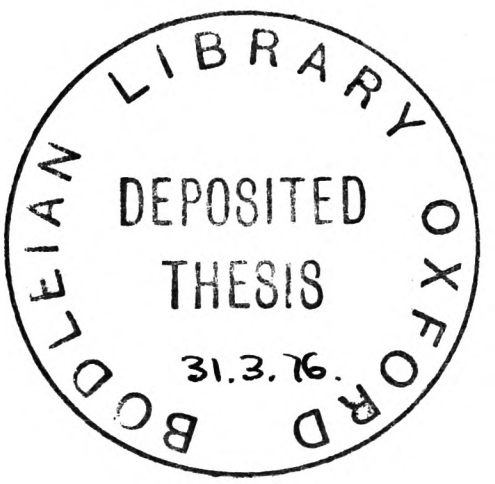
BEHAVIOUR AND PERSONALITY IN DELINQUENT CHILDREN

by

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ABSTRACT

The thesis is concerned with aspects of personality that may distinguish those children from a high delinquency area who become delinquent from those who do not. In Chapter 1 the limitations this approach places on the selection of the area and the sample to be studied are discussed. The two main methods of measuring criminality, convictions and self-report delinquency, are compared as to their usefulness for the study. The theoretical background for the choice of the personality variables to be considered is given. Two of these, susceptibility to reward and susceptibility to punishment, derive from operant conditioning tasks in which the subject presses a lever to obtain reward. Tests possibly measuring susceptibility to reward were stimulus generalization (from an intradimensional discrimination) and performance under differential reinforcement of low rates of response. In children, tests of susceptibility to punishment must be tests of susceptibility to frustrative nonreward (considered equivalent to punishment in its behavioural effects). In the present study the ones used were behavioural contrast on both extradimensional and intradimensional discriminations and a measure of peak shift. Questionnaire measures of extraversion, neuroticism and psychoticism were also used.

The main hypothesis of the present study is that delinquents should be more susceptible to reward and less susceptible to punishment than nondelinquents. This may be tested in three ways: The first is to administer tests of susceptibility to reward and to punishment (the behavioural measures), and tests of delinquency (self-report delinquency) and to correlate the results of the two. The second is to correlate

the scores of the children on tests of susceptibility to reward and to punishment and on personality questionnaires. The prediction (from Gray, 1973) is that susceptibility to reward should be correlated with extraversion and neuroticism and susceptibility to punishment with introversion and neuroticism. The third is to correlate delinquency scores with personality questionnaire scores, with the prediction that delinquents should be more extravert but not more neurotic than nondelinquents. All three ways are used in the present study.

The total sample of the present study consisted of 54 school boys aged 11.1 to 12.9 years at the time of first testing, from a working-class housing estate. They were first given the personality questionnaires and delinquency tests (test administration). 31 boys (the behavioural sample) were selected from the total sample so that a full range of delinquency scores was obtained and given the behavioural tests of susceptibility to reward and to punishment. After this, the total sample was then given the personality questionnaires and delinquency tests again (retest administration).

A study performed by Dr. J.P. Rushton on younger children aged 7 to 11 years was designed to run parallel with the present study. Comparisons are made with this study and with the previous work of Nicholson (1972) and de Wit (unpublished: described in Appendix C) throughout the thesis.

Chapter 2 is concerned with the description of the personality questionnaires used and their reliability and intercorrelations. The questionnaires used were the Junior Eysenck Personality Inventory (JEPI), the High School Personality Questionnaire (HSPQ), the Junior Personality Questionnaire (JPQ) and a Teacher's Rating Scale (TRS: Nicholson, 1972), in which the form teachers of the boys rated the boys in their year. These give measures of extraversion, neuroticism, psychoticism and tendency to fake.

Chapter 3 is concerned with the measurement of delinquency by the self-report method. A review of the rationale behind the method and the various methodological problems encountered is given. It is also shown that delinquency is heterogeneous so that it is necessary to measure participation in various aspects of crime, for example, group versus solitary crime. The self-report interview used in the present study is described. This produces a measure of number of different types of crime committed and measures of involvement in group crime, solitary crime, self-suggested crime and other-suggested crime. The interview was shown to have high test-retest reliability and internal consistency. Principle components analysis produced a large first component, loading on all the delinquency items. Inconsistent responders between the test and retest administration of the interview were identified and inconsistent responding shown to relate positively to the JPQ lie scale and negatively to number of crimes admitted.

The third way of testing the main hypothesis, the correlations between personality and crime, is examined in Chapter 4. A review of the studies used to test Eysenck's theory of the relationship between personality and crime is given. Significant positive correlations of number of delinquent acts admitted with both extraversion and psychoticism were found. No such correlations were found with neuroticism. The hypotheses of Eysenck (1974) and Burgess (1972a) that the extravert neurotic quadrant should contain more criminals than other quadrants in the Eysenckian two-dimensional space was not supported.

The behavioural measures and their correlations with the personality questionnaire scores and crime scores (the first and second ways of testing the main hypothesis) are discussed in Chapters 5 to 8. Chapter 5 deals with the phenomenon of behavioural contrast and its use to measure susceptibility to frustrative nonreward. A review of the

animal and human literature is given, in which it is concluded that the frustration theory of behavioural contrast is the best currently available. The extradimensional and intradimensional discriminations of the present study are then described, together with possible controls for the behavioural contrast shown. Measures of the time taken to reach the baseline criterion, the time taken to be able to describe the discrimination conditions and the time then required to perform the discrimination to criterion were also used. The correlations with introversion and neuroticism found by Nicholson (1972) were not replicated with all the personality measures used in the present study.

Chapter 6 discusses the phenomena occurring in the generalization test given after the intradimensional discrimination: peak shift, mean shift and stimulus generalization. A review of the animal and human literature on these phenomena is given. Mean shift, although shown by 18 out of 24 boys tested, was not found to be correlated with either introversion or neuroticism as found by Nicholson (1972). Stimulus generalization, however, did show some correlations with extraversion and neuroticism.

Chapter 7 is concerned with the differential reinforcement of low rates of response tasks. A review of these tasks in animals and humans with regard to the use of a series of progressively more difficult tasks in measuring susceptibility to reward is given. The results of the present studies tend to indicate that the first task in the series correlates with developmental measures such as age, whereas the second and third tasks correlate more with the personality measures, notably extraversion and neuroticism. The third task (and, in the present study, the second task) may hence be used as a measure of susceptibility to reward.

Chapter 8 discusses the correlations between all the measures taken. The two measures of susceptibility to reward show some moderate positive correlations. There is independence for the most part between the measures of susceptibility to reward and susceptibility to frustrative

nonreward, but the measures of susceptibility to frustrative nonreward, contrary to the hypothesis of Terrace (1966a) are also independent of each other. It is, however, suggested that the measures of frustrative nonreward reflect different aspects of frustration i.e. the directive and energizing aspects. The main hypothesis is considered to be very much more complex than originally specified, both with regard to the definition of criminality and that of susceptibility to reward and to frustrative nonreward.

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CHAPTER 1

INTRODUCTION

Reckless et al., (1957) first drew attention to the problem of the '"good" boy in a high delinquency area' - why it is that boys, handicapped as much as their peers by home background, area of residence, deviant companions and the many other so-called causes of delinquency, manage not to become delinquent. There have been many investigations of the 'environmental' causes of delinquency but very few of the personality differences between delinquents and nondelinquents. First, one may look at the various influences on the boy in a high delinquency area which may predispose him to become delinquent or protect him from becoming delinquent.

First, there is the influence of poverty, of inadequate housing and of slum living. Although there is little absolute deprivation in Britain today, there is a considerable amount of 'relative' deprivation. People shoplift to acquire what their neighbours have, not just to feed themselves (Radzinowicz, 1971). Secondly, there is the immediate area in which the boy lives. This will determine the opportunities for delinquency and the types of offences committed. A rural area has a different pattern of offences from an urban area. It may also have a different level of crime, either because of the policies of law enforcement agencies such as the police, the welfare agencies and the courts, or because of the differing visibility of the types of crimes committed. The area also includes the kind of housing - which will influence the kind of upbringing the boy has (Newson and Newson, 1968) and the pattern of life in the street (Sprott et al, 1954). Even whether his school is streamed or unstreamed affects the peer groups

formed and the pattern of group delinquent activity (Hargreaves, 1967). Thirdly, there is the effect of the family environment - the method of upbringing, the number of children, one-parent families and so on. In this last, however, the process is not one-way - the child influences the parent as the parent influences the child. There is no way of separating out the variance due to each separately and that due to the interaction (Bell, 1968; Schaffer, 1974). Finally, there is the child's own personality. Although all these influences will affect him in any decision he takes about delinquency, it is he who chooses which peer group he belongs to and he who perceives the possibly criminal situation and decides what action to take.

It is the purpose of the present study to investigate this last source of variance, the child's own personality, in the context of the problem of the 'good' boy in a high delinquency area. In other words, the problem is to discover what it is about the personality of delinquents which differs from that of nondelinquents from the same background. In order to study the child's own personality, which is perhaps the smallest source of variance quantitatively, although the most important when studying individual differences in a high delinquency area, it is necessary to hold the other sources of variance constant as far as possible. This immediately limits the possible sample, area and type of person investigated. The area should, as far as possible, be as homogeneous as possible in terms of money coming into the home, employment status and type of housing. There should be only one school in the area, which should be unstreamed. Adolescents would be better than adults, as jobs, unemployment and staying on at school after the minimum school leaving age provide different opportunities for criminality. The population has been narrowed down by these considerations to adolescents under the age of 16. The age of the adolescents however, should also be as high as possible, since the minimum age of criminal

responsibility is 10. The police deal very differently with offenders over 10 and offenders under 10. Finally, one may decide to study only one sex or to compare both sexes. As regards the purpose of the present study, either of these approaches might be made. It is, however, not only the purpose of a study but also its methods which determine the decisions made. Each decision made limits the conclusions that may be drawn from the study. It might be objected that the choice of one small area of homogeneous housing would produce findings incapable of generalization to other areas in the country. One may reply that delinquency is always an interplay between the opportunities of the environment and the decisions of the person. There can be no complete generalization from any study of individual differences, especially delinquency, from one sample to another. Any findings are totally valid only for that area, those people, that point in time.

