1 Introduction

Porteus' Maze Tests are widely used measures of behavioural impulsiveness. There are three series of Porteus Maze Tests available, the original or Vineland Revision (Porteus, 1933) and two practice free sets, the Extension Series (Porteus, 1955) to be administered at the second testing, and the Supplement Series (Porteus, 1959), to be administered at the third testing.

The Vineland series consists of a set of 10 mazes of increasing difficulty which are individually administered. Scoring of the qualitative measure is fairly subjective although high reliabilities of scoring qualitative errors have been reported (Docter, 1972).

Porteus developed the Maze Test as an adjunct to other intelligence tests because he believed that these tended to ignore practical aspects of intelligence such as planning and foresight. He also observed that two individuals might earn the same test age (TA) but differ widely in the style of their performance (Porteus, 1965). The measure was originally intended to supplement the Stanford-Binet Intelligence scale in identifying

retardation and only after several years use was the maze tests' potential utility in the area of social adjustment investigated. Porteus (1922) noted that the responses of delinquents to the mazes showed different style of performance from those of normals even though both groups had the same test age. He suggested that test responses may reflect important temperamental differences that were not readily observable and were independent of test age.

2.3.2 Porteus test age

The qualitative score, test age (TA) is a measure of reasoning ability necessary to solve or successfully trace through the series of mazes. Test age scoring is based on the difficulty of the highest level maze successfully completed and number of trials required to solve each maze. Test age has been claimed by Porteus (1939, 1965) to be a measure of foresight, judgement and planning ability. The correlations between TA and intelligence for children varies around +.5 according to the IQ measure used and the characteristics of the group tested (Riddle & Roberts, 1977). As less than half of the variance of the maze test age score is accounted for by measures of general intelligence it appears that maze solving requires a level of intellectual functioning not required by many other IQ tests.

In the early investigations with the mazes (Karpeles, 1932; Poull & Montgomery, 1929) significant differences in TA were found between institutionalized children with delinquent

characteristics and children considered to be socially well adjusted; delinquent children had lower TA. It was thought that low TA reflected an individual's capacity for social adjustment and predisposition for delinquent behaviour. Similar findings were reported by Porteus (1939, 1954, 1955), Shakow and Millard (1935) and Wright (1944). However the evidence linking TA to criminal behaviour is not clear cut, since several studies have found that the TA scores of delinquents were not below those of matched control subjects. (Porteus & Gregor, 1963; Roberts & Erikson, 1968). Erikson and Roberts (1966) found that both conduct problem and well-behaved groups of delinquents scored TA above the general population. However, most of the studies linking TA with ratings of social adjustment have been based on populations with low intelligence. As a high level of intellectual functioning is required to successfully complete the mazes, areas of planning, judgement and foresight ability would be substantially lower and restricted for offenders who had under achieved at school and intellectual deficiencies. There does not appear to be a consistent relationship between offender and non-offender groups in terms of maze test age. Riddle and Roberts (1977) in a recent re-analysis of maze test age found that TA, either separately or in conjunction with intelligence test scores, could not be used to discriminate between criminal offenders and non-offenders.

2.3.3 Porteus Q score

Porteus (1942) set out to devise a qualitative scoring system which would identify delinquents not identified by the

TA score. He conducted a systematic study of the planning and psychomotor errors made by various groups of delinquents, particularly those variables that seemed independent of TA. These variations he called qualitative errors. Porteus (1950) specified the following:

"In order to discover qualitative differences it was essential that the subject should not know that his performance was being scored. Thus his attention being directed chiefly towards the avoidance of blind alleys, habits of slovenliness, impulsiveness, or haphazard performance are given every opportunity to show themselves. Conversely, the careful, dependable, work-conscientious individual, although he does not suspect that his work is being scored for these characteristics, will be likely to display characteristically high standards of achievement in his execution of the test, but will reveal these phases of his personality since performance is likely to conform with his ordinary type of response and attitude to a task." (p. 95)

The rationale for the Q score was based on Porteus' observation that test taking style of response was markedly different. Individuals differed in impulsiveness, carelessness in performance and failure to follow directions. Typical qualitative errors were found to be:

"...cutting corners or crossing lines in the maze designs, lifting the pencil from the paper after a specific warning that this should not be done, taking a wrong direction but correcting it before a quantitative error would normally be scored, a

general untidiness or waviness of line in the whole drawing... Because impulsive individuals frequently make the first mistake possible, while overconfident persons conversely, fall into error when they think the task is about completed, mistakes in the first, third and the last third of the design were also penalized. An additional weighting was given to qualitative errors made in the first five and six year designs, with which normally the testing begins." (p. 96)

The qualitative errors were assigned weights which were determined from norms provided by delinquent subjects (Porteus, 1942, 1954). The weighted qualitative score, or Q score, is determined by the following characteristics:

- 1) an error in the first third of the maze;
- 2) an error in the last third of the maze;
- 3) a cut corner;
- 4) a crossed line;
- 5) a lifted pencil;
- 6) a wavy line;
- 7) a changed direction; and
- 8) any qualitative error in Tests V and VI (Porteus, 1933).

The higher the Q score, the poorer the performance, and presumably, the poorer the individual's impulse control. The correlation between Q score and various intelligence measures has been shown to be in the range $-.2$ to $-.4$ while the reliability of scoring qualitative errors is around $.95$ (Docter, 1972). Rankin and Thompson (1966) obtained a split half r of $.82$ for the total Q score derived from odd and even mazes.

With the introduction of the Q score, interest in TA declined.

2.3.4 Metric properties

The metric properties of the Porteus Maze Test have received little attention. No information is currently available about the internal consistency of the nine items that collectively make up the Q score. The correlation between TA and Q score has been found to be around $-.2$ (Riddle & Roberts, 1977). Factor analysis and intercorrelation among the components of the Q score have shown heavy loadings for the pencil lifts and wavy line components, Barry, Everstine and Kleman (1961), Docter (1960, 1972), Barry et al. (1961) found that 70 percent of the Q score measure was accounted for by these two components. The subject who frequently lifted his pencil had either failed to learn the instructions or comply with them. In addition these two errors did not correlate with each other. In contrast Rankin and Thompson (1966) factor analysed the Q score component items and found that most of the variance of the Q score was accounted for by cut-corner and crossed-line errors. The Factor analytic evidence is inconclusive but it does appear that the Q score cannot be interpreted as a single trait such as "impulsivity" or impulse control. It is likely that some components of Q may contribute substantially to the total and that refinement of the Q score is possible. Furthermore, the relationship between the various components of Q and TA remains unexplored.

The weighting system used in computing Q has been questioned by Docter and Winder (1954), Fooks and Thomas (1957) and Riddle and Roberts (1977). They suggested that the use of weights did not appear to improve the ability of Q to differentiate between offender and non-offender groups. Riddle and Roberts found that the mean weighted Q score could be accurately estimated from twice the unweighted sum of the components.

2.3.5 Maze test performance and its relation to criminal behaviour

Porteus noted that criminal offenders appeared to underestimate the difficulty of the task, to show overconfidence and to disregard instructions. The Q score has successfully differentiated delinquents from non-delinquents and criminals from non-criminals. Fooks and Thomas (1957), Porteus (1942, 1945, 1955, 1959, 1965), Porteus and Gregor (1963) and Wright (1944) reported differences between offenders and non-offenders with offenders having significantly higher Q scores.

Porteus (1942, 1945) established a cut-off score of 29 above which 80 percent of delinquent males were found. For girls the cut-off score was 32. Docter and Winder (1954) replicated the mean Q figures established earlier by Porteus. They found that 70 percent of delinquents and 30 percent of non-delinquents had scores above 29.

There is evidence that the cutoff point between offenders and non-offenders varies between populations. Craft, Fabisch,

Stephenson, Burnard and Kerridge (1962) and Gibbens (1958) reported mean Q scores within the British population that were lower than comparable samples from the United States. Gibbens found a Q score of 22 to be a better cutoff point for differentiating British delinquents from normals.

Porteus (1945) found that the type of offence committed was related to the individuals Q score. Within a criminal group prisoners convicted for violent crimes such as murder, rape or assault, had higher Q scores than those convicted of non-violent crimes. Violent offenders were seen as impulsive types who lacked deliberation or social inhibitions. Porteus (1965) found that they averaged a Q score of 67, while the Q scores of sex offenders, burglars and embezzlers were respectively 57, 54 and 44.

Roberts, Erikson, Riddle and Bacon (1974) in two studies found that a relationship existed between high Q scores and recidivism. In a follow up period from 1 to 3 years, recidivists had significantly higher Q scores. The relationship between Porteus mental age and recidivism was equivocal. In the first study mental age was lower for recidivists than for non-recidivists, but in a follow up study they failed to replicate this result.

A problem exists with the predictive selectivity of the instrument. The test appears to successfully discriminate between subjects at each end of the Q scale but is far from satisfactory in discriminating between the bulk of subjects who fall in the middle ranges. Predictive efficiency in clarifying

offenders before they committed an offence would only occur if the offender/non-offender ratio in the population was on a 1:1 basis. When one considers that the over-riding proportion of a normal population are not incarcerated offenders then the application of the Porteus Maze as a screening device for an unselected sample would result in the unwarranted labelling as "potential offenders" of numerous non-offenders who had high Q scores.

2.3.6 Construct validity

Personality variables related to dependability, impulsiveness and achievement have been found to be correlated with Porteus Maze performance. Porteus (1945) compared individuals who were rated as satisfactory workers with those rated as lazy and undependable. The Q score differentiated between the two groups with those having poor work ratings having a higher Q score.

Erikson and Roberts (1966) found that incarcerated delinquents rated as adjusted and non-adjusted differed significantly in mean Q scores. Delinquents who were poorly adjusted had significantly higher Q scores. They concluded that the Q score was able to discriminate impulse control problems even within a restricted sample of institutionalized delinquents. Similar findings for criminals were reported by Schalling and Rosén (1968).

West (1973) administered the Porteus Maze, the Gibson Spiral Maze (Gibson, 1964) and Foulds Tapping Test (Foulds, 1961)

to boys at the ages of 8, 10 and 14. He obtained a clumsiness score by combining the results of the three psychomotor measures and showed that it was predictive of future delinquency. The delinquents were over represented amongst the clumsiest boys (31.7% as opposed to 16.6% of non-offenders). The combined psychomotor score was also related to teacher school conduct ratings which West (1967) had demonstrated to be predictive of criminal behaviour.

Lefkowitz (1968) reported that for a sample of 147 delinquents Porteus Q score was significantly negatively related to poor school performance but was unrelated to age, IQ, socio-economic status, introversion-extraversion or neuroticism. He concluded that it appeared that for his sample of delinquents non-intellective factors such as impulsiveness account for some of the variance in poor school performance unexplained by the usual measure of IQ.

Roberts and Erikson (1968) explored the ability of a delinquent group in a training school to delay gratification, manifest planning and foresight and control impulsiveness. They found that the ability or willingness to delay gratification was associated with high Porteus mental age and low Q score. Furthermore the delinquent adolescent males who were able or willing to delay gratification and control impulsiveness were more able to adjust and conform to the rules and regulations of the training institution.

2.3.7 Summary

The Porteus Maze test is a performance test which yields both a test age score and a score designed to measure an individual's test taking style of response.

The test appears to have considerable face validity as a task requiring planning towards a final goal of maze problem solving and this ability is related to age and appears to be measuring a specific area of intellectual functioning. Studies relating test age with ratings of social adjustment have been based on populations with low intelligence and it is doubtful whether test age discriminates between individuals with problem behaviour.

The Q score is a measure of an individual's style of response regardless of his success in solving the mazes. It has been shown to correlate with various indices of social adjustment and to differentiate offenders from non-offenders.

A relationship also appears to exist between Maze Test performance and recidivism, type of offence committed and conduct problems within an institutional setting.

2.4 ROTTER INTERNAL-EXTERNAL LOCUS OF CONTROL SCALE

2.4.1 Introduction

Rotter (1966) postulated that there are individual differences in a person's expectancies concerning reinforcement. Those individuals who have an internal locus of control have a belief that rewards follow from, or are dependent on their own behaviour. They believe that their actions can affect the course

of their lives. Conversely, individuals who have an external locus of control have a belief that rewards are controlled by forces outside of themselves and that their lives are determined by chance, luck or fate.

Rotter developed a measure of this internal-external control construct (Rotter, 1966) by constructing a 29 forced choice item scale (including 6 filler items) labelled the I-E scale. The scale is relatively short and easy to comprehend. It assumes additivity as answers reflecting a belief in external control are summed to provide a total score. Low scores reflect an internal locus of control and high scores an external locus of control.

The I-E scale has been widely used in research as a measure of internal-external control expectancies, leading to the confirmation of the locus of control construct as an important personality variable (Lefcourt, 1976; Phares, 1976; Throop & MacDonald, 1971). In constructing the scale Rotter eliminated those items that measured more specific areas of internal-external control. It was designed to sample behaviour from a wide range of life areas such as love and affection, dominance, social-political events, social recognition, academic recognition and general life philosophy. As the scale samples from a variety of areas it has been viewed as being a measure of generalized expectancy across a range of situations. All answers are summed to provide a total scale score.

2.4.2 Test-retest reliability

Considerable retesting on the scale has been undertaken and the test-retest reliability of the scale appears adequate. Rotter (1966) reported reliabilities for several samples that varied from .49 to .84 over one to two months. These figures are close to the .43 to .84 reported by Hersche and Scheibe (1967) for a seven week period. Similarly, Harrow and Ferrante (1969) reported a reliability figure of .75 for psychiatric patients over a six-week time span. As would be expected the correlations tend to be lower the longer the time period between testing although still remaining acceptably high. Zerega, Tseng and Greever (1976), for example, reported a retest reliability of .55 for high school students over an eight month period and Little (1979) found a reliability of .64 for graduates over a two year period. These results confirm that I-E locus of control is a stable attribute of individuals.

2.4.3 Dimensionality and internal consistency reliability

Rotter (1966) claimed the degree of control an individual has over events is a unitary dimension. He cited, but did not report, the data from a factor analysis by Franklin (1963). Most of the variance (53%) was included in a general factor. The several additional factors involving few items which were isolated were not sufficiently reliable to produce subscales within the test. Rotter presented internal consistency reliability estimates for a unidimensional I-E scale ranging from .65 to .79 using the split half, Spearman-Brown and Kuder-Richardson formulae.

A possible problem with the I-E scale is that there are so few items and they sample from so many settings that there are not enough items to show up in any reliable subscale. The total score may be masking different components of locus of control and thereby lose specific predictive ability. Behaviour, based on locus of control beliefs may be more highly related within a specific area and may not generalize to other situations. For example, an individual may have internal beliefs about his control over and participation in political activities or behave in an internal manner when engaged in academic goals but may be more external when dealing directly with people or when love and affection goals are involved. It is possible that there are several independent beliefs to the locus of control construct.

A suspicion that several factors contribute to locus of control as a generalized expectancy has given rise to several attempts to isolate factors within the I-E scale. The first study to factor Rotter's original 23 items was undertaken by Mirels (1970). Using university subjects unselected for political participation he obtained a two factor structure. Mirels' first factor contained both first-person and third-person I-E items and Mirels described this first factor as a belief concerning mastery over the course of one's life. A second factor which included four of the five items which dealt with controlling political institutions or having an influence on the course of world affairs was labelled Political Control. Subsequent studies by Abrahamson, Schulderman and Schulderman (1973), Cherlin and Bourque (1974), Dixon, McKee and McRae (1976)

Nassi and Abramowitz (1980), Roberts and Reid (1978) and Tobacyk (1978) closely matched Mirels' findings although there has been a lack of agreement as to item content on the general control factor. Cherlin and Bourque suggested that on the basis of their results the five political and world affair items formed a different construct to that of general control and should be included in studies using the I-E scale only if the researcher was interested in the political efficacy aspect of internal versus external control. They also found that the strength of the reliabilities of the derived factor scales was affected by the population sampled. The alphas for the General and Political control subscales for the student sample were .78 and .70 respectively. The alpha for the general population sample uncorrected for scale length were .75 for Political Control and .57 for General Control. Thus the General Control score for the general population they tested was fairly unreliable and this suggests that the factor structure may be different in different populations.

A study by Reid and Ware (1973) also found two factors similar to that of Mirels. The first factor termed Fatalism concerned the belief that luck, fate or fortune versus hard work, ability and personal responsibility determined one's outcomes. The second factor named Social System Control measured the extent to which people believed they could effect change within the socio-political realms of their society. The corrected alpha for the two dimensions was .88 for Social System Control and .74 for Fatalism and both were higher than the coefficient for the total scale score. The correlation

between Fatalism and Social System Control was .18 which indicated that the two scales were measuring largely independent dimensions.

In investigating the political beliefs aspect of internal versus external control Abramowitz (1973) compared scores on the Kerpelman Political Activity Scale and three I-E measures based on the total I-E score and two scores based on Mirels' two factors. Using college students he found that the two Mirels' I-E subscale scores were not correlated and that political commitment was predicted by scores in the political items but not by the Personal Control items hence validating the second factor. Further construct validity for the socio-political items was found by Berndt (1978). The political control subscale significantly correlated with a political activities survey while general control or total score did not. Subjects who were more external on the political control subscale were less likely to vote, less likely to know their congressman and tended to think that politicians were dishonest.

However, in the context of this study the political control subscale is a matter of tangential interest. The main aim was to investigate the relationship between impulsiveness and personal control.

Gurin, Gurin, Lao and Beattie (1969) have also reported that the I-E scale contained several factors. With southern black college students the I-E scale items loaded primarily on two factors labelled Personal Control and Control Ideology. The Personal Control items were all phrased in the first person

and related to the amount of control an individual could exert in his own life. The Control Ideology items were all third person statements and related to the degree of control people in American society had over specific situations. Gurin et al. hypothesized that their subjects were differentiating between the capacity to exercise control in their own lives and the amount of control they had over situations in which they found themselves. Their work, however, was concerned primarily with the status of negroes in American society and the distinction they found between individual and system blame may only be important for this minority group.

The factor structure found by Gurin does not appear to have relevance to the populations in this study. Gurin et al. also changed the scale by including in the factor analysis additional items.

Sanger and Alker (1972) reported a similar Personal Control versus Control Ideology factor structure in a study of college feminists and non-activist control subjects. They added 17 items on feminist ideology and interspersed them with the 23 Rotter items. Similarly, Gurin, Gurin and Morrison (1978) tested a larger random sample of white American men and women to test the generalizability of their factor structure. They found that Personal Control and Control Ideology items loaded on separate factors. The Alphas corrected for scale length for their subscales were Control Ideology, .84; Personal Control, .86; Political Control, .90; Interpersonal Control, .85; and Success Mobility, .87.

Again Gurin et al. (1978) modified the Rotter scale as they excluded three questions relating to school rooms and teachers and included three other items used in previous work. Discriminant validity for the two subscales was demonstrated as Personal Control and not Control Ideology was related to higher socioeconomic status and to mastery in life areas. In predicting political behaviour the distinction between Control Ideology and Personal Control were crucial among those that questioned the status quo. Personal Control was unrelated to political behaviour but external Control Ideology was related to greater political participation.

Only in this recent study have Gurin and her associates moved away from testing minority or selected samples to a large random sample to establish the generality of their factor subscales in the American population. However, it must be emphasized that in all studies items were added to and deleted from Rotter's original 23 items to form special scales. It seems likely that use of other items with the I-E scale may have affected the resultant factor structure.

Factor analyses can thus be seen to have failed to give support to Rotter's earlier (1966) and later (1975) claim that the internal-external scale is unidimensional. There is considerable evidence that it is possible to extract two or more factors.

2.4.4 Factor structure in different samples

It has been reported that not all studies have agreed on which subscale items load. For example the item:

"It is not always wise to plan too far ahead because many times things turn out to be a matter of good or bad fortune anyhow"

was found by Guril et al. (1969) to load on a personal control factor, by Mirels (1970) to load on both general and political control and by Collins (1974) to load on a difficult world factor. One possible reason for the different factor structure found for the I-E scale is that locus of control may be affected by social and cultural influences. If this is in fact the case then the generality of the student two factor structure to groups which have a different social setting is questionable.

Campbell, O'Brien, Mills and Ramey (1977) in comparing advantaged and disadvantaged socioeconomic groups replicated Mirels' two factor structure for advantaged mothers but the disadvantaged mothers showed no consistent, easily interpretable factor structure. The young black mothers differed markedly from middle class women in responding to the I-E scale. They had a harsher view of reality, a more passive approach to life and agreed that planning ahead was useless. However, they were more ready to ascribe personal blame for unhappiness and expressed more hope that job success would follow hard work. Clearly, they were holding inconsistent locus of control beliefs some being internal and others external. These inconsistencies may only be apparent for disadvantaged groups where a distinction is made between individual and system blame.

Munro (1979) investigated locus of control beliefs for black Africans and found two distinct factors. While the general control factor was replicated the second factor to emerge was

concerned with beliefs about supernatural intervention.

The separation of chance items from supernatural items is not surprising for an African group where supernatural beliefs maybe more important in the culture. Nagelschmidt and Jakob (1977) also found a two factor structure for a general population sample of 70 Brazilian women. The first factor contained both items about control over personal relations, life and political events while the second factor corresponded to Collins' (1974) concept of fatalism; a belief that the world cannot be changed and is ruled by powerful others.

In reviewing the locus of control construct it appears that it is based on different beliefs such as control over personal relations or life events, belief in chance, luck, or fate or supernatural intervention, control over political affairs or simply a fatalistic belief that nothing can be changed. The importance of each of these beliefs is going to differ according to the social and cultural setting. The Rotter I-E scale was constructed in North America with student subjects. It would not be surprising if the two factor structure generated out of this particular group failed to generalize to other groups with different population context.

2.4.5 Problems arising from the Rotter scale format

Rotter (1966) stated that the forced choice item format was used as a safeguard against responses bias as the items were balanced. However, Sanger and Alker (1972) identified the forced choice item as a source of conflict in formulating the locus of control construct as item statements were not logical opposites.

On each of the 23 internal versus external items the subject must choose between two statements related to a common event or situation. The statements are said to be logical opposites. For example for item 25 an internal belief is "IT IS IMPOSSIBLE FOR ME TO BELIEVE THAT CHANCE OR LUCK PLAYS AN IMPORTANT ROLE IN MY LIFE", versus the purported opposite external belief "MANY TIMES I FEEL THAT I HAVE LITTLE INFLUENCE OVER THE THINGS THAT HAPPEN TO ME". Each pair of statements are said to represent two widely separated points on a single dimension. If each pair of items did in fact represent polar opposite beliefs then individuals should tend to accept one and reject the other. This would produce moderate to large negative correlations between the statements. Recent evidence suggests that this is not the case.

Kleiber, Veldman and Menaker (1973), Klockars and Varum (1975) and Gatz and Good (1978) examined the bipolarity of the two statements by constructing a revised scale where alternatives to each question were presented separately and subjects could accept or reject them independently. Kleiber et al. reported an average correlation between the pairs of $-.17$ (range $+.14$ to $-.47$), Klockars and Varum of $-.15$ (range $+.06$ to $-.45$) and Gatz and Good of $-.12$ (range $+.10$ to $-.38$). These results are all very similar and indicate that item pairs cannot be regarded as bipolar.

As each item pair are said to be opposite beliefs they should load on the same single factor with opposite loadings.

Collins (1974), Klockars and Varnum (1975), Gatz and Good (1978) and Tyler and Gatz (1979) all found that statements from each item pair did not load on the same factors with opposite loadings. This raises further serious doubts as to whether Rotter's conception of locus of control as a single generalizable construct across a range of events and situations is true. The structural analysis of each of the alternatives suggests that, by loading on separate factors, the I-E scale unevenly represents the domain of beliefs it encompasses. It appears likely that locus of control may be comprised of internal and external attributions which are largely independent of each other and each dependent on the situation in which it occurs.

Collins (1974) factored the 46 separate statements and found that alternatives tended to load on different factors. He identified four distinguishable and relatively orthogonal subscales relating to belief that the world is a difficult place to live, that the world is unjust, that the world is governed by luck and the world is politically unresponsive. Collins also took the analysis a step further by testing whether answers to the 46 item format approximated scores obtained from the 23 item forced choice format. He scored both formats for externality and found a correlation of .82 between them. This suggests that the two formats are measuring the same construct.

The four factor structure found by Collins using the 46 item Likert format has been replicated by Houston (1977a), Kaemmerer and Schwebel (1976) and Zuckerman and Gerbasi (1977).

In examining Collins' four separate factors of world attribution it is possible to see that each encompasses individual dispositional, situation and interactive components. By administering the Rotter scale in the forced choice format the individual is forced to consider each item as involving dispositional and situation components. The interactive components are not considered as the subject does not have to act on one or other of the beliefs based on what control he has over making his plans work. The forced choice format causes an individual to make a decision which he may not make in real life. However, researches using the Rotter scale have invariably interpreted their results in terms of the subjects' perception and understanding of a particular situation.

In view of the multi-factor structure of the I-E scale, the relatively independent nature of the derived subscales and the failure of separated items to load on the same factor with opposite signs, it is difficult to view locus of control as a generalized expectancy. Internal and external responding appear to be independent and each related to the situation in which they occur. Gatz and Good (1978) suggested that:

"A person might be both high internal and high external ("School is an unfair place but I did what I had to do and earned a Diploma"), high internal and low external ("I was totally responsible, nobody else was responsible but me"), low internal and high external ("I just figured that the teacher was after me"), or low internal and low external ("I didn't plan for it, I just sort of got caught up in it")." (p. 384)

In the locus of control construct individuals are apparently integrating diverse beliefs and this would limit the interpretability of any factor analysis of the I-E scale items.

2.4.6 Summary

The Rotter internal versus external locus of control scale has been widely used in research as a measure of internal-external control expectancies and this has led to the confirmation of the locus of control construct as a useful personality variable.

Rotter (1966) claimed the degree of control an individual has over events is a unitary dimension. Factor analysis of the Rotter scale items for a large Australian student sample (Lange & Tiggemann, 1981) indicated that the scale was multidimensional and that the factor structure was stable over a considerable period of time. Two distinct factors relating to personal and political control beliefs were identified. General control concerns the belief that a person has mastery over his own life while political control includes items which measure the extent to which an individual is capable of having an influence on political institutions or the course of world affairs. The correlation between the two factor scales was low which indicates that they are measuring largely independent aspects of internal-external locus of control. However, the importance of locus of control beliefs may vary according to the social and cultural setting or the choice of format used. The two factor structure may not generalize to other groups with different population context.

2.5 ATTITUDE TOWARDS AUTHORITY INVENTORY

2.5.1 Introduction

The attitude towards authority inventory, a self-report scale, originated from a study by Rigby (1975). It purports to be a measure of attitudes towards various institutional authorities. The four scales obtained from the inventory are measures of attitudes towards the police, the army, the law and teachers. The scales consist of eight items, four positive and four negative worded. Rigby and Rump (1979) reported that items in the four scales were eliminated in three criteria:

- "(a) If the ratings concerning the favourable/unfavourable nature of the items indicated that they were ambiguous in evaluative meaning:
- (b) If the personal responses to the items gave low item-total correlations: or
- (c) If there was an excess of positively or negatively keyed items." (p. 472)

The police scale was developed from a group of 261 technology students while the army, law and teacher scales were developed using a sample of 350 university students.

Items which were critical of authority were reverse scored. The correlations between the positively and negatively keyed sections of the scales were .75 for the police scale. .69 for the army scale, .50 for the law scale and .45 for the teacher scale. All were significant ($p < .001$).

A short scale was formed by selecting out from each of the four large scales the four positive and reverse scored items which had the best corrected item-total correlations. The final

TABLE 1. Attitude towards authority scales¹ with the original item-total correlations².

<u>The Police Scale</u>		
ITEM		Item-total Correlation
1. The Police in S. Australia are pretty trustworthy.		.56
8. The Police are quite unfair in their treatment of certain groups in Society. (R)		.54
11. The Police have a hard job which they carry out well.		.66
14. Policemen are unnecessarily violent in handling people they dislike. (R)		.64
20. The Police are generally quite impartial and fair in the way they carry out the law.		.59
22. Policemen like to bully people.(R)		.71
25. The Police help the weaker members of society.		.45
30. The Police use their "badge" as an excuse to push people around. (R)		.66
 <u>The Army Scale</u> 		
2. I would dislike having to salute an Army officer. (R)		.64
6. The Army develops initiative.		.67
10. I disagree with what the Army stands for. (R)		.61
16. Military drill helps to improve a person's character.		.59
17. The Army reduces men to robots. (R)		.68
23. I expect there is a good reason for most rules and regulations in the Army.		.57
28. The Army brutalises people. (R)		.48
32. People should feel proud to serve in the Army.		.66

TABLE 1. cont.

<u>The Law Scale</u>		Item-total Correlation
ITEM		
3. The law rightly claims the allegiance of every citizen at all times.		.60
5. A person should obey only those laws that seem reasonable. (R)		.53
9. The law is the embodiment of Justice and Equality.		.61
13. Laws are so often made for the benefit of small, selfish groups that a man cannot respect the law. (R)		.62
18. The Law represents the wisdom of the ages.		.57
21. The Law is an ass. (R)		.62
26. Obedience to the Law constitutes a value indicative of the highest citizenship.		.52
31. The sentences of judges in court are determined by their prejudices. (R)		.44

The Teacher Scale

4. Teachers seldom have "a sense of proportion". (R)	.57
7. It is reasonable to say that as a rule teachers work in the best interests of their students.	.59
12. A teacher is a somewhat ridiculous figure, posing as an authority on the important things in life, when, in fact, he is often ignorant and immature himself. (R)	.61
15. Teachers frequently acknowledge and respect the rights of students.	.65
19. Teachers do not respect the individual personalities of the students. (R)	.61
24. Teachers are usually ready to take quite seriously whatever it is that the students feel earnest about.	.55
27. In this day and age students should not be expected to call a teacher "sir". (R)	.38
29. The disciplinary measures taken by teachers are usually well considered and desirable.	.58

NOTE: 1. Items followed by (R) were reverse scored.

2. Item-total correlations from Rigby, K., and Rump, E.E. "The generality of attitude to authority". HUMAN RELATIONS, 1979, 32, 469-487.

32 selected consisted of eight items relating to the police, army, law and teachers. The scales along with their original corrected item-total correlation are shown separately in Table 1.

A total score is obtained from adding the scores on each of the four scales but it is not intended to be a general measure of authoritarianism. Rather it relates to the amount an individual approves or disapproves of the four institutional authorities.

2.5.2 Metric properties

Means and standard deviations for the total score on the attitude towards authority inventory for various groups, along with the year tested, are reported in Table 2. The groups who held the most favourable attitudes towards institutional authorities were prison and probation officers while those with

TABLE 2. Means and standard deviations of the attitude towards authority total score for samples previously tested.

Group	Number in sample	Mean	S.D.
Prison Officers	30	129.37	12.15
Probation Officers	15	105.13	19.47
South Australian Institute of Technology students	80	99.55	21.37
Prisoners on a bond	30	96.17	24.19
Adelaide University students	80	90.49	18.39
Prisoners at Yatala jail	15	90.33	22.77

NOTE: Data kindly supplied by KEN RIGBY,
South Australian Institute of Technology,
Adelaide, South Australia, 5000.

the least favourable attitudes were prisoners and university students. Institute of Technology (SAIT) students as distinct from University students were more favourable to authority. Rigby and Rump (1979) reported that among the scales SAIT students had significantly higher scores on the police, army and law scales ($p < .01$) while scores on the teacher scale were similar for both student groups.

The reliabilities of the 8 item scales, using Cronbach's Alpha, were all high. For the police, army, law and teacher scales for a sample of 80 university students they were respectively .92, .91, .89 and .89.

Evidence has been presented by Rigby and Rump (1979) that the police, army, law and teacher scales are consistent, reliable measures. Individuals appear to have a generalized attitude towards institutional authorities and this is reflected by their total score for the four authority scales.

2.5.3 Generality of attitudes toward authority

Not all investigators have supported Rigby and Rump's (1979) view that individuals have a generalizable attitude towards institutional authorities.

Lindgren and Lingren (1960) and Sallery and Lindgren (1966) examined and compared the attitudes of Canadian, American and Arab teachers towards authority figures. They found cross cultural differences in attitudes towards authority figures with Canadian teachers being less favourable towards authority than American teachers. Arab teachers however approved of the authority of experts such as "learned men" but were less

accepting of the authority of government and governmental institutions. The results appeared to support their contention that attitudes towards authority were specific rather than general in nature. However, Sallery and Lindgren failed to report the amount of consistency of attitudes towards authority figures within particular cultures.

Kohn (1972) factored his authoritarian-rebellion scale and identified five distinct factors. Two of his factors "rebelliousness" and "authoritarianism" were not correlated and he suggested that as beliefs towards these aspects of authoritarianism were independent then a generalized attitude towards authority did not exist. However, Kohn's scale contained many items only indirectly related to attitude towards authority.

There is recent evidence to suggest that authoritarianism and attitude towards authority are not highly related. Hollander (1954), Ray (1976) and Titus (1968) reported that no significant relationship exists between authoritarian behaviour and authoritarian attitudes. High scores on authoritarianism scales were not characterized by authoritarian behaviour. For example Ray (1976) pointed out that some authoritarians approve of authority while others do not. He reported a correlation of only .19 between his own attitude toward authority scale which he defined as "The desire or tendency to impose one's own will on others" (p. 314), and self rated authoritarianism. Heaven (1977) reported a correlation of $-.21$ between Ray's attitude towards authority scale and a racial prejudice scale. Yet racial prejudice is one of the main features of authoritarianism.

(Adorno, Frenkel-Brunswick, Levinson & Sanford, 1950). It appears that evidence supporting the existence of a generalized attitude towards authority among the general population remains equivocal.

2.5.4 Summary

In general, the attitude toward authority inventory appears to be a promising instrument. The reliability of the four police, army, law and teacher scales is adequate and each appears to be measuring one facet of an individual's attitude towards institutional authorities.

The items on each scale are balanced therefore reducing the possibility of acquiescence response set.

The inventory appears to be sensitive to variations among populations with different social characteristics.

2.6 PEABODY PICTURE VOCABULARY TEST

2.6.1 Introduction

The Peabody Picture Vocabulary Test (PPVT, Dunn, 1965) is a widely used measure which has been designed to measure verbal intelligence through hearing vocabulary. Besides serving as a quick estimate of verbal intelligence for normal subjects the PPVT was developed for use with special groups for whom standard tests were not always appropriate.

The test consists of 3 practice and 150 test plates each containing 4 pictures and the subject is asked to identify which picture corresponds with a given word. Standard score norms are given for ages between 2 years 6 months and 18 years.

The format places items in ascending order of difficulty and there is little ambiguity in any of the plates. Items were carefully selected from a large pool of words found in Webster's New Collegiate Dictionary. Criteria for selecting words was that each could be illustrated. Norms are provided for 19 age levels using 6 month steps and this has led to big increases in scores between age levels, especially for the younger age groups.

The PPVT has been found to be attractive to subjects, and administration and scoring is relatively simple. It has been frequently used in prisons (Gendreau, 1975).

2.6.2 Metric properties

In developing the PPVT, Dunn tested 750 subjects and selected 300 words that could be illustrated from a pool of 2,055. Standardization was based entirely on the results of 4,012 white children in and around Nashville, Tennessee. Numbers ranged from a minimum of 92 to a maximum of 354 at 19 different age levels from 2.5 years to 18 years. Only children younger than 9 years were given the test individually. Although the standardization was restricted to a specific geographical area Dunn chose schools where pupils' previous IQ scores provided a composite normal probability curve or drew a random sample in some schools until the available IQ scores approximated a normal distribution. Nevertheless, given the restricted area on which the norms are based and the length of time since the norms were established doubts must exist about the generality of these norms to other populations.

While the PPVT has been developed for use in 'normal' populations of 2½ to 18 year olds the test has been successfully administered to samples of subjects above 21 years of age. Dunn (1965), Miller (1972) and Wolfensberger (1962) provide evidence that for adults the PPVT provides an estimate of verbal intelligence through measuring vocabulary level. However, one might expect older subjects to score higher on the test as they are more likely to acquire familiarity with the test words over time. This would be especially true for middle and upper socio-economic levels where reading is more likely to occur.

Technical problems have arisen from the scoring procedure used in the PPVT. Like many individually administered tests the Peabody uses basal and ceiling rules which presuppose that the subject can respond correctly to all the items below the basal and respond incorrectly to all the items above the ceiling. To date no technical data has been presented on the impact basal and ceiling rules have on technical characteristics, especially internal consistency of the PPVT. Usually, basal and ceiling rules are employed in order to reduce testing time but for basal and ceiling limits to be employed without affecting the tests (or an item's) variance, mean or reliability, the test items must be arranged in ascending order of difficulty. In the case of adults to be tested on the PPVT the basal must be low enough to ensure that all but the most severely handicapped could start at this level. Problems arise with the ceiling level employed on the PPVT. The ceiling is set when the subject makes 6 errors in any 8 consecutive presentations and it is assumed he will not

correctly respond to higher items. There is no information currently available concerning PPVT item order to determine whether items are in true ascending order of difficulty. The number of subjects passing each item could be compared with the number of subjects passing every other item by the McNemar test (Siegel, 1956). It is highly likely that over time some items are now out of order and this would affect both the tests and individual items means, standard deviations and internal consistency.

Factor analysis of the component items of the PPVT has been carried out by Ball, Payne and Hallahan (1973). For 354 children with a mean age of 4.4 years they found a single general factor on which 42 of 44 possible items loaded. Further factor analytic evidence is necessary to determine whether the general factor holds up for older subjects.

2.6.3 Construct validity

It cannot be assumed that scores on the Peabody reflect general and in particular verbal intelligence. The PPVT does not provide a comprehensive measure of intellectual functioning. The test was designed to measure recognition vocabulary and inference that the test measures verbal intelligence can only be made on the tests construct validity which is defined as the extent to which PPVT scores compare with scores on other vocabulary and intelligence tests.

Much of the validity data has involved comparing the PPVT and Wechsler scales. Dunn (1965) states that for children PPVT IQ is correlated with the WISC full scale over the range .30

to .84 with a median of .61, with the WISC vocabulary over the range .41 to .74 with a median of .67 and with the WISC performance over the range .19 to .82 with a median of .39. For adults the correlation between PPVT IQ and the full scale IQ coefficients ranged from .40 to .83 with a median of .84 and with performance IQ coefficients ranged from .27 to .70 with a median of .62. As can be seen the PPVT correlated much higher with the Wechsler full and verbal scales than with the performance scale. He states that in terms of comparability the PPVT and Wechsler IQ values were very similar with a tendency for the PPVT IQ scores to be one or two points higher than the Wechsler IQ scores. Since then recent evidence has helped clarify the relationship between the PPVT and the Wechsler scale.

Condit, Lewandowski and Saccuzzo (1976) found that the WISC IQ's for 106 male delinquents from 13-16 years of age were considerably overestimated by IQ's on the PPVT. They questioned the utility of the PPVT in estimating the Wechsler IQ of juvenile delinquents. Similarly, Pasewark, Fitzgerald and Gloeckler (1971), Vance, Lewis and De Bell (1979) and Vance, Pritchard and Wallbrown (1978) have found that the PPVT overestimated WISC IQ's for educable mental retardates. For a sample of 100 adolescents under psychiatric care De Horn and Klings (1978) found mean scores of 90.59 (SD = 17.39) for WISC IQ and 95.03 (SD = 18.90) for PPVT IQ. The differences between the two scores were significant using a test for correlated means ($t = 3.70$; $p < .001$). However, for lower socioeconomic

samples Applebaum and Tuma (1977) found that PPVT IQ underestimated WISC IQs. Low socioeconomic groups would score low on any test of language ability using vocabulary items familiar to white middle class children. For subjects from poverty backgrounds use of the Peabody is probably limited. The evidence overwhelmingly points out that PPVT IQ scores are consistently overestimating Wechsler IQ scores.