Despite these problems, it is necessary to broaden the sample as much as possible. One must make a choice between using convicted delinquents and using self-reported delinquents, those who 'confess' that they have committed a criminal offence. Here, several considerations come into play. The first is that convicted delinquents are the 'tip of the iceberg' - especially in adolescence. If it were the case that convicted delinquents were a random sample of all delinquents then it might be best to use convicted delinquents. Unfortunately, there is considerable evidence that both the police and the courts 'screen out' certain types of delinquents for conviction on social or personal grounds not just on legal grounds. If convicted delinquents were used then a comparison of the personality differences between delinquents and nondelinquents would be invalid, first because it would also contain the selection criteria used by the law enforcement agencies and secondly because it would be possible that the 'nondelinquents' were in fact more delinquent than the delinquents. Also, given the low clear-up rate for most of the crimes of adolescence, it would be very difficult

to acquire a sufficiently large sample from a homogeneous area. A choice of a self-report method, however, poses the problem of how reliable and valid a self-report score of delinquency is. It also means, if the age range between 11 and 16 is chosen, that boys must be used rather than girls. Below the age of 16, a large part of the delinquency of girls is confined to rebellion in the home and sexual offences. These are not questions which can either be asked easily in a self-report interview or be posed in such a manner that all illegal categories of sexual crimes, for example, would be elicited. There is also considerable controversy as to the definition of several of the 'crimes' committed chiefly by girls, for example, being out of control and sexual intercourse if both parties are minors. For these reasons, it was decided to investigate boys only in the present study.

The influence of personality in promoting crime or protecting the boy from crime may also vary according to whether the crime was committed in a group or alone. "It is a criminological cliché that only the most seriously disturbed or isolated individuals commit offenses alone; the 'loner' in crime - the individual delinquent or criminal - is almost by definition seen in a psychopathological framework." (Dinitz, 1973) "Although delinquency and crime in the United States, and in most other nations which report and record official data, is a companiate activity, little or no criminological research has been devoted to the interactional process promoting and precipitating such behavior." (idem). It will be necessary then to find out whether the crimes the boys admit were committed in a group or alone and to investigate the influence of personality on these aspects of the crime situation. Unfortunately, previous work has used a typological approach both for personality and for the manner of committing the crime. This has led to large groups of boys who did not score above the cut-off point on the personality scales or did not

commit all their crimes alone or all their crimes in a group being unclassified. This problem renders the results of such a study of little use. The present study hence uses a dimensional approach, examples of dimensions being percentage number of crimes committed in a group, the Cattell High School Personality Questionnaire exvia scale and the time taken to learn one of the behavioural tasks. The scores on these dimensions are then correlated with one another. This approach requires that all the boys be tested on all the tasks and that the measures used have a sufficient number of distinctions along the dimensions. It is, however, far preferable to the alternative, extreme group analysis, as it allows the investigation of suitable measures throughout testing, which is essential in an unworked field of knowledge, if a very costly pilot phase is not possible.

Personality - consistent individual differences in behaviour - is a very broad term including within it the systems of the psychoanalysts and of the behaviourists. It is necessary to decide what facets of personality might be considered useful with regard to delinquency. Here again, the field is a very uncharted one. Previous work has been confined to the investigation of specific questionnaires (such as the Eysenck Personality Inventory or the Minnesota Multiphasic Personality Inventory) and a few behavioural traits (such as impulsivity or poor avoidance conditioning) with convicted delinquents. There is no work on self-report delinquency which includes an investigation of the situation in which the crime was committed and which explores any facet of personality. Several different theoretical and experimental lines of evidence, however, seem to converge at one hypothesis. This hypothesis has not been tested directly.

This is the hypothesis that delinquents differ from nondelinquents in being more susceptible to reward and less susceptible to punishment, which will be taken as the main hypothesis in the present study. Perhaps

the most direct test of this, is Schlichter and Ratliff's (1971) demonstration of a significant delinquency x reward interaction in which nondelinquent subjects learned best under punishment conditions and delinquent subjects under reward conditions in a two-choice discrimination task. The superiority of punishment for nondelinquent children has been replicated many times (e.g. Penney, 1967; Witte and Grossman, 1971; Tindall and Ratliff, 1974). It is, however, likely that this task is affected by certain errors if used with delinquent children. It is almost impossible for the children not to guess the purpose of the task, which is to learn the discrimination. It is possible that delinquent children will react differently to the experimenter and therefore to the task than nondelinquent children. The measures taken, speed of learning the discrimination or errors made, will be affected by this.

There are, however, other lines of evidence indicating that delinquents may not be as susceptible to punishment. Work with psychopaths, considered by some to be the most criminal of criminals as far as the influence of personality is concerned, indicates that, although psychopaths can learn tasks for reward, especially monetary reward, as easily as normals, they are deficient in avoidance learning (e.g. Lykken, 1957; Schachter and Latané, 1964; Schmauk, 1970). Another more situationally relevant comparison, is that of Schwitzgebel (1967), who compared two matched groups of adolescent male delinquents informally recruited from street corners and differentially treated during the course of 20 tape-recorded interviews on four types of reinforced responses: hostile statements (followed by disagreement or inattention by the interviewer); and positive statements, prompt arrival at work and general employability (all followed by praise or small gifts). He found that there was a significant increase in the frequency of behaviours rewarded either in the natural or the laboratory setting but no decrease in punished behaviours. Claster (1967) compared convicted delinquents with nondelinquents on whether they believed themselves immune to being

caught. The convicted delinquents thought that they were more immune (even though they had already been caught). In a similar vein, Mischel (1966) found that delinquents preferred smaller, immediate rewards to larger, delayed rewards whereas nondelinquents made the opposite choice.

Eysenck (1970) has provided a theory of criminality, in which it is considered that criminals are antisocial because they have failed to be conditioned. Since conditionability, which is thought to be a unitary variable, is related to the factors of introversion and stability, criminals should be extravert and neurotic. This theory has been modified by Trasler (1973) to include environmental conditions and by Gray (1973), among others, to include more modern physiological work on the basis of conditionability. Gray (1970) considers that Eysenck's axes of extroversion (E) and neuroticism (N) are not correctly located. Since introverts are, in fact, only more easily conditioned than extraverts under certain circumstances (Eysenck and Levey, 1973), whereas the opposite is true under other conditions, Gray proposes that the introvert, relative to the extravert, is more susceptible to threats of punishment. He also considers that Eysenck's linking of N with general emotionality stemming from activity in the autonomic nervous system is mistaken, since emotionality is primarily regulated at more central points in the nervous system, for example, the hypothalamus and forebrain sites in the limbic system. Having reviewed the physiological evidence, Gray (1972) considers that there are three limbic emotional systems - an orbitofrontal-septal-hippocampal stop system, an approach system and an amygdaloid fight/flight system. These are considered to be the main psychological mechanisms underlying emotional responses. Susceptibility to warnings of punishment (frustrative nonreward being considered equivalent to punishment in its effects on the system) is mediated via the stop system and lies along the neurotic introvert/stable extravert axis, which is labeled anxiety. Susceptibility to promises of reward (a similar parallel being made with

omission of punishment) is mediated via the approach system and lies along the neurotic extravert/stable introvert axis, which is labeled impulsivity. Psychoticism (similar to the qualities measured by Eysenck's psychoticism, P scale) is tentatively identified with the fight/flight system and considered to be independent of the other two. On this view, a delinquent would, if highly susceptible to reward, be neurotic and extraverted and, if not susceptible to punishment, stable and extraverted. If both characteristics hold, he would be extraverted and in the normal range on the neuroticism scale. On Eysenck's theory, a criminal should be a neurotic extravert.

There is some evidence for Gray's theory using humans. In many respects it is similar to Eysenck's, for which there is a formidable body of evidence using learning and perception tasks and abnormal populations. Critical tests to decide between the two theories, however, have not as yet been done. This would involve the administration of tests of susceptibility to reward, frustrative nonreward, punishment and nonpunishment and the Eysenckian personality questionnaires and the factoring of the tests. On Eysenck's theory, there should be one factor of conditionability running along the extraversion-introversion axis. On Gray's theory, there should be two, as outlined above. There is little evidence for a single factor of conditionability (Lovibond, 1964) and there is some slight evidence that extraverts condition better than introverts under conditions of reward but introverts better than extraverts under conditions of punishment (Gupta, 1975).

There are, hence, three ways to test the main hypothesis of the present study, that delinquents are more susceptible to reward and less susceptible to punishment than nondelinquents. One may administer tests of both and correlate the results with each other - the most direct way, providing that suitable measures of susceptibility to reward and punishment are available. One may correlate the behavioural measures (susceptibility to reward and punishment) with personality questionnaire

scores. One may correlate the personality questionnaire scores with delinquency. All three ways will be used in the present study.

The Behavioural Measures

Perhaps the main problem in testing such a proposition is to find measures which will serve as indices of susceptibility to reward and punishment without the subject knowing what measurements the experimenter is taking as his measures. Punishment, of course, cannot be used with children so it is necessary to use susceptibility to frustrative nonreward. Fortunately, two measures of susceptibility to frustrative nonreward and one of susceptibility to reward have been developed by Nicholson (1972; Nicholson and Gray, 1971, 1972). These use the phenomena of behavioural contrast and peak shift, developed originally with animals and studied in a qualitative fashion - to show whether the phenomenon occurred under different conditions - and later extended to humans, where the amount of the phenomenon shown by each individual subject was measured. Nicholson's subjects were children of both sexes aged between 7 and 11 from a Junior school in Oxfordshire. The phenomena have not previously been shown with children of secondary school age. It was, therefore, considered prudent to run another group of children, of the same age as those of Nicholson, in parallel with the present study (the Rushton study - see below) so that any differences in the phenomena between the present study and those of Nicholson could then be ascribed either to the slight methodological differences or to the difference in population.