The pattern of correlation coefficients between PPVT IQ and WISC IQ scores is similar to that reported by Dunn (1965). De horn and Klinge (1978) reported coefficients between PPVT and WISC full scale scores of .78; with WISC verbal scores of .79 and .65 for WISC performance scores. Mize, Callaway and Smith (1979) reported coefficients of .57 between the PPVT and WISC full scale score. Much of the work with groups of retarded and learning disabled children has been reported by Sattler (1974). He found correlations ranging from .30 to .80 (median of .63) between full scale WISC and Peabody; .36 to .94 (median of .64) between IQ's on the WISC verbal scale and PPVT and .21 to .74 (median of .54) between WISC performance scale and Peabody. All the recently reported correlations between PPVT IQ and WISC verbal scores are within the range originally given by Dunn (1965). They are sufficiently high enough to suggest that Peabody recognition vocabulary has construct validity as a measure of verbal intelligence. While it is clear there is a significant correlation between Peabody and WISC verbal performance little else is known about the exact nature of the relationship. The low non-significant correlation

between PPVT and WISC performance scores suggests that the Peabody is only measuring a limited aspect of what is termed general intelligence. However, the high significant correlations between PPVT IQ and WISC full scale scores establishes the importance of hearing vocabulary as an important measure of general intelligence. Further evidence supporting this view comes from the similar pattern of correlation coefficients found between PPVT IQ and other verbal scales. They are somewhat lower but still range from .50 to .60. Taylor (1979) compared the PPVT to the McCarthy Scales of children's abilities. The Peabody correlated significantly with the verbal scale ($r = .54$), the general cognitive index ($r = .47$); and the memory scale ($r = .35$). Binet Mental age scores have been reported over a range of .60 to .87 with a median of .71 (Dunn, 1965). Similar correlations between .83 to .86 have been reported by Budoff and Purseglove (1963) and .71 for Mein (1962) both testing mentally retarded adolescents. Correlations with other measures have ranged from a high of .82 for the Columbia Test (Dunn & Harley, 1959), .68 for the Otis Test (Moss & Edmonds, 1960), to a low of .30 for the WISC (Sattler, 1974).

2.6.4 Summary

The PPVT is a measure of verbal intelligence that has demonstrated reliability but largely unestablished validity. Researchers have generally found significant correlations between PPVT IQ and WISC full scale IQ and verbal IQ and non-significant correlations between the Peabody and WISC performance IQ. In addition, the Peabody has generally yielded significantly higher

scores than the WISC with most samples, with the possible exception of lower socioeconomic children where the reverse is reported.

Factor analysis of the scale items yield a general factor of receptive vocabulary ability on which most of the items significantly load. However, caution needs to be used when interpreting PPVT norms in populations other than Nashville where the original norms were established.

The PPVT was selected as a measure in this study because it is a widely used measure. It has acceptable correlations with conventional measures of intelligence and research has established the importance of hearing vocabulary in the complex domain called intelligence. The PPVT is totally visual in nature and its easy administration makes it suitable for automation.

2.7 AUTOMATION OF TESTS

In recent years the use of computers in all facets of life has greatly increased. In many areas the use of computers for the automated assessment of human abilities is being studied.

The initial problem of automating a psychological test is that it must be feasible. Both Kagan's Matching Familiar Figures Test (MFFT) and the Peabody Picture Vocabulary test were selected for automation as they are totally visual in nature and both do not require the examiner to affectively and intensively interact with the subject.

A major advantage of automation is that it greatly reduces the interaction between the examiner and the subject and reduces the likelihood of the subject using subjective cues from the tester to solve the problem. For example, in the MFFT, subjects can make use of the examiner's eye pointing as cues to find the correct alternative. In addition the amount of feedback given to the subject is restricted. This is an important advantage in measuring cognitive style as one would expect impulsive and reflective subjects to differ in their motivational characteristics. Impulsives would be more susceptible to boredom and frustration. Glow and Glow (1979) point out that hyperactive children, like impulsives, would differ from others in the extent to which they seek feedback and, in the case of the MFFT where repeated trials are given, would require increased amounts of encouragement.

Another major asset of automation is that it reduces experimenter bias. Innes and Fraser (1971) suggested that psychological research could be seriously distorted by biases of the investigator. They suggested that subjects' performance could be influenced by factors such as the political ideology, cultural background, biographical and personal characteristics of the scientist. By providing invariant feedback the likelihood of such biases intruding into test results is diminished.

Also of importance is that automation reduces the necessity of scoring which leaves the examiner free to give administrative feedback or to observe subjects' behaviour in the test situation. Problems often arise in test situations

where the examiner is required to perform complex ongoing recording procedures and it is possible to miss subjects using unauthorised cues. In the MFFT the subject continues responding to each stimulus figure until he makes a correct choice, he is able to continue scanning the stimulus array while the tester gives feedback and records response time and accuracy. The first response time is thus the only one recorded, unless the tester shields the stimulus array from view, a difficult operation when combined with recording the latency of each response. Subjects can also make use of memory for the position of rejected alternatives, even by using cues such as placing their fingers over alternatives previously chosen. Consistent use of these strategies by some individuals could reduce the construct validity of the test. Automation of the MFFT facilitates the removal of the stimulus array following each response and makes the use of short term memory to solve the task much more difficult.

Automation also increases the speed with which a test can be administered and scored. This is very important for tests like the MFFT and the PPVT which require the measurement of response latencies. In the case of some impulsive subjects MFFT responses can be less than one second duration. The automated procedure for the MFFT also facilitates the recording of every response latency and not just the first response latency.

The most extensive work in the area of automation of intelligence tests has been undertaken by Elwood (1972) with the Wechsler Adult Intelligence Scale (WAIS). He obtained high

high test-retest correlations between automated and clinical administrations.

The feasibility and reliability of automated testing of children on the PPVT has been carried out by Klinge and Rodziewicz (1976), Knights, Richardson and McNarry (1973) and Overton and Scott (1972). In all studies the scores obtained on the automated version of the PPVT were similar to those reported in the test manual and test-retest reliabilities ranged from .81 to .95. The lower coefficient was obtained by Klinge and Rodziewicz using psychiatrically disturbed adolescent in-patients while the higher coefficient was obtained by Knights et al. for adolescent retardates. One possible explanation for the differing coefficients is that different groups of subjects may be differentially intrigued by the automated procedure. It is also possible that instructional set could reduce the reliability coefficient and that changes in instructions for the automated versions of the PPVT would improve the test-retest reliability.

In summary both the MFFT and the PPVT were selected for automation as their format makes them most adaptable for computerization. Automation of the tests would increase the accuracy of recording and reduce experimenter and subject cues by providing invariant feedback.

2.8 RELATIONSHIP BETWEEN IMPULSIVENESS, LOCUS OF CONTROL AND ACADEMIC ACHIEVEMENT : THE PILOT STUDY

The aim of the pilot study was to determine whether the Eysenck impulsiveness measure should be included in the test battery. Previously, Glow et al. (1980, See Appendix E) had reported that measures derived from the Eysenck impulsiveness scale had low correlation with MFFT performance. In addition, the study examined the relationship between impulsiveness, locus of control and academic achievement.

The sample consisted of 63 first year psychology students (mean age 19.46 years, SD = 4.64) enrolled at The University of Adelaide.

Two measures of impulsiveness were used. Kagan's MFFT (Kagan et al., 1964) and Eysenck's EPQ and impulsiveness measure (Eysenck & Eysenck, 1977). Measures derived from the MFFT were first response latency, total errors and two scores of reflectivity-impulsivity and efficiency-inefficiency dimensions. Measures derived from Eysenck's inventory included psychoticism, neuroticism, extraversion, lie, sociability, liveliness, narrow impulsivity, risk taking, non-planning ability and a broad impulsiveness score constructed by summing scores on the liveliness, narrow impulsivity, risk taking and non-planning measures.

Total score on Rotter's internal versus external locus of control scale was used with high scores reflecting external

locus of control beliefs.

Academic achievement was assessed through students' performance in first year psychology examinations. The Adelaide University Psychology Department used continuous assessment. Therefore, several measures of academic performance throughout the year were available. These were one short answer examination given at the end of each term, a statistics paper including both multiple choice and computation answers (given in first term), a 3-hour essay examination in third term, a mark for practical assignments based on three brief reports, and a mark for performance in tutorials based on a small tutorial assignment and on the tutor's rating for participation throughout the year.

Product moment correlations were calculated between the measures and the correlations are presented in Table 3. The correlation between MFFT impulsivity and Eysenck's narrow and broad impulsiveness measures, while significant, were disappointingly low. This is not surprising as Wicker (1969) reported that the inconsistencies between self-report inventories and overt behaviour lead to low correlation between these two types of measures. He concluded that generally self-reports had only slight validity and this created problems in attempts to gain predictive validity for behaviour measures. MFFT performance appeared to be best described on the self-report inventory as risk taking ($r = .39$).

As predicted there was a significant positive relationship between MFFT impulsivity and external locus of control. Of

TABLE 3. Correlation among the impulsivity, personality, locus of control and academic performance measures for first year psychology students.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.		
1. Psychoticism		.09	-.04	-.20	.04	.12	.37	.42	.49	.58	-.15	-.09	-.19	.00	-.10	-.25	-.13	-.16	-.15	.28	.24	.14	.30		
2. Extraversion			-.20	-.10	.95	.59	.08	.44	.13	.28	-.10	-.21	-.05	-.01	-.11	-.05	.02	-.09	-.21	.20	.23	-.02	.10		
3. Neuroticism				-.02	-.18	-.34	.31	.03	-.31	.02	-.02	.01	-.17	.02	.08	.09	-.09	.02	-.31	.25	.32	-.07	.24		
4. Lie					-.09	-.11	-.21	-.26	.06	-.19	.11	.06	-.04	.06	-.01	-.03	-.07	.00	.19	-.12	-.18	.07	-.22		
5. Sociability						.48	.06	.37	.13	.24	-.04	-.12	.02	.06	.00	.05	.11	.03	-.13	.06	.11	-.07	.10		
6. Liveliness							.10	.34	.24	.30	-.05	-.07	-.03	-.07	-.15	-.12	.01	-.11	-.11	.27	.22	.17	.05		
7. Narrow impulsiveness								.32	.21	.73	-.19	-.08	-.13	-.13	-.15	-.27	-.18	-.20	-.13	.28	.23	.16	.13		
8. Risk taking									.38	.74	-.38	-.42	-.34	-.07	-.15	-.17	-.23	-.25	-.32	.37	.39	.05	.44		
9. Non planning										.72	-.21	-.17	-.23	-.05	-.04	-.27	-.12	-.15	.10	-.11	-.12	-.01	.10		
10. Broad impulsiveness											-.34	-.29	-.30	-.12	-.16	-.33	-.23	-.27	-.15	.24	.22	.10	.29		
11. First term statistics paper												.70	.41	.51	.51	.53	.42	.66	-.03	-.07	-.02	-.10	.03		
12. First term short answer paper													.50	.36	.46	.37	.32	.57	.12	-.05	-.10	.07	-.13		
13. Second term short answer paper														.58	.60	.55	.53	.71	.09	-.06	-.08	.02	-.16		
14. Third term short answer paper															.80	.80	.70	.87	-.22	.02	.14	-.21	.09		
15. Third term essay examination																.80	.59	.94	.00	-.11	-.07	-.12	.07		
16. Practicals																	.71	.89	-.14	-.02	.07	-.18	.03		
17. Tutorials																		.76	-.01	-.03	-.01	-.04	-.06		
18. Total first year score																				-.03	-.08	-.03	-.12	.01	
19. MFFT latency																						-.55	-.88	.47	-.30
20. MFFT errors																							.88	.47	.12
21. MFFT reflectivity-impulsivity																								.00	.24
22. MFFT efficiency-inefficiency																									
23. Rotter I-E locus of control score																									

decimal points deleted, coefficients at or above .21 significant at 5% level (in italics)

the two MFFT measures of first response latency and errors, latency was significantly related to locus of control while errors was not. Students who responded quickly on the MFFT tended to have external locus of control beliefs.

Of the Eysenck measures, risk taking had the highest correlation with external variables. The correlations were .44 for locus of control, .39 for reflectivity-impulsivity and -.25 for total first year academic performance. The broad impulsiveness measure also had correlations in the same direction but were generally lower. This suggests an impulsive risk taking individual who has external control beliefs and is likely to do less well in achieving academic success.

Total scores which were composed of other measures (broad impulsiveness and total first year psychology assessment score) were eliminated from the correlation matrix as were the two component measures of MFFT performance (first response latency and errors). The remaining 19 independent measures were factor analysed using the Statistical Package for the Social Sciences, SPSS program PA2, Principal components method (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975, p. 480). This method replaces the main diagonal elements of the correlation matrix with communality estimates and employs an iteration procedure for improving these communality estimates.

The principal components whose eigenvalues were greater than or equal to one were retained for varimax orthogonal rotation with Kaiser normalization. Results of the factor analysis are presented in Table 4-6.

TABLE 4. Principal component analysis: Eigen values and percent of variance data for the impulsivity, locus of control and academic achievement measures for first year psychology students.

	Eigen values	% variance	Cumulative % variance
FACTOR I	4.84	25.5	25.5
FACTOR II	3.17	16.7	42.2
FACTOR III	2.23	11.7	53.9
FACTOR IV	1.56	8.2	62.1
FACTOR V	1.19	6.3	68.5
FACTOR VI	1.03	5.4	73.9

TABLE 5. Unrotated factor matrix of the impulsivity, personality, locus of control and academic achievement for first year psychology students.

	FACTOR					
	I	II	III	IV	V	VI
Psychoticism	-34	27	40	46	15	03
Extraversion	-29	84	-39	-25	10	-08
Neuroticism	03	-15	59	-44	15	-07
Lie	09	-21	-21	05	-05	-14
Sociability	-17	78	-36	-21	03	-11
Liveliness	-27	52	-28	07	19	10
Narrow impulsiveness	-33	13	36	08	29	15
Risk taking	-54	55	34	03	-12	03
Non planning	-36	25	03	67	-18	-15
First term statistics paper	69	08	-03	07	34	-34
First term short answer paper	63	-05	-06	20	54	-16
Second term short answer paper	67	15	-13	08	09	25
Third term short answer paper	76	42	24	11	-19	02
Third term essay examination	78	28	20	14	-12	01
Practicals	84	31	14	-13	-20	07
Tutorials	67	31	-02	05	-10	21
MFFT reflectivity-impulsivity	-13	33	39	-26	19	11
MFFT efficiency-inefficiency	-14	07	-09	14	30	35
Rotter I-E locus of control	-13	29	46	-05	-04	-25

decimal points deleted

TABLE 6. Principal component solution: Varimax rotated factor matrix after rotation to terminal solution with Kaiser normalization of the impulsivity, personality, locus of control and academic achievement measures for first year psychology students.

	FACTOR					
	I	II	III	IV	V	VI
Psychoticism	-10	02	43	61	01	-11
Extraversion	-02	99	14	00	-07	06
Neuroticism	-07	-32	56	-34	08	22
Lie	-06	-08	-31	-04	09	06
Sociability	06	90	08	01	-04	12
Liveliness	-05	62	09	18	-02	-22
Narrow impulsiveness	-19	00	51	19	01	-20
Risk taking	-14	35	54	38	-35	13
Non planning	-11	13	-06	81	-11	05
First term statistics paper	43	-02	-10	-09	70	13
First term short answer paper	34	-11	-10	-06	77	-17
Second term short answer paper	66	02	-15	-14	22	-23
Third term short answer paper	88	-01	09	07	14	21
Third term essay examination	83	-10	02	04	22	15
Practicals	88	-02	01	-22	10	21
Tutorials	77	07	-07	-08	08	-05
MFFT reflectivity-impulsivity	03	15	60	-08	-03	02
MFFT efficiency-inefficiency	-11	01	05	04	02	-50
Rotter I-E locus of control	00	04	46	19	00	36

decimal points deleted,

*factor loadings at or above .33 significant at 1% level
(in italics)*

Six factors were extracted accounting in total for 73.9 percent of the variance. The first factor account for 25.5 percent of variance reflected students' academic performance in first year psychology. All the assessment measures significantly loaded on this factor. The second factor accounting for 16.7 percent of variance was derived from the Eysenck measures and appears to be extraversion with extraverts having a tendency to be lively and take risks. The third factor accounting for 11.7 percent of variance appears to be impulsiveness which is

associated with pathological characteristics. Impulsive performance on the MFFT appears to be associated with risk taking and narrow impulsiveness, neurotic and psychotic beliefs and an external locus of control. The fourth factor accounting for 8.2 percent of the variance was extracted from the Eysenck measures. The fifth factor accounting for 6.3 percent of variance appears to be performance in first term psychology examinations. The examinations in first term may reflect either students' prior knowledge of psychology or perhaps some general academic examination skill which has a low relationship with specific psychology aptitude. This finding has been discussed elsewhere (Lange, 1981, See Appendix C). The final factor relating to an interaction between MFFT inefficiency and locus of control is probably spurious as it is based on a non-significant correlation.

The isolation of a specific factor which appears to describe individuals who are impulsive, have external locus of control beliefs, are high risk takers and who have both neurotic and psychotic tendencies provides some justification for causal relationships predicted in this study.

In order to examine further the relationship between impulsiveness and locus of control and academic achievement the two impulsiveness measures of Kagan's reflectivity-impulsivity and Eysenck's broad impulsiveness score were used as predictor variables in two multiple regression analyses to predict students' academic performance and locus of control beliefs. Results of the multiple regressions are presented in Table 7.

TABLE 7. Multiple regression results: Using MFFT reflectivity-impulsivity and Eysenck's broad impulsiveness as predictors of students' academic performance and locus of control beliefs.

Predictor Variables		Dependent Variable	Multiple R			
1. MFFT reflectivity-impulsivity		1. Rotter I-E locus of control	R square			.34
2. Broad impulsiveness			Adjusted R square			.12
			Std. deviation			.09
						3.78
Source	DF	Sum squares	Mean squares	F	p<	
Regression	2	110.40	55.20	3.86	.05	
Residual	58	828.84	14.29			
Predictor Variables		Dependent Variable	Multiple R			
1. MFFT reflectivity-impulsivity		1. Total first year score	R square			.28
2. Broad impulsiveness			Adjusted R square			.08
			Std. deviation			.04
						16.51
Source	DF	Sum squares	Mean squares	F	p<	
Regression	2	1308.21	654.11	2.40	ns.	
Residual	58	15800.92	272.43			

The relationship between impulsiveness and locus of control was significant but the size of the relationship was relatively small. There was no significant relationship between impulsiveness and academic achievement. Use of academic performance measures was discontinued in further studies.

In the pilot study with students it was possible to identify individuals who appeared to be impulsive, have external locus of control beliefs, were high risk takers and who had both psychotic and neurotic tendencies. However, the correlations between MFFT impulsivity and Eysenck's impulsiveness measures were disappointingly low. Together, MFFT impulsivity and Eysenck's broad impulsiveness were no better predictors of locus of control than MFFT impulsivity alone. As the Eysenck impulsiveness measure had been shown to be responsive to a response acquiescence set (Glow et al., 1980) it was discarded from the test battery.

CHAPTER 3.

METHOD3.1 SELECTION OF SUBJECTS3.1.1 The prisoner group

The prisoner group consisted of male inmates of the Yatala Prison, Adelaide, South Australia.

An introductory letter was sent to the Director of Correctional Services in South Australia (see Appendix F) and following the submission of an outline program, access to the prisoners for the purpose of testing was granted.

An introductory letter was distributed to all inmates of the prison asking for volunteers to participate in the experiment. The confidential nature of the information gathered was stressed. Subsequently, an introductory talk was given to prisoners who wished to participate in the program (see Appendix G). Prisoners who wished to participate in the experiment submitted their names to the chief prison officer and a testing time was allocated. Eight individuals of Aboriginal descent volunteered to attend and they participated in the experiment but in order not to confound the results with differences arising due to ethnic and cultural factors their results were excluded from all analyses.

A private room for the purpose of testing was made available and testing was carried out on an individual basis. While prison officers were required to escort prisoners from the maximum security sections of the jail to the testing room only the author was present in the room during testing. On average, the battery of tests took 1½-2 hours to complete.

Six weeks after the completion of the experiment, when preliminary results were available, all prisoners who had participated in the experiment and who were still incarcerated at Yatala were given additional information as to how they had fared, a more detailed outline of the experiment and any questions relating to the experiment answered. During this debriefing stage a random sample of 40 prisoners was re-administered the MFFT under varying conditions of instruction set and feedback.

Sixty-one inmates participated in the experiment, mean age 28.6 years (SD = 8.49 years).

The prisoners were drawn from three security divisions within the prison. Fifteen from maximum security, twenty-one from medium security and twenty-five from minimum security.

Prisoner biographical information was obtained by examining the South Australian Correctional Services Departmental Files. A prisoner personal data inventory was constructed (see Appendix H), and information relating to prisoners who participated in the experiment was coded onto the inventory by a Department of Correctional Services Officer.

In general only prisoners in South Australia who have been sentenced for a period of more than nine months or are recidivists has biographical information collected on him by the Department of Correctional Services. Thus, not all prisoners who participated in the study had biographical information available. Thirty-two prisoners had biographical information available for study. A range of categories of biographical

TABLE 8. Types of biographical information and the number of prisoners with recorded data in each category.

Type of biographical information	Number
1. Age of first offense	31
2. Type of crime committed for first offense	31
3. Outcome of court hearing for first offense	31
4. Age of first imprisonment	29
5. Type of crime committed for offense first imprisoned	30
6. Length of sentence of offense first imprisoned	29
7. Age of current offense	30
8. Type of crime committed for current offense	32
9. Date of admission to jail	32
10. Number of juvenile offenses	31
11. Types of juvenile offenses committed	31
12. Number of adult offenses	31
13. Types of adult offenses committed	31
14. Level of schooling achieved	32
15. Number of primary schools attended	22
16. Number of secondary schools attended	27

information was available from the prisoner's personal data inventory but not all prisoners had complete recorded histories. The types of biographical information that was available and the number of prisoners having recorded information for them are presented in Table 8.

3.1.2 The police cadet group

The police cadet group was selected as a non-offender comparison group in order to partially control for the effects of institutionalization. It consisted of male police cadets who were completing the final stage of a two year training period. During this time they had spent considerable time living and training at the South Australian Police Training Academy at Fort Largs, Adelaide.

Introductory letters were sent to the South Australian Commissioner of Police (see Appendix I, and Appendix J), and following a reply (see Appendix K) access to the police cadets for the purpose of testing was granted.

All members of courses 58 and 59 at the police training academy were given an introductory talk (see Appendix L) and cadets who volunteered to participate were immediately given a testing time. Every cadet arrived at his appointed testing time.

A private room for the purpose of testing was made available and testing was carried out in private on an individual basis. On average the cadets took from 1-1½ hours to complete the battery of tests.

One week after the completion of the experiment the cadets graduated and follow up debriefing at the academy was not possible. Although all cadets had an address to contact the author for any additional information none availed themselves of the opportunity.

Forty-six police cadets participated in the experiment, mean age 19.04 years (SD = .02 years). The cadets were very homogeneous with respect to age as only 8 months separated the youngest and oldest cadets.

The Porteus Maze Test was not given to police cadets as this group was the first tested and Porteus' Mazes were added to the test battery when testing of cadets had been completed.

3.1.3 The student group

The student non-offender sample consisted of male subjects who were first year psychology students at the University of Adelaide.

Part of the first year psychology course requirements at The University of Adelaide is that students participate for a set period in experimental programs. Students were approached through their tutors and a brief outline of the experiment was given. Subjects who volunteered were arranged with a convenient testing time. However, nearly one quarter of students failed to attend this prearranged time and additional follow up was required in order to obtain their participation in the experiment.

A private room was arranged for the testing and students were tested on an individual basis. Debriefing was carried out at the completion of the experiment where additional information was made available.

Thirty-eight students participated in the experiment, mean age 18.06 years (SD = 1.27 years).

3.2 TEST ORDER AND ADMINISTRATION

In order to assess the effect of order of test administration the tests were administered in serial order to subjects within each group according to a latin squares model suggested in Fisher and Yates (1967). The five cells relating to order of test administration made possible the evaluation of subjects' tests performance on subsequent performance.

Students and police cadets completed all the tests. Eight prisoners refused to complete the attitude towards authority inventory and seven prisoners refused to complete the Rotter internal-external locus of control scale.

3.3 AUTOMATED STIMULUS MATERIAL

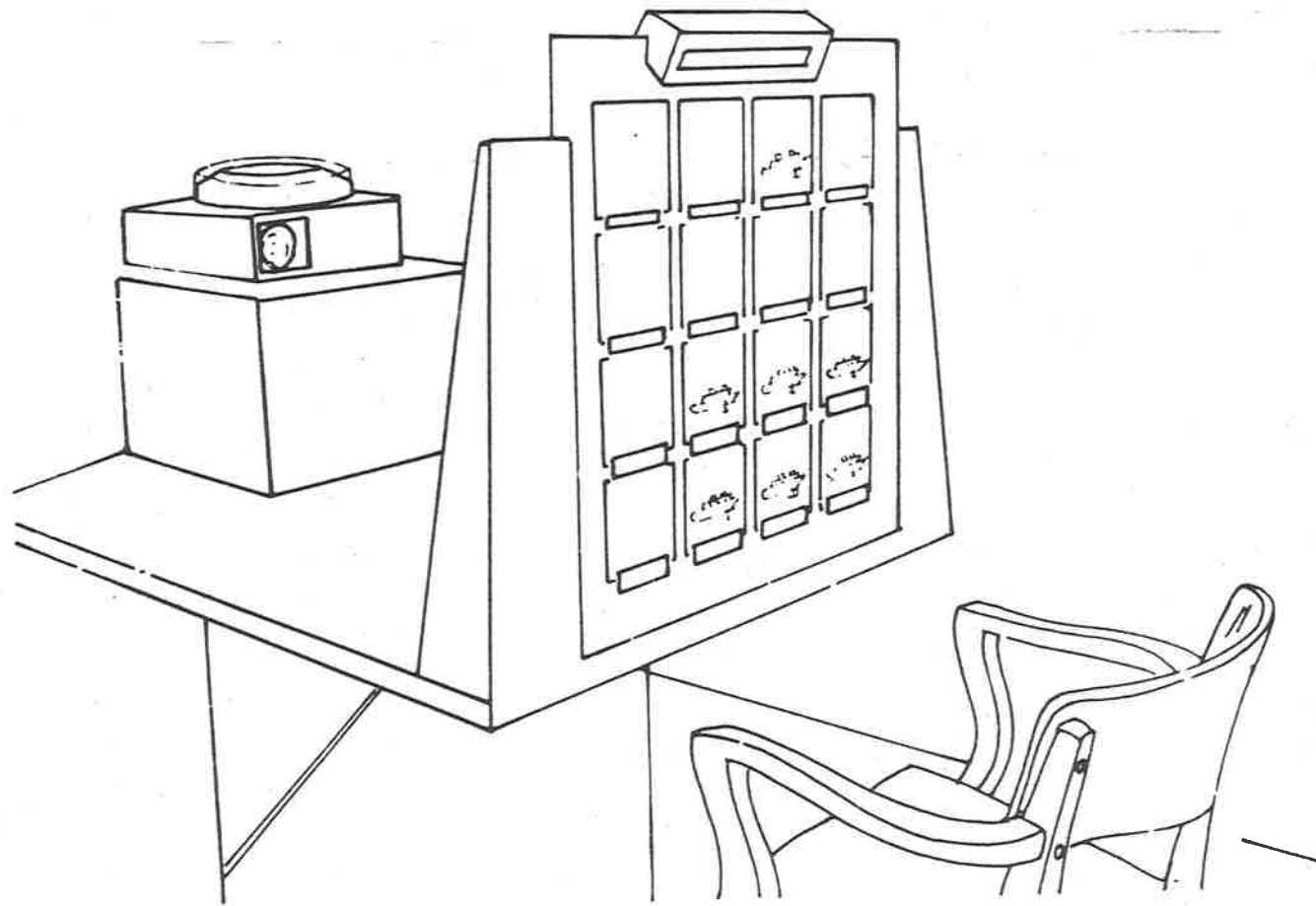
The MFFT and PPVT items were replicated in slide format with the slide items retaining the exact dimensions of the paper and pencil version of the original stimuli.

3.4 APPARATUS

The automated presentations of the MFFT were administered with an automatic visual display apparatus that was designed and constructed by Professor Glow of the Psychology Department at The University of Adelaide.

The MFFT apparatus consisted of a computer controlled random access carousel projector situated 710 mm from the back of a translucent screen (472 mm x 472 mm). The screen was divided into an array (4 x 4) of 16 panels, each 108 mm x 108 mm, separated by black strips, 13 mm wide. A touch sensitive strip (88 mm x 13 mm) allowed automatic recording of response and latency. The slides were projected directly onto the screen with the MFFT standard positioned in a panel in the top row and the comparison figures in the bottom two rows. A positive feedback tone consisting of a 'pip' (2.8 KH; $\frac{1}{2}$ second duration) was given immediately following each correct response. The apparatus is shown in Figure 4.

FIGURE 4. The Matching Familiar Figures Test experimental apparatus.



The PPVT apparatus consisted of the same computer controlled projector that was used for the Matching Familiar Figures Test. The four PPVT items of each plate were positioned in the centre of the screen with two rows of two pictures each. The subjects indicated their answers by touching the metal strip underneath the picture of their choice.

3.5 PROCEDURE FOR ADMINISTRATION

3.5.1 Matching Familiar Figures Test

The MFFT was administered by presenting each of the 12 items until the subject made a correct response (a preset maximum of 14 errors on any one item was not reached by any subject). There was an interval of 1.25 seconds between each response and the onset of the next stimulus.

Subjects were given the following instructions:-

"I AM GOING TO SHOW YOU A SERIES OF PICTURES. IN EACH OF THE PICTURES THERE ARE EIGHT PICTURES ON THE BOTTOM OF THE SCREEN AND ONE AT THE TOP. ONE OF THE EIGHT PICTURES AT THE BOTTOM IS EXACTLY THE SAME AS THE ONE AT THE TOP. I WANT YOU TO FIND THE PICTURE THAT IS MOST NEARLY THE SAME AS THE PICTURE AT THE TOP AND TOUCH THE BAR UNDER THE PICTURE YOU HAVE CHOSEN."

[The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.]

"WHEN YOU FIND THE RIGHT PICTURE, THE SLIDE WILL GO OFF AND YOU WILL GET A NEW SET OF PICTURES. IF YOU

PICK THE WRONG ONE THE SLIDE WILL DISAPPEAR FOR A MOMENT AND WHEN IT REAPPEARS YOU SHOULD TRY ANOTHER PICTURE. LET'S TRY SOME FOR PRACTICE."

[If the subject chose the right alternative the first time he was told "DO YOU HEAR A 'PIP". THAT'S VERY GOOD. NOW HERE'S ANOTHER ONE."]

[If the subject chose an incorrect one he was told "NO THAT'S NOT RIGHT, TRY AGAIN". When correct he was told "HEAR THE 'PIP'. THAT'S VERY GOOD. NOW HERE'S ANOTHER ONE." If not correct after ten tries the correct alternative was pointed out.]

The subject on completion of the second practice item was asked:

"WOULD YOU LIKE TO DO THE PRACTICE SLIDES AGAIN? NOW WE WILL DO SOME THAT ARE HARDER, YOU WILL SEE A PICTURE AT THE TOP AND EIGHT ON THE BOTTOM. FIND THE ONE THAT IS THE SAME OR MOST SIMILAR TO THE ONE ON THE TOP AND TOUCH THE METAL STRIP UNDERNEATH IT. AS YOU FINISH EACH SLIDE ANOTHER WILL COME UP. ARE YOU READY?"

Subjects took from 5 to 40 minutes to complete the 12 MFFT items.

3.5.2 Porteus Maze Test

The original Vineland Revision of the mazes was individually administered with the alternative procedure for adults. The test sheet was placed with the print at the bottom towards the subject. Horizontal lines of the maze were placed roughly perpendicular to the subject's writing-arm. The fingers of one

hand were pressed against the top of the record sheet, in order to keep it flat on the table and to prevent the subject from changing the position. Subjects were presented with the Year V maze and given the following instructions:-

"THE LINES ON THESE DESIGNS ARE SUPPOSED TO BE SOLID STONE WALLS AND YOU WILL SEE ALSO THIS DRAWING OF A RAT THAT IS SUPPOSED TO FIND HIS WAY TO HIS FOOD. I WANT YOU TO FORGET ABOUT THE RAT AND IMAGINE THESE ARE STREETS AND THAT YOU ARE DRIVING A CAR IN AT THIS ENTRANCE [point to the rat on the left side of the five-year maze] AND OUT HERE. BUT THERE ARE SPECIAL RULES. THE CAR CANNOT TURN AROUND OR BACK UP, SO YOU MUST BE SURE THAT YOU DO NOT GO UP ANY ONE-WAY STREET, BECAUSE THEN YOUR CAR WOULD HAVE TO BE TOWED OUT, SINCE IT CANNOT BACK OR REVERSE. YOU CANNOT CROSS ANY LINES. REMEMBER YOUR PENCIL IS THE CAR, SO BE SURE IT STAYS ON THE ROAD. YOU CAN STOP THE CAR ANYWHERE AND LOOK AROUND, BUT DO NOT LIFT THE PENCIL. YOU CAN START DRAWING AS SOON AS YOU ARE READY."

When the subject had completed year V, year VI was presented in the same manner saying:

"NOW WITH THIS ONE YOU START HERE AND GO ON TO HERE."

With Maze VIII and higher the start was pointed out and the subject was told:

"DRIVE IN HERE AND FIND YOUR WAY OUT."

After the tenth pencil lifting the subject was told:

"YOU MUST NOT LIFT THE PENCIL OFF THE ROAD. YOU MUST THINK OF IT AS A CAR, NOT A PLANE."

3.5.3 Rotter I-E locus of control scale

Rotter's 29 item internal versus external locus of control scale was individually administered with the following instructions:

"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: THERE ARE NO RIGHT OR WRONG ANSWERS. THIS IS NOT A TEST.

YOUR ANSWERS TO THE ITEMS ON THIS INVENTORY ARE TO BE RECORDED ON THE RIGHT HAND SIDE OF THE PAPER. PRINT YOUR CODE NUMBER ON THE TOP OF THIS SHEET, THEN FINISH READING THESE DIRECTIONS. DO NOT TURN OVER UNTIL YOU ARE TOLD 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. IN EACH QUESTION PLACE AN X IN THE SPACE AFTER THE LETTER A OR B WHICH YOU CHOOSE AS THE STATEMENT MORE TRUE.

IN SOME CIRCUMSTANCES 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."

On average it took approximately 15 minutes for subjects to complete the Rotter locus of control scale.

3.5.4 Attitude towards authority inventory

The attitude towards authority inventory was individually administered to all subjects by asking them to indicate how favourably or unfavourably they agreed with each statement on a 5-point rating scale. Subjects were presented with the inventory and given the following instructions:-

"HERE ARE SOME STATEMENTS THAT HAVE BEEN MADE ABOUT CERTAIN KINDS OF PEOPLE AND INSTITUTIONS. WOULD YOU PLEASE INDICATE YOUR PERSONAL OPINION TO EACH ONE OF THEM BY PLACING A NUMBER BETWEEN 1 AND 5 IN THE BOX OPPOSITE THE QUESTION.

IF YOU AGREE STRONGLY WRITE	5
IF YOU AGREE BUT <u>NOT</u> STRONGLY WRITE	4
IF YOU ARE UNCERTAIN WRITE	3
IF YOU DISAGREE BUT <u>NOT</u> STRONGLY WRITE	2
IF YOU DISAGREE STRONGLY WRITE	1

THIS IS A MEASURE OF PERSONAL BELIEF: THERE ARE NO RIGHT OR WRONG ANSWERS. BE CAREFUL TO ANSWER EVERY

ITEM AND IF YOU CANNOT UNDERSTAND AN ITEM PLEASE ASK FOR HELP."

On average it took subjects approximately 15 minutes to complete all items on the scale. No subject required additional help in completing the inventory.

3.5.5 Peabody Picture Vocabulary Test

The procedure for the automated administration was similar to that of Dunn (1965). The test was individually administered by the author and testing and scoring time for the automated version was approximately 10 minutes. Words were given orally and practice in the correct pronunciation of each of the word items was undertaken before the test was given to the first subject.

Subjects were seated facing the screen and given the following instructions:

"I HAVE SOME PICTURES TO SHOW YOU."

[Example was put up on the screen.]

"SEE THERE ARE FOUR PICTURES ON THE SCREEN. I WILL SAY A WORD, THEN I WANT YOU TO TOUCH THE BAR UNDER THE PICTURE WHICH BEST TELLS ME THE MEANING OF THE WORD. LET US TRY ONE. TOUCH THE BAR UNDER THE PICTURE WHICH BEST TELLS THE MEANING OF "CRIB"... NOW I AM GOING TO SHOW YOU SOME OTHER PICTURES. EACH TIME YOU HEAR A WORD, YOU TOUCH THE BAR UNDER THE PICTURE WHICH BEST TELLS THE MEANING OF THE WORD. AS WE GO ALONG, YOU MAY NOT BE SURE YOU KNOW THE MEANING OF SOME OF THE WORDS, BUT I WANT YOU TO LOOK

CAREFULLY AT ALL OF THE PICTURES ANYWAY AND CHOOSE THE ONE YOU THINK IS RIGHT.

REMEMBER THAT IF YOU DO NOT HEAR A "PIP" YOU SHOULD TOUCH THE BAR AGAIN. WHICH ONE IS CHEMIST?"

Each of the word items was then spoken once immediately following the presentation of the slide. No praise or any other type of feedback was given. Words were repeated once again if requested.

CHAPTER 4.

ANALYSIS OF RESULTS OF POPULATIONS4.1 COMPARISON OF POPULATIONS4.1.1 Descriptive statistics

The means and standard deviations of age for the prisoner, student, police cadet and combined group are presented in Table 9. The prisoners were significantly older ($p < .01$) than the students and police cadets. The police cadets were very homogeneous with respect to age.

TABLE 9. Means and standard deviations of age for all groups.

	AGE	
	Mean	S.D.
Prisoners	28.60	8.49
Students	18.06	1.27
Police Cadets	19.04	.02
Totals	22.80	7.42

The means and standard deviations for the prisoner, student, police cadet and combined group on each of the five measures are presented in Tables 10-14.

TABLE 10. Means and standard deviations of Matching Familiar Figures Test measures for all subject groups.

	Latency		Errors		Reflectivity-impulsivity		Efficiency-inefficiency	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Prisoners	32.41	20.55	20.71	13.35	.60	1.80	-.01	.98
Students	45.66	27.57	14.89	9.41	-.45	1.79	.00	.81
Police Cadets	45.24	26.16	15.13	7.92	-.42	1.56	.01	.88
Totals	39.95	25.04	17.41	11.16	.00	1.79	.00	.90

TABLE 11. Means and standard deviations of Porteus Maze Test performance for all subject groups.

	Porteus mental age (TA)		Porteus Q score	
	Mean	S.D.	Mean	S.D.
Prisoners	15.50	1.99	39.44	19.56
Students	16.32	.67	31.05	17.63
Totals	15.82	1.67	36.22	19.19

TABLE 12. Means and standard deviations of Peabody Picture Vocabulary Test (PPVT) performance for all groups.

	PPVT IQ			PPVT first response latency	
	Mean	S.D.	Range	Mean	S.D.
Prisoners	107.25	19.51	68-136	4.88	1.94
Students	121.05	12.48	82-138	3.76	1.22
Police Cadets	111.26	10.77	92-131	5.11	2.05
Totals	112.14	16.32	68-138	4.65	1.88

TABLE 13. Means and standard deviations of Rotter's internal-external locus of control score for all groups.