Although these measures, behavioural contrast, mean shift and generalization of reward, are adequate to measure both susceptibility to reward and susceptibility to frustrative nonreward according to Nicholson's results, a search was instituted for a measure which would measure both qualities simultaneously and so be less time-consuming. The ideal candidate would have been the technique of Baltzer and

Weiskrantz (1970) in which a high reward condition and a low reward condition are alternated day by day as the baseline condition. A few minutes of the other reward condition to that pertaining that day are then inserted as intrusions. The difference between the rate of response to the high reward intrusion over high reward baseline gives a measure of susceptibility to reward and that between low reward intrusion and low reward baseline a measure of susceptibility to frustrative nonreward. A pilot study was conducted using this technique but it was found that insufficient children showed the phenomena described by Baltzer and Weiskrantz using rats to be able to use it to assess quantitative differences between children. This was found to be because the children were not sensitive either to magnitude or to density of reward differences. It therefore became necessary to use the original measures of Nicholson. These are very time-consuming - at one session a schoolday, a child requires from two to four weeks to learn each task.

It was, however, thought important to include another measure of susceptibility to reward, which needed to be quick to administer, as it was thought that a total of 10 weeks for the behavioural measures and say 5 days for the personality and crime measures would be enough for any child. That selected was the schedule of differential reinforcement of low rates of response (DRL) which may be considered a measure of behavioural restraint, and so will score on the diagonal of impulsivity or susceptibility to reward in the opposite direction to generalization of reward. All the behavioural measures used are defined and described in the later chapters.

The Area

In the 1930's, the Chicago school of criminology established that the highest delinquency area of a city was the inner city, a region of slums, industry and shops. The crime rate then fell off as the suburbs

were approached. Recently, however, although the inner city remains a focus of delinquency, there has also been found to be a surrounding halo of high delinquency areas comprising the new housing estates built on the edge of the city. Wilson (1963) writes on the Bristol Social Project: "The accent is no longer on the topographical location of an area but on the atmosphere of the neighbourhood, shaped not like Chicago on successive waves of immigrants but because of the rehousing policy of the local authority". Similar striking relations between housing estates and delinquency have been found in Leicester (Jones, 1958), Glasgow (Ferguson, 1952) and in the north (Brown et al, 1972). For the purposes of the present study, a housing estate would fill most criteria. The housing would be homogeneous, the families from approximately the same income group, the schools on the estate and the children able to interact with anyone on the estate but having more difficulty in keeping up friendships off the estate.

The estate chosen is primarily local authority housing, built in the middle 1960s. It contains both three- and four-bedroomed houses and a few flats in two high-rise blocks. There are some shops, two public houses, an interdenominational church, one secondary school and about six primary schools. It borders on the countryside and is about 5 miles from the centre of the town. The population structure is somewhat unbalanced, being almost entirely composed of young families with children. Perhaps as a result of this the neighbourhood, although modern, looks rundown and desolate and the levels of the indices of social deprivation, divorce, one-parent families, mental illness, etc., are high. Most parents work either in the car works on the edge of the estate or in service industries or light industry in the town.

The Sample

At the time of the study, the Oxford educational system was in a state of change from a junior school/secondary school system in which the change of school was made at 11 years to a lower, middle and upper school system, changes being made at 9 and 13 years. The school from which the sample was taken was the secondary modern school serving the housing estate. In the three years of the study, the population of the school was decreased so that, by the end of the study, it had become a comprehensive upper school. This meant that the first year children at the beginning of the study were the youngest in the school for three years. The alternative, however, would have been to take children from 9 to 13, who would be the oldest in the new middle schools. This is too young to measure delinquency.

The children were randomly distributed to the first year classes when they entered the school. There was no streaming except in mathematics. It was hence decided to take a sample of about 50 boys from the first and second years, the boys from two first year classes and two second year classes. The 54 boys chosen (referred to hereafter as the total sample) were aged 11.1 to 12.9 years at time of first testing and were given personality and intelligence test and took part in the self-report delinquency interview. 31 boys were selected from the total sample so that the whole range of delinquency scores was, as far as possible, equally represented. These boys will be referred to hereafter as the behavioural sample, as they were given the behavioural measures.

To discover if there were any differences between the total sample and the behavioural sample on personality developmental and crime variables, t-tests were computed. The means, standard deviation and values of t for these variables, all of which had normal distribution, are given in Tables 1.1 and 1.2. The only significant difference was found for teachers'

TABLE 1.1

MEANS AND STANDARD DEVIATIONS FOR PERSONALITY AND DEVELOPMENT COMPARING TOTAL SAMPLE AND BEHAVIOURAL SAMPLE AND VALUES OF T

	VARIABLE	TOTAL MEAN	TOTAL SD	BEHAVIOURAL MEAN	BEHAVIOURAL SD	T
Test	JEPIE	(54) 18.91	2.90	(29) 18.86	2.91	0.026
	CATEXK1	(52) 5.68	1.83	(28) 5.79	1.84	0.144
	TRSE	(53) 3.14	0.52	(29) 3.25	0.48	1.929
	JEPIN	(54) 14.57	4.28	(29) 14.79	3.58	0.060
	CATANXK1	(52) 6.26	1.37	(29) 6.26	1.24	0.000
	TRSN	(53) 2.96	0.56	(29) 2.98	0.53	0.298
	JEPIL	(54) 2.15	1.68	(29) 2.17	1.73	0.031
	RACA	(54) 3.82	1.76	(29) 3.58	1.75	0.345
	IQ	(54) 94.37	11.09	(29) 91.89	9.74	0.098
	CATBUK1	(52) 3.48	1.39	(28) 3.29	1.56	0.395
Retest	JEPIE2	(46) 18.16	4.43	(25) 18.84	4.31	0.146
	CATEXK2	(48) 5.71	2.33	(27) 6.17	2.25	0.371
	JPQE2	(49) 18.69	3.42	(25) 19.36	2.93	0.263
	TRSE2	(53) 3.29	0.51	(29) 3.41	0.49	2.104*
	JEPIN2	(48) 12.87	5.53	(25) 11.84	5.68	0.020
	CATANXK2	(49) 5.75	1.21	(28) 5.81	1.05	0.195
	JPQN2	(48) 10.90	4.65	(25) 10.88	4.12	0.004
	TRSN2	(53) 3.18	0.71	(29) 3.20	0.66	0.185
	JEPIL2	(54) 2.43	2.71	(29) 2.59	2.76	0.096
	JPQL2	(48) 4.98	3.50	(25) 4.76	3.27	0.078
	JPQP2	(50) 6.42	2.98	(26) 7.08	3.08	0.309
	CATBUK2	(49) 3.78	1.40	(27) 3.59	1.28	0.441

Value of t for significance on 2-tailed test at 5% level with = 80 df = 2.00*

TABLE 1.2

MEANS AND STANDARD DEVIATIONS FOR CRIME COMPARING TOTAL SAMPLE AND BEHAVIOURAL SAMPLE AND VALUES OF T

	VARIABLE	TOTAL MEAN	TOTAL SD	BEHAVIOURAL MEAN	BEHAVIOURAL SD	T
Test	NOCRIM	(54) 10.61	5.70	(22) 12.32	7.03	0.186
	FNOCRIM	(54) 15.72	9.81	-	-	-
Retest	NOCRIM2	(51) 12.65	6.39	(27) 13.78	6.54	0.117
	FNOCRIM2	(51) 20.37	11.04	(27) 22.41	11.18	0.072
	NOCRIS2	(51) 13.84	7.20	(27) 14.96	7.43	0.091
	FNOCRIS2	(51) 22.18	12.21	(27) 24.30	12.52	0.060
	PERG	(49) 59.68	15.66	(26) 61.55	11.77	0.038
	PERS	(50) 33.02	16.43	(27) 31.71	15.36	0.022
	PERSS	(48) 60.04	16.94	(25) 57.89	14.95	0.034
	PERGS	(49) 31.28	16.51	(26) 32.41	15.76	0.018

Value of t for significance on 2-tailed test at 5% level with = 80 df = 2.00.

ratings of extraversion on the Teachers' Rating Scale (TRSE: Nicholson, 1972, see Chapter 2). Here it was found that the teachers rated the behavioural sample as being more extraverted than the total sample on test (see plan of the study below).

The Plan of the present study

In order to test the main hypothesis, that delinquents are more susceptible to reward and less susceptible to punishment than nondelinquents, using all three ways mentioned above, it is necessary for the boys to be given personality, developmental, crime and behavioural tests. The order in which these were given and the measurements taken from each test are set out below. The phenomena involved are described in more detail in the chapters relating to them, as discussed below in the plan of the thesis.

A very similar study was also performed by Rushton (the JPR study), in consultation with Dr. J.A. Gray and the present author so that a comparison with normal children on the behavioural measures would be available. This study was analysed by Rushton, again in consultation with the present author. A comparison of the results of the present study and those of the JPR study is given in this thesis for each of the behavioural measures. This was done by the present author. The sample for the JPR study was 10 boys and 10 girls selected from a population of 7- to 11-year-old children in a primary school in Oxfordshire such that they were evenly distributed across the age range. They represented a wide range of backgrounds and abilities. Two children (1 boy and 1 girl) were chosen by the form teacher from each of 10 different classes in the school to minimize discussion between the subjects.

The apparatus used in the behavioural part of the JPR study was similar to that used in the present study (see Chapter 5) except that

the reinforcement consisted of poker chips which could be exchanged for Green Shield Stamps after every session. The only difference in procedure from the present study was that each child received the tasks (see below) one directly after the other, as opposed to the method of the present study where the whole sample completed one task before moving on to the next. Aside from these minor differences, the results of the JPR study are thus directly comparable with those of the present study (JMS). The measures taken in the JPR study are also shown below. The personality measures used are similar to those of the present study and are described in Chapter 2 below except for the Children's Personality Questionnaire (Porter and Cattell, 1959), which is a more junior version of the High School Personality Questionnaire.

For the phenomena of behavioural contrast and structuring generalization comparisons will also be made with the studies of Nicholson (JNN). The JNN Normal group (Nicholson and Gray, 1972; Nicholson, 1972, 1974) comprised children aged 7 to 11 from a primary school in Oxfordshire. The JNN Maladjusted group (Nicholson, 1972, 1974) comprised children of mean age 13.32 years from a special school for maladjusted children. For the differential reinforcement of low rates task, comparison will also be made with the pilot study of de Wit, which is described in Appendix C.

The measures of behavioural contrast and mean shift are taken as measures of susceptibility to frustrative nonreward. Generalization of reward is taken as a measure of susceptibility to reward and good performance at the differential reinforcement of low rates of response tasks as a measure of behavioural restraint considered to lie along the dimension of susceptibility to reward with low behavioural restraint indicating high susceptibility to reward.

The first way of testing the main hypothesis of the present study hence involves the behavioural measures (tests of susceptibility to

reward and frustrative nonreward) and the crime measures. The second way involves the behavioural measures and the personality questionnaires. The third way involves the personality questionnaires and the crime scores.

Detailed progress of the present study, the measures taken and the comparison studies used

The present study took place between January 1973 and December 1974.

1. Personality measures (test)

The total sample of boys was given the Junior Eysenck Personality Inventory and the High School Personality Questionnaire in groups of five to 15 boys. This took between three and four sessions of 40 minutes each. During the same period the form teachers of the boys completed the Teachers Rating Scale. These will be termed the test personality measures.

The JPR children were given the Junior Eysenck Personality Inventory and the Children's Personality Questionnaire. Their form teachers also completed the Teachers Rating Scale.

The JNN children were given the Junior Eysenck Personality Inventory and their teachers completed the Teachers Rating Scale neuroticism scale.

2. Development measures

The chronological age, reading age (Schonell test) and intelligence quotient were obtained from the school records for the total sample of the present study.

Chronological age and reading quotient (from the Schonell test) were obtained from school records for the JPR sample.

Similar measures were obtained for the JNN sample.

3. Crime Measures (test)

During the same period as the personality (test) measures were taken, the total sample of the present study was given individual self-report delinquency interviews lasting between 20 and 80 minutes. This

took one school term (14 weeks). Measures of total self-reported delinquency for each boy were obtained. These will be termed the test crime measures.

4. Extradimensional discrimination training

The behavioural sample of the present study was then given extradimensional discrimination training individually. Each session lasted 20 minutes and between 5 and 17 sessions per child were given. This took about 6 months. Measures of behavioural contrast were taken.

Procedure for the JPR study was very similar.

5. Intradimensional discrimination training

The behavioural sample was then given intradimensional discrimination training, again on an individual basis. Each session again lasted 20 minutes and between 5 and 17 sessions per child were given. This again took about 6 months. Measures of behavioural contrast, mean shift and generalization of reward were taken.

A similar procedure was adopted in the JPR study. The JNN children received only intradimensional discrimination training.

6. Differential reinforcement of low rates of response (DRL)

The behavioural sample was then put on to DRL training and measures of the time taken to learn the tasks and the efficiency with which they were learnt (measures of behavioural restraint) were taken. Testing was on an individual basis and took between 1 and 4 sessions of 20 minutes per child. This part of the study occupied 2 months up to the end of the school summer term.

The procedure was again similar in the JPR study. The de Wit study (Appendix C) was a pilot study for this part of the present study.

7. Personality measures (retest)

The total sample was then given the Junior Eysenck Personality Inventory, the High School Personality Questionnaire and the Junior

Personality Questionnaire in groups of 5 to 15 boys. This took between 4 and 6 sessions per boy and occupied the winter school term. During the same period the form teachers of boys completed the Teachers Rating Scale. These will be termed the retest personality measures.

8. Crime measures (retest)

During the same period as the personality tests, the total sample were given expanded individual self-report interviews of delinquency, lasting between 20 and 90 minutes per boy. Measures of the total delinquency of the boy and of the manner in which his crimes were committed were taken. These will be termed the retest crime measures.

The Plan of the Thesis

The succeeding chapters have two aims: to explore the usefulness of the various measures and to examine and simplify the three ways of testing the main hypothesis. A glossary of all the abbreviations of the measures used is given in Appendix A. Tables are numbered sequentially together with figures in each chapter.

Chapter 2 is concerned with the personality questionnaires used in the study and whether they are reliable and valid. It was considered that, since both Eysenck and Gray claim that their 'lines of causal influence' are universal, several methods to measure each factor should be used, to ensure that the factors are not solely due to a certain selection of questions being used.

Chapter 3 considers the development and use of self-report delinquency measures and their place in the present study to measure both overall delinquency and the manner in which the crimes admitted were committed.

Chapter 4 leads on from chapters 2 and 3 in looking at the third way of testing the main hypothesis - the connection between personality and crime.

Chapters 5 to 7 deal with the first and second ways for each behavioural measure of susceptibility to reward and frustrative non-reward separately, chapters 5 and 6 dealing with measures of susceptibility to frustrative nonreward and chapters 6 and 7 with measures of susceptibility to reward with both personality and crime measures.

Chapter 8 attempts to bring together chapters 5, 6 and 7 in considering how the behavioural measures interact with each other and with the personality and crime measures.

CHAPTER 2

PERSONALITY AND DEVELOPMENTAL MEASURES

All the self-rated personality questionnaires were given to the boys in groups of 5 to 15. The boys were tested over two periods, one at the beginning of the study and one at the end of behavioural testing, eighteen months later. All tests were administered by the same experimenter. The boys were provided with copies of the test questions, and the experimenter also read out the questions, as a considerable number of the boys could not read.

In the first testing period (test), two self-rated personality inventories were given, the Junior Eysenck Personality Inventory (JEPI), which took one session of 35 minutes, and the Cattell High School Personality Questionnaire (HSPQ), which usually took two sessions.

In the second testing period (retest), both the JEPI and the HSPQ were readministered and a third personality questionnaire, the Junior Personality Questionnaire (JPQ) was also given. This last took one session.

During the same periods as the boys were filling in the self-report inventories, the form teachers of the boys were asked to fill out a Teacher's Rating Scale on the boys. Boys were taken from four classes in the school, two first-year and two second-year classes (which were, by the second period of testing, third- and fourth-year classes). Each teacher was asked to fill out the rating scale on all the boys in his year. There were thus four raters at each testing period, each rater theoretically rating half the boys. In fact, three teachers only rated the boys in their classes as they did not consider they knew the other boys well enough. Unfortunately, due to the high turnover of staff in the school, it was not possible for the original raters to be used in

the second period of testing. Two boys also left the school in the time between periods of testing. One moved to another area and one was convicted of various criminal offences and sent to a remand home. An additional boy refused to participate in the second testing due to family difficulties. Both boys and teachers were interested in filling out the questionnaires and no difficulty was experienced in maintaining interest during the period of testing.

There were three developmental measures - the age of the boy, his nonverbal intelligence quotient (IQ) and his reading age. The last two of these were obtained from school records, the school having a policy of testing every boy on entry into the first year.

The Junior Eysenck Personality Inventory

The JEPI has been developed by Sybil Eysenck (Eysenck, 1965) from the Maudsley Personality Inventory (Eysenck, 1959) and the Eysenck Personality Inventory (Eysenck and Eysenck, 1964) for adults. It is a test for measuring the higher-order factors of extraversion (E), neuroticism (N) and the detection of faking (lie scales: L) in children aged between 7 and 15 years. 24 items to measure E, 24 to measure N and 12 to measure L were chosen on the basis of a factor analysis of an original pool of 108 items. The factors have intercorrelations of less than $\pm$ 0.23 for the age range 11 to 14 years (the age range of the sample used in this study). There is minimal correlation between either E or N and intelligence. The answers to the questions are of a Yes/No variety and the score for each scale is calculated by adding the Yes or No answers to the items leading on the factor concerned. The scales are balanced between Yes or No indicating a positive loading.

For the first period of testing the instructions emphasized that all questions were to be answered, that only one answer was to be given for each question and that the experimenter was interested in what the boy himself was like so that he should fill it in without regard to

his neighbours.

Between the first and second periods of testing, questions arose as to the nature of the lie scale, due to the high negative correlation found between delinquency and the lie scale Michaelis and Eysenck (1971) report that the pattern of responding to the lie scale on the P.E.N. (a questionnaire developed from the Eysenck Personality Inventory for use with adults) changes according to the motivation of the subjects. They suggest that there are three possible causes for high L scorers:

a) deliberate 'faking'

b) response in terms of an ideal self-concept rather than a candid self-appraisal.

c) response in terms of an 'honest' but inaccurate and uninsightful self-assessment.

They, together with Furneaux and Lindahl (personal communication to Eysenck), posited a general rule that a large proportion of high lie scores, together with a strong negative correlation between scores for lying and neuroticism, will usually be found in groups completing tests under strong conditions of motivation.

Eysenck, Eysenck and Shaw (1974) propose that a means of reducing dissimulation would be to warn the subjects not to put themselves in a good light, but to answer truthfully. They present data on adult subjects and on prisoners, again using the P.E.N., which show that the correlation between the L scale and the other scales, particularly N, change if such instructions are given, but that the L scale continues to have high internal reliability under these conditions. They were not able to test the same population both with and without 'honesty' instructions.