	I-E locus of control	
	Mean	S.D.
Prisoners	9.48	3.35
Students	11.55	3.83
Police Cadets	11.61	3.65
Totals	10.76	3.71

TABLE 14. Means and standard deviations of the attitude towards authority scales for all groups.

	Attitude towards the police		Attitude towards the law		Attitude towards the army		Attitude towards teachers		Total attitude towards authority score	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Prisoners	22.42	7.72	25.77	6.26	30.91	5.79	27.70	4.95	106.79	17.77
Students	27.47	6.82	27.26	5.86	25.08	7.39	28.63	4.92	108.45	19.73
Police Cadets	33.63	3.09	31.37	4.02	32.20	4.19	28.59	4.37	125.78	10.81
Totals	27.58	7.83	28.07	5.97	29.72	6.49	28.26	4.74	113.63	18.47

4.1.2 Differences among the populations

The assessment of differences between the prisoner, student and police cadet samples were made by comparing paired groups by means of unrelated t-tests for each of the independent measures. Results of the t-tests are presented in Tables 15-17.

TABLE 15. Differences between prisoners and students on the measures.

	Prisoners		Students		t	Significance
	Mean	s.d.	Mean	s.d.		
MFFT latency	32.41	20.55	45.66	27.57	2.55	.01
MFFT errors	20.70	13.35	14.89	9.41	2.54	.01
MFFT impulsivity	.60	1.80	-.45	1.79	2.83	.01
MFFT inefficiency	-.01	.98	.00	.81	.05	ns
PPVT IQ	107.25	19.51	121.05	12.48	4.29	.001
Porteus mental age	15.51	1.99	16.33	.67	2.96	.01
Porteus Q score	39.44	19.56	31.05	17.63	2.21	.05
Rotter I-E locus of control	9.48	3.35	11.55	3.83	2.69	.01
Attitude towards the police	22.42	7.72	27.47	6.82	3.30	.001
Attitude towards the army	30.91	5.79	25.08	7.39	4.05	.001
Attitude towards the law	25.77	6.26	27.26	5.86	1.16	ns
Attitude towards teachers	27.70	4.95	28.63	4.92	.89	ns
Total attitude towards authority score	106.79	17.78	108.45	19.73	.41	ns

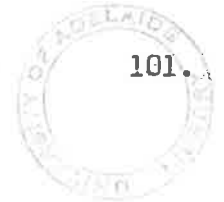


TABLE 16. Differences between prisoners and police cadets on the measures.

	Prisoners		Police cadets		t	Significance
	Mean	s.d.	Mean	s.d.		
MFFT latency	32.41	20.55	45.24	26.16	2.75	.01
MFFT errors	20.70	13.35	15.13	7.92	2.69	.01
MFFT impulsivity	.60	1.80	-.42	1.56	3.11	.01
MFFT inefficiency	-.01	.98	.01	.88	.07	ns
PPVT IQ	107.25	19.51	111.26	10.79	1.36	ns
Rotter I-E locus of control	9.48	3.35	11.61	3.65	3.02	.01
Attitude towards the police	22.42	7.72	33.63	3.09	9.72	.001
Attitude towards the army	30.91	5.79	32.30	4.19	1.28	ns
Attitude towards the law	25.77	6.26	31.37	4.02	5.36	.001
Attitude towards teachers	27.70	4.95	28.59	4.37	.95	ns
Total attitude towards authority score	106.79	17.78	125.78	10.81	6.51	.001

TABLE 17. Differences between students and police cadets on the measures.

	Students		Police cadets		t	Significance
	Mean	s.d.	Mean	s.d.		
MFFT latency	45.66	27.57	45.24	26.16	.07	ns
MFFT errors	14.89	9.41	15.13	7.92	.12	ns
MFFT impulsivity	-.45	1.79	-.42	1.56	.10	ns
MFFT inefficiency	.00	.81	.01	.88	.02	ns
PPVT IQ	121.05	12.48	111.26	10.79	3.80	.001
Rotter I-E locus of control	11.55	3.83	11.61	3.65	.07	ns
Attitude towards the police	27.47	6.82	33.63	3.09	5.15	.001
Attitude towards the army	25.08	7.39	32.20	4.19	5.28	.001
Attitude towards the law	27.26	5.86	31.37	4.02	3.67	.001
Attitude towards teachers	28.63	4.92	28.59	4.37	.04	ns
Total attitude towards authority score	108.45	19.73	125.78	10.81	4.85	.001

On the MFFT students and police cadets had similar performance. In contrast prisoners were significantly more impulsive taking less time to select alternatives and making more errors. All three groups had similar MFFT efficiency-inefficiency test performance.

On the Porteus Maze Test prisoners had significantly lower TA and higher Q scores than students. However, the students had higher and prisoners lower Q scores than those typically found for non-offender and offender groups. The students were a more homogeneous group than prisoners on maze planning ability.

The students scored significantly higher for I.Q. than police cadets and prisoners. The police cadets took longer to make each selection which may indicate either that they were more careful in the test, deliberating before making a selection, or that on average they were not as familiar with the items. The police cadets also had a much smaller range of I.Q. scores being a more homogeneous group. This probably results from the stringent screening procedures used to select cadets for training.

Prisoners, in comparison to students and police cadets tended to have more internal scores on the Rotter I-E scale although the difference was not significant. It was predicted that prisoners would have a higher locus of control score than students or police cadets and their low internal score may reflect either the effect of imprisonment for a period of time or biasing of responses to portray a more favourable picture on the questionnaire.

In the total attitude towards authority score police cadets were significantly more favourable towards institutional authority than either prisoners or students. The police cadets were a more homogeneous group. Differences in the total score masked differences between each group on the four scales. The police cadets had significantly higher opinions of the police and law. The police cadets and prisoners held similar attitudes towards the army and both were significantly higher than the attitudes held by students. Prisoners and students had similar attitudes towards the law and all groups tended to have the same attitude towards teachers. The general consensus of opinion towards teachers suggests that attitudes on this scale may not be very useful in discriminating between various groups. Early prolonged contact with teachers through primary and secondary school appears to generate robust general attitudes towards them within the population.

4.1.3 Effect of order of test administration

As each of the five measures was administered to subjects in a fixed order a one-way analysis of variance was used to assess the effect of order of test administration on subjects' performance on the measures. There were five levels of order to test administration and the criterion variables were MFFT latency, errors, reflectivity-impulsivity, efficiency-inefficiency measures; PPVT IQ: Porteus mental age and Q score; Rotter I-E locus of control total score and attitude towards police, army, law and teachers. Results of the one-way analysis of variance

for prisoner, student, police cadet and combined group are presented in Tables 18-21.

The order of administering tests produced no effect on subsequent performance.

TABLE 18. Analysis of variance data for the effect of order of test administration for the prisoner sample.

MFFT FIRST RESPONSE LATENCY					
Source	Sum Square	DF	Mean Square	F	p
Order	852.66	5	170.53	.38	ns
Subjects within group (error)	24488.10	55	445.24		

MFFT ERRORS					
Source	Sum Square	DF	Mean Square	F	p
Order	210.92	5	42.18	.22	ns
Subjects within group (error)	10483.77	55	190.61		

MFFT REFLECTIVITY - IMPULSIVITY					
Source	Sum Square	DF	Mean Square	F	p
Order	4.45	5	.89	.26	ns
Subjects within group (error)	185.07	55	3.37		

MFFT EFFICIENCY - INEFFICIENCY					
Source	Sum Square	DF	Mean Square	F	p
Order	1.95	5	.39	.44	ns
Subjects within group (error)	48.53	55	.88		

PPVT IQ					
Source	Sum Square	DF	Mean Square	F	p
Order	1942.84	5	388.57	1.02	ns
Subjects within group (error)	20888.47	55	379.79		

PORTEUS MENTAL AGE					
Source	Sum Square	DF	Mean Square	F	p
Order	10.31	5	2.06	.50	ns
Subjects within group (error)	227.43	55	4.14		

TABLE 18. cont.

PORTEUS Q SCORE						
Source	Sum Square	DF	Mean Square	F	p	
Order	2104.45	5	420.89	1.11	ns	
Subjects within group (error)	20856.60	55	379.21			

ROTTER INTERNAL - EXTERNAL LOCUS OF CONTROL						
Source	Sum Square	DF	Mean Square	F	p	
Order	42.50	5	8.50	.74	ns	
Subjects within group (error)	538.37	47	11.46			

ATTITUDE TOWARDS THE POLICE						
Source	Sum Square	DF	Mean Square	F	p	
Order	150.22	5	30.04	.48	ns	
Subjects within group (error)	2946.65	47	62.70			

ATTITUDE TOWARDS THE ARMY						
Source	Sum Square	DF	Mean Square	F	p	
Order	87.94	5	17.59	.50	ns	
Subjects within group (error)	1652.59	47	35.16			

ATTITUDE TOWARDS THE LAW						
Source	Sum Square	DF	Mean Square	F	p	
Order	174.67	5	34.93	.88	ns	
Subjects within group (error)	1860.61	47	39.59			

ATTITUDE TOWARDS TEACHERS						
Source	Sum Square	DF	Mean Square	F	p	
Order	70.21	5	14.04	.55	ns	
Subjects within group (error)	1202.96	47	25.60			

TABLE 19. Analysis of variance data for the effect of order of test administration for the student sample.

MFFT FIRST RESPONSE LATENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	2675.58	5	535.12	.67	ns	
Subjects within group (error)	25456.98	32	795.53			

MFFT ERRORS						
Source	Sum Square	DF	Mean Square	F	p	
Order	128.20	5	25.64	.26	ns	
Subjects within group (error)	3145.38	32	98.29			

MFFT REFLECTIVITY - IMPULSIVITY						
Source	Sum Square	DF	Mean Square	F	p	
Order	4.68	5	.94	.25	ns	
Subjects within group (error)	119.97	32	3.75			

MFFT EFFICIENCY - INEFFICIENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	5.26	5	1.05	1.86	ns	
Subjects within group (error)	18.10	32	.57			

PPVT IQ						
Source	Sum Square	DF	Mean Square	F	p	
Order	742.44	5	148.48	.95	ns	
Subjects within group (error)	5023.45	32	156.98			

PORTEUS MENTAL AGE						
Source	Sum Square	DF	Mean Square	F	p	
Order	2.79	5	.56	1.29	ns	
Subjects within group (error)	13.85	32	.43			

TABLE 19. cont.

PORTEUS Q SCORE						
Source	Sum Square	DF	Mean Square	F	p	
Order	711.18	5	142.24	.42	ns	
Subjects within group (error)	10782.71	32	336.96			

ROTTER INTERNAL - EXTERNAL LOCUS OF CONTROL						
Source	Sum Square	DF	Mean Square	F	p	
Order	30.54	5	6.11	.38	ns	
Subjects within group (error)	510.86	32	15.96			

ATTITUDE TOWARDS THE POLICE						
Source	Sum Square	DF	Mean Square	F	p	
Order	46.13	5	9.22	1.10	ns	
Subjects within group (error)	267.76	32	8.37			

ATTITUDE TOWARDS THE ARMY						
Source	Sum Square	DF	Mean Square	F	p	
Order	72.37	5	14.47	1.64	ns	
Subjects within group (error)	282.71	32	8.84			

ATTITUDE TOWARDS THE LAW						
Source	Sum Square	DF	Mean Square	F	p	
Order	56.29	5	11.26	1.37	ns	
Subjects within group (error)	263.29	32	8.28			

ATTITUDE TOWARDS TEACHERS						
Source	Sum Square	DF	Mean Square	F	p	
Order	15.28	5	3.06	.32	ns	
Subjects within group (error)	304.93	32	9.53			

TABLE 20. Analysis of variance data for the effect of order of test administration for the police cadet sample.

MFFT FIRST RESPONSE LATENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	1344.63	5	268.93	.37	ns	
Subjects within group (error)	29439.74	40	735.99			

MFFT ERRORS						
Source	Sum Square	DF	Mean Square	F	p	
Order	341.64	5	68.33	1.10	ns	
Subjects within group (error)	2477.58	40	61.94			

MFFT REFLECTIVITY - IMPULSIVITY						
Source	Sum Square	DF	Mean Square	F	p	
Order	3.63	5	.73	.21	ns	
Subjects within group (error)	136.62	40	3.42			

MFFT EFFICIENCY - INEFFICIENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	11.21	5	2.24	3.14	.05	
Subjects within group (error)	28.55	40	.71			

PPVT IQ						
Source	Sum Square	DF	Mean Square	F	p	
Order	521.28	5	104.26	.86	ns	
Subjects within group (error)	4713.59	40	117.84			

TABLE 20. cont.

ROTTER INTERNAL - EXTERNAL LOCUS OF CONTROL						
Source	Sum Square	DF	Mean Square	F	p	
Order	108.99	5	21.79	1.77	ns	
Subjects within group (error)	491.97	40	12.30			

ATTITUDE TOWARDS THE POLICE						
Source	Sum Square	DF	Mean Square	F	p	
Order	49.25	5	9.85	1.04	ns	
Subjects within group (error)	379.47	40	9.49			

ATTITUDE TOWARDS THE ARMY						
Source	Sum Square	DF	Mean Square	F	p	
Order	29.44	5	5.89	.31	ns	
Subjects within group (error)	761.80	40	19.05			

ATTITUDE TOWARDS THE LAW						
Source	Sum Square	DF	Mean Square	F	p	
Order	149.62	5	29.93	2.07	ns	
Subjects within group (error)	577.09	40	14.43			

ATTITUDE TOWARDS TEACHERS						
Source	Sum Square	DF	Mean Square	F	p	
Order	76.27	5	15.25	.78	ns	
Subjects within group (error)	782.89	40	19.57			

TABLE 21. Analysis of variance data for the effect of order of test administration for the combined groups.

MFFT FIRST RESPONSE LATENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	764.09	5	152.82	.24	ns	
Subjects within group (error)	89486.57	139	643.79			

MFFT ERRORS						
Source	Sum Square	DF	Mean Square	F	p	
Order	444.92	5	88.99	.71	ns	
Subjects within group (error)	17484.25	139	125.79			

MFFT REFLECTIVITY - IMPULSIVITY						
Source	Sum Square	DF	Mean Square	F	p	
Order	3.27	5	.65	.20	ns	
Subjects within group (error)	456.01	139	3.28			

MFFT EFFICIENCY - INEFFICIENCY						
Source	Sum Square	DF	Mean Square	F	p	
Order	6.32	5	1.26	1.59	ns	
Subjects within group (error)	110.41	139	.79			

PPVT IQ						
Source	Sum Square	DF	Mean Square	F	p	
Order	1828.69	5	365.74	1.39	ns	
Subjects within group (error)	36518.55	139	262.72			

PORTEUS MENTAL AGE						
Source	Sum Square	DF	Mean Square	F	p	
Order	3.96	5	.79	.27	ns	
Subjects within group (error)	266.80	93	2.86			

TABLE 21. cont.

PORTEUS Q SCORE						
Source	Sum Square	DF	Mean Square	F	p	
Order	1558.05	5	311.61	.84	ns	
Subjects within group (error)	34545.06	93	371.45			

ROTTER INTERNAL - EXTERNAL LOCUS OF CONTROL						
Source	Sum Square	DF	Mean Square	F	p	
Order	105.71	5	21.14	1.56	ns	
Subjects within group (error)	1770.35	131	13.51			

ATTITUDE TOWARDS THE POLICE						
Source	Sum Square	DF	Mean Square	F	p	
Order	239.10	5	47.82	.77	ns	
Subjects within group (error)	8106.18	131	61.88			

ATTITUDE TOWARDS THE ARMY						
Source	Sum Square	DF	Mean Square	F	p	
Order	156.58	5	31.32	.74	ns	
Subjects within group (error)	5570.88	131	42.53			

ATTITUDE TOWARDS THE LAW						
Source	Sum Square	DF	Mean Square	F	p	
Order	262.05	5	52.41	1.50	ns	
Subjects within group (error)	4576.36	131	34.93			

ATTITUDE TOWARDS TEACHERS						
Source	Sum Square	DF	Mean Square	F	p	
Order	126.96	5	25.39	1.14	ns	
Subjects within group (error)	2927.10	131	22.34			

4.1.4 Relationship of MFFT performance to other measures

The relationships between MFFT performance and the other measures for the prisoner, student, police cadet and combined group were examined by means of Pearson product-moment correlation coefficients. They were calculated for the four MFFT performance measures and the remaining independent measures. Results are presented in Tables 22-25.

TABLE 22. Correlation between MFFT performance and other measures for prisoners.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	26	-38	-36	-05
Porteus Q score	-19	38	31	13
PPVT IQ	24	-36	-33	-06
Rotter I-E locus of control	-41	29	40	-21
Attitude towards the police	23	02	-13	29
Attitude towards the army	-09	-03	04	-13
Attitude towards the law	15	00	-10	18
Attitude towards teachers	23	-24	-26	05
Total attitude towards authority score	19	-07	-15	16

*decimal points deleted,
coefficients at or above .22 (one tailed test)
significant at 5% level (in italics)*

TABLE 23. Correlation between MFFT performance and other measures for students.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	29	-22	-28	10
Porteus Q score	-20	26	25	07
PPVT IQ	17	-02	-11	18
Rotter I-E locus of control	01	-13	-08	-16
Attitude towards the police	09	07	-01	21
Attitude towards the army	-02	10	07	09
Attitude towards the law	-02	20	12	23
Attitude towards teachers	10	-05	-08	07
Total attitude towards authority score	04	11	04	19

*decimal points deleted,
coefficients at or above .28 (one tailed test)
significant at 5% level (in italics)*

TABLE 24. Correlation between MFFT performance and other measures for police cadets.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
PPVT IQ	14	-20	-19	-06
Rotter I-E locus of control	32	-22	-30	10
Attitude towards the police	-02	-10	-04	-13
Attitude towards the army	-38	04	24	-36
Attitude towards the law	-23	01	13	-24
Attitude towards teachers	-21	08	16	-14
Total attitude towards authority score	-32	02	19	-32

*decimal points deleted,
coefficients at or above .24 (one tailed test)
significant at 5% level (in italics)*

TABLE 25. Correlation between MFFT performance and other measures for the combined groups.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	30	-49	-46	-26
Porteus Q score	-24	40	36	23
PPVT IQ	25	-34	-33	-10
Rottèr I-E locus of control	05	-03	-04	04
Attitude towards the police	20	-06	-15	18
Attitude towards the army	-15	05	12	-13
Attitude towards the law	06	01	-03	08
Attitude towards teachers	06	-11	-10	-04
Total attitude towards authority score	07	-03	-06	05

*decimal points deleted,
coefficients at or above .16 (one tailed test)
significant at 5% level (in italics)*

For prisoners MFFT errors and reflectivity-impulsivity appear to be the best correlate of MFFT performance with the other measures. Prisoners having many errors and an impulsive univariate score on the MFFT tended to have high Porteus Q scores and low Porteus mental age. It appears that prisoners who had an impulsive style of responding on the MFFT had considerable difficulty in solving the Porteus mazes and had poor psychomotor control. In addition they tended to have low non-verbal intelligence and external locus of control and low attitude towards teachers.

For students, the only significant relationship was between Porteus mental age and MFFT latency and reflectivity-impulsivity scores. However, these significant correlations are low and would probably be unreliable to make assumptions about any strong consistent relationship between them.

For police cadets MFFT latency and not errors was the best correlate with other measures in the study. The pattern of correlations differed from that of prisoners and students. MFFT latency and impulsivity significantly correlated with Rotter's I-E locus of control score but in the opposite direction.

PPVT intelligence failed to load on any of the four MFFT performance measures. MFFT inefficiency appears for police cadets to be significantly related to attitude towards the army. Cadets who had an inefficient performance on the MFFT tended to hold low attitudes towards the army.

For the combined population among the MFFT measures the best correlate appears to be the total number of errors. Many errors on the MFFT is significantly related to low Porteus mental age (planning ability), high Q score and low PPVT intelligence. The pattern of correlations for MFFT reflectivity-impulsivity were the same but coefficients were somewhat lower while they were reversed for MFFT latency. Inefficient responding on the MFFT appears to be moderately related to low planning ability, high Q score and favourable attitudes towards the police although the latter is marginally significant.

4.1.5 Effect of intelligence on MFFT performance

As impulsive performance on the MFFT is related to low verbal intelligence, statistical control for intelligence is desired in order to identify whether any relationship between MFFT impulsivity, and impulsive performance on the Porteus mazes, extrinsic motivation and low attitude towards institutional authorities may be spurious. Partial correlation analysis should provide evidence that MFFT performance has trait like properties additional to that of general intelligence. In a partial correlation a statistical control for the effect of intelligence is possible by assuming that the effect of PPVT IQ is linear. The effect of the partial correlation is to simplify the relationship between MFFT performance and other variables by constructing new variables with the effect of intelligence removed. Such a procedure is suggested by Messer (1976). Results of controlling for intelligence of MFFT performance in a partial correlation for all populations are presented in Tables 26-29.

For students, police cadets and the combined population there was little effect on MFFT performance by controlling for PPVT intelligence.

For prisoners, controlling for intelligence has no effect on the strength of relationships between impulsive performance on the MFFT, Porteus Maze Test performance and extrinsic motivation on the Rotter I-E scale. However, the correlation between MFFT impulsivity and low attitudes towards teachers appears to be spurious. Low intelligence is more likely to be the true predictor of low attitudes towards teachers.

TABLE 26. Correlation between MFFT performance and other measures for prisoners with PPVT intelligence controlled in a partial correlation.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	25	-47	-41	-20
Porteus Q score	-10	32	24	21
Rotter I-E locus of control	-39	24	37	-25
Attitude towards the police	23	04	-13	30
Attitude towards the army	-04	-12	-03	-16
Attitude towards the law	16	00	-10	18
Attitude towards teachers	16	-14	-17	09
Total attitude towards authority score	19	-05	-15	17

*decimal points deleted,
coefficients at or above .22 (one tailed test)
significant at 5% level (in italics)*

TABLE 27. Correlations between MFFT performance and other measures for students with PPVT intelligence controlled in a partial correlation.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	30	-21	-28	10
Porteus Q score	-21	26	25	07
Rotter I-E locus of control	02	-13	-09	-14
Attitude towards the police	-04	-04	00	-10
Attitude towards the army	-24	26	28	03
Attitude towards the law	07	-08	-09	-01
Attitude towards teachers	13	-03	-09	13
Total attitude towards authority score	-04	07	06	03

*decimal points deleted,
coefficients at or above .28 (one tailed test)
significant at 5% level (in italics)*

TABLE 28. Correlations between MFFT performance and other measures for police cadets with PPVT intelligence controlled in a partial correlation.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Rotter I-E locus of control	32	-23	-32	10
Attitude towards the police	-04	-08	-02	-13
Attitude towards the army	-36	00	20	-38
Attitude towards the law	-24	02	15	-24
Attitude towards teachers	-19	05	14	-15
Total attitude towards authority score	-31	00	18	-33

*decimal points deleted,
coefficients at or above .24 (one tailed test)
significant at 5% level (in italics)*

TABLE 29. Correlations between MFFT performance and other measures for the combined group with PPVT intelligence controlled in a partial correlation.

	MFFT latency	MFFT errors	MFFT reflectivity- impulsivity	MFFT efficiency- inefficiency
Porteus mental age	25	-44	-39	-25
Porteus Q score	-18	33	29	21
Rotter I-E locus of control	07	-05	-06	03
Attitude towards the police	19	-04	-14	18
Attitude towards the army	-08	-05	03	-17
Attitude towards the law	06	00	-04	07
Attitude towards teachers	03	-07	-05	-02
Total attitude towards authority score	08	-05	-08	04

*decimal points deleted,
coefficients at or above .16 (one tailed test)
significant at 5% level (in italics)*

4.1.6 Identification of components

In order to examine the underlying pattern of relationships that exist among the independent measures, subjects' responses on all the measures were intercorrelated and principal component analysis was carried out using the Statistical Package for the Social Sciences; SPSS program PA2 (Nie et al., 1975). This method of factor analysis replaces the main diagonal elements of the correlation matrix with communality estimates and employs an iteration procedure for improving the estimates of communality. The resultant factor matrix was rotated to a terminal solution using the widely used Varimax method. Only factors with an eigen-value greater than or equal to one were retained for rotation to terminal solution.

Two factor analyses were performed on each of the prisoner, student, police cadet and combined populations. The initial principal component analysis included MFFT latency and errors raw scores and the second included MFFT reflectivity-impulsivity and efficiency-inefficiency univariate scores. Results of the first factor analyses are presented in Tables 30-45.

TABLE 30. Correlation among the measures for the prisoner sample including MFFT raw scores.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. MFFT latency		<i>-57</i>	<i>24</i>	<i>26</i>	<i>-19</i>	<i>-41</i>	<i>23</i>	<i>-09</i>	<i>15</i>	<i>23</i>
2. MFFT errors			<i>-36</i>	<i>-38</i>	<i>38</i>	<i>29</i>	<i>02</i>	<i>-03</i>	<i>00</i>	<i>-24</i>
3. PPVT IQ				<i>32</i>	<i>-25</i>	<i>-20</i>	<i>04</i>	<i>-19</i>	<i>01</i>	<i>28</i>
4. Porteus mental age					<i>-35</i>	<i>-30</i>	<i>03</i>	<i>29</i>	<i>06</i>	<i>20</i>
5. Porteus Q score						<i>17</i>	<i>04</i>	<i>-17</i>	<i>08</i>	<i>-17</i>
6. Rotter I-E locus of control							<i>-41</i>	<i>-02</i>	<i>-42</i>	<i>-51</i>
7. Attitude towards the police								<i>21</i>	<i>58</i>	<i>50</i>
8. Attitude towards the army									<i>23</i>	<i>06</i>
9. Attitude towards the law										<i>42</i>
10. Attitude towards teachers										

decimal points deleted, coefficients at or above .34 significant at 1% level (in italics).

TABLE 31. Principal component analysis: Eigen values and percent of variance data for the prisoner sample for all measures including MFFT raw scores.

	Eigen Value	% Variance	Cumulative % Variance
Factor I	3.10	31.0	31.0
Factor II	1.92	19.2	50.2
Factor III	1.30	13.0	63.2

TABLE 32. Unrotated factor matrix for the prisoner sample for all measures including MFFT raw scores.

		FACTOR		
		I	II	III
1.	MFFT latency	55	26	13
2.	MFFT errors	-55	53	-10
3.	PPVT IQ	38	-36	-11
4.	Porteus mental age	48	-27	32
5.	Porteus Q score	-34	34	-26
6.	Rotter I-E locus of control	-69	-07	17
7.	Attitude towards the police	55	55	-18
8.	Attitude towards the army	23	41	88
9.	Attitude towards the law	50	53	-12
10.	Attitude towards teachers	65	17	-17

decimal points deleted

TABLE 33. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for the prisoner sample for all measures including MFFT raw scores.

		FACTOR		
		I	II	III
1.	MFFT latency	28	54	-15
2.	MFFT errors	-05	-77	03
3.	PPVT IQ	09	49	-19
4.	Porteus mental age	08	58	26
5.	Porteus Q score	04	-52	-16
6.	Rotter I-E locus of control	-60	-38	06
7.	Attitude towards the police	79	-05	09
8.	Attitude towards the army	14	03	99
9.	Attitude towards the law	73	-06	13
10.	Attitude towards teachers	62	29	-03

decimal points deleted, factor loadings at or above .35 (DF=51) significant at 1% level (in italics)

TABLE 34. Correlation among the measures for the student sample including MFFT raw scores.

	1	2	3	4	5	6	7	8	9	10
1. MFFT latency		<i>-68</i>	17	29	-20	01	09	-02	-02	10
2. MFFT errors			<i>-02</i>	-22	26	-13	07	10	20	-05
3. PPVT IQ				02	00	-09	01	-16	-17	07
4. Porteus mental age					-52	40	-33	-26	-15	-03
5. Porteus Q score						-25	16	25	10	00
6. Rotter I-E locus of control							-31	-21	-17	-32
7. Attitude towards the police								51	61	36
8. Attitude towards the army									66	31
9. Attitude towards the law										44
10. Attitude towards teachers										

*decimal points deleted,
coefficients at or above .39 significant at 1% level
(in italics)*

TABLE 35. Principal component analysis: Eigen values and percent of variance data for the student sample for all measures including MFFT raw scores.

	Eigen Value	% Variance	Cumulative % Variance
FACTOR I	3.12	26.0	26.0
FACTOR II	2.16	18.0	44.0
FACTOR III	1.42	11.8	55.8
FACTOR IV	1.12	10.8	66.6

TABLE 36. Unrotated factor matrix for the student sample for all measures including MFFT raw scores.

	FACTOR			
	I	II	III	IV
1. MFFT latency	-36	67	-35	19
2. MFFT errors	49	-53	30	01
3. PPVT IQ	-06	-05	-24	34
4. Porteus mental age	-61	21	22	30
5. Porteus Q score	44	-21	-12	-16
6. Rotter I-E locus of control	-47	-07	-03	-22
7. Attitude towards the police	63	35	-22	06
8. Attitude towards the army	61	39	-07	-28
9. Attitude towards the law	71	45	13	00
10. Attitude towards teachers	37	47	29	30

decimal points deleted

TABLE 37. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for the student samples for all measures including MFFT raw scores.

	FACTOR			
	I	II	III	IV
1. MFFT latency	05	-82	21	17
2. MFFT errors	09	77	-17	01
3. PPVT IQ	-15	-11	00	19
4. Porteus mental age	-15	-13	85	-04
5. Porteus Q score	10	18	-54	03
6. Rotter I-E locus of control	-13	-04	41	-52
7. Attitude towards the police	66	-07	-24	20
8. Attitude towards the army	75	-03	-24	-03
9. Attitude towards the law	89	16	03	18
10. Attitude towards teachers	39	-06	04	60

decimal points deleted, factor loadings at or above .41 (DF=36) significant at 1% level

TABLE 38. Correlation among the measures for the police cadet sample including MFFT raw scores.

	1.	2.	3.	4.	5.	6.	7.	8.
1. MFFT latency		-56	14	32	-02	-38	-23	-21
2. MFFT errors			-20	-22	-10	04	01	08
3. PPVT IQ				-02	12	-22	06	-14
4. Rotter I-E locus of control					-18	-18	-49	-28
5. Attitude towards the police						11	39	32
6. Attitude towards the army							28	29
7. Attitude towards the law								38
8. Attitude towards teachers								

decimal points deleted, coefficients at or above .37 significant at 1% level (in italics)

TABLE 39. Principal component analysis: Eigen values and percent of variance data for the police cadet sample for all measures including MFFT raw scores.

	Eigen Values	% Variance	Cumulative % Variance
FACTOR I	2.48	31.0	31.0
FACTOR II	1.59	19.9	50.9
FACTOR III	1.09	13.7	64.6

TABLE 40. Unrotated factor matrix for the police cadet sample for all measures including MFFT raw scores.

	FACTOR		
	I	II	III
1. MFFT latency	-64	41	-01
2. MFFT errors	43	-69	-27
3. PPVT IQ	-14	25	-29
4. Rotter I-E locus of control	-57	-10	23
5. Attitude towards the police	31	41	-08
6. Attitude towards the army	52	01	53
7. Attitude towards the law	67	45	-17
8. Attitude towards teachers	50	19	11

decimal points deleted

TABLE 41. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the police cadet sample for all measures including MFFT raw scores.

	FACTOR		
	I	II	III
1. MFFT latency	-22	63	-35
2. MFFT errors	-05	-85	08
3. PPVT IQ	11	15	-37
4. Rotter I-E locus of control	-54	30	-01
5. Attitude towards the police	51	12	-02
6. Attitude towards the army	29	-05	68
7. Attitude towards the law	82	-07	04
8. Attitude towards teachers	47	-07	26

decimal points deleted,

factor loadings at or above .38 (DF=44) significant at 1% level (in italics)

TABLE 42. Correlation among the measures for the combined groups including MFFT raw score.

	1	2	3	4	5	6	7	8	9	10
1. MFFT latency		-59	25	30	-24	05	20	-15	06	06
2. MFFT errors			-34	-49	40	-03	-06	05	01	-11
3. PPVT IQ				27	-30	-05	07	-29	-02	15
4. Porteus mental age					-24	-03	03	01	04	15
5. Porteus Q score						-09	01	11	06	-12
6. Rotter I-E locus of control							-09	-15	-22	-33
7. Attitude towards the police								27	65	37
8. Attitude towards the army									40	17
9. Attitude towards the law										40
10. Attitude towards teachers										

*decimal points deleted,
coefficients at or above .27 significant at 1% level
(in italics)*

TABLE 43. Principal component analysis: Eigen values and percent of variance data for the combined groups for all measures including MFFT raw scores.

	Eigen Values	% Variance	Cumulative % Variance
Factor I	2.52	25.2	25.2
Factor II	2.26	22.6	47.9
Factor III	1.09	10.9	58.8

TABLE 44. Unrotated factor matrix for the combined groups for all measures including MFFT raw scores.

	FACTOR		
	I	II	III
1. MFFT latency	57	-31	24
2. MFFT errors	-70	46	-12
3. PPVT IQ	40	-29	-21
4. Porteus mental age	47	-24	-05
5. Porteus Q score	-36	31	08
6. Rotter I-E locus of control	-14	-27	32
7. Attitude towards the police	47	52	21
8. Attitude towards the army	08	47	11
9. Attitude towards the law	45	73	16
10. Attitude towards teachers	49	39	-43

decimal points deleted

TABLE 45. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the combined groups for all measures including MFFT raw scores.

	FACTOR		
	I	II	III
1. MFFT latency	65	14	-17
2. MFFT errors	-84	-04	08
3. PPVT IQ	49	-13	19
4. Porteus mental age	52	01	09
5. Porteus Q score	-47	11	-06
6. Rotter I-E locus of control	04	-12	-42
7. Attitude towards the police	12	71	15
8. Attitude towards the army	-18	44	10
9. Attitude towards the law	00	83	26
10. Attitude towards teachers	19	32	66

*decimal points deleted,
factor loadings at or above .25 significant
at 1% level (in italics)*

For the prisoner group three factors were extracted accounting for respectively 31.0, 19.2 and 13.0 percent of variance. The first factor appears to be an instrument related factor within the self-report measures. Prisoners with an internal locus of control tended to have more favourable attitudes towards the police, the law and teachers. The second factor identifies a number of characteristics which collectively could be labelled impulsive performance. Prisoners with short first response latencies and many errors on the MFFT tended to have low maze planning ability, poor maze psychomotor control, low verbal intelligence and an external locus of control. All are characteristics typically displayed by hyperactive children.

The third factor, attitude towards the army is likely to be a residual factor.

For students and police cadets there were few significant correlations between the measures. The resultant factors may be spurious. The factor structure appears to reflect performance on each of the measures.

For the combined population three factors were extracted accounting for 58.8 percent of variance. The first factor appears to be impulsive responding. Fast, inaccurate responding on the MFFT tends to be associated with low Porteus mental age, high Q scores and poor verbal intelligence. The second factor appears to be an instrument factor related to positive responding on the attitude towards authority inventory. The third factor, probably a residual one relates an internal locus of control with high attitudes towards teachers.

Use of the two MFFT univariate scores of reflectivity-impulsivity and efficiency-inefficiency on the second factor analyses makes very clear the nature of each factor. Results of these factor analyses are presented in Tables 46-61.

For prisoners high loading of the MFFT reflectivity-impulsivity score and the low loading of the efficiency-inefficiency score on the second factor adds further justification for the labelling of this factor as impulsive performance by prisoners.

For students and police cadets results on the second factor analyses were almost identical to that with MFFT raw scores.

For the combined population four factors were extracted accounting for 67.3 percent of variance. The factor structure is very similar to that of the first factor analysis, however, the second factor now clearly relates to impulsive performance. Impulsive responding on the MFFT is associated with poor maze planning ability, poor psychomotor control and low verbal intelligence. The additional fourth factor appears to relate inefficient responding on the MFFT with high attitudes towards the army. Use of the MFFT efficiency-inefficiency score makes possible the discrimination of this extra factor although its eigen-value loading is just above the set criterion level. The fourth factor is probably artifactual.