It was, therefore, decided to administer the JEPI on the second period of testing with these honesty instructions, both to ensure more truthful responding and to test the predictions made by Eysenck,

Eysenck and Shaw as to the change in correlations expected with instructions. Since the boys would also be required to complete the JPQ, another derivation of the JEPI, a comparison measure of the correlations between the various scales at the time of the second period of testing would also be available.

The honesty instructions were read to the boys before they started to complete the questionnaire. They are, as modified slightly from Experiment 1 of Eysenck, Eysenck and Shaw:

'It has been found in the past that some people give answers which they feel put themselves in a better light. For example, one of the questions might be: "Have you ever told a lie?" - the obvious answer to this is "Yes", but it is still found that there are a number of people who say "No". Therefore the questionnaire includes some items to check people on this.'

After some details on filling in the questionnaire, the boys were then told "... be as truthful as you can". The instructions were given by the experimenter.

Results

The distributions of the scores were plotted and found to be normal. The means and standard deviations, together with standardization means and standard deviations for that age and sex, are given in Table 2.1. t-tests were calculated between the total sample means and standardization means. It may be seen that, compared with the standardization sample, the total sample is significantly more extravert and neurotic and less susceptible to lying in the first period of testing (test) and more neurotic in the second period of testing (retest). The sample consists of working-class boys, which have previously (see Passingham, 1972) been found to be more extravert and neurotic than middle-class boys. This may explain the divergences from the standardization population. The

TABLE 2.1

MEANS AND STANDARD DEVIATIONS FOR TOTAL SAMPLE AND STANDARDIZED SAMPLE FOR JEPI

	Variable	Total Sample n	Total Sample Mean	Total Sample S.D.	Standardized Sample n	Standardized Sample Mean	Standardized Sample S.D.	t
Test	JEPIE	54	18.91	2.90	688	17.69	3.48	2.930**
	JEPIN	54	14.57	4.28	688	11.10	5.12	5.649***
	JEPIL	54	2.15	1.68	178	4.79	2.62	-8.760***
Re-test	JEPIE	46	18.16	4.43	550	17.84	3.80	0.476
	JEPIN	47	12.87	5.53	550	10.85	4.83	2.426*
	JEPIL	50	2.43	2.01	155	3.03	2.34	-1.761

For 120 d.f. and $p<.05$, t must be greater than 1.98 (*)

$p<.01$ 2.62 (**)

$p<.001$ 3.37 (***)

reason for the smaller amount of lying may well be the rapport established with the experimenter during the delinquency interviews which took place immediately before the administration of the questionnaires. It is interesting in this respect that it is the standardization sample decreasing their mean L score rather than the total sample increasing their mean L score which accounts for the lack of a significant difference between the two on L at retest. It is also noteworthy that, contrary to the standardization data, the lie scale mean increases on retest.

One may now look at the test-retest correlations of the scales. These are presented in Table 2.2. It may be seen that the correlations for JEPIE and JEPIN are reasonably high although lower than the standardization test-retest correlations which are E: 0.768, N: 0.717, L: 0.681. The correlation for the L scale, however, is very low. This might seem to be due to the effect of the instructions except that the mean value of the L scale increased on retest whereas that of the standardization sample decreased. From the t-tests between the means on test and retest, it may be seen that there is no significant difference although both extraversion and neuroticism decreased. This is interesting since both would be expected to increase with age, according to the standardization data, but decrease slightly with age, according to the results of Eysenck, Eysenck and Shaw (1974) on giving honesty instructions. It may be that the instructions are having some effect on the E and N scales but not on the L scale. Reasons for this are discussed below.

Turning now to the correlations between the scales, these are presented for test in Table 2.3 and for retest in Table 2.4. It may be seen that the correlations between JEPIE and JEPIN are low on test and retest. The correlations between JEPIE and JEPIL and those between JEPIN and JEPIL are negative and significant on retest. The values are,

TABLE 2.2

TEST - RETEST COMPARISONS

A CORRELATIONS

JEPIE	0.48 (.002)
JEPIN	0.53 (.001)
JEPIL	0.19 (NS)
CATEX	0.53 (.001)
CATANX	0.47 (.002)
TRSE	0.53 (.001)
TRSN	0.56 (.001)
CATB	0.33 (.018)

B T-TESTS BETWEEN TEST AND RETEST MEANS

JEPIE	0.983	for 100 df and $p < .05$	t must be greater than 1.99(*)
JEPIN	1.709	$p < .01$	2.64(**)
JEPIL	-0.645	$p < .001$	3.42 (***)
CATEX	-0.071		
CATANX	-1.986*		
TRSE	-1.500		
TRSN	-1.772		

TABLE 2.3

PERSONALITY INTERCORRELATIONS - TEST

	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	JEPIL
JEPIE							
CATEX	0.45 (.002)						
TRSE	0.08 (NS)	0.28 (.046)					
JEPIN	0.10 (NS)	-0.17 (NS)	0.28 (.044)				
CATANX	0.18 (NS)	-0.14 (NS)	0.29 (.042)	0.46 (.002)			
TRSN	0.07 (NS)	0.06 (NS)	0.68 (.001)	0.13 (NS)	0.32 (.022)		
JEPIL	-0.24 (NS)	-0.10 (NS)	-0.29 (NS)	-0.05 (NS)	-0.45 (.002)	-0.17 (NS)	

TABLE 2.4

PERSONALITY INTERCORRELATIONS - RETEST

1 EXTRAVERSION WITH NEUROTICISM

	JEPIN2	JPQN2	CATANXK2	TRSN2
JEPIE2	-0.08 (NS)	0.00 (NS)	0.00 (NS)	0.32 (.030)
JPQE2	-0.04 (NS)	0.16 (NS)	-0.03 (NS)	0.33 (.024)
CATEXK2	-0.01 (NS)	-0.03 (NS)	0.03 (NS)	0.30 (.044)
TRSE2	0.17 (NS)	0.11 (NS)	0.24 (NS)	0.53 (.001)

2 EXTRAVERSION WITH LIE SCALES

	JEPIE2(44)	JPQE2(48)	CATEXK2(48)	TRSE2(53)
JEPIL2	-0.31 (.036)	-0.15 (NS)	-0.22 (NS)	0.02 (NS)
JPQL2	-0.39 (.008)	-0.26 (NS)	-0.25 (NS)	-0.42 (.002)

Table 2.4 con. Personality intercorrelations - retest

3. Neuroticism with lie scales

	JEPIN2	JPQN2	CATANXK2	TRSN2
JEPIL2	- 0.28 (NS)	- 0.02 (NS)	- 0.29 (.042)	0.04 (NS)
JPQL2	- 0.03 (NS)	- 0.21 (NS)	- 0.45 (.002)	- 0.21 (NS)

4. Psychoticism with lie scales

JPQP2 with JEPIL2 - 0.27 (NS)

JPQP2 with JPQL2 - 0.51 (.002)

5. Psychoticism with extraversion and neuroticism

JPQP2 with extraversion:	JEPIE2	0.41	(.006)
	JPQE2	0.29	(.044)
	CATEXK2	0.42	(.004)
	TRSE2	0.12	(NS)
neuroticism:	JEPIN2	- 0.15	(NS)
	JPQN2	- 0.05	(NS)
	CATANXK2	0.12	(NS)
	TRSN2	0.09	(NS)

however, lower than the standardization values. As regards the effect of honesty instructions, the correlations of E and N with L increase in value on retest, although the difference is not significant, whereas the standardization sample does not show any consistent pattern of either increase or decrease in the size of the correlations with age. Eysenck, Eysenck and Shaw (1974) also found considerably increased negative correlations between N and L and slightly increased negative correlations between E and L. One reason for the means not changing greatly may be that sufficient motivation and empathy was achieved with the boys at the time of first testing since they had already been exposed to the experimenter on an individual basis. This may have produced a result similar to that indicated by Eysenck, Eysenck and Shaw, namely that, when motivation to dissimulate is low, changes in mean values may be small or nonexistent. Another reason may be that the lie scale mean for the sample is so low that no decrease is possible.

This last reason is given added weight by a consideration of the natures of the items involved. During the retest session, several boys complained that two items, no. 16 'Can you always keep a secret?' and no. 44 'Do you always eat everything you are given at meals' were inapplicable to them because they always did eat everything, being hungry, and defined a secret as something you didn't tell anyone. Question 44, together with questions 20 and 28, was also thought to have poor validity by Waters (1968). With this in mind, the distributions of the lie scale answers were plotted and are given in Figure 2.5. It may be seen that question 16 accounts for 26.8% of the responses and question 44 for 15.4% on retest, the corresponding figures for test being 29.9% and 18.2%. Doubt must hence be cast on the lie scales as presently constituted being a measure of faking in this population. It is, therefore, quite possible that, in this sample, lie scale scores might not be reduced by honesty instructions but the

NUMBER OF RESPONSES

RETEST

TEST

32
28
24
20
16
12
8
4
0

4 8 12 16 20 24 28 32 36 40 44 48

4 8 12 16 20 24 28 32 36 40 44 48

QUESTION NUMBER

means of the other factors might be affected. Although questions 16 and 44 may be non-faking items for some boys, this does not necessarily apply to all boys in the sample and so it is not advisable to recalculate the lie scale scores for the boys omitting these items.

Another point of similarity between the present study and that of Eysenck, Eysenck and Shaw is the increased standard deviations of E, N and L on retest with honesty instructions. The difference in this study, however, is not significant.

One point which Eysenck, Eysenck and Shaw bring up but which they are not able to investigate is whether a greater increase in neuroticism is shown by high or low liers under honesty instructions. This can be investigated in the present study as the same sample received both ordinary and honesty instructions. t-tests were calculated between test L score and the difference between test and retest scores for the E and N scales. The values were -1.034 for E and -0.054 for N. Neither of these is significant, a value greater than 2.021 being required for 5% significance. The direction, however, suggests that, if anything, the greater liers show less difference in score on retest.