TABLE 46. Correlation among the measures for the prisoner sample including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. MFFT impulsivity		<i>-27</i>	<i>-33</i>	<i>-36</i>	<i>31</i>	<i>40</i>	<i>-13</i>	<i>04</i>	<i>-10</i>	<i>-26</i>
2. MFFT inefficiency			<i>-06</i>	<i>-05</i>	<i>13</i>	<i>-21</i>	<i>29</i>	<i>-13</i>	<i>18</i>	<i>05</i>
3. PPVT IQ				<i>32</i>	<i>-25</i>	<i>-20</i>	<i>04</i>	<i>-19</i>	<i>01</i>	<i>28</i>
4. Porteus mental age					<i>-35</i>	<i>-30</i>	<i>03</i>	<i>29</i>	<i>06</i>	<i>20</i>
5. Porteus Q score						<i>17</i>	<i>04</i>	<i>-17</i>	<i>08</i>	<i>-17</i>
6. Rotter I-E locus of control							<i>-41</i>	<i>-02</i>	<i>-42</i>	<i>-51</i>
7. Attitude towards the police								<i>21</i>	<i>58</i>	<i>50</i>
8. Attitude towards the army									<i>23</i>	<i>08</i>
9. Attitude towards the law										<i>42</i>
10. Attitude towards teachers										

decimal points deleted, coefficients at or above .34 significant at 1% level (in italics)

TABLE 47. Principal component analysis: Eigen values and percent of variance data for the prisoner sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	Eigen Values	% Variance	Cumulative % Variance
Factor I	2.92	29.2	29.2
Factor II	1.81	18.1	47.3
Factor III	1.38	13.8	61.1

TABLE 48. Unrotated factor matrix for the prisoner sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

		FACTOR		
		I	II	III
1.	MFFT impulsivity	-49	37	16
2.	MFFT inefficiency	22	18	-26
3.	PPVT IQ	32	-44	-18
4.	Porteus mental age	43	-46	27
5.	Porteus Q score	-26	48	-20
6.	Rotter I-E locus of control	-71	04	16
7.	Attitude towards the police	66	47	-05
8.	Attitude towards the army	25	17	89
9.	Attitude towards the law	59	44	01
10.	Attitude towards teachers	67	03	-10

decimal points deleted

TABLE 49. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for the prisoner sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

		FACTOR		
		I	II	III
1.	MFFT impulsivity	-23	58	13
2.	MFFT inefficiency	33	03	-20
3.	PPVT IQ	05	-54	-18
4.	Porteus mental age	04	-63	27
5.	Porteus Q score	09	55	-17
6.	Rotter I-E locus of control	-59	42	05
7.	Attitude towards the police	80	02	11
8.	Attitude towards the army	12	-02	93
9.	Attitude towards the law	72	03	16
10.	Attitude towards teachers	58	-35	01

decimal points deleted, factor loadings at or above .35 (DF=51) significant at 1% level (in italics)

TABLE 50. Correlation among the measures for the student sample including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	1	2	3	4	5	6	7	8	9	10
1. MFFT impulsivity		00	-11	-28	25	-08	-01	07	12	-03
2. MFFT inefficiency			18	10	07	-16	21	09	23	07
3. PPVT IQ				02	00	-09	01	-16	-17	07
4. Porteus mental age					-52	40	-33	-26	-15	-03
5. Porteus Q score						-25	16	25	10	00
6. Rotter I-E locus of control							-31	-21	-17	-32
7. Attitude towards the police								51	61	36
8. Attitude towards the army									66	31
9. Attitude towards the law										44
10. Attitude towards teachers										

*decimal points deleted,
coefficients at or above .39 significant at 1% level
(in italics)*

TABLE 51. Principal component analysis: Eigen values and percent of variance data for the student sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	Eigen Value	% Variance	Cumulative % Variance
FACTOR I	3.06	25.5	25.5
FACTOR II	1.87	15.6	41.1
FACTOR III	1.37	11.4	52.5
FACTOR IV	1.13	10.8	63.3

TABLE 52. Unrotated factor matrix for the student sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR			
	I	II	III	IV
1. MFFT impulsivity	26	-42	14	31
2. MFFT inefficiency	19	08	10	-16
3. PPVT IQ	-04	-15	00	-51
4. Porteus mental age	-58	42	38	10
5. Porteus Q score	40	-32	-17	-01
6. Rotter I-E locus of control	-48	11	-13	36
7. Attitude towards the police	70	19	-16	-12
8. Attitude towards the army	65	32	-22	16
9. Attitude towards the law	78	41	10	28
10. Attitude towards teachers	44	39	35	-26

decimal points deleted

TABLE 53. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for the student sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR			
	I	II	III	IV
1. MFFT impulsivity	02	-25	49	-21
2. MFFT inefficiency	21	05	06	26
3. PPVT IQ	-11	-01	-04	58
4. Porteus mental age	-12	91	-04	07
5. Porteus Q score	10	-54	14	-03
6. Rotter I-E locus of control	-19	45	-17	-29
7. Attitude towards the police	69	-26	-04	22
8. Attitude towards the army	72	-23	-10	-13
9. Attitude towards the law	93	-01	18	-10
10. Attitude towards teachers	44	-03	09	23

decimal points deleted, factor loadings at or above .41 (DF=36) significant at 1% level (in italics)

TABLE 54. Correlation among the measures for the police cadet sample, including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	1.	2.	3.	4.	5.	6.	7.	8.
1. MFFT impulsivity		00	-19	-30	-04	24	13	16
2. MFFT inefficiency			-06	10	-13	-36	-24	-14
3. PPVT IQ				-02	12	-22	06	-14
4. Rotter I-E locus of control					-18	-18	-49	-28
5. Attitude towards the police						11	39	32
6. Attitude towards the army							28	29
7. Attitude towards the law								38
8. Attitude towards teachers								

*decimal points deleted,
coefficients at or above .37 significant at 1% level
(in italics)*

TABLE 55. Principal component analysis: Eigen values and percent of variance data for the police cadet sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	Eigen Values	% Variance	Cumulative % Variance
FACTOR I	2.42	30.2	30.2
FACTOR II	1.37	17.1	47.3
FACTOR III	1.09	13.7	61.0

TABLE 56. Unrotated factor matrix for the police cadet sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR		
	I	II	III
1. MFFT impulsivity	33	-30	-45
2. MFFT inefficiency	-34	04	-30
3. PPVT IQ	-08	38	13
4. Rotter I-E locus of control	-56	-16	33
5. Attitude towards the police	40	34	16
6. Attitude towards the army	64	-55	31
7. Attitude towards the law	73	35	-02
8. Attitude towards teachers	52	03	-02

decimal points deleted

TABLE 57. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the police cadet sample for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR		
	I	II	III
1. MFFT impulsivity	25	-03	-58
2. MFFT inefficiency	-16	-42	-07
3. PPVT IQ	09	-10	39
4. Rotter I-E locus of control	-63	00	22
5. Attitude towards the police	44	20	25
6. Attitude towards the army	14	79	-39
7. Attitude towards the law	77	24	07
8. Attitude towards teachers	44	26	-12

*decimal points deleted,
factor loadings at or above .38 (DF=44) significant
at 1% level (in italics)*

TABLE 58. Correlation among the measures for the combined groups including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. MFFT impulsivity		00	-33	-46	36	-04	-15	12	-03	-10
2. MFFT inefficiency			-10	-26	23	04	18	-13	08	-04
3. PPVT IQ				27	-30	-05	07	-29	-02	15
4. Porteus mental age					-24	-03	03	01	04	15
5. Porteus Q score						-09	01	11	06	-12
6. Rotter I-E locus of control							-09	-15	-22	-33
7. Attitude towards the police								27	65	37
8. Attitude towards the army									40	17
9. Attitude towards the law										40
10. Attitude towards teachers										

*decimal points deleted,
coefficients at or above .26 significant at 1% level
(in italics)*

TABLE 59. Principal component analysis: Eigen values and percent of variance data for the combined groups for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	Eigen Values	% Variance	Cumulative % Variance
FACTOR I	2.31	23.2	23.2
FACTOR II	2.13	21.3	44.5
FACTOR III	1.24	12.4	56.9
FACTOR IV	1.05	10.5	67.3

TABLE 60. Unrotated factor matrix for the combined groups for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR			
	I	II	III	IV
1. MFFT impulsivity	-16	65	-15	-22
2. MFFT inefficiency	03	25	52	00
3. PPVT IQ	07	-57	13	-18
4. Porteus mental age	16	-56	-21	11
5. Porteus Q score	-02	52	07	-06
6. Rotter I-E locus of control	-30	-05	16	38
7. Attitude towards the police	77	05	32	15
8. Attitude towards the army	47	33	-44	27
9. Attitude towards the law	78	15	06	04
10. Attitude towards teachers	58	-14	-08	-35

decimal points deleted

TABLE 61. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for the combined groups for all measures including MFFT reflectivity-impulsivity and efficiency-inefficiency scores.

	FACTOR			
	I	II	III	IV
1. MFFT impulsivity	-18	<i>68</i>	12	10
2. MFFT inefficiency	<i>28</i>	<i>28</i>	-14	-40
3. PPVT IQ	-03	-53	17	-26
4. Porteus mental age	00	-60	06	18
5. Porteus Q score	07	53	00	00
6. Rotter I-E locus of control	-07	-05	-50	06
7. Attitude towards the police	<i>83</i>	-07	14	-01
8. Attitude towards the army	33	18	10	66
9. Attitude towards the law	71	03	31	19
10. Attitude towards teachers	32	-18	59	04

*decimal points deleted,
factor loadings at or above .25 significant at
1% level (in italics)*

4.2 THE PRISONER BIOGRAPHICAL DATA

4.2.1 Descriptive statistics

The means and standard deviations for the prisoner biographical information are presented in Table 62.

TABLE 62. Means and standard deviations for the prisoner biographical information.

Measure	N	Mean	S.D.
Age of first offense (years)	31	16.25	6.68
Age of first imprisonment (years)	30	22.29	8.25
Number of juvenile offenses	31	3.00	2.46
Number of adult offenses	31	4.81	1.83
Types of juvenile offenses	31	1.77	1.45
Types of adult offenses	31	2.71	1.44

The types of juvenile and adult offense measures is a measure of the number of different types of juvenile and adult crimes the individual has committed and been sentenced. High scores on these measures indicates that an individual has engaged in a broad range of criminal activity.

The frequency distributions for type of first offense, outcome of first offense, type of offense first imprisoned, outcome of first imprisonment and obtained education level are presented in Figures 5-9.

FIGURE 5. Frequency distribution for type of first offense for prisoners with records available. (N=31)

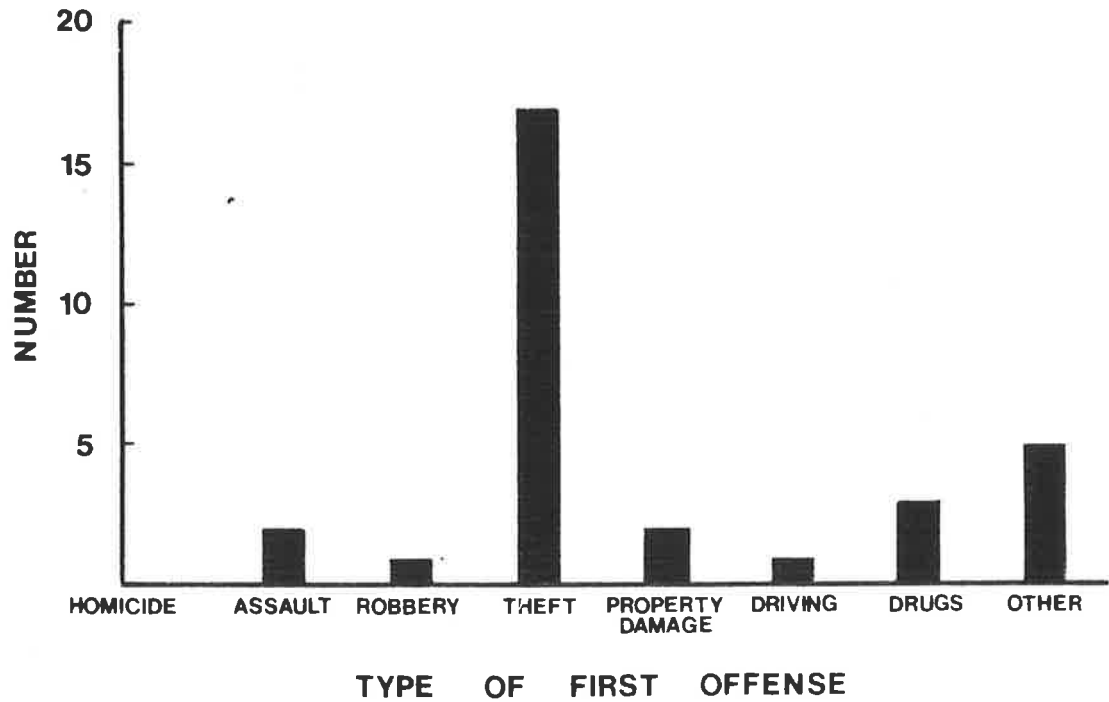


FIGURE 6. Frequency distribution for outcome of first offense for prisoners with records available. (N=31)

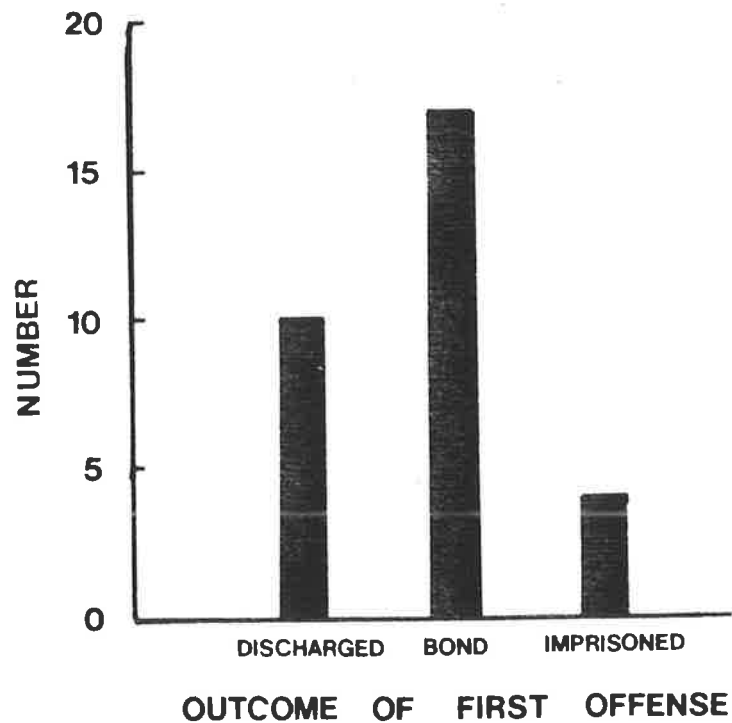


FIGURE 7. Frequency distribution for type of offense for first imprisonment for prisoners with records available. (N=30)

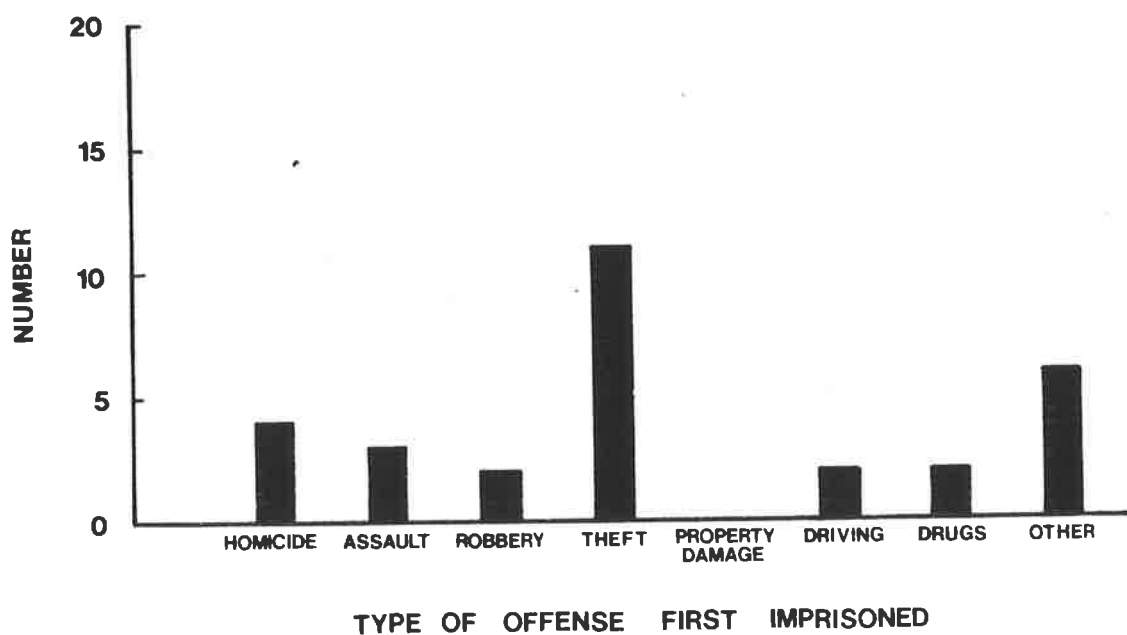


FIGURE 8. Frequency distribution for length of first imprisonment for prisoners with records available. (N=29)

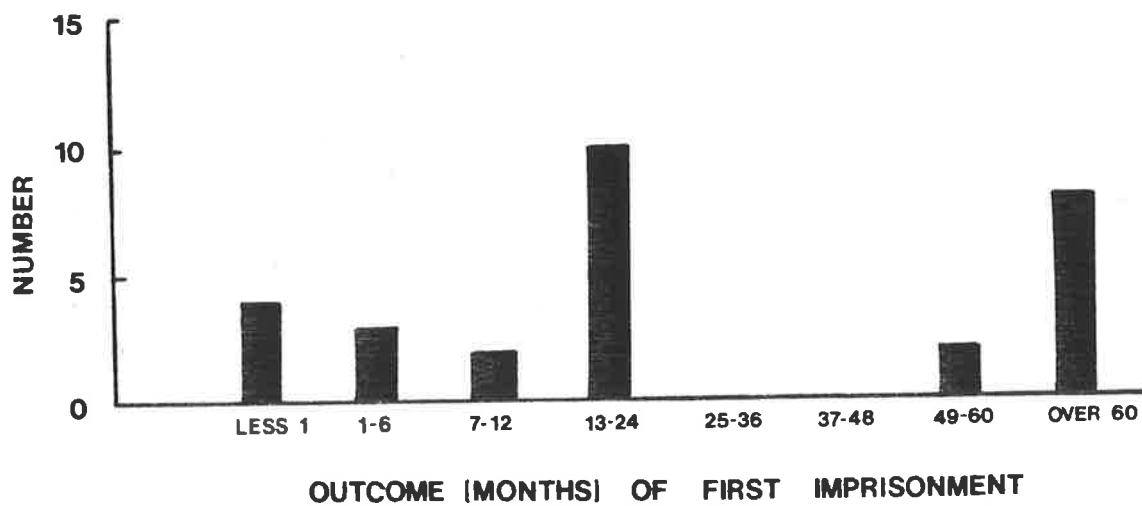
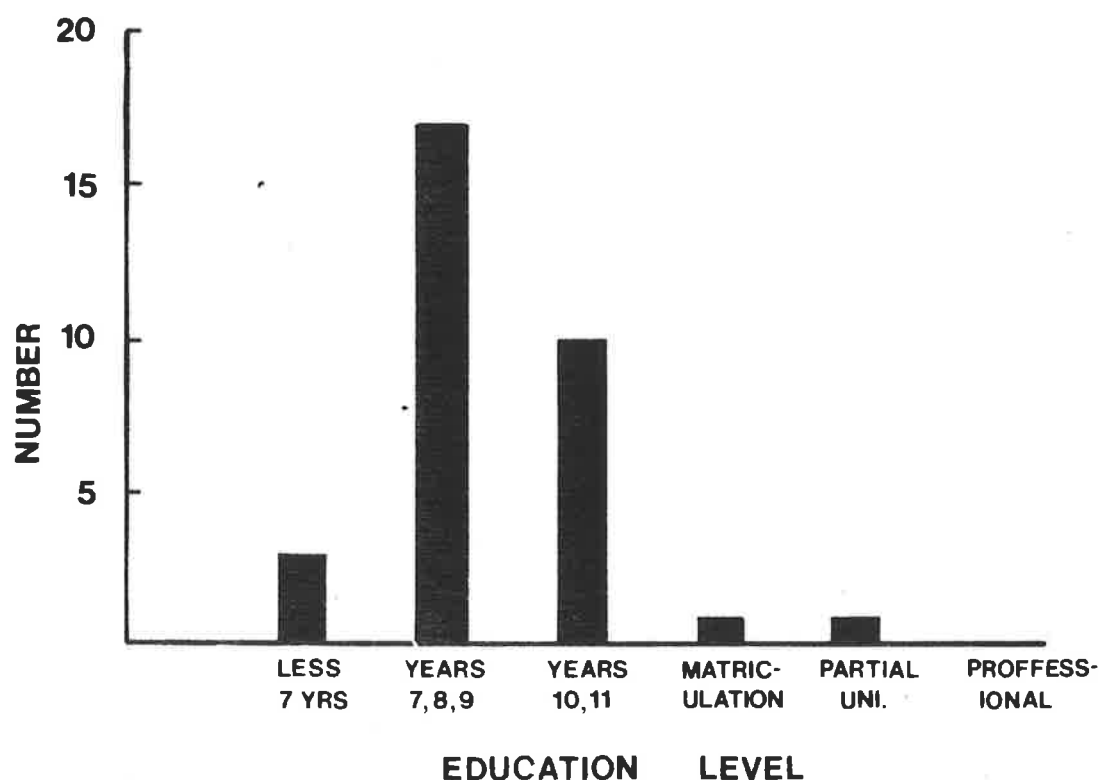


FIGURE 9. Frequency distribution for level of schooling for prisoners with records available. (N=32)



The most popular offense committed for the first offense and for the first time imprisoned was that of theft. This is not surprising because according to the recent survey of crime in South Australia (Bureau of Statistics survey, 1975) theft was by far the most frequently committed crime in this State. On these measures the categories of offenses were grouped to create bivariate scores indicating violent versus non-violent crimes. Homicide and assault were grouped as violent offenses while robbery, theft, property damage, driving, drugs and other offenses were categorized as non-violent crimes. High scores

on these measures indicates that the individual has committed non-violent type offenses.

The most common outcome for the first contact with the law was for the individual to be placed on either a bond or have the charge dismissed. Of the 31 prisoners with records available only 4 were imprisoned for their first offense and all had committed a violent offense. The tendency within South Australia is clearly not to imprison the individual for the first offense.

Interestingly, the length of sentence given for the first time that the individual is incarcerated falls into either a light or very severe category. 19 prisoners were sentenced for two years or less for the first time they were imprisoned while 10 were imprisoned for more than 4 years for the first time. No individuals fell in the middle 2-4 years range. The severity of sentence probably indicates the type of offense committed.

None of the 32 prisoners had obtained a professional education level and only 2 had reached their matriculation year or beyond. A disproportionate number of prisoners had failed to even reach a secondary level of education. High scores on this measure indicate a high obtained level of education.

4.2.2 Differences for prisoners with and without biographical information

Only prisoners in South Australia who have been sentenced for a period of more than nine months, or are recidivists have biographical information collected on them by the South Australian Department of Correctional Services. Thus, not all prisoners

who participated in the study had biographical information available. By classifying prisoners according to whether they had a Correctional Services Department file it was possible to obtain two groups.

An assessment of differences between prisoners with and without biographical data was made by comparing the two groups on each of the measures by means of unrelated t-tests. Results are presented in Table 63.

TABLE 63. Differences amongst prisoners with and without file information.

	Biographical data not available			Biographical data available			t
	Mean	S.D.	N	Mean	S.D.	N	
MFFT latency	37.54	24.11	28	28.06	16.09	33	1.77*
MFFT errors	17.29	10.86	28	23.61	14.69	33	1.93*
MFFT impulsivity	-.51	1.79	28	.43	1.68	33	2.09*
MFFT inefficiency	-.01	.93	28	.01	.92	33	.05
PPVT IQ	111.93	18.93	28	103.27	19.39	33	1.76*
Porteus mental age	16.29	.73	28	14.85	2.45	33	3.21***
Porteus Q score	35.32	16.94	28	42.94	21.16	33	1.56
Rotter I-E locus of control	8.60	3.58	25	10.24	2.98	29	1.81*
Attitude towards the police	23.04	7.95	25	21.86	7.61	28	.55
Attitude towards the army	31.00	6.72	25	30.82	5.43	28	.11
Attitude towards the law	26.44	6.36	25	25.18	6.21	28	.73
Attitude towards teachers	29.20	4.78	25	26.36	4.79	28	2.16*
Total attitude towards authority	109.68	17.83	25	104.21	17.65	28	1.12

* $p < .05$

** $p < .001$

Prisoners who had biographical data available, in comparison to prisoners with no file information, were significantly more impulsive on the MFFT taking less time to respond and making more errors. They had significantly lower Porteus test ages, lower verbal intelligence, a more external locus of control score and less favourable attitudes towards teachers. As a group prisoners who are either multiple offenders or have committed a serious offense appear to have problems in impulse control.

4.2.3 Correlation among the measures

Pearson product-moment correlation coefficients were calculated between all the measures for prisoners who had biographical information available. The correlation matrix is presented in Table 64.

Among the biographical measures a low age of first offense was related to a non-violent first offense, a less serious outcome for first offense, low age of first imprisonment, non-violent type of offense for which he was first imprisoned, shorter sentence for first imprisonment, having many juvenile offenses which were of a wide variety and a poor education level. This portrays a picture of an individual who commits frequent non-violent type offense at an early juvenile age, who gets a light sentence, and who gravitates into the same types of non-violent offenses at an early adult age. As a consequence he is first imprisoned at a relatively low age.

TABLE 64. Correlation among all the measures for prisoners with biographical information available.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
1. MPFT impulsivity		09	-17	-57	55	50	-11	-29	-17	-22	-29	-09	35	-41	17	-19	25	25	-08	03	-13
2. MPFT inefficiency			-14	-10	33	-08	30	-06	-15	-04	08	01	00	39	33	15	14	09	03	-12	34
3. PPVT IQ				45	-46	-04	-26	00	-17	27	29	22	20	15	12	02	22	-19	-09	08	46
4. Porteus mental age					-41	-31	08	46	04	18	48	-34	-40	68	-01	-04	-33	-35	-31	11	50
5. Porteus Q score						30	07	-06	06	-22	-31	13	25	-25	-03	17	16	10	17	05	-23
6. Rotter I-E locus of control							-48	-25	-56	-43	-06	22	-37	02	09	19	07	02	-24	-17	-42
7. Attitude towards the police								29	64	62	-24	-11	05	-14	12	-45	08	27	17	36	01
8. Attitude towards the army									37	19	-18	-18	-27	-33	-04	-23	24	26	02	-26	-06
9. Attitude towards the law										34	14	-21	06	10	01	-27	03	02	-13	27	26
10. Attitude towards teachers											-02	11	05	-19	12	-28	-16	01	04	08	-23
11. Age of first offense												-71	43	77	-49	41	-73	-73	-25	-04	47
12. Type of first offense													-51	67	59	-17	-17	-20	24	10	-70
13. Outcome of first offense														-19	-40	-03	-28	-24	-16	04	40
14. Age of first imprisonment															-59	37	-54	-57	-29	-02	32
15. Type of offense first imprisoned																-27	34	30	29	19	-30
16. Outcome of first imprisoned																	-37	-46	-68	-51	03
17. Types of juvenile offenses																		90	12	17	-24
18. Number of juvenile offenses																			23	24	-23
19. Types of adult offenses																				62	-09
20. Number of adult offenses																					-16
21. Education level																					

decimal points deleted, coefficients at or above .41
 significant at 1% level (in italics)

As expected for adults, those who were first imprisoned for a relatively short period tended to have many juvenile offenses, many different types and a high number of adult offenses.

Among the biographical data the only significant correlate with the MEFT reflectivity-impulsivity score was age of first imprisonment with impulsives having a significantly lower age. The performance measures which best correlated with the biographical data was Porteus mental age. Individuals who had a low maze test age had a significantly lower age of first offense, lower age of first imprisonment, and a low education level.

High scores on the PPVT verbal intelligence test was significantly related to a higher achieved education level.

4.2.4 Identification of components

Subject scores for all the measures for prisoners who had biographical data available were factor analysed by the principal-components method, retaining for varimax rotation to a terminal solution those factors with an eigen-value greater than one.

Results are presented in Tables 65-67.

TABLE 65. Principal component analysis: Eigen values and percent of variance data: All the measures for prisoners with biographical information available.

	Eigen Value	% Variance	Cumulative % Variance
FACTOR I	5.35	25.5	25.5
FACTOR II	3.88	18.5	44.0
FACTOR III	2.72	13.0	57.0
FACTOR IV	2.01	9.6	66.6
FACTOR V	1.40	6.6	73.2

TABLE 66. Unrotated factor matrix. All the measures for prisoners with biographical information available.

	I	II	III	IV	V
1. MFFT impulsivity	07	-56	44	03	-03
2. MFFT inefficiency	32	00	19	-57	47
3. PPVT IQ	-36	50	-30	58	00
4. Porteus mental age	-46	52	-29	-59	08
5. Porteus Q score	29	-42	46	-27	-11
6. Rotter I-E locus of control	29	-41	-71	19	01
7. Attitude towards the police	17	42	64	-36	-16
8. Attitude towards the army	16	27	-26	-23	-36
9. Attitude towards the law	-16	34	54	-20	-36
10. Attitude towards teachers	-07	10	52	01	-32
11. Age of first offense	-87	-17	17	-63	-01
12. Type of first offense	81	-17	-22	-01	-13
13. Outcome of first offense	-56	25	04	-06	48
14. Age of first imprisonment	-73	27	25	-17	22
15. Type of offense first imprisoned	60	-09	-01	41	-22
16. Outcome of first imprisonment	-43	-53	-33	-25	-09
17. Types of juvenile offenses	72	31	-32	-61	39
18. Number of juvenile offenses	72	41	-20	-62	32
19. Types of adult offenses	40	16	27	39	06
20. Number of adult offenses	17	29	31	43	-70
21. Education level	-65	44	02	30	08

decimal points deleted

TABLE 67. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization, for prisoners with biographical information available.

	I	II	III	IV	V
1. MFFT impulsivity	06	59	-27	-28	-12
2. MFFT inefficiency	07	01	-01	24	-80
3. PPVT IQ	23	-60	-12	01	05
4. Porteus mental age	46	-54	21	45	30
5. Porteus Q score	00	48	-02	-02	-30
6. Rotter I-E locus of control	-28	32	-62	-02	05
7. Attitude towards the police	00	-02	80	12	-30
8. Attitude towards the army	-15	05	32	22	17
9. Attitude towards the law	20	13	75	-05	05
10. Attitude towards teachers	-11	-26	56	-10	13
11. Age of first offense	89	-03	-04	51	24
12. Type of first offense	-85	05	-16	16	-26
13. Outcome of first offense	53	11	-01	-19	-17
14. Age of first imprisonment	78	-24	-14	-34	-04
15. Type of offense first imprisoned	-66	14	-12	08	17
16. Outcome of first imprisonment	26	15	-34	-24	05
17. Types of juvenile offenses	-31	-04	-10	89	-15
18. Number of juvenile offenses	-54	-07	05	82	-18
19. Types of adult offenses	-26	-07	08	01	-01
20. Number of adult offenses	19	15	13	13	71
21. Education level	60	-67	22	03	32

decimal points deleted, factor loadings at or above .41 significant at 1% level (in italics)

Five factors were extracted accounting for 73.2 percent of the total variance. While the impulsive performance factor (factor 2) was again apparent, the only measure from the biographical data to load significantly was the obtained level of education. Impulsive responding on the MFFT was related to low PPVT intelligence, low Porteus planning ability, high Q score and a low level of schooling.

The first main factor appears to be related to subjects' history of offenses and Porteus mental age. Prisoners with a low mental age tended to have an early age of first offense, non-violent type of first offense, an early age and non-violent type of offense for which first imprisoned, many juvenile offenses and a poor education level.

The third factor was again an instrument factor with a significant interaction between the self-report inventories. The fourth factor appears to be related to juvenile criminal activity as the significant loadings are age of first offense, types and number of juvenile offenses and Porteus mental age. High maze planning ability is related to high age of first offense and many juvenile offenses of different varieties. It reflects prisoners who begin their criminal activities at an early juvenile age and who have a history of a wide variety of different juvenile offenses. The fifth factor appears to identify prisoners who respond inefficiently on the MFFT and who have a low number of adult offenses. However it is probably spurious as it is derived from a low non-significant correlation.

4.3 INCIDENTAL RESULTS

4.3.1 Age effects

As the prisoner sample was the only sample heretogeneous with respect to age (Mean = 28.59 years, SD = 8.49 years) it was possible to assess the effect of chronological age by correlating test performance with age. The results of the Pearson product-moment correlation are presented in Table 68.

TABLE 68. Correlation among all the measures and age for the prisoner sample.

Measure	Age
MFFT latency	-.05
MFFT errors	.13
MFFT reflectivity-impulsivity	.10
MFFT efficiency-inefficiency	.08
PPVT IQ	.16
Porteus mental age	-.50**
Porteus Q score	.04
Rotter I-E locus of control	-.32*
Attitude towards the police	.21
Attitude towards the army	-.28*
Attitude towards the law	.16
Attitude towards teachers	.27*
Total attitude towards authority score	.13

* $p < .05$

** $p < .01$

Older prisoners had significantly lower maze test age, held more internal beliefs, tended to have an unfavourable attitude towards the army but held favourable attitudes towards teachers. There was no significant relationship between the impulsivity measures of MFFT performance, Porteus Q score and chronological age.

4.3.2 Differences among prisoners in different security sections

Prisoners were drawn from the maximum, medium and minimum security sections within the jail. Differences in test performance between individuals belonging to the three security sections were examined by means of a series of unrelated t-tests. Results of the t-tests are presented in Tables 69-71.

TABLE 69. Differences among prisoners belonging to maximum and minimum security divisions.

	Maximum Security			Minimum Security			t	Significance
	Mean	S.D.	N	Mean	S.D.	N		
MFFT latency	24.67	13.23	15	35.08	23.12	25	1.81	ns
MFFT errors	23.53	14.92	15	20.64	13.80	25	.61	ns
MFFT impulsivity	.59	1.53	15	-.13	1.96	25	1.30	ns
MFFT inefficiency	-.16	.99	15	.12	.92	25	.92	ns
PPVT IQ	97.47	20.43	15	110.08	19.68	25	1.92	ns
Porteus mental age	15.30	1.35	15	15.26	2.80	25	.06	ns
Porteus Q score	45.27	26.30	15	35.28	15.30	25	1.34	ns
Rotter I-E locus of control	9.31	2.14	13	8.05	3.47	21	1.31	ns
Attitude towards the police	19.61	8.45	13	23.80	8.33	20	1.40	ns
Attitude towards the army	30.23	6.81	13	29.40	5.98	20	.36	ns
Attitude towards the law	23.08	6.25	13	27.55	6.19	20	2.02	ns
Attitude towards teachers	25.46	5.62	13	29.00	5.11	20	1.83	ns
Total attitude towards authority score	98.38	20.64	13	109.75	19.11	20	1.59	ns
Age of first offense	15.05	3.54	9	18.98	9.51	12	1.31	ns
Outcome of first offense	1.78	.67	9	1.92	.67	12	.47	ns
Age of first imprisonment	19.04	1.09	6	25.64	12.19	12	1.86	ns
Number of juvenile offenses	2.56	2.24	9	2.08	2.35	12	.47	ns
Number of adult offenses	4.89	1.76	9	4.42	2.02	12	.57	ns
Education level	2.22	.44	9	2.25	1.22	12	.07	ns
Number of primary schools attended	2.00	1.55	6	1.14	.38	7	1.32	ns
Number of secondary schools attended	1.13	.35	8	1.00	1.07	8	.31	ns

TABLE 70. Differences among prisoners belonging to maximum and medium security divisions.

	Maximum Security			Medium Security			t	Significance
	Mean	S.D.	N	MEAN	S.D.	N		
MFFT latency	24.67	13.23	15	34.76	21.06	21	1.76	ns
MFFT errors	23.53	14.92	15	18.76	11.85	21	1.03	ns
MFFT impulsivity	.59	1.53	15	-.26	1.70	21	1.57	ns
MFFT inefficiency	-.16	.99	15	-.03	.89	21	.42	ns
PPVT IQ	97.47	20.43	15	110.86	17.01	21	2.08	.05
Porteus mental age	15.30	1.35	15	15.95	.95	21	1.61	ns
Porteus Q score	45.27	26.30	15	40.24	18.32	21	.64	ns
Rotter I-E locus of control	9.31	2.14	13	11.10	3.26	20	1.91	ns
Attitude towards the police	19.61	8.45	13	22.85	6.40	20	1.18	ns
Attitude towards the army	30.23	6.81	13	32.85	4.46	20	1.23	ns
Attitude towards the law	23.08	6.25	13	25.75	5.99	20	1.22	ns
Attitude towards teachers	25.46	5.62	13	27.85	3.96	20	1.33	ns
Total attitude towards authority score	98.38	20.64	13	109.30	12.92	20	1.70	ns
Age of first offense	15.05	3.54	9	14.06	3.20	10	.67	ns
Outcome of first offense	1.78	.67	9	1.70	.68	10	.25	ns
Age of first imprisonment	19.04	1.09	6	20.41	1.75	11	1.98	ns
Number of juvenile offenses	2.56	2.24	9	4.50	2.27	10	1.88	ns
Number of adult offenses	4.89	1.76	9	5.20	1.75	10	.39	ns
Education level	2.22	.44	9	2.64	.51	11	1.96	ns
Number of primary schools attended	2.00	1.55	6	2.00	1.23	9	0	ns
Number of secondary schools attended	1.13	.35	8	1.18	.41	11	.33	ns

TABLE 71. Differences among prisoners belonging to medium and minimum security divisions.

	Medium Security			Minimum Security			t	Significance
	Mean	S.D.	N	Mean	S.D.	N		
MFFT latency	34.76	21.06	21	35.08	23.12	25	.05	ns
MFFT errors	18.76	11.85	21	20.64	13.80	25	.50	ns
MFFT impulsivity	-.26	1.70	21	-.13	1.96	25	.23	ns
MFFT inefficiency	-.03	.89	21	.12	.92	25	.58	ns
PPVT IQ	110.86	17.01	21	110.08	19.68	25	.14	ns
Porteus mental age	15.95	.95	21	15.26	2.80	25	1.16	ns
Porteus Q score	40.24	18.32	21	35.28	15.30	25	.99	ns
Rotter I-E locus of control	11.10	3.26	20	8.05	3.47	21	2.90	.01
Attitude towards the police	22.85	6.40	20	23.80	8.33	20	.40	ns
Attitude towards the army	32.85	4.46	20	29.40	5.98	20	2.07	.05
Attitude towards the law	25.75	5.99	20	27.55	6.19	20	.93	ns
Attitude towards teachers	27.85	3.96	20	29.00	5.11	20	.80	ns
Total attitude towards authority score	109.30	12.92	20	109.75	19.11	20	.09	ns
Age of first offense	14.06	3.20	10	18.98	9.51	12	1.68	ns
Outcome of first offense	1.70	.68	10	1.92	.67	12	.75	ns
Age of first imprisonment	20.41	1.75	11	25.64	12.19	12	1.47	ns
Number of juvenile offenses	4.50	2.27	10	2.08	2.35	12	2.44	.05
Number of adult offenses	5.20	1.75	10	4.42	2.02	12	.97	ns
Education level	2.64	.51	11	2.25	1.22	12	1.01	ns
Number of primary schools attended	2.00	1.23	7	1.14	.38	9	1.98	ns
Number of secondary schools attended	1.18	.41	8	1.00	1.07	11	.46	ns

Very few differences between prisoners of different security sections occurred. Between the maximum and minimum security groups there were no differences on any of the measures. Between maximum and medium security divisions the only difference was on PPVT IQ with maximum security prisoners tending to have a lower IQ. However the difference, while significant is only marginal.

The same appears to be true for differences between prisoners of the medium and minimum security divisions. Prisoners in medium security tend to have a higher locus of control, more favourable attitude towards the army and more juvenile offenses.

It is possible that as a large number of t-tests were performed, some of the above differences between security sections within the jail are due to chance.

4.3.3 Differences among police cadets in different courses

Police cadets were drawn from two parallel training courses each in their final stages of training before graduation from the academy. Differences in test performance between cadets belonging to different training courses were examined by means of a series of unrelated t-tests. Results of the t-tests are presented in Table 7.2.

The only significant difference between the cadet courses was in performance on the MFFT where cadets from Course 58 were more impulsive. Reasons for such a difference between the two courses is unclear.

TABLE 72. Differences among police cadets belonging to different intake groups.

MEASURE	COURSE 58		COURSE 59		t	Signif.
	MEAN	S.D.	MEAN	S.D.		
MFFT latency	55.88	29.29	39.57	22.85	1.94	ns
MFFT errors	12.69	7.11	16.43	8.12	1.62	ns
MFFT impulsivity	-.72	1.70	.38	1.70	2.08	.05
MFFT inefficiency	.10	1.10	-.05	.85	.47	ns
PPVT IQ	111.25	9.70	111.27	11.48	.01	ns
Rotter I-E locus of control	12.19	3.76	11.30	3.62	.77	ns
Attitude towards the police	34.50	3.22	33.17	2.96	1.37	ns
Attitude towards the army	32.88	5.52	31.83	3.33	.69	ns
Attitude towards the law	32.13	4.04	30.97	4.01	.93	ns
Attitude towards teachers	29.00	4.19	28.37	4.51	.47	ns
Total attitude towards authority score	128.50	11.66	124.33	10.23	1.20	ns

CHAPTER 5.

MEASURE RESULTS5.1 EFFECT OF INSTRUCTIONAL SET AND FEEDBACK ON
MFFT PERFORMANCE5.1.1 Introduction

Evidence has been presented that impulsiveness is a biological trait. The MFFT has been used as a measure of impulsiveness and it should display trait properties. The test should be robust and be resistant to environmental changes.

Several attempts have been made to modify experimentally the reflective-impulsive dimension by altering MFFT instructions, either by introducing more cognitive control either through direct training of a strategy for systematic scanning or by training impulsives verbally to instruct themselves.

Kagan et al. (1964) and Kagan, Pearson and Welch (1966) examined the effect of telling subjects to either answer as fast as possible or to take their time to think about their answers. By training subjects to go slow the time of first response was made longer but it did not produce a corresponding change in the number of errors made. Kagan et al. (1966) also reported that high perceived similarity with the experimenter had no effect on MFFT performance.

A number of studies have attempted to change an impulsive tempo by teaching reflective strategies of problem solving. One difference between impulsives and reflectives on the MFFT is that impulsives do not examine the array of alternatives

as carefully as reflectives. Nelson (1968) reported that reflectives employed a global scanning strategy where they looked at each of the alternatives and compared them to the standard. Impulsives took less time to look at the standard, took less time to look at the alternatives and scanned across the alternate stimulus array tending to choose the first alternate item that differed from the stimulus. He varied the instructional set and again obtained longer latencies for impulsives with no change in the number of errors. However, by training impulsives to scan the stimulus array he obtained significantly longer latencies and fewer errors. Reflectives also improved their performance with training but not to such a large extent as impulsives. Similar results were obtained by Albert (1968).

Briggs (1966) and Peters (1979) made reward contingent on MFFT responding. Rewards were given for correct responses and a penalty for incorrect responses. Impulsives showed more change in performance under the penalty condition than the reward condition. Reflectives' performance was the same under both conditions.

Meichenbaum and Goodman (1971) trained impulsive second grade children to talk to themselves in an attempt to increase self control. Impulsive subjects trained to verbally instruct themselves became significantly more reflective in their responses than did control subjects on immediate retesting on the MFFT.

Heider (1971) compared the effects of incentives for accuracy, enforced delay of responding and training in a reflective strategy among impulsive middle and lower class boys. For the lower class boys only, task instructions significantly reduced the number of errors and delayed responding. Providing incentives for accuracy increased latency but had no effect on errors.

Egeland (1974) demonstrated that both training to delay responding and using an effective scanning strategy changed the performance of impulsive children on the MFFT. Immediately after training both groups had significantly fewer errors and longer latencies. In a follow up study two months later only impulsive subjects given the training in effective scanning techniques maintained the changed reflective performance. Those who had been taught to delay responding still had a longer response time but made more errors.

Zelniker, Jeffrey, Ault and Parsons (1972) attempted to change MFFT performance by changing the stimulus materials. They changed the alternative items so that all but one was identical to the standard. After ten items with this format impulsive subjects had significantly fewer errors but no change in latency on immediate retest on the MFFT. Their results may have also been caused through the effect of practice on the MFFT. Wright and Vlietstra (1977) using the univariate method of scoring MFFT performance found substantial practice effects on the efficiency-inefficiency but not the reflectivity-impulsivity score. Similarly, Glow et al. (1981) found that

the reflectivity-impulsivity univariate score showed small change with immediate retest while the efficiency-inefficiency score showed substantial practice effects. With retest, subjects became more efficient.

Researchers have also attempted to modify impulsives' performance by having them model reflectives' scanning techniques. Ridberg, Parke and Hetherington (1971) exposed children to a film model of a cognitive style which was opposite to their own. The cognitive style of reflectives was unchanged but impulsives had significantly longer latencies and fewer errors. These changes were stable over a one week follow up period.

It appears that impulsives in responding to MFFT items were employing a different scanning strategy than reflectives and this scanning strategy possessed trait like qualities as it is resistant to simple task instruction change. The training procedures that have produced the most lasting changes in both longer latencies and fewer errors for impulsives have been those that provide training in systematic methods of scanning the MFFT visual array. By simply changing MFFT instructions to emphasize accuracy impulsives changed their game plan in an attempt to answer right the first time but there was no evidence to suggest that they had increased their discriminative ability. For both MFFT latencies and errors to be changed a change in task instructions had to be accompanied with environmental feedback. This feedback may take the form of directly teaching more efficient scanning strategies or by

making reward contingent on delayed responding. Variation of the instructional set or providing feedback should modify latency but not error performance on the MFFT.

5.1.2 Method

From a sample of 61 prisoners incarcerated at Yatala jail, Adelaide, who had been given an automated version of Kagan's Matching Familiar Figures Test with standard instructions six weeks previously, 40 were randomly assigned to one of eight experimental groups and the MFFT was re-administered on an exact parallel form.

The experimental design was a 2 x 4 factorial with two levels of instruction (standard and reflective) and four types of feedback (none, positive only, negative only, positive and negative). Five subjects were allocated to each of the experimental groups.

The standard set of instructions consisted of the same set of instructions that had been given at the first testing. The reflective set of instructions was designed to emphasize the necessity for subjects to look closely and compare the alternatives and check back to the standard before responding. It was stressing a global pattern of scanning the stimulus array.

The positive feedback consisted of a 'pip' (2.8 KHZ: $\frac{1}{2}$ second duration) given immediately following each correct response. The negative feedback consisted of a buzzer ($\frac{1}{2}$ second duration) given immediately following each incorrect response.

The complete set of instructions for the eight experimental groups are presented in Appendix M.

5.1.3 Results

The measures derived from MFFT performance for both administrations were first response latency to each new stimulus item, the total number of errors made on the 12 items, a reflectivity-impulsivity univariate score computed from the standardized errors minus the standardized latency and an efficiency-inefficiency univariate score computed from adding the standardized error and latency scores.

The first administration results of the MFFT, which had been given with standard instructions to all groups were grouped in the eight cells to which the subjects had been assigned for the second administration.

The data were analysed by use of a 2 x 4 analysis of variance. The results for all four MFFT performance data are presented in Table 73. As expected there was no significant differences as all subjects had the same administration. Prisoners appeared to have been randomly allocated to the second administration condition.

The performance data for the second administration, where the instructional set and the amount of feedback given varied, were analysed for all four MFFT performance measures by a 2 x 4 analysis of variance. The results are presented in Table 74. There were no main or interaction effects for the second administration.

TABLE 73. Analysis of variance data for the retesting of prisoners on the MFFT: Scores for the first administration grouped under the procedural conditions applied for the second administration.

FIRST RESPONSE LATENCY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	1297.70	3	432.57	1.17	ns
Instructions	1144.90	1	1144.90	3.11	ns
Feedback x instructions	1326.50	3	442.17	1.20	ns
Subjects within group (error)	11786.00	32	368.31		

TOTAL ERRORS					
Source	Sum Square	DF	Mean Square	F	p
Feedback	306.08	3	102.03	.63	ns
Instructions	319.23	1	319.23	1.96	ns
Feedback x instructions	262.28	3	87.43	.54	ns
Subjects within group (error)	5215.20	32	162.96		

REFLECTIVITY - IMPULSIVITY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	9.01	3	3.00	1.10	ns
Instructions	8.91	1	8.91	3.26	ns
Feedback x instructions	5.72	3	1.91	.70	ns
Subjects within group (error)	87.46	32	2.73		

EFFICIENCY - INEFFICIENCY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	.57	3	.19	.23	ns
Instructions	.10	1	.10	.11	ns
Feedback x instructions	3.50	3	1.17	1.39	ns
Subjects within group (error)	26.87	32	.84		

TABLE 74. Analysis of variance data for retesting prisoners on the MFFT: Effect of altering instruction set and feedback for the second administration.

FIRST RESPONSE LATENCY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	1156.68	3	385.56	1.23	ns
Instructions	93.03	1	93.03	.30	ns
Feedback x instructions	1159.28	3	386.43	1.23	ns
Subjects within group (error)	10038.00	32	313.69		

TOTAL ERRORS					
Source	Sum Square	DF	Mean Square	F	p
Feedback	149.90	3	49.97	.72	ns
Instructions	1.60	1	1.60	.02	ns
Feedback x instructions	114.00	3	38.00	.55	ns
Subjects within group (error)	2210.00	32	69.06		

REFLECTIVITY - IMPULSIVITY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	11.14	3	3.71	1.17	ns
Instructions	.49	1	.49	.15	ns
Feedback x instructions	7.28	3	2.43	.77	ns
Subjects within group (error)	101.26	32	3.17		

EFFICIENCY - INEFFICIENCY					
Source	Sum Square	DF	Mean Square	F	p
Feedback	.83	3	.28	.28	ns
Instructions	.15	1	.15	.15	ns
Feedback x instructions	3.58	3	1.19	1.22	ns
Subjects within group (error)	31.28	32	.98		

The difference scores for each of the four MFFT performance measures were calculated by subtracting the results of the second administration from the results of the first administration, Means and standard deviations for the difference scores for the four MFFT measures are presented in Table 75.

Large scores indicate a substantial change in performance on the second administration. These data were then analysed by a 2 x 4 analysis of variance. Results are presented in Table 76.

Only the main effect of instruction set for the difference scores between the first and second administration were significant for the first response latency and the reflectivity-impulsivity measures. The F for reflectivity-impulsivity was considerably reduced from that of the latency raw score from which it is in part derived.

5.1.4 Discussion

The results supported those found in previous studies. By changing MFFT instructions to emphasize accuracy prisoners changed their strategy in answering the first time by responding slower but still made as many errors. There was no evidence that they had improved their discriminative ability.

The MFFT was found to be a very robust measure. On examining the results for the second administration there were no significant effects produced by altering either the instruction set or the amount of feedback given. A comparison of the second administration performance data to that obtained from the first administration, by examining the difference

TABLE 75. Means and standard deviations for the difference scores between the first and second administration of the MFFT.

	FIRST RESPONSE LATENCY			
	No feedback	Positive feedback	Negative feedback	Positive and negative feedback
Standard instructions	1.00 (SD = 10.37)	- 5.00 (SD = 10.37)	-6.20 (SD = 17.84)	12.20 (SD = 17.28)
Reflective instructions	-8.40 (SD = 18.68)	-15.80 (SD = 10.13)	-8.40 (SD = 11.93)	-20.40 (SD = 20.23)
	TOTAL ERRORS			
	No feedback	Positive feedback	Negative feedback	Positive and negative feedback
Standard instructions	12.40 (SD = 16.65)	9.80 (SD = 10.03)	4.40 (SD = 5.32)	2.60 (SD = 4.39)
Reflective instructions	10.00 (SD = 10.77)	16.40 (SD = 14.52)	11.60 (SD = 4.22)	15.40 (SD = 12.38)
	REFLECTIVITY - IMPULSIVITY			
	No feedback	Positive feedback	Negative feedback	Positive and negative feedback
Standard instructions	.42 (SD = 1.66)	.15 (SD = 1.10)	.49 (SD = 1.33)	1.50 (SD = 1.01)
Reflective instructions	.07 (SD = 1.80)	- .89 (SD = 1.77)	.11 (SD = 1.20)	-1.38 (SD = 1.62)
	EFFICIENCY - INEFFICIENCY			
	No feedback	Positive feedback	Negative feedback	Positive and negative feedback
Standard instructions	.47 (SD = .82)	.09 (SD = .75)	-.53 (SD = .98)	.27 (SD = .91)
Reflective instructions	-.17 (SD = .71)	- .14 (SD = 1.15)	-.15 (SD = .71)	- .12 (SD = 1.34)

NOTE: *Smaller scores indicate longer latencies, more errors, more reflective and more efficient performance. Larger scores indicate shorter latencies, less errors, more impulsive and more inefficient performance.*

TABLE 76. Analysis of variance data for retesting prisoners on the MFFT: Effect of altering instruction set and feedback on the difference score between the first and second administration.

FIRST RESPONSE LATENCY						
Source	Sum Square	DF	Mean Square	F	p	
Feedback	293.88	3	97.96	.43	ns	
Instructions	1890.63	1	1890.63	8.24	.01	
Feedback x instructions	1290.88	3	430.29	1.88	ns	
Subjects within group (error)	7340.00	32	229.38			

TOTAL ERRORS						
Source	Sum Square	DF	Mean Square	F	p	
Feedback	156.28	3	52.09	.45	ns	
Instructions	366.03	1	366.03	3.17	ns	
Feedback x instructions	296.48	3	98.83	.86	ns	
Subjects within group (error)	3694.00	32	115.44			

REFLECTIVITY - IMPULSIVITY						
Source	Sum Square	DF	Mean Square	F	p	
Feedback	2.77	3	.92	.43	ns	
Instructions	13.57	1	13.57	6.32	.05	
Feedback x instructions	10.64	3	3.55	1.65	ns	
Subject within group (error)	68.75	32	2.15			

EFFICIENCY - INEFFICIENCY						
Source	Sum Square	DF	Mean Square	F	p	
Feedback	1.38	3	.46	.51	ns	
Instructions	.48	1	.48	.52	ns	
Feedback x instructions	1.43	3	.48	.53	ns	
Subjects within group (error)	29.06	32	.91			

between the two, produced significantly longer first response latencies and hence more reflective performance for instruction set only. No significant effects were found for the number of errors on the difference scores. Providing feedback to the subject on his performance by giving positive and negative tones for respectively accurate and inaccurate responding had no effect on MFFT performance. The effect of altering the instruction set was to induce subjects to go slower without a corresponding reduction in the number of errors. By telling subjects to compare alternative items, to check back to the standard item and to stress accurate responding subjects changed their plan of action without being able to better discriminate for errors.

It appears that error performance on the MFFT has trait like properties as it is highly resistant to instruction or environmental feedback. It is possible that individuals are setting a tolerance level for the amount of errors that they will accept and it appears that they are reluctant to change the number of errors they will allow themselves to make. This suggests that the error measure on the MFFT is the most important component in the speed-accuracy trade-off.

Results of this study confirm this. Errors on the MFFT related to the other measures to the extent of the impulsivity univariate. The latency measure had lower correlations with other measures and added little to the impulsivity univariate. It appears that errors should be the main measure derived from the MFFT.

5.2 METRIC PROPERTIES OF THE PORTEUS MAZES

The metric properties of the Porteus Maze Test have received little attention. No information is currently available about the internal consistency of the nine items that collectively make up the Q score.

The weighting system used in computing Q has been questioned by Docter and Winder (1954), Fooks and Thomas (1957) and Riddle and Roberts (1977). They suggested that the use of weights did not appear to improve the ability of Q to differentiate between offender and non-offender groups. Riddle and Roberts found that the mean weighted Q score could be accurately estimated from twice the unweighted sum of the components.

An unweighted Q (Unw Q) score was computed by summing the nine components. The correlations between Q and Unw Q were .99 for students, .98 for prisoners, and .99 for both groups combined.

The internal consistencies of the Q scores were found using Cronbach's alpha (Cronbach, Schönemann & Mckie, 1965). The internal consistencies (9 items) of Q were .63 for students and .55 for prisoners and they were not significantly different.

As no subject made any errors on the year V Maze and only two prisoner subjects made errors on the year VI maze these scores were eliminated.

The remaining seven components of Q and TA for prisoners and students were intercorrelated and the correlation matrices are presented in Table 77.

TABLE 77. Correlation among the Q score component items and Porteus mental age for the prisoner and student samples

	1.	2.	3.	4.	5.	6.	7.	8.
	Prisoners above diagonal							
1. Errors in the first third		.38	.01	.15	.19	-.11	.51	-.67
2. Errors in the last third	.10		-.03	.07	.01	.23	.18	-.65
3. Cutting corners	.17	.43		.53	.22	.20	.19	.11
4. Crossing lines	.13	.12	.38		.39	.17	.32	-.01
5. Lifting pencil	.28	.45	.39	.30		.23	.31	-.11
6. Wavy lines	.10	.20	.50	.38	.41		.02	.14
7. Going in the wrong direction	.03	.18	.18	.11	.19	.09		-.37
8. Porteus TA	-.75	-.68	-.39	-.24	-.46	-.19	-.12	

Students below diagonal

decimal points deleted, correlations at or above .29 for prisoners and .36 for students significant at 1% level (in italics)

On examining the pattern of correlations the two items errors in the first and last third had many insignificant correlations. This indicates that the reliability of the Q score could be improved by eliminating these items. Factor analysis confirms this. The matrices were subjected to principal components analysis. Results of the factor analyses are presented in Tables 78-81. Three factors with eigen-values greater than one were extracted accounting before rotation for students and prisoners respectively 39.2, 16.8, 12.7 and 32.4, 23.8, 14.0 percent of variance.

TABLE 78. Principal component analysis: Eigen values and percent of variance data for the Q score component items and Porteus mental age for the prisoner and student samples.

	PRISONERS		STUDENTS	
	Eigen Values	% Variance	Eigen Values	% Variance
Factor I	2.59	32.4	3.14	39.2
Factor II	1.90	23.8	1.35	16.8
Factor III	1.12	14.0	1.02	12.7

TABLE 79. Unrotated factor matrix for the Q score component items and Porteus mental age for prisoners.

	FACTOR I	FACTOR II	FACTOR III
Errors in the first third	75	-11	-23
Errors in the last third	73	-30	61
Cutting corners	14	61	08
Crossing lines	33	71	03
Lifting pencil	29	42	-05
Wavy lines	06	29	41
Going in the wrong direction	56	24	-26
Porteus TA	-81	37	11

decimal points deleted

TABLE 80. Unrotated factor matrix for the Q score component items and Porteus mental age for students.

	Factor I	Factor II	Factor III
Errors in the first third	58	-68	33
Errors in the last third	75	16	-65
Cutting corners	61	35	13
Crossing lines	39	25	29
Lifting pencil	61	16	06
Wavy lines	48	44	36
Going in the wrong direction	21	11	-03
Porteus TA	-89	41	12

decimal points deleted

TABLE 81. Principal component solutions: Varimax rotated factor matrix after rotation with Kaiser normalization for the Q score component items and Porteus mental age for the prisoner and student samples.

	FACTOR I		FACTOR II		FACTOR III	
	Prisoners	Students	Prisoners	Students	Prisoners	Students
Errors in the first third	82	95	10	11	03	-02
Errors in the last third	43	11	-05	16	90	98
Cutting corners	-07	11	62	63	04	32
Crossing lines	10	10	78	53	05	05
Lifting pencil	17	23	49	48	01	35
Wavy lines	-20	02	31	74	35	08
Going in the wrong direction	54	02	38	17	-04	17
Porteus TA	-83	-78	12	-19	-29	-56

decimal points deleted, items significant at 1% level in italics

The first factor appears to be a measure of the individual's ability to solve the mazes. It can be labelled a measure of planning ability as both early errors in mazes and poor overall test performance have high loadings on this factor in each of the student and prisoner samples. The second factor includes the items (cutting corners, crossing lines, lifting pencil and wavy lines) that reflect the individual's style of response. The second factor can be labelled psychomotor control. While the item wavy lines only loaded significantly for students on this factor it did have a relatively high loading for prisoners. For this reason it was decided to include it in the psychomotor control factor. The third factor appears to reflect individual's overconfidence on the mazes as it includes the item of making errors in the last third of the mazes for both prisoner and student samples. However, it is likely that this is a residual factor.

The four unweighted component items (cutting corners, crossing lines, lifting pencil and wavy lines) were summed to provide an overall measure of style of responding on the mazes. The correlations of the psychomotor control measure with Porteus Q score were .98 for students and .97 for prisoners. The correlations are high enough to suggest that the psychomotor control measure and Porteus Q score are the same measure. The internal consistencies of the four items that make up the psychomotor control factor as measured by Cronbach's alpha, were .69 for students and .61 for prisoners. Although they

are not significantly different from the internal consistencies for Q (9 items), both are higher.

The use of assigning weights to compute Q cannot be justified by the results of this study. The Q score may be accurately estimated from the unweighted items as there is a very high correlation between weighted and unweighted Q. Porteus' weighting scheme does not seem to add to the efficiency of the test.

For prisoners, TA and Q scores are largely independent measures. The Q score may best be described by the four items cutting corners, crossing lines, lifting pencil and wavy lines. Scoring of Q may be simplified by summing the unweighted scores on these items. The simplified unweighted Q has a high correlation with Q and the four items have higher internal consistencies for both the student and prisoner samples. This simplified method of scoring Q leads to a large reduction in the subjectivity and amount of time required to score the Porteus Maze Test.

Factor analysis of Q component items and TA provides evidence that TA is a measure of planning ability as it is significantly related to early maze errors. The items that best describe Q (cutting corners, crossing lines, lifting pencil and wavy lines) load on separate factors for both the student and prisoner samples and are measures related to psychomotor control. This indicates that they are measuring mainly independent dimensions of Maze Test performance.

5.3 ROTTER I-E LOCUS OF CONTROL SCALE

5.3.1 Dimensionality and reliability of the Rotter Scale

Lange and Tiggeman (1981, see Appendix A) examined the dimensionality and test-retest reliability of the Rotter scale for a sample of 93 students over a two year two month period. Two distinct factors relating to personal and political control beliefs were extracted.

On retesting, 8 of the 9 General Control items loaded on the same first factor. All 5 of the Political Control items loaded on the second factor.

The correlation between the two factor scales for both administrations was low which indicated that they were measuring largely independent aspects of internal-external locus of control. The test-retest reliability of the I-E scale was .61. The results suggest that for students the Rotter Scale and its two factor structure was stable over a considerable period of time.

5.3.2 Factor structure of the Rotter Scale in different samples

Testing of the prisoner, student and police cadets made possible the examination of the Rotter two factor structure in different samples.

Responses to the 23 items for the three groups were inter-correlated and the correlation matrices are shown in Tables 82-84. The correlation matrices were factor analysed by the principal components method, retaining for rotation the number of principal components whose eigen-values were greater than or equal to one. The number of factors extracted was restricted to two.

TABLE 82. Correlation among the Rotter scale items for prisoners.

Item	2.	3.	4.	5.	6.	7.	9.	10.	11.	12.	13.	15.	16.	17.	18.	20.	21.	22.	23.	25.	26.	28.	29.	
2		<i>-20</i>	<i>-20</i>	<i>-05</i>	<i>43</i>	<i>-13</i>	<i>22</i>	<i>01</i>	<i>00</i>	<i>-11</i>	<i>-20</i>	<i>-03</i>	<i>46</i>	<i>07</i>	<i>24</i>	<i>00</i>	<i>15</i>	<i>-06</i>	<i>31</i>	<i>14</i>	<i>-22</i>	<i>10</i>	<i>-10</i>	
3			<i>-21</i>	<i>-13</i>	<i>12</i>	<i>11</i>	<i>-08</i>	<i>-17</i>	<i>-22</i>	<i>-14</i>	<i>-20</i>	<i>-05</i>	<i>-03</i>	<i>37</i>	<i>-15</i>	<i>22</i>	<i>-06</i>	<i>35</i>	<i>05</i>	<i>-13</i>	<i>-01</i>	<i>-21</i>	<i>21</i>	
4				<i>08</i>	<i>-06</i>	<i>-06</i>	<i>-09</i>	<i>15</i>	<i>12</i>	<i>03</i>	<i>26</i>	<i>-03</i>	<i>-06</i>	<i>01</i>	<i>-07</i>	<i>-11</i>	<i>-06</i>	<i>22</i>	<i>08</i>	<i>-03</i>	<i>09</i>	<i>-25</i>	<i>07</i>	
5					<i>05</i>	<i>-05</i>	<i>-13</i>	<i>37</i>	<i>20</i>	<i>56</i>	<i>30</i>	<i>02</i>	<i>10</i>	<i>05</i>	<i>05</i>	<i>07</i>	<i>02</i>	<i>00</i>	<i>31</i>	<i>15</i>	<i>21</i>	<i>19</i>	<i>10</i>	
6						<i>24</i>	<i>17</i>	<i>-15</i>	<i>-01</i>	<i>00</i>	<i>-13</i>	<i>-09</i>	<i>12</i>	<i>32</i>	<i>06</i>	<i>-08</i>	<i>-05</i>	<i>01</i>	<i>00</i>	<i>-08</i>	<i>07</i>	<i>00</i>	<i>-06</i>	
7							<i>-04</i>	<i>-15</i>	<i>-06</i>	<i>-06</i>	<i>06</i>	<i>06</i>	<i>01</i>	<i>04</i>	<i>-29</i>	<i>14</i>	<i>-03</i>	<i>08</i>	<i>-04</i>	<i>-22</i>	<i>-02</i>	<i>06</i>	<i>06</i>	
9								<i>-04</i>	<i>15</i>	<i>27</i>	<i>15</i>	<i>-10</i>	<i>07</i>	<i>03</i>	<i>35</i>	<i>15</i>	<i>-04</i>	<i>06</i>	<i>16</i>	<i>38</i>	<i>11</i>	<i>16</i>	<i>03</i>	
10									<i>09</i>	<i>17</i>	<i>16</i>	<i>11</i>	<i>01</i>	<i>-14</i>	<i>-08</i>	<i>00</i>	<i>10</i>	<i>06</i>	<i>19</i>	<i>26</i>	<i>13</i>	<i>05</i>	<i>-01</i>	
11										<i>40</i>	<i>09</i>	<i>05</i>	<i>15</i>	<i>19</i>	<i>25</i>	<i>-08</i>	<i>10</i>	<i>03</i>	<i>02</i>	<i>25</i>	<i>10</i>	<i>14</i>	<i>08</i>	
12											<i>08</i>	<i>03</i>	<i>-11</i>	<i>05</i>	<i>14</i>	<i>03</i>	<i>-14</i>	<i>19</i>	<i>-09</i>	<i>11</i>	<i>38</i>	<i>14</i>	<i>02</i>	
13												<i>-08</i>	<i>-06</i>	<i>00</i>	<i>08</i>	<i>03</i>	<i>-08</i>	<i>11</i>	<i>-05</i>	<i>42</i>	<i>16</i>	<i>06</i>	<i>14</i>	
15													<i>-03</i>	<i>-05</i>	<i>10</i>	<i>11</i>	<i>06</i>	<i>-03</i>	<i>-14</i>	<i>-03</i>	<i>-14</i>	<i>09</i>	<i>08</i>	
16														<i>21</i>	<i>24</i>	<i>01</i>	<i>29</i>	<i>-06</i>	<i>31</i>	<i>14</i>	<i>-22</i>	<i>-10</i>	<i>04</i>	
17															<i>11</i>	<i>07</i>	<i>20</i>	<i>33</i>	<i>06</i>	<i>15</i>	<i>28</i>	<i>06</i>	<i>11</i>	
18																<i>18</i>	<i>15</i>	<i>00</i>	<i>10</i>	<i>48</i>	<i>11</i>	<i>-11</i>	<i>13</i>	
20																	<i>07</i>	<i>18</i>	<i>38</i>	<i>18</i>	<i>23</i>	<i>-05</i>	<i>-03</i>	
21																		<i>-06</i>	<i>06</i>	<i>29</i>	<i>20</i>	<i>-04</i>	<i>-15</i>	
22																			<i>08</i>	<i>-03</i>	<i>25</i>	<i>-14</i>	<i>22</i>	
23																				<i>27</i>	<i>-04</i>	<i>01</i>	<i>22</i>	
25																					<i>15</i>	<i>16</i>	<i>18</i>	
26																						<i>18</i>	<i>11</i>	
28																							<i>11</i>	
29																								

decimal points deleted, coefficients at or above .29 significant at 1% level (in italics)

TABLE 83. Correlation among the Rotter scale items for students.

Item	2.	3.	4.	5.	6.	7.	9.	10.	11.	12.	13.	15.	16.	17.	18.	20.	21.	22.	23.	25.	26.	28.	29.	
2		<i>-06</i>	17	24	08	20	13	27	26	18	30	<i>-06</i>	19	26	29	<i>-12</i>	29	15	<i>-19</i>	21	<i>-04</i>	08	27	
3			18	05	14	<i>-17</i>	11	05	<i>-11</i>	37	<i>-09</i>	<i>-06</i>	09	<i>49</i>	05	14	12	36	<i>-12</i>	<i>-08</i>	18	20	06	
4				17	<i>38</i>	19	00	05	11	<i>-11</i>	26	<i>-06</i>	25	<i>-02</i>	05	27	<i>-11</i>	<i>-02</i>	05	27	18	33	06	
5					<i>-05</i>	16	<i>-01</i>	37	<i>38</i>	<i>-09</i>	05	<i>-31</i>	14	01	30	21	12	01	04	12	<i>-02</i>	25	<i>-24</i>	
6						16	07	14	<i>-10</i>	03	13	<i>-01</i>	21	12	<i>-09</i>	<i>-16</i>	14	<i>-10</i>	<i>-01</i>	<i>-15</i>	23	01	01	
7							12	11	<i>-16</i>	<i>-35</i>	27	<i>-24</i>	00	<i>-01</i>	<i>-05</i>	<i>-09</i>	09	<i>-13</i>	<i>-04</i>	<i>-01</i>	13	<i>-25</i>	<i>-31</i>	
9								16	05	21	<i>-03</i>	03	24	31	23	04	00	<i>-03</i>	00	22	29	<i>-17</i>	18	
10									<i>07</i>	15	29	<i>-19</i>	25	<i>-07</i>	05	07	15	<i>-07</i>	<i>-15</i>	21	35	18	03	
11										16	31	15	<i>43</i>	11	35	05	16	<i>-11</i>	<i>-23</i>	<i>42</i>	<i>-15</i>	21	15	
12											03	07	<i>-09</i>	<i>49</i>	12	07	22	37	<i>-32</i>	20	03	28	35	
13												19	36	12	26	07	14	12	<i>-17</i>	<i>48</i>	01	12	12	
15													19	<i>-07</i>	17	<i>-24</i>	<i>-03</i>	04	<i>-03</i>	00	<i>-04</i>	<i>-02</i>	27	
16														01	25	<i>-04</i>	20	<i>-01</i>	<i>-16</i>	26	<i>-04</i>	26	09	
17															23	<i>-05</i>	03	14	<i>-23</i>	14	07	<i>-06</i>	07	
18																01	37	10	05	<i>39</i>	<i>-17</i>	20	18	
20																	07	19	<i>-09</i>	32	<i>-10</i>	36	<i>-22</i>	
21																		26	<i>-16</i>	09	<i>-40</i>	17	<i>-07</i>	
22																			<i>-07</i>	14	<i>-26</i>	28	29	
23																					<i>-25</i>	03	<i>-13</i>	03
25																						<i>-11</i>	<i>39</i>	20
26																							<i>-19</i>	04
28																								13
29																								

decimal points deleted, coefficients at or above .38 significant at 1% level (in italics)

TABLE 84. Correlation among the Rotter scale items for police cadets.

Item	2.	3.	4.	5.	6.	7.	9.	10.	11.	12.	13.	15.	16.	17.	18.	20.	21.	22.	23.	25.	26.	28.	29.
2		<i>-07</i>	<i>10</i>	<i>08</i>	<i>-24</i>	<i>07</i>	<i>21</i>	<i>00</i>	<i>18</i>	<i>12</i>	<i>01</i>	<i>01</i>	<i>04</i>	<i>-08</i>	<i>19</i>	<i>-11</i>	<i>04</i>	<i>10</i>	<i>09</i>	<i>23</i>	<i>-08</i>	<i>-13</i>	<i>17</i>
3			<i>29</i>	<i>-11</i>	<i>10</i>	<i>07</i>	<i>-04</i>	<i>29</i>	<i>-11</i>	<i>12</i>	<i>05</i>	<i>44</i>	<i>-06</i>	<i>22</i>	<i>-17</i>	<i>36</i>	<i>10</i>	<i>05</i>	<i>14</i>	<i>01</i>	<i>43</i>	<i>01</i>	<i>07</i>
4				<i>-08</i>	<i>17</i>	<i>37</i>	<i>00</i>	<i>12</i>	<i>25</i>	<i>23</i>	<i>27</i>	<i>01</i>	<i>05</i>	<i>20</i>	<i>14</i>	<i>11</i>	<i>20</i>	<i>-15</i>	<i>10</i>	<i>20</i>	<i>08</i>	<i>14</i>	<i>19</i>
5					<i>-06</i>	<i>02</i>	<i>26</i>	<i>04</i>	<i>01</i>	<i>20</i>	<i>01</i>	<i>18</i>	<i>01</i>	<i>09</i>	<i>-01</i>	<i>07</i>	<i>-17</i>	<i>25</i>	<i>41</i>	<i>-21</i>	<i>-11</i>	<i>11</i>	<i>08</i>
6						<i>24</i>	<i>-15</i>	<i>07</i>	<i>-06</i>	<i>23</i>	<i>00</i>	<i>-07</i>	<i>24</i>	<i>17</i>	<i>02</i>	<i>-07</i>	<i>26</i>	<i>-08</i>	<i>-12</i>	<i>17</i>	<i>-04</i>	<i>04</i>	<i>18</i>
7							<i>-11</i>	<i>00</i>	<i>02</i>	<i>27</i>	<i>28</i>	<i>-11</i>	<i>10</i>	<i>39</i>	<i>30</i>	<i>00</i>	<i>-13</i>	<i>-10</i>	<i>-10</i>	<i>28</i>	<i>18</i>	<i>33</i>	<i>31</i>
9								<i>08</i>	<i>14</i>	<i>-03</i>	<i>-04</i>	<i>-05</i>	<i>-12</i>	<i>16</i>	<i>-03</i>	<i>13</i>	<i>-02</i>	<i>12</i>	<i>-05</i>	<i>16</i>	<i>06</i>	<i>-26</i>	<i>03</i>
10									<i>04</i>	<i>07</i>	<i>-23</i>	<i>34</i>	<i>02</i>	<i>26</i>	<i>-03</i>	<i>13</i>	<i>-02</i>	<i>23</i>	<i>20</i>	<i>16</i>	<i>16</i>	<i>14</i>	<i>03</i>
11										<i>02</i>	<i>01</i>	<i>-30</i>	<i>28</i>	<i>09</i>	<i>23</i>	<i>-04</i>	<i>21</i>	<i>-08</i>	<i>29</i>	<i>19</i>	<i>-01</i>	<i>21</i>	<i>26</i>
12											<i>09</i>	<i>03</i>	<i>-02</i>	<i>36</i>	<i>-03</i>	<i>22</i>	<i>-01</i>	<i>34</i>	<i>-02</i>	<i>08</i>	<i>-02</i>	<i>20</i>	<i>48</i>
13												<i>02</i>	<i>03</i>	<i>08</i>	<i>01</i>	<i>-15</i>	<i>06</i>	<i>-26</i>	<i>16</i>	<i>-01</i>	<i>17</i>	<i>29</i>	<i>35</i>
15													<i>-09</i>	<i>01</i>	<i>-17</i>	<i>24</i>	<i>-04</i>	<i>44</i>	<i>37</i>	<i>-18</i>	<i>39</i>	<i>-20</i>	<i>-21</i>
16														<i>-01</i>	<i>19</i>	<i>-02</i>	<i>06</i>	<i>05</i>	<i>16</i>	<i>13</i>	<i>-01</i>	<i>14</i>	<i>15</i>
17															<i>-11</i>	<i>-06</i>	<i>-11</i>	<i>08</i>	<i>07</i>	<i>21</i>	<i>21</i>	<i>38</i>	<i>48</i>
18																<i>-09</i>	<i>03</i>	<i>-26</i>	<i>08</i>	<i>59</i>	<i>-11</i>	<i>23</i>	<i>14</i>
20																	<i>-08</i>	<i>11</i>	<i>18</i>	<i>-06</i>	<i>25</i>	<i>-25</i>	<i>-12</i>
21																		<i>-01</i>	<i>04</i>	<i>17</i>	<i>17</i>	<i>02</i>	<i>18</i>
22																			<i>24</i>	<i>-14</i>	<i>08</i>	<i>-08</i>	<i>08</i>
23																				<i>-05</i>	<i>07</i>	<i>-07</i>	<i>25</i>
25																					<i>11</i>	<i>29</i>	<i>29</i>
26																						<i>-01</i>	<i>02</i>
29																							<i>45</i>

decimal points deleted, coefficients at or above .33 significant at 1% level (in italics)

Meaningful factors were identified mainly through an examination of magnitude of the eigen-values of each factor. Items were considered to load on a rotated factor if their loading on that factor was .40 or greater and if the item had no comparable loading on another factor (Armor, 1974). Results of these factor analyses for the three samples are presented in Tables 85-93.

TABLE 85. Principal component analysis: Eigen values and percent of variance data for the Rotter scale items for prisoners.

	EIGEN VALUES	% VARIANCE
FACTOR I	3.06	13.3
FACTOR II	2.39	10.4

TABLE 86. Principal component analysis: Eigen values and percent of variance data for the Rotter scale items for students.

	EIGEN VALUE	% VARIANCE
FACTOR I	3.87	16.8
FACTOR II	2.48	10.8

TABLE 87. Principal component analysis: Eigen values and percent of variance data for the Rotter scale items for police cadets.

	EIGEN VALUES	% VARIANCE
FACTOR I	3.42	14.9
FACTOR II	2.84	12.3

TABLE 88. Unrotated factor matrix for the Rotter scale items for prisoners.

ITEM	FACTOR II	FACTOR II
2	28	-75
3	-22	-08
4	07	41
5	42	25
6	09	-41
7	-23	08
9	49	-15
10	34	29
11	50	15
12	38	40
13	37	48
15	-03	05
16	33	-59
17	32	-13
18	60	-25
20	27	-03
21	29	-27
22	16	27
23	44	-27
25	76	-02
26	40	44
28	23	11
29	24	19

decimal points deleted

TABLE 89. Unrotated factor matrix for the Rotter scale items for students.

ITEM	FACTOR I	FACTOR II
2	48	12
3	23	-36
4	27	31
5	31	38
6	07	13
7	-06	49
9	22	-04
10	34	27
11	54	17
12	50	-68
13	51	31
15	07	-17
16	50	28
17	33	-32
18	53	04
20	21	05
21	37	-01
22	32	-40
23	-32	08
25	65	13
26	-10	09
28	48	-04
29	30	-32

decimal points deleted

TABLE 90. Unrotated factor matrix for the Rotter scale items for police cadets.

ITEM	FACTOR I	FACTOR II
2	15	-05
3	14	65
4	53	15
5	02	27
6	34	-01
7	64	01
9	-03	04
10	15	49
11	40	-17
12	45	34
13	39	-03
15	-22	77
16	29	-10
17	57	33
18	42	-38
20	-12	51
21	20	-03
22	-12	56
23	13	44
25	58	-19
26	13	51
28	63	-12
29	75	07

decimal points deleted

TABLE 91. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the Rotter scale items for prisoners: Number of factors extracted limited to two.

	ITEM	FACTOR	
		I	II
25.	"Many times I feel that I have little influence over the things that happen to me," vs. "It is impossible for me to believe that chance or luck play an important role in my life."	53	55
18.	"Most people don't realize the extent to which their lives are controlled by accidental happenings," vs. "There really is no such thing as 'luck'."	25	60
11.	"Becoming a success is a matter of hard work; luck has little or nothing to do with it", vs. "Getting a good job depends mainly on being in the right place at the right time."	46	25
15.	"In my case, getting what I want has little or nothing to do with luck," vs. "Many times we might just as well decide what to do by flipping a coin."	02	-06
16.	"Who gets to be the boss often depends on who was lucky enough to be in the right place first," vs. "Who gets to be boss depends on who has the skill and ability; luck has little or nothing to do with it."	-19	08
9.	"I have often found that what is going to happen will happen," vs. "Trusting to fate has never turned out as well for me as making a decision to take a definite course of action."	25	45
13.	"When I make plans, I am almost certain that I can make them work," vs. "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."	60	-08
28.	"What happens to me is my own doing," vs. "Sometimes I feel that I don't have enough control over the direction my life is taking."	24	08
5.	"The idea that teachers are unfair to students is nonsense", vs. "Most students don't realize the extent to which their grades are influenced by accidental happenings."	47	12
2.	"Many of the unhappy things in people's lives are partly due to bad luck," vs. "People's misfortunes result from the mistakes they make."	-33	73
23.	"Sometimes I can't understand how teachers arrive at the grades they give", vs. "There is a direct connection between how hard I study and the grades I get".	12	50

ITEM	FACTOR	FACTOR
	I	II
21. "In the long run, the bad things that happen to us are balanced by the good ones", vs. "Most misfortunes are the result of lack of ability, ignorance, laziness, or all three."	01	40
6. "Without the right breaks one cannot be an effective leader," vs. "Capable people who fail to become leaders have not taken advantage of their opportunities."	-23	36
17. "As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control," vs. "By taking an active part in political and social affairs, the people can control world events".	13	31
22. "With enough effort we can wipe out political corruption," vs. "It is difficult for people to have much control over the things politicians do in office".	31	-08
12. "The average citizen can have an influence in government decisions," vs. "This world is run by the few people in power, and there is not much the little guy can do about it."	55	-02
3. "One of the major reasons why we have wars is because people don't take enough interest in politics," vs. "There will always be wars, no matter how hard people try to prevent them."	-21	-09
29. "Most of the time I can't understand why politicians behave the way they do," vs. "In the long run, the people are responsible for bad government on a national as well as on a local level."	30	04
4. "In the long run, people get the respect they deserve in this world," vs. "Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries."	34	-24
7. "No matter how hard you try, some people just don't like you," vs. "People who can't get others to like them don't understand how to get along with others."	-11	-22
10. "In the case of the well prepared student there is rarely if ever such a thing as an unfair test", vs. "Many times exam questions tend to be so unrelated to course work that studying is really useless."	44	03
20. "It is hard to know whether or not a person really likes you," vs. "How many friends you have depends upon how nice a person you are."	17	21
26. "People are lonely because they don't try to be friendly," vs. "There's not much use in trying too hard to please people: if they like you they like you."	60	-02

TABLE 92. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the Rotter scale items for students. Number of factors extracted limited to two.