One may conclude that, although some reservation must be expressed about the nature of the L scale in this sample, which may be reflected in the failure of the mean of the L scores to decrease on retest, honesty instructions do have some effect on the correlations between E, N and L and on the standard deviations, although none on the means. A comparison with the correlations in the JPQ (see below) may throw light on this. The tentative conclusion, given the nature of the L scale, is that it is the low L scorers rather than the high L scorers which show the greater difference in scores on retest. The results in the present study are confounded with the effects of age, there being 18 months between test and retest. E and N scores show definite changes during adolescence. It is difficult to see, however, how a shorter period of

time between test and retest would produce better results, as then practice effects would become important and the children would remember their previous answers.

Since one of the behavioural measures to be used with the sample measures behavioural restraint, it was considered useful to have a questionnaire measure of impulsivity (the other pole of the presumed dimension of behavioural restraint). Unfortunately, although factor loadings of the items of the adult Eysenck Personality Inventory on impulsivity and sociability, the two subfactors of extraversion, have been calculated, this has not been done for the children's questionnaire. Sybil Eysenck (personal communication), however, has suggested that the impulsivity items on the JEPI are numbers 1, 3, 14, 35, 41, 56, 57 and 60 and on the JPQ numbers 1, 5, 39 and 71. The last are too few in number to provide a reasonable scale. It was thought worthwhile to calculate an impulsivity score (JEPIIMP) from the JEPI, even though this had not been established factorially.

On test, the mean score was 5.83 (n=52) and standard deviation 1.04. JEPIIMP correlates 0.32 (ns) with JEPIE, 0.33 (ns) with JEPIN and -0.08 (ns) with JEPIL.[1] The equal correlations with E and N would be expected if it is a measure of the dimension at 45^{o} to both the E and N axes.

On retest, the mean score was 5.63 (n=49) and standard deviation 1.56. JEPIIMP2 correlates 0.65 ($p<.001$) with JEPIE2, 0.19 (ns) with JEPIN2 and -0.21 (ns) with JEPIL2. The mean score has not changed much between test and retest. The correlation with E is now higher than that with N. The same difference occurs in the correlations of JEPIIMP2 with CATEXK2 and CATANXK2, and JPQE2 and JPQN2, but the correlations with the Teacher's Rating Scale measure of N (TRSN: see below) is higher (0.45) than that with the rating of extraversion

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[1] The significance levels of the correlations are given in brackets after the correlation coefficient, ns standing for not significant. All significance levels refer to 2-tail tests.

(TRSE: 0.26). It may be that the TRS is measuring a dimension of neurotic extraversion i.e. impulsivity (see below under the Teacher's Rating Scale).

The validity of the E and N scales is confirmed in the present sample, but the L scale does not appear to measure faking to any accurate degree.

The Junior Personality Questionnaire

This is an unpublished questionnaire developed from the JEPI by Eysenck during the period of the present study. It has several advantages over the JEPI, one being the increased length of the L scale, which reduces the effect of particular somewhat dubious questions. It also includes a psychoticism scale (P) derived from the adult P.E.N. scale (see Michaelis and Eysenck, 1971). The high P scorer, according to the adult study, is cold, impersonal, hostile, lacking in empathy, unfriendly, untrustful, rude, unmannered, unhelpful, unemotional and lacking in human feeling. There is a close relationship between P score and sex (males scoring higher). Criminals also have high P scores (see the chapter on personality and crime below). Claridge and Chappa (1973) have used a group of high P scorers in an experiment comparing perceptual sensitivity with autonomic reactivity and shown that they produce a pattern of response similar to that of a group of clinically diagnosed psychotics and a group of people who were under the influence of LSD-25, but dissimilar to that of a normal group of controls. Claridge and Chappa, however, comment on the similar performance of high P and low N subjects and suggest that the P scale may be measuring only active psychosis (manic-depressive) rather than both active and retarded (schizophrenic) psychosis.

The present questionnaire may be used with children from 7 to 15. It contains 18 items to measure P, 24 for E, 20 for N and 20 for L.

The correlations between factors in a very similar inventory with 20 items in each scale (Eysenck and Eysenck, 1971) are very low. The correlations between scale scores, however, vary somewhat. Independence is shown between P and N, E and N, P and E, and E and L. There are, however, small negative correlations between P and L and N and L.

Allsopp (personal communication) has shown that delinquents have very much higher P scores than non-delinquents and that this relationship is stronger than the one between E and delinquency. This obviously makes the inclusion of a P scale in the present study desirable. Some caution, however, must be exercised in looking at the results as some criterion contamination may exist for delinquency. Three of the items loading on P are:

23. Do you seem to get into more quarrels and squabbles than most children?

41. Do you seem to get into a lot of fights?

45. Are you in more trouble at school than most children?

These would be just as appropriate in a questionnaire measuring delinquency.

Results

The sample and appropriate standardization means and standard deviations for the JPQ are presented in Table 2.6. All the variables have normal distributions. The different numbers of subjects are due to the failure of two subjects to complete all the questions on some of the scales. The scores for these subjects are hence omitted. It may be seen that the sample is significantly more psychotic than the standardization sample, possibly, as discussed above, because it is a more delinquent sample. It is also somewhat more neurotic and less prone to lying. The results for neuroticism and lying are similar to those found with the JEPI.

Table 2.6 Means and standard deviations

for sample and standardized sample for the JPQ

Variable	sample n	sample mean	sample S.D.	standardization n	standardization mean	standardization S.D.	t
P	50	6.42	2.98	228	4.86	3.05	3.340**
E	49	18.69	3.42	228	18.99	3.94	- 0.542
N	48	10.90	4.65	228	9.94	4.91	1.287
L	48	4.98	3.50	228	5.77	3.76	- 1.403

For 120 df and p<.05 t must be greater than 1.980 (*)
p<.01 2.617 (**)
p<.001 3.373 (***)

The intercorrelations between the scale scores are given in Table 2.4. There is a low positive correlation between E and N, moderate negative ones between E and L and N and L and a high negative one between P and L. A moderate positive correlation is shown between P and E and a negligible one between P and N. These correlations substantially replicate the position indicated above. There is orthogonality between E and L and P and N, the latter replicating the findings of Eysenck and Eysenck (1971). The negative correlations between E and L and N and L are as found with the JEPI and in the standardization literature. Looking in fact at the intercorrelations of JEPIE and JPQE with JEPIL and JPQL on retest, very similar results emerge. The correlations between P and L and P and E, however, are high.

One may now compare the intercorrelations of the JPQ with those of the JEPI on retest to look at possible effects of the honesty instructions given with the JEPI. The main effect of honesty instructions is posited to be on the N - L correlation which should be reduced (Eysenck, Eysenck and Shaw, 1974). This does not occur in this study unless the correlations across questionnaires i.e. the JEPIN - JPQL and JPQN - JPQL correlations are taken. There may be some reason for this seeing the dubious nature of the L scale but of course, in this case, no honesty instructions were given for the JPQL scale. No effect is found on E - N or E - L correlations.

The High School Personality Questionnaire (HSPQ)

The HSPQ has been devised by Cattell (Cattell and Cattell, 1969) to measure all the major dimensions of personality for the age group 12 to 18 using the technique of factor analysis. It provides self-report scales to measure 14 primary factors or dimensions which are described in terms of bipolar adjectives. A list of the primary factors is given in Table 2.7. It may be noted that factor B may be used as a measure of intelligence. These primary factors are correlated with each

Table 2.7 The HSPQ: Titles and symbols for designating the fourteen dimensions

	Low Sten Score Description (1-3)	Alphabetic Designation of Factor	High Sten Score Description (8-10)	
Professional Term (A-)	Sizothymia	A	Affectothymia	(A+)
Popular Terms	Reserved, detached, critical, aloof, stiff		Warmhearted, outgoing, easygoing, participating	
Professional (B-)	Low intelligence (Crystallized, power measure)	B	High intelligence (Crystallized, power measure)	(B+)
Popular	Dull		Bright	
Professional (C-)	Lower ego strength	C	Higher ego strength	(C+)
Popular	Affected by feelings, emotionally less stable, easily upset, changeable		Emotionally stable, mature, faces reality, calm	
Professional (D-)	Phlegmatic temperament	D	Excitability	(D+)
Popular	Undemonstrative, deliberate, inactive, stodgy		Excitable, impatient, demanding, overactive, unrestrained	
Professional (E-)	Submissiveness	E	Dominance	(E+)
Popular	Obedient, mild, easily led, docile, accommodating		Assertive, aggressive, competitive, stubborn	
Professional (F-)	Desurgency	F	Surgency	(F+)
Popular	Sober, taciturn, serious		Enthusiastic, heedless, happy-go-lucky	
Professional (G-)	Weaker superego strength	G	Stronger superego strength	(G+)
Popular	Disregards rules, expedient		Conscientious, persistent, moralistic, staid	

Table 2.7 con.