	ITEM	FACTOR I	FACTOR II
25.	"Many times I feel that I have little influence over the things that happen to me," vs. "It is impossible for me to believe that chance or luck play an important role in my life."	62	23
18.	"Most people don't realize the extent to which their lives are controlled by accidental happenings," vs. "There really is no such thing as 'luck'".	47	24
11.	"Becoming a success is a matter of hard work; luck has little or nothing to do with it", vs. "Getting a good job depends mainly on being in the right place at the right time."	55	14
15.	"In my case, getting what I want has little or nothing to do with luck," vs. "Many times we might just as well decide what to do by flipping a coin."	-03	18
16.	"Who gets to be the boss often depends on who was lucky enough to be in the right place first," vs. "Who gets to be boss depends on who has the skill and ability; luck has little or nothing to do with it."	54	01
9.	"I have often found that what is going to happen will happen," vs. "Trusting to fate has never turned out as well for me as making a decision to take a definite course of action."	17	15
13.	"When I make plans, I am almost certain that I can make them work," vs. "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."	59	00
28.	"What happens to me is my own doing," vs. "Sometimes I feel that I don't have enough control over the direction my life is taking."	40	29
5.	"The idea that teachers are unfair to students is nonsense", vs. "Most students don't realize the extent to which their grades are influenced by accidental happenings."	46	-16
2.	"Many of the unhappy things in people's lives are partly due to bad luck," vs. "People's misfortunes result from the mistakes they make."	48	14
23.	"Sometimes I can't understand how teachers arrive at the grades they give", vs. "There is a direct connection between how hard I study and the grades I get".	-23	-24

TABLE 92. cont.

	ITEMS	FACTOR	FACTOR
		I	II
21.	"In the long run, the bad things that happen to us are balanced by the good ones", vs. "Most misfortunes are the result of lack of ability, ignorance, laziness, or all three."	31	21
6.	"Without the right breaks one cannot be an effective leader," vs. "Capable people who fail to become leaders have not taken advantage of their opportunities."	12	-07
17.	"As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control," vs. "By taking an active part in political and social affairs, the people can control world events".	12	44
22.	"With enough effort we can wipe out political corruption," vs. "It is difficult for people to have much control over the things politicians do in office".	06	51
12.	"The average citizen can have an influence in government decisions," vs. "This world is run by the few people in power, and there is not much the little guy can do about it."	07	84
3.	"One of the major reasons why we have wars is because people don't take enough interest in politics," vs. "There will always be wars, no matter how hard people try to prevent them."	01	43
29.	"Most of the time I can't understand why politicians behave the way they do," vs. "In the long run, the people are responsible for bad government on a national as well as on a local level."	08	43
4.	"In the long run, people get the respect they deserve in this world," vs. "Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries."	39	-12
7.	"No matter how hard you try, some people just don't like you," vs. "People who can't get others to like them don't understand how to get along with others."	21	-45
10.	"In the case of the well prepared student there is rarely if ever such a thing as an unfair test", vs. "Many times exam questions tend to be so unrelated to course work that studying is really useless."	43	-05
20.	"It is hard to know whether or not a person really likes you," vs. "How many friends you have depends upon how nice a person you are."	21	07
26.	"People are lonely because they don't try to be friendly," vs. "There's not much use in trying too hard to please people: if they like you they like you."	-04	-13

decimal points deleted; items loading above .40 in italics

TABLE 93. Principal component solution: Varimax rotated factor matrix after rotation with Kaiser normalization for the Rotter scale items for police cadets. Number of factors extracted limited to two.

	ITEM	FACTOR I	FACTOR II
25.	"Many times I feel that I have little influence over the things that happen to me," vs. "It is impossible for me to believe that chance or luck play an important role in my life."	60	-13
18.	"Most people don't realize the extent to which their lives are controlled by accidental happenings," vs. "There really is no such thing as 'luck'".	46	-33
11.	"Becoming a success is a matter of hard work; luck has little or nothing to do with it", vs. "Getting a good job depends mainly on being in the right place at the right time."	42	-13
15.	"In my case, getting what I want has little or nothing to do with luck," vs. "Many times we might just as well decide what to do by flipping a coin."	-30	74
16.	"Who gets to be the boss often depends on who was lucky enough to be in the right place first," vs. "Who gets to be boss depends on who has the skill and ability; luck has little or nothing to do with it."	30	-06
9.	"I have often found that what is going to happen will happen," vs. "Trusting to fate has never turned out as well for me as making a decision to take a definite course of action."	-04	04
13.	"When I make plans, I am almost certain that I can make them work," vs. "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."	40	-08
28.	"What happens to me is my own doing," vs. "Sometimes I feel that I don't have enough control over the direction my life is taking."	64	-06
5.	"The idea that teachers are unfair to students is nonsense", vs. "Most students don't realize the extent to which their grades are influenced by accidental happenings."	-01	27
2.	"Many of the unhappy things in people's lives are partly due to bad luck," vs. "People's misfortunes result from the mistakes they make."	16	-04
23.	"Sometimes I can't understand how teachers arrive at the grades they give", vs. "There is a direct connection between how hard I study and the grades I get".	09	45

	ITEM	FACTOR	FACTOR
		I	II
21.	"In the long run, the bad things that happen to us are balanced by the good ones", vs. "Most misfortunes are the result of lack of ability, ignorance, laziness, or all three."	20	-01
6.	"Without the right breaks one cannot be an effective leader," vs. "Capable people who fail to become leaders have not taken advantage of their opportunities."	33	03
17.	"As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control," vs. "By taking an active part in political and social affairs, the people can control world events".	53	38
22.	"With enough effort we can wipe out political corruption," vs. "It is difficult for people to have much control over the things politicians do in office".	-17	55
12.	"The average citizen can have an influence in government decisions," vs. "This world is run by the few people in power, and there is not much the little guy can do about it."	42	38
3.	"One of the major reasons why we have wars is because people don't take enough interest in politics," vs. "There will always be wars, no matter how hard people try to prevent them."	07	66
29.	"Most of the time I can't understand why politicians behave the way they do," vs. "In the long run, the people are responsible for bad government on a national as well as on a local level."	74	14
4.	"In the long run, people get the respect they deserve in this world," vs. "Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries."	51	20
7.	"No matter how hard you try, some people just don't like you," vs. "People who can't get others to like them don't understand how to get along with others."	63	8
10.	"In the case of the well prepared student there is rarely if ever such a thing as an unfair test", vs. "Many times exam questions tend to be so unrelated to course work that studying is really useless."	10	51
20.	"It is hard to know whether or not a person really likes you," vs. "How many friends you have depends upon how nice a person you are."	-16	49
26.	"People are lonely because they don't try to be friendly," vs. "There's not much use in trying too hard to please people: if they like you they like you."	08	52

The student factor structure closely resembles the two factor structure found previously. The first factor included 8 of the general control items (items 2, 5, 11, 13, 16, 18, 25, 28) and all 5 of the political control items (items 3, 12, 17, 22, 29). Again two distinct factors could be found for students.

Both the prisoner and police cadet samples failed to replicate the two factor structure within the Rotter Scale. In Table 94 the item loadings of the student, prisoner and police cadet samples on the two factors are compared. The prisoner and police cadet item loadings differed with each other and no consistent pattern of loadings could be found for these groups.

The two factor structure was not replicable in the prisoner and police cadet populations. This may be due to the highly selected nature of these populations. They could have a different set of world views or failed to understand instructions. It appears that in this study it was not possible to generalize from the student population to the prisoner or police cadet populations.

It appears that only students are consistently making a distinction between beliefs concerning the importance an individual places on his own and the action of others in determining the events in their lives and the control they have over political institutions and world affairs.

TABLE 94. Comparing students, prisoners and police cadets: Principal component solutions: Varimax rotated factor matrices after rotation with Kaiser normalization of the Rotter scale items.

Items	FACTOR I			FACTOR II		
	Stud- ents	Pris- oners	Police Cadets	Stud- ents	Pris- oners	Police Cadets
25. "Many times I feel that I have little influence over the things that happen to me," vs. "It is impossible for me to believe that chance or luck play an important role in my life."	62	53	60	23	55	-13
18. "Most people don't realize the extent to which their lives are controlled by accidental happenings," vs. "There really is no such thing as 'luck'".	47	25	46	24	60	-33
11. "Becoming a success is a matter of hard work; luck has little or nothing to do with it", vs. "Getting a good job depends mainly on being in the right place at the right time."	55	46	42	14	25	-13
15. "In my case, getting what I want has little or nothing to do with luck," vs. "Many times we might just as well decide what to do by flipping a coin."	-03	02	-30	18	-06	74
16. "Who gets to be the boss often depends on who was lucky enough to be in the right place first," vs. "Who gets to be boss depends on who has the skill and ability; luck has little or nothing to do with it."	54	-19	30	01	65	-06
9. "I have often found that what is going to happen will happen," vs. "Trusting to fate has never turned out as well for me as making a decision to take a definite course of action."	17	25	-04	15	45	04
13. "When I make plans, I am almost certain that I can make them work," vs. "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."	59	60	40	00	-08	01
28. "What happens to me is my own doing," vs. "Sometimes I feel that I don't have enough control over the direction my life is taking."	40	24	64	29	08	-06
5. "The idea that teachers are unfair to students is nonsense", vs. "Most students don't realize the extent to which their grades are influenced by accidental happenings."	46	47	-01	-16	12	27
2. "Many of the unhappy things in people's lives are partly due to bad luck," vs. "People's misfortunes result from the mistakes they make."	48	-33	16	14	73	-04
23. "Sometimes I can't understand how teachers arrive at the grades they give", vs. "There is a direct connection between how hard I study and the grades I get".	-23	12	09	-24	50	45

TABLE 94. cont.

Items	FACTOR I			FACTOR II		
	Stud-ents	Pris-oners	Police Cadets	Stud-ents	Pris-oners	Police Cadets
21. "In the long run, the bad things that happen to us are balanced by the good ones", vs. "Most misfortunes are the result of lack of ability, ignorance, laziness, or all three."	31	01	20	21	40	-01
6. "Without the right breaks one cannot be an effective leader," vs. "Capable people who fail to become leaders have not taken advantage of their opportunities."	12	-23	33	-07	36	03
17. "As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control," vs. "By taking an active part in political and social affairs, the people can control world events".	12	13	53	44	31	38
22. "With enough effort we can wipe out political corruption," vs. "It is difficult for people to have much control over the things politicians do in office".	06	31	-17	51	-08	55
12. "The average citizen can have an influence in government decisions," vs. "This world is run by the few people in power, and there is not much the little guy can do about it."	07	55	42	84	-02	38
3. "One of the major reasons why we have wars is because people don't take enough interest in politics," vs. "There will always be wars, no matter how hard people try to prevent them."	01	-21	07	43	-09	66
29. "Most of the time I can't understand why politicians behave the way they do," vs. "In the long run, the people are responsible for bad government on a national as well as on a local level."	08	30	74	43	04	14
4. "In the long run, people get the respect they deserve in this world," vs. "Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries."	39	34	51	-12	-24	20
7. "No matter how hard you try, some people just don't like you," vs. "People who can't get others to like them don't understand how to get along with others."	21	-11	63	-45	-22	08
10. "In the case of the well prepared student there is rarely if ever such a thing as an unfair test", vs. "Many times exam questions tend to be so unrelated to course work that studying is really useless."	43	44	10	-05	03	51
20. "It is hard to know whether or not a person really likes you," vs. "How many friends you have depends upon how nice a person you are."	21	17	-16	07	21	49
26. "People are lonely because they don't try to be friendly," vs. "There's not much use in trying too hard to please people: if they like you they like you."	-04	60	08	-13	-02	52

decimal points deleted; items loading above .40 in italics

The factor analyses provides justification that for students the political control items should be kept separate from the general control items especially if a researcher is interested in the political efficacy aspect of internal versus external control.

The factor structure of the three populations were very different. It is possible that there are so few items in the Rotter Scale and they sample from so many settings that there is not enough items to show up in any reliable subscale. The factor structure of the Rotter Scale has also been found to vary with item content and method of administration. These results cast doubt on the generality of the two factor structure in the general population. While the total score may be masking different components of locus of control and thereby lose specific predictive ability it is suggested that for the general population it is the most appropriate score derived from the present scale format.

5.4 SECULAR CHANGES

It was postulated that beliefs such as locus of control and attitude towards authority could vary in the general population according to the prevailing economic climate or current social and political issues. Changes in these beliefs maybe distinguishable over time.

The Rotter locus of control scale has been used in many different studies with varying setting, culture, context and time. While there have been consistent reports of variation

in structure over many studies there has usually been an acceptance of the stability of the norms derived from the scale.

Gorman, Jones and Holman (1980), however, questioned the generality of the American locus of control norms to the Australian population. They found that a sample of Australian undergraduate university students were substantially more external in their average locus of control beliefs.

In a review of mean locus of control scores for Australian undergraduate samples Lange and Tiggemann (1980, see Appendix B) confirmed that Australian students were consistently scoring higher than the American norms. Over a considerable period of time the Australian students had shown a strong secular trend towards external beliefs.

The data provided strong evidence that locus of control beliefs were not stable across different cohort groups and that the American norms were no longer applicable to Australian samples.

One of the explanations put forward by Lange and Tiggemann (1980) for a change to more external perspectives among Australian students was that it is a consequence of the prevailing economic conditions. With high unemployment limiting job prospects and high inflation eroding standards of living it may be reasonable to assume that the Australian and possibly the Western population has shifted to a more conservative viewpoint. If this is the case then it is reasonable to expect social influences to affect other higher order beliefs such as attitude to authority.

Rigby (1975) derived the attitude towards authority scales from students in the early 1970's. This was a time of significant student political activity and unrest. Issues such as opposition to conscription and condemnation of the Vietnam war were current social topics. Many students participated in political demonstrations and often came into conflict with both student authorities and the police. Such contact would inevitably cause a lowering of their attitudes towards institutional authorities. Flacks (1967) and Morgan and Osmond (1970) pointed out that this was a time when anti-authority movements had considerable influence amongst students.

Attitude towards authority is embedded in the general construct of authoritarianism. It has been suggested that threat is related to an individual's level of authoritarianism (Adorno et al., 1950). Rokeach (1960) reported the more threatening a situation was for adults the more authoritarian their beliefs became. He found a significant positive relationship between anxiety and authoritarianism. A similar significant positive correlation between anxiety and the California F Scale, a particular measure of authoritarianism, was reported by Davids (1955).

Several other studies have indicated that threat leads individuals to become more suspicious and conservative. Sander and Havelin (1960) found that under threat individuals tended to reject persons who were perceived to be different and Berkowitz and Knurek (1969) found that threat increased hostility by group members to individuals seen as outsiders.

Direct evidence linking the prevailing economic conditions to the level of authoritarianism within a population has been reported by Sales (1973). Analysis of archival data showed changes in social themes to be correlated with economic climate. The data indicated that environmental threat evoked increased authoritarianism in that period. Sales and Friend (1973) found that perceived success and failure led to individuals having respectively less and more authoritarian beliefs.

Sales (1972) found that for both authoritarian and non-authoritarian churches there was an overall significant correlation between per capita disposable income and estimated conversion ratio. During hard times the number of converts to authoritarian churches increased while the number for non-authoritarian churches declined. Conversely, in good years the number of converts to non-authoritarian churches increased while the number of authoritarian churches declined.

These findings support the prediction that in economic bad times individuals will be drawn to authoritarian organizations. Recent evidence suggests that they also become more partial to community authority figures.

Rigby and Rump (1979) in a partial replication for university students on the attitude to authority scales found that between 1972 and 1975 there was a change in the evaluation of the army and the law as institutional authorities.

Rigby (1975) obtained scores for 80 Adelaide University students tested in 1972 and 15 prisoners at Yatala jail. Mean scores were 90.49 (SD = 18.39) for students and 90.33 (SD = 22.70)

for prisoners. The present study conducted in 1979, a bad economic year, found scores for 38 Adelaide university undergraduates and 54 prisoners at Yatala which were significantly higher. The mean scores were 108.45 (SD = 19.73) for students ($t = 20.76$, $p < .001$) and 106.79 (SD = 17.77) ($t = 12.16$, $p < .001$) for prisoners.

If such disparate groups as this reflect more favourable attitudes towards the authorities then it seems reasonable to assume that within the general population there has also been a change towards more conservative beliefs. It is not as yet possible to say whether this swing is totally a consequence of the prevailing economic conditions.

Evidence has been presented that, within a culture, higher order beliefs such as locus of control and attitudes towards authority are not necessarily stable over a number of year. Norms do change, and may well be dependent upon social influences.

CHAPTER 6.

SUMMARY AND CONCLUSIONS6.1 MAIN FINDINGS

The motivational theory of hyperactive impulse disorder in children proposed by Glow and Glow (1979) was used to generate predictions relating to adult behaviour. It was postulated that H.I.D. children, who are characterized by impulsiveness and problem behaviour in school, would not simply outgrow their problems. Having left school H.I.D. children would gravitate into delinquency and adult crime. They would become problems for the juvenile, police and law authorities.

It was postulated that impulsiveness, a major characteristic of H.I.D. children, would persist from childhood in adult life. If this occurred, impulsiveness would be a biological trait and measures of it would have trait-like properties.

If H.I.D. children tended to develop anti-social behaviour an examination of a prisoner population would reveal a substantial subgroup who had problems in impulse control. This would result in prisoners, as a group, in comparison to others, being significantly more impulsive on average.

It was also postulated that trait impulsivity could either initiate or disinhibit violence and other forms of criminality. A retrospective approach examining prisoners' history of offenses should identify any relationship between trait impulsivity and specific criminal behaviour.

Comparison of prisoners with other groups showed that prisoners were significantly more impulsive. They took less

time to select alternatives and made more errors on the MFFT. Prisoners had significantly poorer planning, foresight and motor control on the Porteus Mazes.

Among prisoners there appeared to be a general trait of impulsiveness with the characteristics of hasty responsiveness, many errors, poor planning and foresight, poor psychomotor performance and external locus of control. These were related to low intelligence and poor education level. It appears that trait impulsivity together with intelligence and locus of control were successful in identifying among prisoners those who had poor impulse control. All the predicted relationships between impulsiveness, intelligence and locus of control were confirmed for prisoners.

The predicted relationships between impulsiveness, intelligence and locus of control were not confirmed for either the student or police cadet populations. The correlations between the MFFT impulsivity univariate and PPVT intelligence for students and police cadets were non-significant. For students, the correlation between the MFFT impulsivity univariate and the Rotter I-E locus of control score was non-significant. For police cadets, the correlation was significant but in the opposite direction to the predicted relationship. Police cadets who responded impulsively on the MFFT tended to have internal locus of control beliefs.

It is likely that a particular institutional context influenced performance. The prisoners were in a closed institution. Prisoners' impulsive responding on the measures

maybe in part due to their living in a day to day setting. In studies with prisoners it is difficult to control for the possible effects of institutionalization. Population context may also be a major factor in the different correlation for police cadets between the Rotter scale and MFFT impulsivity. It maybe possible that either overtly or covertly the police cadets were biasing their responses in a systematic way to portrait more favourable characteristics. The cadets were in a highly competitive, examination setting. Their results at the academy would in part determine the course of their police careers. Even though anonymity was assured they would have been more likely to view the measures as tests of personal characteristics which could be used for assessment and future reference. In the context of a police officer's role in the community, impulsive performance could be reviewed as undesirable and such characteristics could be seen to be mollified by internal control beliefs.

The predicted relationship between impulsiveness and prisoners' record of criminal behaviour was not confirmed. Impulsive responding on the MFFT and Porteus Mazes was not related to any of the biographical measures.

A major problem encountered with the biographical information was the incompleteness of the data. The South Australian Department of Correctional Services only had data available for prisoners who had either been recidivists or had been sentenced for a a period of nine months or more. Only half of the prisoners in the study had biographical information

available. The interpretation of results from those prisoners with biographical information was limited as they represented a restricted group comprising multiple and serious offenders. This affected the generalizability of the data to all prisoners. In addition, the biographical information that was available was subjective and unstructured. There is no point in having data of this nature when it has no use for the penal establishment for assessment and referral purposes. It appears essential that a retrospective approach has a complete data base if meaningful results are to be obtained.

However there was an interesting pattern of relationships among the biographical data centred on the age of the first reported offense. A prisoner who had an early age of contact with the law tended to have engaged in repeated non-violent types of juvenile offenses. They had relatively low planning ability on the Porteus Mazes and a poor education level. As adults they continued to engage in non-violent offenses and were imprisoned at a relatively early age. The early offenders appear to have difficulty in adjusting successfully to society and further investigation in this area appears warranted. If these individuals could be identified then it may be possible that remediation could be contemplated at an early age.

6.2 TRAIT PROPERTIES OF THE MFFT

One of the important findings was that the MFFT was a very robust measure and appears to be measuring a general trait. Providing feedback to the prisoners on their performance by

providing positive and negative tones for accurate and inaccurate responding respectively had little effect on MFFT performance. Instructions which emphasised the need to respond slowly induced prisoners to have longer first response latencies to the MFFT items without a corresponding reduction in the number of errors. It appeared that MFFT errors was resistant to both changes in instruction and the provision of feedback. This suggests that for prisoners the error measure is the most important component of MFFT performance and scoring by the univariate method is not necessary. It could be possible to view this process as a setting of a level for the amount of errors they made. This may not be an active conscious decision, especially for individuals concerned with their degree of impulsivity. Further research is necessary to determine whether the prisoners' MFFT results generalize to the entire population.

The pattern of correlation among the independent measures confirmed that MFFT errors related better to other measures than either latency or MFFT impulsivity for all subjects in the study. MFFT errors significantly correlated with Porteus Maze performance and PPVT intelligence. In contrast MFFT latency showed little external validity and MFFT latency appeared to contribute little to the MFFT impulsivity univariate. It substantially reduced the correlations between MFFT impulsivity and external measures. Errors appeared to be the principal measure of MFFT performance.

The correlation between the two impulsiveness measures was disappointingly low. For prisoners the correlation between

MFFT errors and Porteus Q score was significant but may not have much psychological meaningfulness as the proportion of shared variance was low. For students there was no significant relationship between the two impulsiveness measures. These results indicate that MFFT performance and Porteus Q score cannot be seen as measuring the same aspects of trait impulsiveness for a student population.

The low correlation between MFFT and Porteus performance may have been due to structural differences between them. While both are viewed conceptually as measuring trait impulsivity the test procedure for the Porteus Mazes was very different to that of the MFFT. Changes in the context of the test setting may influence impulsive performance and lead to a reduction in the correlation between the two. As the MFFT was shown to be a reliable behavioural measure and the Porteus was somewhat subjective in nature, the MFFT appears to be the more appropriate measure of trait impulsivity.

There was a strong interaction between impulsive responding and intelligence for prisoners. The correlations between MFFT errors, Q score and PPVT IQ were around the median reported in previous studies. The two intelligence measures were unrelated. The correlation between Porteus mental age and PPVT IQ for prisoners was non-significant. There was confirmation that Porteus mental age was more than a simple index of intelligence. Controlling for intelligence by a partial correlation analysis should have resulted in a lowering of the correlation between MFFT errors and Porteus mental age.

Instead the correlation was substantially increased. Further investigation is needed to clarify the relationship between intelligence and Porteus mental age. There is little information available on what Porteus mental age actually measures for prisoners.

There was no relationship between the two impulsiveness measures for students. Students' MFFT performance did not significantly correlate with their performance on the mazes. However, the students were a much more homogeneous group than prisoners on the Porteus mental age measure. This may have reflected the restricted age range for students. They also had a very high correlation between Porteus mental age and Q score. It was possible that students' performance on the mazes indicated a ceiling effect. Most were successful in completing the mazes and were clustered at the top end. As the students did not have a wide spread of maze performance it appeared that for students the mazes were not difficult enough and were easily solved. This would have limited the predictability from students' maze test results to performance on related tasks. The results cast doubt on the usefulness of the Porteus Maze test among students. It appears that for students additional maze items of increasing difficulty would need to be added before meaningful results were possible.

The failure of MFFT and Porteus performances to relate highly cast doubt on the validity of each to measure impulsiveness. There was also low correlations in the pilot study between MFFT performance and Eysenck's impulsiveness

measures of narrow impulsiveness, risk-taking, non-planning ability and broad impulsiveness. Results of this study indicated that both the Eysenck and Porteus tests were relatively poor measures of impulsiveness in comparison with the highly refined MFFT. Impulsiveness appeared to be a complex concept with many factors contributing to it. Intelligence was a major component and needs to be considered when the impulsive construct is being investigated.

For the prisoner, student and police cadet population there was no relationship between attitude towards authority and impulsiveness. There appears to be little point in further investigating this relationship.

6.3 MEASURE RESULTS

6.3.1 MFFT

The MFFT appeared to be the best measure of impulsiveness. The MFFT was found to be robust and the trade-off between speed and accuracy had stabilized for adults. The MFFT was found to be an internally consistent, reliable measure. In its automated format the MFFT provided a very precise measure which was resistant to experimental influences.

6.3.2 Porteus Mazes

Measures derived from the Porteus Mazes were complex and contained unrelated components. The scoring method on the mazes appeared to require revision. The use of assigning weights to compute Q score could not be justified. The Q score could

be accurately estimated from the unweighted items. Factor analysis of the Q score component items indicated that Porteus mental age was a measure of planning ability while Q was a measure of both intelligence and psychomotor control.

The Q score could be best described by the four items of cutting corners, crossing lines, lifting pencil and wavy lines. All were measures related to psychomotor control. Scoring of Q could be simplified by summing the unweighted scores on these items. For both prisoners and students the four unweighted items had higher internal consistencies than the nine items that made up Q score.

The simplified Q measure was internally consistent, mainly independent of planning ability and did not lead to any loss of information. Its relation to impulsiveness requires further investigation.

6.3.3 Rotter locus of control scale

The Rotter I-E locus of control scale was found to be an internally consistent, reliable measure.

For students, two distinct factors relating to personal control and political control beliefs were identified. This two factor structure was stable over a number of years. It appeared that students were making a distinction between beliefs concerning the importance they placed on their own efforts and the amount of control they had over political institutions and world affairs. The two factor structure provided justification that for students the political control items should be kept separate from the general control items. This is important

if the researcher is interested in the political efficacy aspect of internal versus external control.

The two factor structure was not replicated in either the prisoner or police cadet populations. The scale items sampled from a wide variety of areas and it appeared that there were not enough items to show up in any reliable sub-scale. It is possible that additional items need to be added to the scale. Review of the literature also indicated that the Rotter scale structure varied with item content and method of administration. These results cast doubt on the generality of the two factor structure in the general population. While the total score may be masking different components of locus of control and thereby lose specific predictive ability for the general population it appeared to be the most appropriate measure derived from the scale in its current format.

6.3.4 Attitude towards authority scale

There were marked differences among the populations on the attitude towards authority subscale with the police cadets being much more homogeneous and having significantly favourable attitudes towards the law, police and army. There was a general consensus of opinion towards teachers. The total score masked differences and similarities among the populations. In the context of this study there was no predictability from the attitude towards authority scale. Its self-report format, obvious item content and absence of a lie scale left it open to faking of responses.

6.3.5 Secular changes

Evidence was found that changes in beliefs such as locus of control and attitude towards authority were distinguishable over time.

A review of the mean locus of control scores for Australian students confirmed that they were scoring higher than the American norms. There appeared to have been a consistent secular change towards more external control beliefs among Australian students. It appeared that the American norms established by Rotter in the mid-sixties were not applicable to Australian samples. It is possible that similar drift has occurred in other populations.

Prisoners and students held more favourable attitudes towards authorities than comparable groups tested from the same institutions in the early seventies. There appeared to be a strong trend towards more conservative beliefs within the Australian population. It would be worthwhile to note whether similar changes occurred in other countries and were dependent on social influences.

6.4 SAMPLING PROBLEMS

Sampling problems were evident in the study. It was necessary to restrict subjects to volunteers and among the populations there appeared to be different reasons for participation. For prisoners, boredom with the recurrent daily prison routine and relief from work duties appeared to be main factors in volunteering. It was not difficult to obtain participants

and nearly all sought their results. Prisoners were simply escorted to the experiment and none missed their allotted time. In contrast, it was extremely difficult to get students to participate even though participation in experimental work is a notional requirement of their course. Many missed their appointed times and continual follow up was required. None bothered to follow up results even though the results were readily available. For police cadets participation was complete. After the introductory speech, given in the presence of a senior police instructor, all cadets volunteered. It was clear that cadets were complying to a request from an authority figure. None missed their allotted time but few cadets followed up results. The cadets were tested just prior to graduation from the academy and considerable effort on their behalf would have been required to obtain results.

Differences in institutional context may have influenced performance. The populations were not equivalent in the degree of their institutional setting and the prisoner results may have reflected effects of institutionalization. Having to live day by day in a closed prison system could result in an impulsive style of responding. On release from gaol the prisoners would revert back to their former style of responding. A study comparing prisoners with parolees would help identify effects due to institutionalization. It would also be useful to examine the effect of institutionalization on prisoners by examining other areas such as perceived length of time. It is plausible to expect that a prisoners' perception of time

would be long at the commencement of his sentence and diminish throughout the duration of confinement.

The samples were not ideal and were highly selected and restricted. This confounded results and limited generalizations that could be made. For conclusive results to be obtained it would be necessary to have complete samples and make comparisons with results obtained from the general population.

It was also highly likely faking of responses occurred, even though complete anonymity was assured. The self-report measures in particular were open to manipulation. Item content in the Rotter and attitude towards authority scales was obvious and they did not have any built-in lie scale to measure social desirability. Prisoners and police cadets were likely to see these scales as tests that could be used for assessment purposes and respond in a socially desirable way. Faking of responses on these measures may have as much or more relevance to inferences about personality than the actual item content.

6.5 IMPLICATIONS FOR INVESTIGATIONS WITH PRISONERS

One important role correctional psychologists fulfil is the assessment of inmate characteristics and attitudes for the purpose of assignment to institutional vocational and/or treatment programs. This assessment may also have reference for clinical diagnosis by psycho-medical staff and post-release educational and vocational counselling. Thus, it is evident that this type of assessment has important implications for the client and the correctional administration.

This study shed some light on the utility of impulsiveness measures for providing an understanding of some of the factors leading to criminal behaviour. While prisoners were found to be significantly more impulsive than comparison groups there was so much overlap in the distribution of the MFFT and Porteus measures that they could not be used for individual prognosis. Although the relationship between impulsiveness and criminal behaviour appears to be a valid one, it is probably not close enough to have much practical value for prediction in the individual case. Only extreme impulsives are likely to be reliably predicted by the MFFT and Porteus measures and they constitute only a small percentage of the range. There exists a wide middle range of scores so that no prediction is available for the majority. Using the MFFT and the Porteus as predictors of future criminal behaviour would result in the unwarranted labelling of many non-offenders as potential offenders. There appears little possibility that both the MFFT and the Porteus mazes will prove useful in detecting individuals at an early age before they engage in criminal behaviour.

The retrospective approach used in this study was limited. Studies with prisoners in South Australia will not be able to use this approach until the file information kept on prisoners is restructured and complete. A possible solution to the identification of relationships between hyperkinesis and crime would be a longitudinal study over a considerable period of time. All identified H.I.D. children could be followed up and assessed at regular intervals until they reached adulthood.

Comparisons could be made to the general population. However, it does not appear feasible to engage in such a study. At the present time it is against public policy to categorize offenders. The funding expenses of such a study would also be immense. There is little likelihood that sufficient funds to sustain the project could be obtained.

One difficulty with the assessment measures used with prisoners has been the lack of validity. No single trait in isolation has been found to be a determinant of criminal activity. It is possible that interactive relationships exist between traits and criminal behaviour. In this study prisoners could be distinguished from other groups in terms of impulsiveness. However, it could not be determined how this was associated with an individual's specific crimes or record of criminal behaviour. The relationship between impulsiveness and crime or delinquency needs to be systematically investigated further. The evidence suggests that impulsiveness is not a determinant of crime, rather than just an occasional concomitant of it. For some people impulsiveness is a contributing factor in crime. Investigation of impulsiveness may prove worthwhile in identifying its interaction with other factors which collectively cause criminal behaviour. It has yet to be determined whether impulsiveness can either initiate or disinhibit violence and other forms of criminal behaviour.

A conclusion to be drawn from this research is that, while a battery of self-report measures does not show a great deal of

promise in differentiating a criminal population from other groups, on the basis of impulsiveness, there is promise in the value of performance measures such as the automated version of the MFFT. The MFFT deserves further attention in tracking down the role played by the trait of impulsiveness in the determination of criminal and anti-social behaviour.

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Lange, R. V. & Tiggemann, M. (1981). Dimensionality and reliability of the Rotter I-E Locus of Control Scale. *Journal of Personality Assessment*, 45(4), 398-406.

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of the thesis held in the University of Adelaide Library.

APPENDIX C. Assessment of performance in first year psychology and mathematics.

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Pivot, 1981, 8 (2), 39-41.

Little is known about how students academic performance in first year may vary across courses. One might expect that performance in tertiary subjects studied previously at high school would be consistent throughout first year with initial scores relating quite highly with end of year examination marks. Where a subject has not been studied before one might expect that early performance may not be such a good predictor of later achievement. High scores in the first term may be highly dependent upon school knowledge and skills, but later performance may be more dependent upon the growth of skills and interests acquired during the course of the academic year.

This may be one of the reasons why correlations typically found between matriculation marks and overall performance in first year subjects have been slightly higher for science and engineering than for arts. In Table 1, Otto (1974) gives the correlation between matriculation and subject marks at Adelaide University for 1971.

TABLE 1. Correlations between first year university marks and matriculation exam scores at the University of Adelaide for 1971.

Faculty	Matric Exam
Engineering	.74
Architecture	.69
Science	.67
Economics	.60
Agricultural Science	.58
Arts	.56
Law	.47
Medicine	.41
Dentistry	.41

For dentistry and medicine, correlations are reduced by the small range of matriculation marks created by high selection criteria.

In the present study marks in first year psychology and mathematics at the University of Adelaide were examined to test the hypothesis that where a subject had not been previously studied, early scores in the course would be less valid predictors of final performance than later scores.

Measures

The Psychology Department used continuous assessment. Therefore several measures of academic performance throughout the year were available. These were one short answer examination given at the end of each term, a statistics paper including both multiple choice and computation answers, (given in first term), a 3 hour essay examination in third term, a mark for practical assignments based on three brief reports, and a mark for performance in tutorials based on a small tutorial assignment and on the tutor's rating for participation throughout the year.

The results of a random sample of 96 first year psychology students were available. Matriculation marks from the preceding year were obtained for 55 of these students. (The remainder matriculated in other years).

The Mathematics Department also used continuous assessment, in their case a two hour term examination and a mark for class exercises assigned throughout the year. All first year students who sat for two of the three examinations were included in the analysis, $N = 388$.

Method and Results

Product moment correlations were calculated between the 7 independent measures for first year psychology students. The correlation matrix was factor analysed using principal components method. Two factors with eigenvalues greater than or equal to one were extracted, accounting for 63.3 and 14.6 per cent of variance. The correlation and item factor matrix are presented in Table 2. Factor 1 appears to be overall academic performance in first year psychology. The statistics paper had a low significant loading while the first term short answer examination had a non-significant loading. These two tests had their highest loadings on the second factor which could be called first term performance. The examinations in first term may reflect either students' prior knowledge of psychology or perhaps some general academic skill which has a low relationship with specific psychology aptitude. The effect is marked during first term with some carry over into the second and third term.

APPENDIX C. cont.

TABLE 2. Factor analysis of psychology examination results.

	% of Assessment	Correlation matrix						
		1.	2.	3.	4.	5.	6.	7.
1. Statistics Term 1	8	—	.66	.36	.46	.52	.45	.45
2. Short answer Term 1	5		—	.42	.36	.46	.36	.40
3. Short answer Term 2	10			—	.65	.66	.55	.50
4. Short answer Term 3	10				—	.84	.78	.73
5. Essay Term 3	40					—	.78	.69
6. Practicals	12						—	.73
7. Tutorials	15							—

 $p < .01$

	Rotated factor matrix	
	Factor 1.	Factor 2.
Statistics Term 1	.35	.66
Short Answer Term 1	.19	.90
Short Answer Term 2	.62	.29
Short Answer Term 3	.91	.21
Essay Term 3	.85	.34
Practicals	.83	.23
Tutorials	.73	.28

All factor loadings greater than .28 significant at .01 level.

In support of this view the matriculation marks for the psychology students showed a trend in the direction of higher correlation with later than first term marks

TABLE 3. Correlation between matriculation marks and the first year psychology assessment measures.

Matriculation Mark	Statistics Term 1	Short answer Term 1	Short answer Term 2	Short answer Term 3	Essay Term 3	Practicals	Tutorials	Total Assessment
		.24	.24	.40	.39	.39	.34	.27

 $p < .01$

APPENDIX C. cont.

Product moment correlations were calculated between the four assessment measures for first year mathematics. The correlation matrix was factor analysed and the correlation and factor matrix are presented in Table 4.

TABLE 4. Factor analysis of mathematics examination results.

	% of assessment	Correlation matrix			
		1.	2.	3.	4.
1. First Term Examination	30	—	.80	.79	.51
2. Second Term Examination	30		—	.77	.51
3. Third Term Examination	30			—	.65
4. Class Exercise	10				—

$p < .01$

	Rotated factor matrix Factor 1.
First Term Examination	.87
Second Term Examination	.86
Third Term Examination	.93
Class Exercises	.63

All factor loadings significant at .01 level.

One factor with an eigenvalue greater than one was extracted and it accounted for 75.9 per cent of the variance. All the assessment measures for first year mathematics have a high degree of validity as predictors of overall academic performance.

The internal consistencies of the first year marks were found using Cronbach's alpha (Cronbach, Schonemann and McKie, 1965). The internal consistencies of the 7 psychology and 4 mathematic assessment items were respectively .69 and .88. The psychology assessment items had significantly lower internal consistency than the mathematic assessment items.

APPENDIX C. cont.

Discussion and Conclusion

Comparison of the analysis of marks of first year psychology with mathematics supported the hypothesis that where a subject has not been previously studied, early scores in the course may be less valid overall indices of performance than later scores. Possible implications are that first term examination of subjects which are studied for the first time at a tertiary level should be treated as introductory papers and made redeemable.

In contrast, the weighting of the four measures in mathematics appears to be justified by this analysis. A further implication of this study is that this type of analysis of the relationships amongst marks can help University teachers to make better decisions about the weighting of different assessment components. This is especially important as continuous assessment is increasingly used.

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APPENDIX D. The measurement of cognitive impulsiveness:
Psychometric properties of two automated
adult versions of the Matching Familiar
Figures Test.¹

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The University of Adelaide

Journal of Behavioral Assessment, 1981, 3(4), 415-429.

Summary

An automated version of the MFFT was administered to undergraduates, along with a parallel form. The latency-errors correlation (-.61) was higher than that reported for most studies in children, and weakly supports the view that the correlation increases with age. Repeated exposure resulted in improved performance, which was faster, more accurate and more efficient, but there was no effect on impulsiveness. Reliability and internal consistency of both forms were acceptably high and the forms were comparable. Use of the univariate measures (impulsiveness-reflectiveness and efficiency-inefficiency) is superior to other scoring methods.

a. Introduction

Cognitive impulsiveness or reflectiveness is observable in situations of high response uncertainty, in which impulsive subjects tend to respond quickly with many errors, and reflective subjects tend to delay responding and to make few errors. Kagan's Matching Familiar Figures Test (MFFT; 17) has achieved wide acceptance as a measure of this cognitive style characteristic. In the MFFT, the subject selects, from an array of closely similar alternatives, the one which matches a standard figure. The latency of the first response to each of the twelve items, and the total number of errors made before the subject makes each correct choice are the two basic scores from which impulsiveness-reflectiveness is computed.

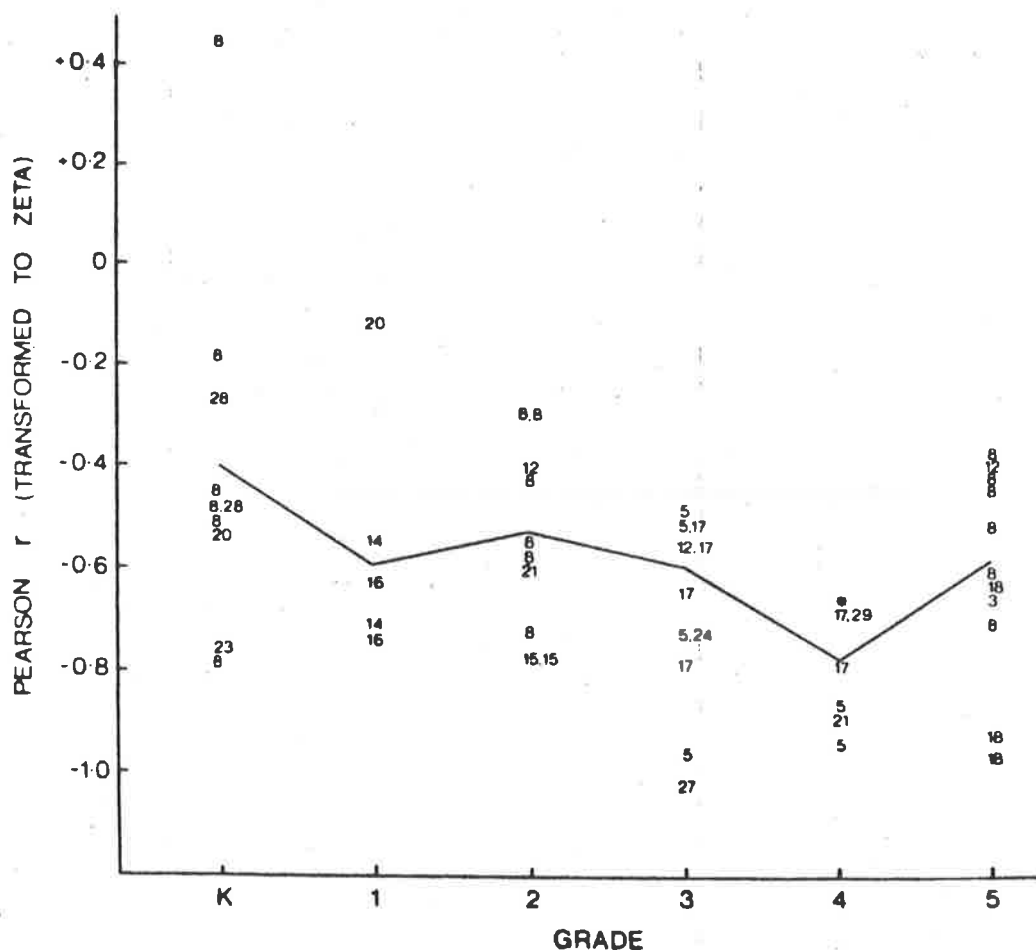
Data have often been reported on the correlation between latency and errors, moderate, negative correlations being generally reported. Toner, Holstein and Hetherington (28) expected the negative correlation between latency and errors to increase throughout childhood. Wright and Vlietstra (33) suggested that cognitive style crystallizes with age. It has

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also been hypothesised (25) that the increasing stability of latency from preschool to middle childhood might result in an increased negative correlation between latency and errors.

To test the hypothesis of increasing correlation, we perused all available reports of the latency - errors correlation on the MFFT and selected studies in which age or school grade were both stated and limited in range. Grades at which there were four or more studies were retained for analysis. The correlations between latency and errors were transformed, (Fisher's δ), and \bar{r} computed for each age-grade level, and for the total sample ($\bar{r} = -.54$, $N = 2300$, $d.f. = 2189$).

FIGURE 1. Correlations between latency and errors: 54 data points from 17 studies and the weighted average correlation for data at each grade level.



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FIGURE 1 cont.

3	Bentler & McClain, 1976
5	Bush & Dweck, 1975
8	Egeland & Weinberg, 1976
12	Kaskins & McKinney, 1976
14	Kagan, 1965
15	Kagan, 1965
16	Kagan, Pearson & Welch, 1966
17	Kagan, Rosman, Day, Albert & Phillips, 1964
18	Kendall & Finch, 1978
20	Mann, 1971 (data kindly supplied by author)
21	Mann, 1973
23	Meichenbaum & Goodman, 1971
24	Messer, 1970
27	Stein & Prindavale, 1976
28	Toner, Holstein & Hetherington, 1977
29	Weiner & Adams, 1974
*	Barnett, 1976. Unpublished data, available from author.

Figure 1 shows the correlation data transformed to ζ for each of the 54 samples, and the ζ at each grade level. It can be seen that there are large differences between samples at various grade levels, however the trend towards increasing (negative) correlation with age is apparent. Although the N s for each sample varied from 22 to 109, appropriate statistical tests which would take into account the sampling error of each data point were not available. We thus computed the Pearson correlation coefficient between grade and zeta, and found $r = .37$, ($N = 54$, $p < .05$) when kindergarten was treated as zero grade. Thus about 14% of the variance in the data of Figure 1 are accounted for by school grade. This analysis clearly supports the assertion that the negative correlation between latency and errors on the MFFT increases during the primary school years, although the variability of sample data is notable.

In a study of the effects of ageing on MFFT performance, Denney and List (7) found that both time and errors but not their correlation, increased from the fourth to the eighth decade of life. Unfortunately in this study the elementary version of the MFFT appears to have been used, and this may have reduced response uncertainty below that expected.

Also the apparent failure to screen the subjects for ability to see the test material is a major short-coming in the studies of visual task performance in the aged. Wenger (personal communication) found that while all of his oldest subjects had spectacles, correction was required in order to produce adequate acuity for the precise conditions of his tasks,

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where the viewing distance was greater than the normal 'reading' distance. Five, six and ten out of twelve of his 50, 60 and 70 year olds required this additional correction (due to presbyopia). Taking these two factors into account, Denney & Lists' (7) findings of latency-errors correlations ranging from $-.24$ to $-.64$ may be of limited relevance.

Problems have arisen from the method of scoring the MFFT. Studies of validity have concentrated on the bivariate score (1, 4), the metric properties of which have received little attention. In this procedure, subjects are assigned on the basis of performance, to one of the cells in a fourfold table, each of the two measures (latency and errors) being split at the median. Impulsive subjects are those below median latency and above median errors, while reflective subjects are those above median latency and below median errors. These two groups comprise about $1/3$ each of subjects in most studies. The remaining two groups, with about $1/6$ of subjects in each, are designated fast-accurate and slow-inaccurate.

Ault, Mitchell and Hartmann (2) assessed the reliability of assignment of subjects by this procedure, and calculated that 24% of cases would be differently categorised upon retest. Generally the psychometric properties of the bivariate score have been little studied, and it is being abandoned.

Studies of reliability have focussed on the two basic measures, latency and errors. The short-term stability of latency has been assessed several times, with values ranging from $.58$ to $.96$ for elementary school children over a one to eight week period (1) and $.19$ for preschool children (4) while in the case of errors, values ranging from $.39$ to $.80$ for school children (2) and $.21$ for preschool children (34) have been reported. Internal consistency has been less often studied, although Block *et al.* (4) found coefficient alpha of $.86$ for latency and $.52$ for errors on the elementary form.

The use of the two basic measures can obscure important relationships in the data, and the negative correlation between them makes the interpretation of the results of statistical analysis difficult (26). Use of univariate scores computed from the standardized latency and errors scores (impulsiveness-reflectiveness is z score latency minus z score errors; efficiency-inefficiency is z score latency plus z score errors) overcomes many problems in assessment of the test's psychometric properties. They are superior to the bivariate score, and in many cases, to the latency and error scores, as the two univariate scores are orthogonal and continuously measured and allow all subjects to be included in the analysis.

APPENDIX D. cont.

The utility of this scoring method is illustrated by Wright and Vlietstra's (33) finding of substantial practice effects on the efficiency-inefficiency but not on the impulsiveness-reflectiveness score.

The usual method of administering the MFFT has some inherent problems. Since the subject continues responding to each stimulus figure until he makes a correct choice, he is able to continue scanning the stimulus array while the tester gives feedback and records response time and accuracy. The first response time is thus the only one recorded, unless the tester shields the stimulus array from view, a difficult operation when combined with recording the latency of each response. Subjects can also make use of memory for the position of rejected alternatives, even by using cues such as placing their fingers over alternatives previously chosen. Consistent use of these strategies by some individuals could reduce the construct validity of the test. As the tester must observe the subject's chosen alternative, subjects may make use of the tester's eye pointing as cues. Of even greater importance is the fact that the repeated trials procedure allows differing amounts of encouragement to be given. One would expect impulsive and reflective subjects like hyperactive children, to differ from others in their susceptibility to boredom and frustration and in the extent to which they seek feedback (10). This feature of MFFT administration may reduce the sensitivity of the test to individual differences affected by motivation. Computer controlled administration of the MFFT provides invariant feedback, improves the accuracy of recording, especially of short latencies, and facilitates the removal of the stimulus array following each response, thus enabling the valid recording of every response latency.

The availability of a single test form with but 12 items makes assessment of the tests' repeat reliability difficult. Repeated use of the same form may reduce response uncertainty to the point where the second administration is not a valid measure of impulsiveness-reflectiveness (25). Use of a parallel form could overcome some of the problems of repeated use.

The aims of this study are

1. to test the hypothesis that the correlation between latency and errors is higher in first year undergraduates than in school children
2. to devise an automated version of the MFFT and to refine the administration and scoring of the test

APPENDIX D. cont.

3. to develop and assess a parallel form of the adult MFFT
4. to assess the reliability and internal consistency of the test
5. to assess the utility of a method of presentation designed to reduce reliance on memory, feedback from the tester and non-cognitive strategies.

b. Method1. Subjects

Forty eight male and forty eight female first year psychology students (age $x = 19.68$, $sd = 4.41$, range 16 to 39) chose to participate in this experiment.

2. Stimulus material

Form 1 was the adult version of Kagan's MFFT. A parallel form, Form 2², was prepared from the original by choosing a new standard figure from each set of alternatives and changing the remaining figures so as to maintain the existing relationship between the standard and the alternatives. The position of the Form 2 correct alternative was assigned in a quasi-random fashion and the remaining alternatives were randomly assigned to the remaining positions.

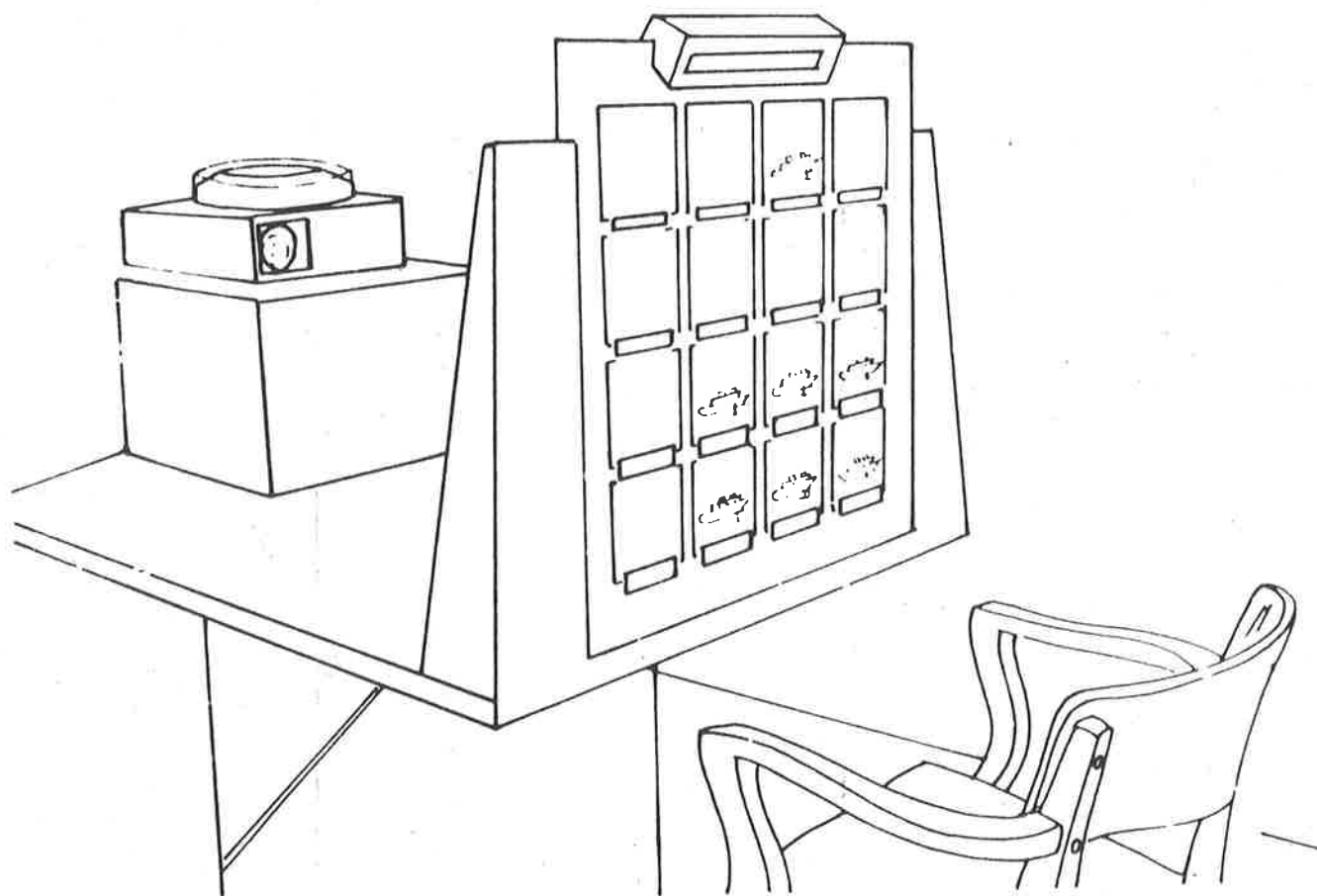
3. Apparatus

A random access carousel projector 720 mm from the back of a translucent screen (472mm x 472 mm) was computer controlled. The screen was divided into an array (4 x 4) of 16 panels, each 108mm x 108mm, separated by black strips, 13 mm wide. A touch sensitive metal strip (88mm x 13mm) allowed automatic recoding of response and latency. The MFFT standard was positioned in a panel in the top row, with the comparison figures in the bottom two rows. A feedback tone (2.8kHz; $\frac{1}{2}$ second duration) was given immediately following each correct response. The apparatus is shown in Figure 2.

4. Procedure

In the standard mode of presentation each of the 12 MFFT items were presented until the subject made a correct response (the preset maximum of 14 errors on any item was not reached by any subject). In the nonstandard mode of presentation each item was presented once, followed by the next item until all twelve had been presented. At the end of the first series, incorrect items were presented again (correct items being dropped from the series) to a maximum of 14 cycles.

FIGURE 2. Experimental apparatus.



In either mode, there was an interval of 1.25 seconds between each response and the onset of the next stimulus.

Subjects were given the following instructions.

"This is a test to see how people make difficult perceptual judgements. I'm going to show you a series of slides of familiar figures. Each slide will have a standard figure in one of the top windows of the touch screen. You are to touch the metal strip beneath the picture on the bottom of the screen that is the same as or most similar to the item at the top of the screen. You will hear a tone if your choice is the correct one".

(The addition of the words "or most similar to" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

"We will use two items for practice. You will see that if you make a mistake you will have additional opportunities".

Subjects were allowed repeated trials on the practice items, and then told

"Now we will do some that are harder, you will see a picture at the top and eight on the bottom. Find the one that is the same as, or most similar to the one on the top and touch the appropriate strip".

After their first run there was a 10 minute rest period, and subjects were instructed that the exercise would be repeated with a different set of slides.

5. Experimental design

Each subject was given the two forms of the test in one of four possible orders of mode of presentation. The experiment conformed to a repeated measures 2 x 2 x 4 counter balanced partially crossed design, (Kirk's (19), SPF-pru.q design an expansion of Winer's (32), model 2) with the runs, two levels of sex, two levels of sequence of forms and four of mode order. Each group consisted of 6 subjects.

a. Measures

The measures computed were

- 1) The sum of latencies of the first response to each of 12 stimulus items
- 2) The mean of all response latencies
- 3) The total number of errors made to 12 items
- 4) The impulsiveness-reflectiveness score
- 5) The efficiency-inefficiency score.

Examination of the results showed that the first response latency measure (1) was no less sensitive than the mean response latency (2) so the results of the latter are not reported here.

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c. Results1. Correlation between latency and errors

A specific prediction of this study was that the correlation between latency and errors would be above that found for children ($r = -.54$, $df = 2189$, $N = 2300$).

The first run correlation between latency and errors was found to be $-.61$. This was not significantly greater than the weighted average r for the 54 child samples. However a one sample χ^2 test showed that the significant preponderance of child studies had lower negative correlations than $-.61$ ($\chi^2 = 7.69$, $df = 1$, $p < .01$) 26 values being lower than, 2 equal to, and 16 higher than the young adult value found by us.

2. Effects of control variables and repeated measures on performance

The results of the repeated measures analysis of variance are shown in Table 1 for all four measures. Because of the large number of F tests, 1% was chosen as the appropriate significance level.

Neither sex nor any of the control variables (between subjects effects) was significant. The repeated measure was significant for three of the four measures, subjects tending to improve their performance, which was faster, more accurate and more efficient on the second run. The proportion of variance accounted for by the repeated measure is directly computable from the Anova results (19). The effect of the repeated runs was greatest for efficiency-inefficiency ($r = .36$; 13% of variance). It was intermediate for errors ($r = .24$; 6% of variance) and lower for latency ($r = .11$; 1% of variance). It was negligible for impulsiveness-reflectiveness ($r = .07$; < 1% of variance).

The interaction between sequence of forms and runs was significant for first response latency and for efficiency-inefficiency. Comparison among the means showed that there was no overall superiority of performance on either form and the slight tendency for Form 2 to be responded to faster than Form 1 on run 1 was not significant ($t = 1.48$). Form 2 was responded to more efficiently than Form 1 on run 2 ($t = 2.47$, $df = 47$, $p < .05$), while the opposite tendency on run 1 did not reach significance ($t = 1.58$).

There was no overall difference between the two modes of presentation. The mean errors and latency were 9.84 and 55.33 (sd 9.25, 30.74) for Run 1 and 5.86 and 49.40 (sd 7.07, 24.83) for Run 2.

TABLE 1 Results of analysis of variance for each of four performance measures.

SOURCE	DF	First response latency		Total errors		Impulsiveness-reflectiveness		Efficiency-inefficiency	
		MS	F	MS	F	MS	F	MS	F
Between subjects	95								
A Sex	1	23.08	0.02	121.93	0.99	2.18	0.38	1.29	0.94
B Sequence of forms	1	663.43	0.47	109.51	0.89	4.66	0.82	0.10	0.07
C Method of presentation	3	2138.83	1.51	200.06	1.62	10.72	1.88	0.33	0.24
A x B	1	25.49	0.02	19.38	0.16	0.11	0.02	0.49	0.36
A x C	3	653.01	0.46	88.85	0.72	2.81	0.49	1.33	0.97
B x C	3	94.86	0.07	34.30	0.28	0.81	0.14	0.40	0.29
A x B x C	3	2867.82	2.03	32.06	0.26	6.49	1.14	1.60	1.16
Subjects within group (error)	80	1412.60		123.61		5.69		1.37	
Within subjects and interaction	96								
D Runs	1	1686.38	11.01**	756.04	46.46**	3.20	5.16	22.27	101.23**
D x A	1	448.83	2.93	11.51	0.72	0.13	0.21	1.34	6.09
D x B	1	1470.86	9.60**	84.01	5.16	0.07	0.11	6.02	27.36**
D x C	3	556.94	3.64	26.98	1.66	1.59	2.56	0.59	2.67
D x A x B	1	102.21	0.67	45.05	2.77	1.34	2.16	0.19	0.86
D x A x C	3	59.24	0.39	4.88	0.30	0.28	0.45	0.01	0.05
D x B x C	3	264.11	1.72	23.52	1.45	1.30	2.10	0.02	0.09
D x A x B x C	3	139.58	0.91	18.34	1.13	0.70	1.13	0.28	1.29
D x subjects within groups (error)	80	153.19		16.27		0.62		0.22	

** p ≤ .01

APPENDIX D. cont.

2. Reliability

The correlations between scores on runs one and two were computed to assess parallel forms reliability. The correlations were then compared, using, where appropriate, a method for non-independent correlations, (formula 10.7, McNemar, (22) p. 140).

TABLE 2. A. Parallel forms reliabilities for each of four measures
B. Comparisons among correlations.

	A	B			
	Correlation	Differences Among Correlations			
	r	1	2	3	4
1. Latency	.78**	-	NS	NS	**
2. Errors	.79**		-	NS	**
3. Impulsiveness-reflectiveness	.83**			-	**
4. Efficiency-inefficiency	.63**				-

It can be seen in Table 2 that the parallel forms reliabilities were significant for all four measures, and acceptably high (.83) for the impulsiveness-reflectiveness score. The efficiency-inefficiency score was significantly less reliable than each of the other measures.

3. Internal consistency

The internal consistencies of each Form were computed by means of an approximation of Kuder Richardson formula 20 (r_{20}) using Cronbach's alpha (6). Table 3 shows that the internal consistencies were acceptably high, for all significant (13).

The contribution of each item to the r_{20} was then assessed, and it was found that neither the impulsiveness-reflectiveness nor the efficiency-inefficiency measure could be made more consistent by eliminating any of the 12 items. This was despite substantial differences in item difficulties. The internal consistency of the combined 24 item test was also high on each of the four measures.

TABLE 3. Internal consistency (r_{20} coefficients) of the MFFT by Form and Measure.

Measure	Form 1 12 items		Form 2 12 items		Form 1 & 2 combined 24 items
	r_{20}	90% confidence limits	r_{20}	90% confidence limits	r_{20}
Latency	.93	.91 to .95	.90	.87 to .91	.95
Errors	.79	.73 to .84	.81	.76 to .85	.87
Impulsiveness-Reflectiveness	.91	.89 to .93	.89	.86 to .92	.94
Efficiency-Inefficiency	.70	.62 to .77	.73	.66 to .79	.80

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Unlike the case of Pearson r , no simple method for comparing r_{20} 's is available. However, Feldt (9) gives a method for calculating the sampling distribution of ρ_{20} (the parameter corresponding to r_{20}) using the F distribution. To test the hypothesis that any two r_{20} 's were sampled from different populations, we calculated the 90% confidence intervals of ρ_{20} and compared the upper limit of the smaller ρ_{20} with the lower limit of the larger ρ_{20} . If these limits were not overlapping we rejected the hypothesis of no difference. Table 3 shows that the internal consistencies are not different from forms 1 and 2 on any of the four measures. The reliabilities for the 24 item test were at or beyond the upper confidence limit of each 12 item test for all four measures.

If measures, rather than forms, are compared, it can be seen that latency is more internally consistent than errors and that impulsiveness - reflectiveness is more consistent than efficiency-inefficiency. This holds whether Form 1 or Form 2 is considered.

To compare a basic measure (latency or errors) with a univariate one (impulsiveness-reflectiveness or efficiency-inefficiency) it is necessary to make use of the coefficients from non-overlapping data, as the two sets of scores are non-independent. Form 1 and Form 2 results are independent, and allow such comparison.

Perusal of Table 3 shows that latency and impulsiveness-reflectiveness were not significantly different in internal consistency (i.e. the confidence intervals were overlapping) and nor were errors and efficiency-inefficiency. However, all other differences were significant. These results suggest that the r_{20} coefficients were sampled from two populations, one being the internal consistency of latency and impulsiveness-reflectiveness and the other being that of errors and efficiency-inefficiency.

The internal consistencies of Forms 1 and 2 were compared with the highest previously reported internal consistencies of the 12 item MFFT, those reported by Block et al, (3). The comparisons are shown in Table 4.

It can be seen that the internal consistency of the latency score is not different from that previously reported, while for the errors score it is significantly greater, whether Form 1 or Form 2 is considered.

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TABLE 4. Internal consistencies of the MFFT: Comparison with previous findings.

Measure	Present Study		Block <u>et al</u> (4)	
	r_{20}	90% C.I.	r_{20}	90% C.I.
latency				
Form 1	.93	.91 to .95	.86	.89 to .92
Form 2	.90	.87 to .91		
errors				
* Form 1	.79	.73 to .79	.52	.62 to .71
* Form 2	.81	.76 to .85		

* Present study and Block's are significantly different since confidence intervals are non-overlapping.

d. Discussion

1. Correlation between latency and errors

The correlation between latency and errors found in this study with adults was higher than that typically found with children. This tends to support Wright and Vlietstra's (33) and Toner et al's (28) view that the speed-accuracy trade off crystalizes during childhood. Cross-sectional studies using properly chosen samples, and with sizeable numbers would be required to demonstrate a growth function in the correlation, while longitudinal studies are needed to resolve the issue of the contribution of cohort, sample, and task to change in speed-accuracy trade-off.

Although the MFFT has overwhelmingly been used with children, it appears to be suitable as a test of cognitive style for adults.

2. Control variables and repeated measures

The main finding of this analysis was that although repeated exposure to the MFFT task resulted in improved performance there was no significant change in the impulsiveness-reflectiveness measure with practice. Additionally the two forms were found to be highly similar despite some apparent learning effects when Form 2 followed Form 1 after a 10 minute interval.

The absence of an overall sex difference in performance contrasts with previous findings using children, since boys have sometimes been found to be slightly more impulsive than

APPENDIX D. cont.

girls (25). This difference could be due to any or combination of a number of factors. The undergraduates used in this study were sampled from the highest achieving 12% of their age cohort who became university students. It is possible that a broader sampling would show sex differences. Alternatively, the sex difference found in children may disappear with maturity.

3. Reliability

The parallel forms reliability of the MFFT adult version is acceptably high, at least for the measure of greatest interest, impulsiveness-reflectiveness. The use of two forms for the assessment of changes appears to be reasonable. The acceptable reliability suggests the comparability of the two forms, however trait stability needs to be assessed.

4. Internal consistency.

The finding of similar internal consistencies for the two forms gives additional evidence for their comparability. Within each form some items were found to be more difficult than others, and this tended to reduce the internal consistency of the errors measure. The possibility exists that items at either extreme of difficulty could be replaced with others which would raise the internal consistency of the errors measure, but this would have little effect on latency or on the impulsiveness-reflectiveness measure. The item analysis showed that subjects tend to maintain a consistent response time across all items, allowing the probability of error to vary with item difficulty. This characteristic appears to be task dependent since there is suggestive evidence (30, 31) that in a simple information processing task subjects maintain a consistent, though individual, probability of errors of commission. Perhaps the apparent similarity of each MFFT comparison figure to the standard discourages subjects from assessing differences in item difficulty and adjusting their response time accordingly from item to item.

The high internal consistency for the 24 item combined form gives further support to the view that both forms measure a single entity.

The reliabilities of the univariate scores found in the present study could not be compared with previous findings because of lack of reported data. The parallel forms reliability of the basic scores were found to be at the upper end of the range of previously reported repeated measures reliabilities, as were the internal consistencies of the latency scores, while the internal consistencies of the errors scores were significantly greater for the present automated adult MFFT used with undergraduates than for the previously reported

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(4) study of school children on the elementary MFFT with standard administration. Whether the improvement is due to the stimulus materials, age of subjects or automated procedure cannot be decided by this study.

The main findings of this study are that the MFFT can be used in an automated version with adults, that the univariate impulsiveness-reflectiveness score computed from the standardized first response latency to each MFFT item and the standardized number of errors is an internally consistent, reliable measure which shows trivial change with immediate retest using a parallel form. The orthogonal univariate score, efficiency-inefficiency, shows substantial practice effects on such retest, but is acceptably internally consistent and reliable. The two forms were found to be highly comparable on all four measures and in internal consistency. The only difference between the two forms was a slight tendency for more efficient performance on Form 2 when this followed Form 1.

An alternative method of presentation designed to reduce reliance on memory and non-cognitive strategies during MFFT performance was found to have little impact on results.

No sex differences were found in first year undergraduates' MFFT performance. The negative correlation between speed and accuracy was found to be higher in these young adults than in most child studies, weakly supporting the view that the tendency to trade-off speed against accuracy increases with age.

Overall the results of the study show that computer-controlled administration is feasible, but its additional data collecting capacity was not required for better interpretation of MFFT results in this study, where the error rate was low. Computer control may be justified on the grounds of great accuracy of data collection, or where massive amounts of testing are required. The parallel forms are comparable enough to allow for before-after studies of cognitive style (with counterbalancing of forms), and the impulsiveness-reflectiveness measure is reliable enough to warrant a search for validity. The results of one such search are reported elsewhere (11).

Footnotes

1. Supported in part by a grant from the Nuffield Foundation, England. We are grateful to Professor J. Kagan of Harvard University, for his permission to reproduce the MFFT figures.
2. Available from the first author.

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APPENDIX E. Cognitive and self-reported impulsiveness:
Comparison of Kagan's MFFT and Eysenck's
EPQ and impulsiveness measures.¹

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Summary

Cognitive impulsiveness as measured by Kagan's Matching Familiar Figures Test (MFFT) has come to be regarded as trait-like construct, despite repeated queries of this overgeneralisation.

The appropriateness of the 'impulsive' label for fast-inaccurate MFFT performance was assessed by measuring MFFT performance along with response to questionnaire items traditionally used to measure impulsiveness, and available measures of the subjects' performance as students.

Fast-inaccurate responders on the MFFT were found to agree with description of themselves as risk-taking, lively, and impulsive, and their tutors tended to agree with them about their unconscientiousness. However these relationships were never strong, were partly due to a response acquiescence set, and were about as great for MFFT errors as MFFT impulsiveness.

Fast-inaccurate MFFT performance should be regarded as a measure of cognitive style, not socially relevant impulsiveness.

A. Introduction

In the area of children's cognitive style differences, performance on Kagan's Matching Familiar Figures Test (MFFT) (Kagan et al., 14) dominates the field. Block, Block and Harrington (5) attribute this high level of interest to the 'great surplus meaning and implication of the terms reflective and impulsive'. In study after study, where the MFFT has been used, impulsive children have been characterised in general trait terms, although the evidence for such generalization is tenuous.

Thus 'impulsive' children (i.e. those whose performance on the MFFT is both fast and inaccurate) have been described as "likely to display momentary lapses of attention during involvement in a school task" (14, p. 29) and "spending more time in gross

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motor activity than the non-impulsives (14, p. 30). The tendencies were attributed to "constitutional predispositions, degree of involvement in tasks, and expectation of failure" (14, p. 33). In a recent paper (27, p. 59) Rotenberg and Nashon state that impulsiveness usually refers to "generalized state of high arousal which is characterised by hasty responsiveness, carefreeness, impatience or low impulse control", and draw attention to the looseness of this formulation. Scrutiny of the publications of the fourteen intervening years reveals very limited substance to the claims that MFFT impulsiveness-reflectiveness has trait-like properties additional to those of general mental maturity, with which it is moderately correlated in children (16, 17). While differences in task performance of MFFT impulsive and reflective children have shown in numerous studies (see Messer's review, 21) and in a few of these, the findings are not referable simply to the mental age covariate, the balance of studies suggests that, when general cognitive level is partialled out, differences in task performance between impulsive and reflective children are highly dependent upon the specific nature of the task (28, 30, 32) including the reinforcement and other conditions under which it is carried out (20, 25, 26).

When socially significant, rather than experimental task performance is considered, differences between 'impulsive' and 'reflective' children are even more difficult to specify.

Thus Bentler and McClain (4) found excellent cross-validity between teacher, peer and self ratings of extraversion, test anxiety, impulsiveness and achievement motivation. However when these 12 (3 x 4) variables were correlated with MFFT performance, the number of significant correlations was as expected by chance, and MFFT impulsiveness-reflectiveness did not correlate significantly with any of the 12 rating variables.

Block, Block and Harrington (5) used teacher Q-sorts and found significant differences between the profiles of MFFT impulsive and reflective children, but these were swamped by greater and more numerous differences between the profiles of children with many and few MFFT errors. Other workers have reported significant differences between teacher ratings of MFFT impulsive and reflective children (18, 22) but the better controlled and described studies show few differences (23, 4). When grossly different groups are compared, significant differences on MFFT impulsiveness-reflectiveness have been found in the expected direction for delinquents, (27) hyperactive patients, (7, 29) and behaviour problem children, (31). Since such selected groups differ from unselected or normal children on many parameters, demonstration of gross differences gives only limited support to the notion of a socially significant trait indexed by MFFT performance. Impulsiveness is a key concept to both the understanding of and the recognition of attention

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deficit disorder or hyperkinetic impulse disorder (2,12). Since the concept of impulsiveness includes both cognitive style and socially relevant trait aspects, the disentanglement of the latter has practical as well as theoretical import.

The aim of this paper is to assess the relationship between MFFT performance and self-ratings on items 'traditionally used to measure impulsiveness' (10, p. 57) and thus to assess the appropriateness of the 'impulsiveness' label for fast-inaccurate MFFT performance. In addition, the relationship of these variables to some aspects of the subjects' actual behaviour in the performance of his or her student role is assessed.

B. Method

1. Subjects

Subjects were psychology undergraduates, 48 men, 48 women, (age $X = 19.68$, s.d. = 4.41, range = 16-39).

2. Measures

a. Kagan's Matching Familiar Figures Test for Adults

This was used for half of the subjects, and a parallel form² was used for the remainder. A previous report (13) shows that the forms are comparable. The administration was computer-controlled. Measures used in this analysis were mean response latency for the first response to each of the 12 stimulus arrays. Only data relevant to the first two runs in the previously reported study (13) are reported here.

b. The Eysenck Personality Questionnaire

The EPQ with the interpolation of 49 items that have been used in various factor analytic studies of impulsiveness (10) was used. Exact item wordings are given in tables 1-5 below.

c. Additional measures

The performance of each student in Psychology I was found from academic records. Where students withdrew from the course before the end of the year, no adjustment to the score was made, thus dropouts would tend to score low.

The conscientiousness of each student's performance of his role was rated (1 - 7) by each tutor, demonstrator or lecturer who knew him or her³. Raters were independent and blind to the results of the study. For all but a few students, multiple ratings were available and these were averaged.

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Promptness of the subject in arriving for the experimental session and returning the questionnaire to the experimenters was rated on a 0 - 1 scale. Subjects who failed to attend at the times they themselves had nominated, who were 15 or more minutes late, or who failed to return the questionnaire without a follow up letter were scored 0. Prompt subjects were scored 1. No account was taken of reasons for delay. The rationale for inclusion of these measures was to sample real-life behaviour as well as performance and self-report.

3. Procedure

The MFFT was administered individually using a computer-controlled apparatus (13). Following this the subject was handed the EPQ - impulsiveness questionnaire and asked to return it when complete. Some subjects completed it immediately, in the area adjacent to the test room.

4. Method of Analysis

a. MFFT

Computation of impulsiveness and efficiency was made by adding and subtracting (respectively) the standardized time and errors scores. Standard scores were computed from the sample data. To aid interpretation, the signs of the scores were changed so that high scores represent impulsiveness and efficiency in this paper.

b. Questionnaire data

EPQ items were scored as directed in the manual. However, scale scores with missing items were scaled up proportionately since the EPQ manual (9) assumes no missing data. The 49 impulsiveness items were subjected to principal component analysis. (SPSS PAL; 24) for the 86 subjects with complete item data, and seventeen factors with eigen values ≥ 1 , accounting for 71.1% of variance were extracted. Use of Cattell's (8) scree criterion suggested that 10 factors, accounting for 55.2% of variance should be extracted and rotated. However to replicate Eysenck and Eysenck's study (10) we rotated and interpreted four factors, accounting for 32.6% of initially extracted variance. Varimax rotation with Kaiser normalization was used. A previous run, using Promax, (Ofprot, IMSL, 15) produced unclear results. The factor results are shown in Tables 1-5, and the classification of each item as reported by Eysenck and Eysenck (10) is given to facilitate comparison.

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TABLE 1. Rotated factor matrix.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR I Narrow Impulsiveness			
		I	II	III	IV
Narrow - Impulsiveness	Do you generally do and say things without stopping to think?	64	11	17	12
Narrow - Impulsiveness	Do you get so "carried away" by new exciting ideas that you never think of possible snags?	63	17	02	-20
Narrow - Impulsiveness	Do you often get into a jam because you do things without thinking?	63	-03	05	-15
Narrow - Impulsiveness	Do you usually think carefully before doing anything?	-61	-04	-10	27
Narrow - Impulsiveness	Do you mostly speak before thinking things out?	54	-06	-15	08
Risk - Taking	Do you often change your interests?	53	16	-07	28
Narrow - Impulsiveness	Are you an impulsive person?	52	26	33	-12
Risk - Taking	Do you often long for excitement?	48	20	09	-10
Narrow - Impulsiveness	Do you need to use a lot of self-control to keep out of trouble?	47	03	-04	15
Narrow - Impulsiveness	Do you often get involved in things you later wish you could get out of?	38	-01	00	00
Excluded	When you want to buy something expensive can you save up for some time patiently?	-37	-28	31	30
Narrow - Impulsiveness	Do you get extremely impatient if you are kept waiting by someone who is late?	36	-12	-11	27
Excluded	When you meet new people, do you very quickly decide whether you like them or not?	36	-10	-01	-08
Narrow - Impulsiveness	Do you often do things on the spur of the moment?	35	33	24	-09

Note: Decimal points deleted

APPENDIX E cont.

TABLE 2. Rotated factor matrix.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR			
		I	II	III	IV
Non - Planning	Would you agree that planning things ahead takes the fun out of life?	13	69	-04	-06
Non - Planning	Do you think an evening out is more successful if it is unplanned or arranged at the last moment?	10	59	00	11
Non - Planning	Do you like planning things well ahead of time?	10	-58	19	13
Non - Planning	If it were practically possible would you like to live each day as it comes along?	05	58	-05	-06
Non - Planning	Do you prefer activities that just happen to those planned in advance?	18	54	10	-08
Non - Planning	Would you rather plan things than do things?	30	-52	-13	03
Risk - Taking	Would you enjoy fast driving?	21	47	11	08
Risk - Taking	Would you prefer a job involving change, travel and variety even though it might be insecure?	-15	43	12	-30
Risk - Taking	Do you get bored more easily than most people, doing the same old things?	25	41	03	-15
Excluded	Do you generally feel that things will sort themselves out and come right in the end somehow?	-14	37	22	-08
Non - Planning	Would you make quite sure you had another job before giving up your old one?	15	-36	-11	39
Excluded	Do you know what you will be doing on your next holiday?	-13	31	-08	-05
Risk - Taking	Would you do almost anything for a dare?	17	31	29	-08

Note: Decimal points deleted

APPENDIX E cont.