	Low Sten Score Description (1-3)	Alphabetic Designation of Factor	High Sten Score Description (8-10)	
Professional (H-)	Threctia	H	Parmia	(H+)
Popular	Shy, timid, threat-sensitive		Adventurous, "thick-skinned", socially bold	
Professional (I-)	Harria	I	Premsia	(I+)
Popular	Tough-minded, rejects illusions		Tender-minded, sensitive, dependent, overprotected	
Professional (J-)	Zeppia	J	Coasthenia	(J+)
Popular	Zestful, liking group action		Circumspect individualism, reflective, internally restrained	
Professional (O-)	Untroubled adequacy	O	Guilt proneness	(O+)
Popular	Self-assured, placid, secure, complacent, serene		Apprehensive, self-reproaching, insecure, worrying, troubled	
Professional (Q_2-)	Group dependency	Q_2	Self-sufficiency	(Q_2+)
Popular	Sociably group dependent, a "joiner" and sound follower		Self-sufficient, resourceful, prefers own decisions	
Professional (Q_3-)	Low self-sentiment integration	Q_3	High strength of self-sentiment	(Q_3+)
Popular	Uncontrolled, lax, follows own urges, careless of social rules		Controlled, exacting will power, socially precise, compulsive, following self-image	
Professional (Q_4-)	Low ergic tension	Q_4	High ergic tension	(Q_4+)
Popular	Relaxed, tranquil, torpid, unfrustrated, composed		Tense, driven, overwrought, fretful	

other and may be factor analysed again to produce several second-order factors. The scores for each primary factor are transformed into sten scores using norm tables and then weighted and added according to the factor loadings of the primary factors on the second-order factors to produce scores for the second-order factors. The second-order factors which have been calculated in this study are exvia (CATEX) and anxiety (CATANX) which may be considered as analogous to Eysenck's extroversion and neuroticism (Eysenck and Eysenck, 1969).

Although norm tables for a British standardization sample have recently been published (Saville and Finlayson, 1973), enabling the sten scores to be calculated from British norms, the authors have not calculated the regression equations for exvia and anxiety for the British standardization sample (personal communication). It has hence been necessary to use the American regression equations.

Results

The means and standard deviations for the sample, together with standardization means and standard deviations, also calculated using the American equations, are given in Table 2.8. For CATB, the t-test between standardization figures and the present study has only been done for the retest figure as the mean age of the standardization sample was 14.4 years (similar to the retest sample) and CATB displays distinct variation with age. CATEX and CATANX do not show pronounced variation. All the distributions are normal. It may be seen that the sample is significantly more neurotic and less intelligent than the standardization sample. The neuroticism result was also found with the JEPI. The sample is biased as far as intelligence is concerned, being taken from a secondary modern school, and so this result might be expected.

Test-retest correlations and the results of t-tests between test and retest are given in Table 2.2. The figures for CATEX and CATANX

Table 2.8 Means and standard deviation for the HSPQ

	Variable	Sample n	Sample mean	Sample S.D.	Standardization n	Standardization mean	Standardization S.D.	t
test	CATEXK1	52	5.68	1.83	1261	5.78	2.32	- 0.382
	CATANXK1	52	6.26	1.37	1261	5.36	2.02	4.539***
	CATBUK1	52	3.48	1.39	-		-	-
retest	CATEXK2	48	5.71	2.33	1261	5.78	2.32	- 0.204
	CATANXK2	49	5.75	1.21	1261	5.36	2.02	2.144*
	CATBUK2	49	3.78	1.40	1261	7.09	2.01	-15.926***

For p<.05 t must be greater than 1.980(*)
p<.01 2.617(**)
p<.001 3.373(***)

are very similar to those for the JEPI, moderately high reliabilities for both CATEX and CATANX and a significant lowering of the mean anxiety score on retest being shown.

The correlations between CATEX and CATANX are given in Tables 2.3 and 2.4. They are non-significant on both test and retest, paralleling the orthogonality of extraversion and neuroticism.

The Teacher's Rating Scale

The TRS was devised as an alternative method of assessing children's positions on the personality dimensions of neuroticism and extroversion. It was originally developed to bypass the hypothesized tendency of young or neurotic children to be poor at self-ratings. The original form of the TRS measured only neuroticism (Nicholson, 1972). Twelve adjectives were chosen from those used by Eysenck and Rachman (1965) to describe neuroticism and teachers are asked to rate each adjective as a description of the child on a 5-point scale from 'not at all' to 'very'. The adjectives chosen were balanced between the neurotic introvert and neurotic extravert traits and between stable and unstable poles of the neuroticism dimension. The adjectives used are moody, anxious, flexible, touchy, restless, aggressive, calm, even-tempered, reliable, lively, care-free and stable. Each child obtains a score on each adjective form 1 to 5 and these scores are added to give the neuroticism score of the child.

The scale for extraversion-introversion is similar in its construction and scoring. The adjectives are exciteable, passive, thoughtful, careful, reserved, quiet, unsociable, impulsive, optimistic, talkative, responsive and outgoing.

Results

As there are no published standardization data on the TRS which use a large sample, it is necessary to examine it in more detail. Table 2.9 gives the means and standard deviations for the TRSN and TRSE scores on test and retest and the individual adjectives on test and retest. The TRSN and TRSE scores are an average of the ratings of each child by the various teachers. Individual adjective means have been calculated from all the ratings given by the various teachers on test or on retest on that adjective. The lower numbers for FLEXIBLE and OPTIMISTIC are due to one teacher losing those pages of the questionnaire.

It may be seen first that the individual adjective means are all round the mean point of the scale (3). The teachers may hence be rating the boys taking as reference point the population of boys rather than any general population (although the mean of the general population may be 3). The TRS may hence not be comparable to the self-rating scales which are standardized on the general population of boys of that age range. This may also be seen in the lower mean for neuroticism than extraversion on both test and retest, the self-rating scales showing significantly more neuroticism than the general population but few significant differences for extraversion. Secondly, the individual adjective means for neuroticism on test range from 2.79 to 3.22 whereas those for extraversion range from 2.89 to 3.30, only 2 adjectives on N being greater than 3.10 and only 3 on E being less than 3.10. There is hence little overlap. It appears that the teachers were rating the E and N scales as separate wholes even though the adjectives were randomly ordered in the questionnaire. This tends to encourage the belief that the E and N scales are distinct entities and that the teachers rated them as such. On retest, however, there is far more overlap, the N means ranging from 2.71 to 3.62 and the E means from 2.97 to 3.50.

Table 2.9 Means and standard deviations for the TRS

	Variable	n	mean	S.D.
test	TRSN	53	2.96	0.56
	TRSE	53	3.14	0.52
retest	TRSN2	53	3.18	0.71
	TRSE2	53	3.29	0.51

Individual adjectives

	Variable	Test n	Test mean	Test S.D.	Retest n	Retest mean	Retest S.D.
N	MOODY	91	2.94	1.43	69	3.16	1.17
	ANXIOUS	90	2.88	1.27	68	2.71	0.95
	FLEXIBLE	79	2.79	1.24	69	3.26	0.92
	TOUCHY	91	3.03	1.41	69	3.35	1.05
	RESTLESS	92	3.10	1.38	69	3.57	1.13
	CALM	91	2.86	1.33	69	3.23	0.99
	EVEN-TEMPERED	91	2.85	1.17	68	3.06	1.22
	AGGRESSIVE	91	3.05	1.08	69	3.04	1.14
	RELIABLE	91	2.93	1.21	69	3.16	1.15
	LIVELY	92	3.22	1.06	69	3.62	0.89
	CAREFREE	90	2.76	0.95	69	2.97	0.89
	STABLE	90	3.02	1.18	69	3.19	1.09

Table 2.9 con.

Individual Adjectives

Variable	Test n	Test mean	Test S.D.	Retest n	Retest mean	Retest S.D.
E OPTIMISTIC	67	3.03	0.85	69	3,10	0.73
IMPULSIVE	92	3.10	1.09	69	3.41	0.91
UNSOCIABLE	92	3.14	0.90	69	3.16	0.90
EXCITEABLE	91	3.16	1.08	68	3.50	0.86
QUIET	91	3.12	1.10	69	3.36	1.35
TALKATIVE	91	3.30	1.04	69	3.38	0.96
RESPONSIVE	91	2.98	1.02	69	2.99	0.85
RESERVED	91	3.01	1.03	69	3.19	0.83
OUTGOING	93	2.89	1.14	68	3.25	0.89
CAREFUL	92	3.30	1.09	69	3.41	0.96
THOUGHTFUL	90	3.21	1.17	69	2.97	1.03
PASSIVE	92	3.10	1.09	69	3.49	0.87

Table 2.10 shows the means and standard deviations of the teachers. It may be seen that, again, the means of the teachers tend towards the mean point of the scale (3). There is, however, considerable variation between teachers as to their standard deviations. The intercorrelations between teachers ($inter_{rater}$ concordance) are only given for pairs 1 and 2, 3 and 4, and 5 and 6 since teachers 7 and 8 only rated 2 children in common. The correlations for TRSN are reasonably high but those for TRSE are low and must cast doubt on the reliability of the scale.

The test-retest correlations for TRSN and TRSE are 0.56 (.002) and 0.53 (.002). These compare very favourably with the correlations obtained with the self-report extraversion and neuroticism questionnaires.

The correlation between TRSN and TRSE on test is 0.68 (.001) and on retest 0.53 (.002). These are as high as the test-retest correlations and the interteacher correlations. They mitigate against the items comprising the TRSE and TRSN scales being able to be differentiated. The other possibilities are that either the population is one in which the children high on extraversion are also high on neuroticism or vice versa, or that the teachers rate both neuroticism and extraversion items as being part of one scale of, say, behaviour disorder or troublesomeness. The first of these is unlikely given the low correlations between E and N on the self-report scales. Since, as discussed above, some adjectives have consistently lower or higher means than others, it seems more likely that the teachers are regarding the test as describing one quantity rather than not being able to distinguish the individual adjectives. This was also found with a similar scale by Eysenck and Cookson (1969).