TABLE 3. Rotated factor matrix.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR III Lively - Optimistic			
		I	II	III	IV
Liveliness	Can you make decisions quickly?	-25	-08	69	-17
Liveliness	Are you usually carefree?	06	04	62	-01
Liveliness	Do you usually make up your mind quickly?	03	-20	58	-49
Risk - Taking	Would life with no danger in it be too dull for you?	11	25	52	03
Risk - Taking	Do you quite enjoy taking risks?	28	35	50	-24
Risk - Taking	When the odds are against you, do you still usually think it worth taking a chance?	21	19	49	07
Liveliness	Can you put your thoughts into words quickly?	-15	-19	45	03
Non - Planning	Are you rather cautious in unusual situations?	-23	-28	-35	13

Note: Decimal points deleted

TABLE 4. Rotated factor matrix.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR IV Careful			
		I	II	III	IV
Non - Planning	When buying things do you usually worry about the guarantee?	06	-07	-21	54
Narrow - Impulsiveness	Do you hate standing in a long queue for anything?	18	04	-29	-54
Narrow - Impulsiveness	Before making up your mind do you carefully consider all the advantages and disadvantages?	-35	-05	-12	54
Excluded	Do you prefer work that needs close attention most of the time?	-05	06	02	52
Non - Planning	When you go on a trip do you like to plan routes and time-tables carefully?	19	-49	15	51

continued.

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TABLE 4. cont.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR			
		I	II	III	IV
Liveliness	Do you prefer to "sleep on it" before making decisions?	-14	-02	-38	45
Non - Planning	Do you save regularly?	-10	-16	11	42
Narrow - Impulsiveness	Do you often buy things on impulse?	40	06	16	-42
Non - Planning	Are you an easy-going person, not generally bothered about having everything 'just so'?	-22	38	20	-40

Note: Decimal points deleted

TABLE 5. Rotated factor loadings of impulsiveness items with no material loading on any factor.

EYSENCK CLASSIFICATION	ITEM WORDING	FACTOR			
		I	II	III	IV
Risk - Taking	Would you enjoy parachute jumping?	23	21	30	27
Risk - Taking	When on holiday, do you look for relaxation instead of excitement?	-27	-17	-22	-02
Excluded	Would you agree that even young children have to learn to cross roads by themselves?	17	08	17	11
Liveliness	Are you slow and unhurried in the way you move?	02	12	01	15
Non - Planning	Would regular health checks make you feel better?	02	11	-14	-05

Note: Decimal points deleted. The inclusion of an item with a factor loading apparently above the criterion for a material loading ($\geq .30$) results from rounding.

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It can be seen (Table 1) that the first factor, Narrow-Impulsiveness, corresponds quite well to the previously identified factor with the same name. Table 2 shows that Factor II, Non-Planning, also corresponds to the previously reported factor with the same name. However, it includes a component that was included with Risk-Taking items in the Eysencks' study (10). Table 3 shows that Factor III, Lively-Optimism, combines the remaining Risk-Taking items with the items previously identified as measuring Liveliness. Factor IV, Indecisive (see Table 4) combines items previously identified as Non-Planning and Narrow-Impulsiveness. Thus, for these subjects, the Risk-Taking factor is distributed among the other factors, but three of the four impulsiveness factors identified by Eysenck and Eysenck (10) were found. Table 5 shows items with no material ($\geq .30$) loading on any factor.

Further analysis of the impulsiveness questionnaire data was based not on the factor results of the present study, but on the four impulsiveness scales constructed by Eysenck and Eysenck (10) on the basis of their series of three studies. This was done in order to make the results more generalizable. The previous sub-scale classification (10) has to be preferred on the grounds that it was based on successive studies with an aggregate of 2107 subjects. To compute the questionnaire impulsiveness scores, items were equally weighted and scale scores were averaged up to adjust for missing item data. Item content can be gleaned from scrutiny of Table 1 - 5.

c. Relationships among variables and sets of variables

Variables were intercorrelated using the product-moment correlation. Since it was notable that many of the impulsiveness questionnaire items were scored in the same direction (YES being the impulsive answer) the subject's bias toward YES was found over all 139 items (once again averaging up to correct for missing items) and the partial correlation matrix was computed, with the effects of response bias removed.

In order to construct a self-description vignette of impulsive responders on the MFFT, the 139 available questionnaire items were correlated with MFFT impulsiveness, and from the highest correlating items, a scale to correlate as highly as possible with the criterion was constructed. The scale had to be internally consistent (coefficient alpha $\geq .70$) and no item could be included if it reduced alpha. Moreover items were to be equally weighted. This procedure reduced the capitalization on chance relationships that is inherent when many correlates are available.

A similar exercise was carried out for MFFT errors. Of many possible solutions, those with the highest correlation with the relevant criterion (MFFT impulsiveness or error) were chosen.

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C. Resultsa. MFFT

The means and standard deviations of first response latency, and errors were as follows. Mean latency = 55.33 seconds (s.d. = 30.73), mean errors = 9.84 (s.d. = 9.25). The correlation between latency and errors was $-.61$.

b. Questionnaire data

The means and standard deviations of the traditional EPQ measures, and the four impulsiveness measures are shown in Table 6.

TABLE 6. Means and standard deviations by sex of 96 subjects on Eysenck Personality Questionnaire and Impulsiveness Questionnaire variables.

VARIABLE	Males		Females		Persons	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
<u>EPQ Variables</u>						
Psychoticism	4.0	3.0	3.8*	2.4	3.9	2.7
Extraversion	12.7*	4.9	13.1	4.8	12.9	4.8
Neuroticism	11.1	5.4	12.7	5.6	11.9	5.5
Lie	6.1	3.8	5.9*	3.5	6.0	3.7
<u>Impulsiveness Questionnaire</u>						
Narrow - Impulsiveness	5.6*	2.9	6.0	3.5	5.8	3.2
Risk - Taking	6.5	2.6	5.5	2.5	6.0	2.6
Non - Planning	7.3	3.1	7.1	2.7	7.2	2.9
Liveliness	3.1	1.8	3.2	1.6	3.1	1.7

Note: *Significantly different from EPQ or Impulsiveness norms, see text. No sex differences were significant.

It can be seen that no sex differences were significant. In most cases, the EPQ scores for the sample were close to the relevant normative age (16-19, 20-29) and sex groups. There were three exceptions. The female students in this study had significantly higher Psychoticism scores than either of the relevant normative groups. The females also had lower Lie scores than the older relevant normative group. The males had significantly lower Extraversion scores than the younger normative group.

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The questionnaire impulsiveness scores were similar to those previously reported (10), the only exception being that the males in this sample scored significantly lower on Narrow - Impulsiveness.

c. Relationships between MFFT and other variables

The correlations between the four MFFT variables and EPQ questionnaire impulsiveness, and student role performance variables are shown in Table 7. With 44 correlations reported, one expects about two to be significant by chance. Fifteen significant correlations ($p \leq .05$, two-tailed) were found.

TABLE 7. Correlations for 96 subjects, between MFFT, Eysenck Personality Questionnaire, Impulsiveness Questionnaire, and Student Role Performance Variables.

	MFFT Variables			
	Time	Errors	Impulsiveness	Efficiency
<u>Eysenck Personality Questionnaire</u>				
Psychoticism	-.16	<u>.21</u>	<u>.21</u>	-.09
Extraversion	-.15	.15	.17	.15
Neuroticism	-.18	<u>.23</u>	<u>.23</u>	-.01
Lie	.17	-.05	-.13	-.03
<u>Questionnaire Impulsiveness</u>				
Narrow-Impulsiveness	-.19	<u>.29</u>	<u>.27</u>	-.09
Risk-Taking	<u>-.29</u>	<u>.33</u>	<u>.34</u>	.03
Non-Planning	.04	-.03	-.04	.08
Liveliness	-.15	<u>.26</u>	<u>.26</u>	-.06
<u>Student Role Performance</u>				
Psychology I Assessment	.17	-.15	-.18	<u>.21</u>
Rated Conscientiousness	.16	<u>-.27</u>	<u>-.24</u>	.12
Promptness of Participation in Experiment	<u>-.22</u>	.11	-.18	.12

Note: Significant values underlined (two-tailed test, $p \leq .05$) where $p \leq .01$, number is doubly underlined.

First to be noted is that twelve of the significant correlations were between MFFT impulsiveness or MFFT errors and other variables. Only two and one (respectively) significant correlations between MFFT time and efficiency and other variables

APPENDIX E cont.

were found. Moreover, the patterns of correlations between MFFT impulsiveness and MFFT errors were strikingly similar.

The EPQ variables Psychoticism and Neuroticism both correlated positively and significantly with both MFFT errors and MFFT impulsiveness. The remaining EPQ variables, namely Extraversion and Lie, did not correlate significantly with any MFFT variable.

The questionnaire impulsiveness variables, in three out of the four cases, correlated significantly and moderately with the MFFT variables, and in the expected direction. Thus Risk-Taking correlated $-.29$ with MFFT time, $+.33$ with MFFT errors and $+.34$ with MFFT impulsiveness. Narrow impulsiveness showed a similar pattern of correlations, but with somewhat lower correlation coefficient, and Liveliness had a similar pattern to Narrow impulsiveness. The Non-Planning scale did not correlate significantly with the MFFT variables.

The student role performance measures showed no interesting pattern of relationships with MFFT performance. Psychology I performance correlated significantly and positively with MFFT efficiency. Although the size of the correlation was modest ($.21$), the MFFT efficiency score contains little variance, (since it consists of the difference between positively correlated scores) and was expected to be insensitive to individual differences. The tutors' ratings of student conscientiousness showed a broadly similar pattern of correlations with MFFT variables to those shown by the questionnaire measures of narrow impulsiveness or liveliness (except that the direction of correlations was reversed as expected). The subjects' promptness showed a different pattern, since promptness was significantly associated with fast performance on the MFFT.

McNemar's (19) formula for comparison of non-independent correlations shows that the largest correlation, that between MFFT impulsiveness and questionnaire Risk Taking, was not significantly higher than the smallest significant correlation between MFFT impulsiveness and any other variable. Thus it is reasonable to regard the correlations of Table 6 as falling into two classes, those above and those below $.20$, and not to place too much importance on the fact that some of the significant correlations appear to be higher than others.

d. Item analysis, MFFT impulsiveness, and MFFT errors

An internally consistent ($\alpha = .72$) scale based on EPQ and impulsiveness questionnaire items, and designed to correlate with MFFT impulsiveness was constructed. It is shown in Table 8. The complementary scale to correlate with MFFT errors is shown in Table 9.

APPENDIX E cont.

TABLE 8. A post hoc scale to correlate with MFFT impulsiveness.

ITEM WORDING	CATEGORY	YES/NO	CORRELATION
Would you call yourself tense or highly strung?	Neuroticism	Yes	.36
Do you often long for excitement?	Risk Taking	Yes	.35
Does your mood often go up and down?	Neuroticism	Yes	.33
Would life with no danger in it be too dull for you?	Risk Taking	Yes	.33
Do you suffer from 'nerves'?	Neuroticism	Yes	.33
Have you ever taken the praise for something you knew someone else had really done?	Lie (opposite direction)	Yes	.31
When the odds are against you, do you still usually think it worth taking a chance?	Risk Taking	Yes	.30
Are you an impulsive person?	Narrow impulsiveness	Yes	.30
Do you nearly always have a "ready answer" when people talk to you?	Extraversion	Yes	.27
Do you stop to think things over before doing anything?	Psychoticism	No	.27
Are you rather cautious in unusual situations?	Non-planning	No	.26
Do you like plenty of bustle and excitement around you?	Extraversion	Yes	.24
Have you ever cheated at a game?	Lie (opposite direction)	Yes	.23
Do you often buy things on impulse?	Narrow impulsiveness	Yes	.23
Do you lock up your house carefully at night?	Psychoticism	No	.22
Do you sometimes talk about things you know nothing about?	Lie (opposite direction)	Yes	.22
Do you often change your interests?	Risk Taking	Yes	.22

Coefficient alpha for 17 item scale = .72
 Correlation with MFFT impulsiveness = .64

APPENDIX E cont.

TABLE 9. A post hoc scale to correlate with MFFT errors.

ITEM WORDING	CATEGORY	YES/NO	CORRELATION
Do you suffer from 'nerves'?	Neuroticism	Yes	.34
Would you call yourself tense or highly strung?	Neuroticism	Yes	.33
Do you lock up your house carefully at night?	Psychoticism	No	.31
When the odds are against you, do you still usually think it worth taking a chance?	Risk Taking	Yes	.28
Would life with no danger in it be too dull for you?	Risk Taking	Yes	.27
Are you an impulsive person?	Narrow impulsiveness	Yes	.27
Do you stop to think things over before doing anything?	Psychoticism	No	.27
Do you often long for excitement?	Risk Taking	Yes	.27
Do you quite enjoy taking risks?	Risk Taking	Yes	.25
Do you often buy things on impulse?	Narrow impulsiveness	Yes	.23
Do you often feel life is very dull?	Neuroticism	Yes	.23

Coefficient alpha for an 11 item scale = .72
Correlation with MFFT errors = .51

The correlation between the empirical sub-scale for predicting MFFT impulsiveness and its criterion was .64. It can be seen that six of the twelve items were from the set of impulsiveness items, with Risk-Taking being represented by four items, Narrow Impulsiveness by two, and Non-Planning by one. The remaining items were from the EPQ, with Neuroticism contributing three items and Psychoticism and Extraversion two items each. The Lie scale contributed three items, and it is notable that these were scored in the opposite direction, suggesting an association between admission of imperfection and fast-inaccurate MFFT performance.

A similar attempt to build a scale to predict MFFT errors from questionnaire responses gave rather similar results, ($\alpha = .72$ for an 11 item scale, $r = .51$) with nine items being included in both scales.

Since for the majority of these discriminating items, the YES response was associated with impulsiveness, an examination of response bias was made.

Most variables were found to be significantly associated with response bias. EPQ Psychoticism, Extraversion and Neuroticism, questionnaire Narrow-Impulsiveness and Risk-Taking, and MFFT errors and impulsiveness were all significantly correlated with bias towards acquiescence, while the opposite tendency, towards negativness, was significantly associated with EPQ Lie score, MFFT time, Psychology I performance and Promptness of participation in the experiment. In the case of questionnaire variables of course, response bias is confounded by the inclusion of some responses in both measures. The clearest example of this is EPQ Neuroticism, where the Neuroticism score comprises of YES responses to the 23 relevant items, and the acquiescence score is the Neuroticism score plus the number of YES responses to the remaining 116 items (i.e. it is a part-whole correlation). No other questionnaire measure consisted entirely of YES items, but nor is any of them balanced with regard to scoring direction. The present form of the EPQ and impulsiveness questionnaire does not allow response bias to be unconfounded.

When the partial correlations between MFFT and other variables, controlling the response bias, were computed, the effect on the relationships was profound.

Thirteen of the fifteen significant relationships dropped to non-significant, while only the relationships between MFFT errors and questionnaire Liveliness on the one hand, and MFFT errors and rated conscientiousness on the other remained significant (.22 and -.23; respectively, d.f. = 93, $p \leq .05$ two-tailed). An example will clarify this effect. MFFT impulsiveness accounted for about 12% of variance of questionnaire Risk-Taking. When the influence of response bias was controlled, this dropped to about 1% of variance.

Since the reflective-impulsive dimension of cognitive style is supposed to be observable in conditions of high response uncertainty, the hypothesis was entertained that for impulsive subjects, acquiescence to questionnaire items might be associated with item difficulty. Item difficulty was consequently assessed, using the criterion of syllables per item, (an approximation to the readability formula of Fry (11)). The first author and a research assistant independently assessed item length. The few disagreements were reconciled by a phoneticist. Sentence (item) length was not found to be significantly associated with acquiescence, nor with a high correlation between acquiescence and MFFT impulsiveness.

D. Discussiona. MFFT

Because of the automated procedure, it is difficult to know whether the first response latency and errors measures are comparable with those found in other adult MFFT studies. However, the correlation, of $-.61$, was certainly stronger than that found in the majority of child studies (13), and equalled that reported for undergraduates by Butter and Vallano (6).

b. Questionnaire measures

EPQ results for this group of subjects were reasonably similar to those of Eysenck and Eysenck's normative groups. However the study revealed two technical problems with the instrument, namely the absence of data on or a standard procedure for dealing with missing questionnaire responses, and confounding of response bias with EPQ scale scores. Although it is true that in constructing the instrument its authors have concentrated on the discriminative power of items, it would appear to be useful to be able to unconfound acquiescence from other variables. With respect to the impulsiveness items, this study confirmed the view that questionnaire impulsiveness is factorially complex, and identified three of Eysenck and Eysenck's (10) four impulsiveness factors. Once again it is unfortunate that the set of impulsiveness items is not balanced for response bias.

c. Relationships between MFFT and other variables

With respect to the relationships between MFFT performance and questionnaire variables, it is true that MFFT impulsiveness correlated significantly with three of the four questionnaire impulsiveness variables, however the correlations with EPQ Psychoticism and Neuroticism were not significantly lower. It is also notable that, judging from criterion validity, MFFT errors is no worse as a measure of an impulsiveness trait than MFFT impulsiveness. The failure of the Non-Planning variable to correlate significantly with MFFT variables is partly accounted for by response bias, since it is the only questionnaire variable in the set that has a majority of NO items. It is important to note, though that this lack of balance in item direction did not eradicate an otherwise important relationship, rather it merely failed to produce an artefactual one.

The inclusion of available data on the subjects' socially significant behaviour, such as their promptness of experimental participation, and behaviour as seen by others (rated conscientiousness) proved to be useful in aiding interpretation of the data. Thus response acquiescence emerged from this study as having some trait-like properties, since it correlated significantly (negatively) with promptness and with the MFFT variables time (negatively) errors, and impulsiveness, as well as the questionnaire variables with which it is confounded.

APPENDIX E cont.

In this respect the characterisation of MFFT impulsive subjects is refined: fast-inaccurate responders on the MFFT tend to agree with questionnaire items, especially when they describe risk-taking, lively, and socially disapproved behaviour, they agree with the statement "I am an impulsive person" and with many other statements describing undeliberate, unconscientious behaviour. Moreover their Psychology I teachers would tend to agree with them about their unconscientiousness. However, these relationships never achieve a substantial size, such that the various measures (MFFT impulsiveness, questionnaire impulsiveness, etc.) could be said to be measuring the same thing. MFFT errors emerges as about as adequate a measure of impulsive, lively, undeliberate, acquiescent behaviour as is MFFT impulsiveness.

Two conclusions emerge. The first is that acquiescence, a significant aspect of response style, must be taken into account in questionnaire studies. Perhaps analyses of questionnaire data that make use of signal detection theory will be capable of resolving this confounding. The second is that MFFT errors is as good (or bad) a measure of socially significant impulsive behaviour as MFFT impulsiveness, at least for these young adults. It will clarify work in this area if fast-inaccurate MFFT performance is divested of its excess meaning, and returned to its initial status as a measure of cognitive style on information processing tasks where there is high response uncertainty.

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Footnotes

1. Supported in part by the Nuffield Foundation, England and the Channel 10 Children's Medical Research Foundation, Inc., Adelaide, Australia. We are grateful to Professor J. Kagan of Harvard University, for permission to reproduce the MFFT figures, and to Dr. S.B.G. & Professor H.J. Eysenck, Institute of Psychiatry, University of London, for making available the impulsiveness questionnaire items.
2. Copy available of request.
3. Copy of protocol available on request.

APPENDIX F. Introductory letter to the Director of
 Correctional Services from R. Lange.

Department of Psychology

The Director,
Department of Correctional Services,
I.A.C. Building,
345 King William Street,
ADELAIDE

19 October, 1978

Dear Sir,

I am a postgraduate student at this University.
As part of the research for my doctorate in Psychology
I would like to undertake some testing of remand prisoners.

I have had a preliminary meeting with Mr. Michael
Scaundrette-Smith of your Department. An outcome of
that meeting is the attached research proposal which I
submit for your inspection.

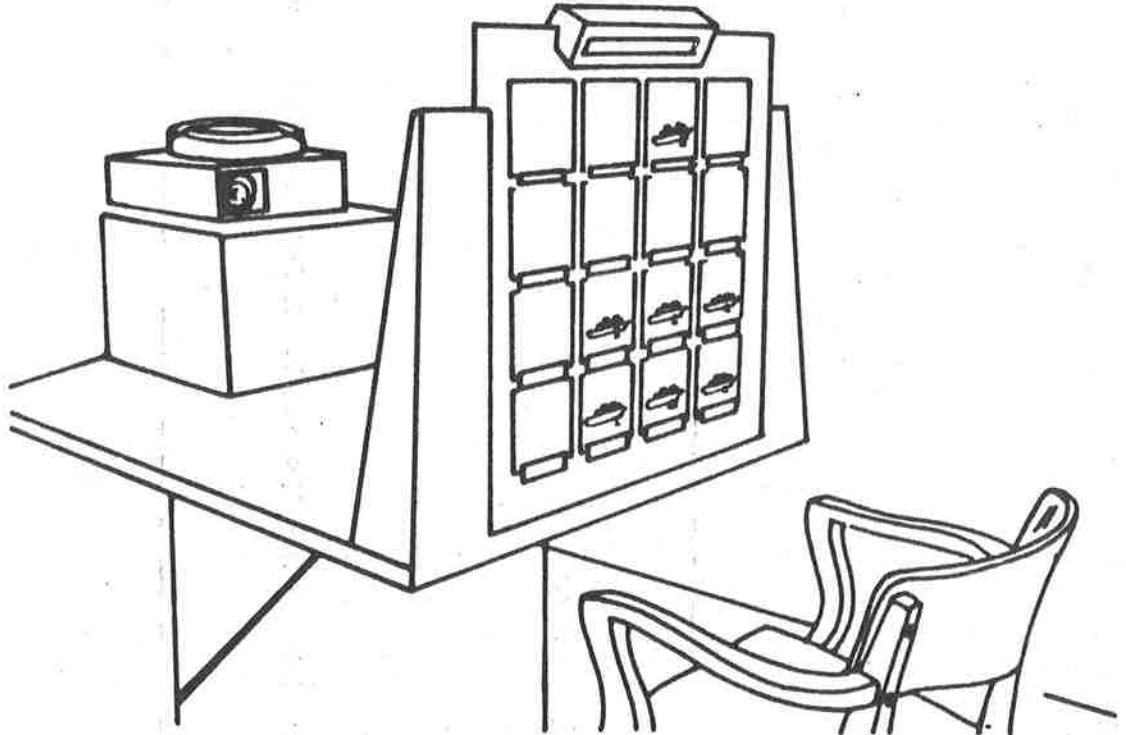
My supervisors in this study will be Professor
P. Glow (233 4333, Ext. 2258) and Dr. J.M. Innes (223 4333,
Ext. 2266). Should you require additional information
concerning the proposed research programme I am available
for further meetings and can be contacted via the Department
of Psychology. Alternatively you may wish to contact one
or both of my supervisors via the above telephone numbers.
I look forward to your reply.

Yours faithfully,

R. Lange, B.A. (Hons.)

Hi,

My name is Bob Lange and I am a student at Adelaide University. I *need* your help for some research that I am doing. I am looking at the way in which people make judgements in different situations. For example, in the figure below, how fast or slow, accurate or inaccurate people are in matching one figure from a selection of figures which which are similar to it.



I am also interested in the way people feel about the authorities in our society.

I am looking for *volunteers* to give me some of their time. The amount of time involved is not large; in the order of 60 to 90 minutes for each person.

The tasks are *not difficult* and consist mainly of game like puzzle solving problems. Some of them consist of viewing a number of slides and making judgements about them. Others consist of questionnaires to find out the way certain important events in society affect different people.

I am looking at the characteristics of different groups of people on these various tasks. All the information will be treated with care and there will be no way prison officers could identify your own results.

If you decide to participate please give your name to your chief. I will then contact you and arrange a suitable time period. You will not lose money for any work that you may miss.

At the end, when all people have finished, it will be made clear to those who require additional information, how they went on the tasks.

If you would like more information, please give me your name so that I can show you the equipment and discuss the tasks with you in more detail.

I would appreciate it if as many of you as possible would volunteer. Please come to the visitors interviewing room and have a chat and a cup of coffee.

Bob Lange

APPENDIX H. Prisoner personal data inventory.

Name _____

1. FIRST OFFENCE

	YEARS	MONTHS
<u>AGE</u>	<input type="text"/>	<input type="text"/>
<u>TYPE OF OFFENCE</u>		
1. Homicide		<input type="text"/> 1
2. Assault		<input type="text"/> 2
3. Robbery, Extortion		<input type="text"/> 3
4. Fraud, Forgery, Misappropriation		<input type="text"/> 4
5. Theft, Breaking and Entering		<input type="text"/> 5
6. Property Damage		<input type="text"/> 6
7. Driving and Related Offences		<input type="text"/> 7
8. Drug Offences		<input type="text"/> 8
9. Other Offences		<input type="text"/> 9
<u>OUTCOME</u>		
1. Discharged		<input type="text"/> 1
2. Bond		<input type="text"/> 2
3. Imprisoned		<input type="text"/> 3

2. FIRST TIME IMPRISONED

	YEARS	MONTHS
<u>AGE</u>	<input type="text"/>	<input type="text"/>
<u>TYPE OF OFFENCE</u>		
1. Homicide		<input type="text"/> 1
2. Assault		<input type="text"/> 2
3. Robbery, Extortion		<input type="text"/> 3

- 4. Fraud, Forgery, Misappropriation 4
- 5. Theft, Breaking and Entering 5
- 6. Property Damage 6
- 7. Driving and Related Offences 7
- 8. Drug Offences 8
- 9. Other Offences 9

LENGTH OF SENTENCE

- 1. Less 1 month 1
- 2. 1 - 6 months 2
- 3. 7 - 12 months 3
- 4. 13 - 24 months 4
- 5. 25 - 36 months 5
- 6. 37 - 48 months 6
- 7. 49 - 60 months 7
- 8. More than 60 months 8

3. CURRENT OFFENCE

AGE

YEARS

MONTHS

TYPE OF OFFENCE

- 1. Homicide 1
- 2. Assault 2
- 3. Robbery, Extortion 3
- 4. Fraud, Forgery, Misappropriation 4
- 5. Theft, Breaking and Entering 5
- 6. Property Damage 6
- 7. Driving and Related Offences 7
- 8. Drug Offences 8
- 9. Other Offences 9

DATE OF ADMISSION

DAY

MONTH

YEAR

4. JUVENILE OFFENCES (Under 18 Years)

NUMBER OF OFFENCES

0	None	<input type="text"/>	0
1	One	<input type="text"/>	1
2	Two	<input type="text"/>	2
3	Three	<input type="text"/>	3
4	Four	<input type="text"/>	4
5	Five	<input type="text"/>	5
6	Six or More	<input type="text"/>	6

TYPE OF OFFENCE

1	Homicide	<input type="text"/>	1
2	Assault	<input type="text"/>	2
3	Robbery, Extortion	<input type="text"/>	3
4	Fraud, Forgery, Misappropriation	<input type="text"/>	4
5	Theft, Breaking and Entering	<input type="text"/>	5
6	Property Damage	<input type="text"/>	6
7	Driving and Related Offences	<input type="text"/>	7
8	Drug Offences	<input type="text"/>	8
9	Other Offences	<input type="text"/>	9

5. ADULT OFFENCES (Over 18 Years)

NUMBER OF OFFENCES

1	One	<input type="text"/>	1
2	Two	<input type="text"/>	2
3	Three	<input type="text"/>	3
4	Four	<input type="text"/>	4
5	Five	<input type="text"/>	5
6	Six or More	<input type="text"/>	6

TYPE OF OFFENCE

- | | | | |
|---|----------------------------------|----------------------|---|
| 1 | Homicide | <input type="text"/> | 1 |
| 2 | Assault | <input type="text"/> | 2 |
| 3 | Robbery, Extortion | <input type="text"/> | 3 |
| 4 | Fraud, Forgery, Misappropriation | <input type="text"/> | 4 |
| 5 | Theft, Breaking and Entering | <input type="text"/> | 5 |
| 6 | Property Damage | <input type="text"/> | 6 |
| 7 | Driving and Related Offences | <input type="text"/> | 7 |
| 8 | Drug Offences | <input type="text"/> | 8 |
| 9 | Other Offences | <input type="text"/> | 9 |

6. EDUCATION

LEVEL OF SCHOOLING

- | | | | |
|---|--|----------------------|---|
| 1 | Graduate or Professional Training | <input type="text"/> | 1 |
| 2 | College or University Graduate | <input type="text"/> | 2 |
| 3 | Partial College or University Graduate | <input type="text"/> | 3 |
| 4 | High School Graduate, Matriculation
(Year 12) | <input type="text"/> | 4 |
| 5 | Partial High School (Years 10, 11) | <input type="text"/> | 5 |
| 6 | Junior High School (Years 7, 8 and 9) | <input type="text"/> | 6 |
| 7 | Less Than 7 Years of School | <input type="text"/> | 7 |
| 8 | Not Available | <input type="text"/> | 8 |

7. NUMBER OF SCHOOLS ATTENDED

PRIMARY

- | | | | |
|---|--------------|----------------------|---|
| 1 | One | <input type="text"/> | 1 |
| 2 | Two | <input type="text"/> | 2 |
| 3 | Three | <input type="text"/> | 3 |
| 4 | Four or More | <input type="text"/> | 4 |

SECONDARY

- | | | | |
|---|-------|----------------------|---|
| 1 | One | <input type="text"/> | 1 |
| 2 | Two | <input type="text"/> | 2 |
| 3 | Three | <input type="text"/> | 3 |
| 4 | Four | <input type="text"/> | 4 |

APPENDIX I. Introductory letter to the Commissioner of
Police from Dr. J.M. Innes.

Department of Psychology

The Commissioner of Police,
1 Angas Street,
ADELAIDE

4 October, 1978

Dear Sir,

I am writing to you in order to request permission for a graduate student in this Department to have access to the police cadets in training at Fort Largs for the purpose of research.

The student, Mr. R.V. Lange, is currently enrolled for the Ph.D. degree under the joint supervision of Professor Peter Glow and myself. The purpose of the research is to identify a number of personality and social characteristics associated with the personality dimension of reflectivity/impulsivity, i.e. the tendency to act after reflection or on impulse without much thought. The work on which Mr. Lange is engaged is part of a larger project conducted by Professor Glow concerned with the development from children to adult of the reflectivity characteristic. A cohort of police cadets would be a very appropriate group of individuals to investigate within the context of the larger project.

Mr. Lange and Professor Glow have developed a number of tests and problems for the measurement of the personality dimensions and the amount of time involved in testing would not be large. We believe that the persons involved in the testing sessions would find the tasks interesting.

We believe also that the results of any programme using police cadets would be of interest to the South Australian Police. The characteristics of the cadets on these various dimensions, relative to the data on a large sample of the population, should be of value to the police and while it would be going too far at present to say that such measures would have some value in selection procedures, we do hope that some such practical use may emerge.

I very much hope that you will consider granting permission for access. If you wish Mr. Lange will be only too pleased to give further details about the measures, time, involved, etc. to you or any of your staff you may delegate. If you do want further information do not hesitate to write to me or contact me by telephone on 223 4333. I look forward to your reply.

Yours faithfully,

J.M. Innes, Ph.D.
Senior Lecturer in Social Psychology

APPENDIX J. Introductory letter to the Commissioner of
Police from R. Lange.

University of Adelaide
Department of Psychology

25th October, 1978.

The Commissioner of Police,
1 Angus Street,
ADELAIDE. 5000

Dear Sir,

I am a postgraduate student at this University. As part of the research for my doctorate in Psychology I would like to undertake some testing of police cadets in training at Fort Largs.

I have had a preliminary meeting with your senior psychologist, Mr. Milton Kelley. An outcome of that meeting is the attached research proposal which I submit for your inspection.

My supervisors in this study will be Professor P. Glow (223 4333 ext 2258) and Dr. J.M. Innes (223 4333 ext 2266). Should you require additional information concerning the proposed research programme I am available for further meetings with Mr. Kelley. Alternatively you may wish to contact one or both of my supervisors via the above telephone numbers.

I look forward to your reply.

Yours faithfully,

Robert Lange B.A. (Hons.)

APPENDIX K. Reply letter from the Commissioner of Police.

POLICE HEADQUARTERS
ADELAIDE
SOUTH AUSTRALIA



217 0333

TELEPHONE: ~~XXXX~~
BOX No. 1539, G.P.O.
ADELAIDE, 5001

OUR REF. 39/1/34753
YOUR REF.

21 November, 1978

Mr. R. Lange,
Department of Psychology,
University of Adelaide,
ADELAIDE S.A. 5001

Dear Sir,

In reply to your letter of 25 October, 1978 I advise that there is no objection to your testing police cadets as part of the research programme for your doctorate in Psychology.

The approval is given on the understanding that there is no significant interruption to our training programme and that the cadet volunteers are identified only by coded numbers to ensure confidentiality.

It is suggested you liaise with our Senior Psychologist, Mr. M. J. Kelly who will make the arrangements for testing of the Cadets.

Yours faithfully,

D/ Commissioner of Police.

APPENDIX L. Introductory talk given to police cadets.

My name is Bob Lange. I am engaged in a research project at the University of Adelaide. The research looks at the methods by which people make judgements in different situations. I am also interested in the attitudes people hold towards the authorities in our society.

I am looking for volunteers from cadets in the final phase of their training to participate in my experiment. The amount of time involved is not large; in the order of 60 to 80 minutes for each person.

The tasks are not difficult, are like games, and I believe you will find them most interesting. Some of them consist of viewing a number of slides and making judgements about them. Others consist of questionnaires to find out the way certain important events in society affect different people. They are measures of personal belief and there are no right or wrong answers. All the information will be treated as confidential and code numbers allocated so that it is impossible to identify, by name any individual's results.

The results of this program are important to the University to help understand the characteristics of different groups of people on these various measures. I again emphasize that the information will be treated with care and confidentiality.

If you decide to participate I would like you to select a suitable time slot and code number in the book provided here. The experiment will be conducted in a room in the basement of the administration building. If you are unable, through illness or other cause to attend please contact me in this room so that I am able to arrange another time period. If you decide to participate please remember your code number.

I would appreciate it if as many of you as possible volunteer as the success of this experiment depends upon sufficient numbers of people being tested.

Are there any questions that you would like to ask me?

APPENDIX M. Instruction set for the second administration of the MFFT with prisoners.

Group 1 (Standard instructions: no feed back).

You remember back several weeks ago we tried a matching pictures task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

(The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures).

When you find the right picture, the slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment and when it reappears you should try another picture. Let's try some for practice.

If the subject chose the right alternative the first time he was told:

That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right, try again.

When correct he was told:

That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject, on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that

APPENDIX M cont.

is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready,

Group 2 (Standard instructions: negative feedback).

You remember back several weeks ago we tried a matching pictures task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, the slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment, you will hear a buzzer and when the slide reappears you should try another picture. Let's try some for practice.

If the subject chose the right alternative the first time he was told:

That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right, do you hear the buzzer, try again.

When correct he was told:

That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked.

APPENDIX M cont.

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

Group 3 (Standard instructions: positive feedback).

You remember back several weeks ago we tried a matching picture task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, you will hear a 'pip'. The slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment and when it reappears you should try another picture. Let's try some for practice.

If the subject chose the right alternative the first time he was told:

Do you hear a 'pip'. That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right, try again.

When correct he was told:

Hear the 'pip'. That's very good. Now here's another one.

APPENDIX M cont.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

Group 4 (Standard instructions: positive and negative feedback).

You remember back several weeks ago we tried a matching pictures task. Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, you will hear a 'pip'. The slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment. You will hear a buzzer and when the slide reappears you should try another picture. Let's try some for practice.

If the subject chose the right alternative the first time he was told:

Do you hear a 'pip'. That's very good. Now here's another one.

APPENDIX M cont.

If the subject chose an incorrect one he was told:

No that's not right, do you hear the buzzer, try again.

When correct he was told:

Hear the 'pip'. That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

Group 5 (Reflective instructions: no feedback).

You remember back several weeks ago we tried a matching pictures task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, the slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment and when it reappears you should try another picture.

APPENDIX M cont.

Let's do this one together. We will try to find out as much as we can about each design before we choose the right answer. We know that there is only one on the bottom here that looks just like the one on the top, so let's look between these down here to see how different they are from one another. Then we check back with the standard up the top to discover if the one down the bottom is different to it. Look closely at each picture on the bottom to make sure that it is either the right or wrong choice. Do not choose any until you are sure that it is the right one.

If the subject chose the right alternative the first time he was told:

That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

Now that's not right, try again.

When correct he was told:

That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

Group 6 (Reflective instructions: negative feedback).

You remember back several weeks ago we tried a matching pictures task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

APPENDIX M cont.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, the slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment, you will hear a buzzer and when the slide reappears you should try another picture.

Let's do this one together. We will try to find out as much as we can about each design before we choose the right answer. We know that there is only one on the bottom here that looks just like the one on the top, so let's look between these down here to see how different they are from one another. Then we check back with the standard up the top to discover if the one down the bottom is different to it. Look closely at each picture on the bottom to make sure that it is either the right or wrong choice. Do not choose any until you are sure that it is the right one.

If the subject chose the right alternative the first time he was told:

That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right, do you hear the buzzer, try again.

When correct he was told:

That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

APPENDIX M cont.

Group 7 (Reflective instructions: positive feedback).

You remember back several weeks ago we tried a matching pictures task? Well, we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture you will hear a 'pip'. The slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment and when it reappears you should try another picture.

Let's do this one together. We will try to find out as much as we can about each design before we choose the right answer. We know that there is only one on the bottom here that looks just like the one on the top, so let's look between these down here to see how different they are from one another. Then we check back with the standard up the top to discover if the one down the bottom is different to it. Look closely at each picture on the bottom to make sure that it is either the right or wrong choice. Do not choose any until you are sure that it is the right one.

If the subject chose the right alternative the first time he was told:

Do you hear a 'pip'. That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right. Try again.

When correct he was told:

APPENDIX M cont.

Hear the 'pip'. That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

Group 8 (Reflective instructions: positive and negative feedback).

You remember back several weeks ago we tried a matching picture task? Well, now we are going to do the task again.

I am going to show you a series of pictures. In each of the pictures there are eight pictures on the bottom of the screen and one at the top. One of the eight pictures at the bottom is exactly the same as the one at the top. I want you to find the picture that is most nearly the same as the picture at the top and touch the bar under the picture you have chosen.

The use of the words "most nearly the same" was necessary since the close projection produced tiny variations in line thickness between the projected figures.

When you find the right picture, you will hear a 'pip'. The slide will go off and you will get a new set of pictures. If you pick the wrong one the slide will disappear for a moment, you will hear a buzzer, and when the slide reappears you should try another picture.

Let's do this one together. We will try to find out as much as we can about each design before we choose the right answer. We know that there is only one on the bottom here that looks just like the one on the top, so let's look between these down here to see how different they are from one another. Then we check back with the standard up the top to

APPENDIX M cont.

discover if the one down the bottom is different to it. Look closely at each picture on the bottom to make sure that it is either the right or wrong choice. Do not choose any until you are sure that it is the right one.

If the subject chose the right alternative the first time he was told:

Do you hear a 'pip'. That's very good. Now here's another one.

If the subject chose an incorrect one he was told:

No that's not right, do you hear the buzzer, try again.

When correct he was told:

Hear the 'pip'. That's very good. Now here's another one.

If not correct after ten tries the correct alternative was pointed out. The subject on completion of the second practice item was asked:

Would you like to do the practice slides again? Now we will do some that are harder. You will see a picture at the top and eight on the bottom. Find the one that is the same or most similar to the one on the top and touch the metal strip underneath it. As you finish each slide another will come up. Are you ready?

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ADDENDUM

One of the examiners has argued that hyperactivity has been linked theoretically and experimentally with the personality measures of extraversion and neuroticism. At the time of the literature review the Eysenck impulsiveness scale (Eysenck and Eysenck, 1977) was under investigation and at that time extraversion and neuroticism did not appear to be central components of trait impulsivity. Wardell and Yeudall (1980) found that both Eysenck measures and Cattell's inhibition measured the expression or inhibition of impulses. The study also indicated that impulsivity was accompanied by signs such as low basal metabolic rate, involuntary muscle tension and salivation to strong stimulation. It appears that trait impulsivity may have a large biological component. The social and political context of the present research, however, did not make possible the inclusion of all components of trait impulsivity.