In this regard, it is instructive to look at the findings of other studies that have used the TRS. Nicholson (1972) using only TRSN obtained test-retest reliability of 0.81 over a period of a few months and inter-rater concordance of 0.83. These results, however, were found in a boarding-school for emotionally maladjusted children

Table 2.10 Teacher means and intercorrelations for the TRS

Means and standard deviations

Teacher	TRSN n	TRSN mean	TRSN S.D.	TRSE n	TRSE mean	TRSE S.D.
1 test 1st year	12	3.08	0.73	12	2.89	0.76
2 test 1st year	25	3.01	0.38	25	3.19	0.37
3 test 2nd year	28	2.97	0.99	28	3.01	0.81
4 test 2nd year	28	2.84	0.53	28	3.1[illegible]	0.59
5 retest 1st year	13	2.92	0.81	13	2.77	0.48
6 retest 1st year	25	3.53	0.59	25	3.45	0.39
7 retest 2nd year	19	3.11	0.80	19	3.33	0.67
8 retest 2nd year	12	2.94	0.53	12	3.41	0.41

Intercorrelations

Correlation	TRSN n	TRSE n
1 with 2	0.741 (<.02) 11	0.631 (NS) 11
3 with 4	0.582 (<.02) 28	0.422 (NS) 28
5 with 6	0.813 (<.002) 13	0.201 (NS) 13

in which the teachers knew the children very well. In the same school, in a later experiment, the correlation between TRSN and TRSE was found to be 0.39 (ns).

De Wit (unpublished) found test-retest correlations over 3 years in the same school of 0.22 (ns) for TRSN and 0.74 (<.01) for TRSE. Since this was a school for emotionally maladjusted children with high neuroticism scores, the low correlation for TRSN over such a long period of time is not surprising. Her correlation between TRSN and TRSE was 0.73 (.001). This is an even higher figure than that obtained in the present study.

Rushton (unpublished) used both TRSN and TRSE with younger children aged 7 to 11. His test-retest correlations (time range 1-13 months) were 0.38 (<.05) for TRSN and 0.70 (.001) for TRSE. His correlation between TRSN and TRSE was 0.28 (ns).

It seems that the older the children, the higher the correlations between TRSN and TRSE. Inter-rater concordances are respectable, as are test-retest correlations, but doubt must remain as to the true nature of the scale.

Correlations between extraversion, between neuroticism and between lie scale scores

These are shown in Tables 2.3 and 2.11. On test, it may be seen that the correlation between self-report extraversion measures and that between self-report neuroticism measures are significant, at the .002 level (0.45 and 0.46). The correlations between JEPIE, CATEX and TRSE, however, are low, as are the correlations between JEPIN, CATANX and TRSN, the correlations with the HSPQ being higher than those with the JEPI. TRSE in fact correlates more highly with the neuroticism measures than the extraversion measures.

Table 2.11 Personality intercorrelations - retest

1. Extraversion

	JEPI	JPQ	CATEX	TRS
JEPI				
JPQ	0.78 (.001)			
CATEX	0.68 (.002)	0.63 (.002)		
TRS	0.32 (.032)	0.27 (NS)	0.23 (NS)	

2. Neuroticism

	JEPI	JPQ	CATANX	TRS
JEPI				
JPQ	0.67 (.002)			
CATANX	0.41 (.004)	0.54 (.002)		
TRS	0.14 (NS)	0.11 (NS)	- 0.03 (NS)	

3. Lie scale

JEPIL2 with JPQL2 0.38 (.006)

On retest, the JEPI, JPQ and HSPQ have high intercorrelations for both extraversion and neuroticism. The TRS again shows low correlations with self-report extraversion measures and negligible correlations with self-report neuroticism measures. The lie scale measures, JEPIL and JPQL, correlate to a moderate degree.

The TRS was originally developed to provide another measure of neuroticism for the younger age groups because of a hypothesized inability of younger children to self-rate themselves accurately on neuroticism. Although the low correlations between TRSN and JEPIN found in Nicholson's (1972) studies of both young (7-11 years) and older but maladjusted children were again to be seen in Rushton's study of 7 to 11 year old children (correlations of 0.11 and 0.20 with JEPIN and CATANX), one must conclude from the present study that either older boys share the inability of younger children to self-rate themselves on neuroticism or that teachers are not using the TRSN scale to rate the boys on neuroticism. Correlations of -0.20 between TRSE and JEPIE in Nicholson's study of older maladjusted boys and 0.10 and -0.27 between TRSE and JEPIE, and TRSE and CATEX in Rushton's study point to the same phenomenon occuring with the TRSE scale. The high positive correlations between TRSN and TRSE found in the Nicholson maladjusted study and the present study lead to the tentative conclusion that teachers are not using the TRS to rate the boys on neuroticism and extraversion but are rating them on one dimension related to both of these. This would be expected from Gray's (1972) theory of personality in which the dimension of impulsivity, at 45° to the E and N axes, is considered to be one of the factors of causal influence, other than either the N or the E axis. The self-report neuroticism and extraversion scales, however, appear to possess convergent validity.

Correlations between neuroticism, extraversion, psychoticism and the lie scales

Neuroticism, extraversion and psychoticism have been postulated to be independent factors. Tables 2.3 and 2.4 show the intercorrelations in this study. Correlations between E and N on both test and retest for the self-report scales are very low and support the hypothesis. TRSE, however, correlates very highly with TRSN and moderately with JEPIN and CATANX on test and CATANX on retest. TRSN correlates moderately with JEPIE, JPQE and CATEX on retest. The lie scales correlate negatively with all the E and N measures except TRSE and TRSN on retest. Correlations with extraversion are quite high for JEPIE and TRSE. Correlations with neuroticism are very high for CATANX on both test and retest. It may be that anxiety is very prone to faking although it is surprising in this case that exvia, which is calculated from the same kind of questions, does not correlate highly with faking. The low correlations with JEPIN and JPQN are another point weighing against the argument that children are not capable of self-rating themselves on neuroticism.

It may be seen that psychoticism is quite highly correlated with extraversion on all the self-rating scales. This bears out the suggestion of Claridge mentioned above that psychoticism, as measured by the JPQ, only reflects active psychosis which may be linked to extraversion. Psychoticism is not correlated with neuroticism. It is, however, highly negatively correlated with the lie scales.

One may conclude that discriminant validity (Campbell and Fiske, 1959) has been shown between E and N and N and P for the self-report questionnaires. There are, however, high correlations between E and P for the self-report scales and E and N for the Teacher's Rating Scale.

Developmental Measures

Three of the developmental measures were obtained from school records. These are the chronological age of the child in months at the time of first behavioural testing (AGE); the chronological age subtracted from the reading age of the child at age 11 when he entered the school as measured by the Schonell Attainment and Diagnostic Test of Reading English (Schonell and Schonell, 1960) to give a relative reading score (RACA); and a nonverbal IQ score using the Calvert Nonverbal Test 3 (National Foundation for Educational Research) also obtained at age 11 (IQ). Subsequent testing by the school of a sample of children indicated that there was not very much change in reading age or IQ during the first year except for those pupils receiving remedial reading lessons of which there were about 8 in the sample. It was not deemed advisable that the experimenter should retest reading or IQ and so these measures must be taken as giving the best estimate available of developmental variables.

The primary factor B of the Cattell HSPQ may also be taken as a measure of intelligence and this has been calculated for both test and retest administrations of the HSPQ (CATBUKI and CATBUK2).

Results

The means and standard deviations of the developmental variables are given in Table 12, together with their intercorrelations. The low mean intelligence scores of the children are seen in both the IQ and RACA means, there being a greater verbal than nonverbal deficit, (general population means being 100 and 0 respectively). The intelligence variables all correlate positively and significantly. AGE does not correlate with the other developmental variables so highly but it must be remembered that there is only a 2 year age range.

Table 2.12 Developmental variables

Means and standard deviations

Variable	n	Mean	S.D.
IQ	54	94.37	11.09
RACA	54	3.82	1.76
CATBUK1	52	3.48	1.39
CATBUK2	49	3.78	1.40
AGE	54	155.72	5.60

Intercorrelations

	IQ	RACA	CATBUK1	CATBUK2	AGE
IQ					
RACA	0.37 (.006)				
CATBUK1	0.53 (.002)	0.44 (.002)			
CATBUK2	0.38 (.006)	0.39 (.006)	0.33 (.018)		
AGE	0.44 (.002)	- 0.03 (NS)	0.23 (NS)	0.13 (NS)	

It may be seen that there is a test-retest coefficient of 0.33 (.009) for CATB.

The correlations of the developmental variables with personality are given in Table 13. It may be seen that the Eysenck E, N and P scales (JEPI and JPQ) have no significant correlations with intelligence, as shown also by the standardization data. CATEX does not have any significant correlations but CATANX is positively related to both IQ and CATB on retest. The TRSN scale, however, has negative correlations with many of the intelligence variables. The TRSE scale is only significantly related to RACA on test; the correlation becoming negative on retest. The extraversion scales may be regarded as being independent of intelligence but self-rated neuroticism appears to be very slightly related to intelligence and teacher-rated neutoticism to dullness. This may be allied to teachers' expectations of those adjectives characterizing a neurotic child e.g. moody, touchy, restless etc. They could also be taken to describe a child who is not going to get on well in school and so is, possibly, unintelligent.

All the significant correlations of the lie scales with intelligence are negative. The standardization data for the JEPI show a significant tendency for children who have high L scores to be duller than average (-0.38 at age 11 - test and -0.41 at age 14 - retest) which agrees with some unpublished data (Eysenck, 1965) showing that adults of subnormal intelligence tend to have high L scores. The findings of the present study are thus not surprising but indicate that some 'faking' on the L scale may be due to inability to comprehend the questions.

Impulsivity on test correlates highly with all the intelligence measures. There is no known explanation for this but it must be remembered that the impulsivity scale has only face validity in the JEPI. On retest, the correlations become negligible.

Table 2.13 Correlations between personality and intelligence

A. Test

	extraversion			neuroticism			lie scale	impulsivity
	JEPIE	CATEXK1	TRSE	JEPIN	CATANXK1	TRSN	JEPIL	JEPIIMP
IQ	0.14 (NS)	0.11 (NS)	0.16 (NS)	0.16 (NS)	0.18 (NS)	- 0.20 (NS)	- 0.27 (.046)	0.27 (.046)
RACA	0.11 (NS)	0.17 (NS)	0.27 (.050)	0.22 (NS)	- 0.17 (NS)	0.01 (NS)	0.10 (NS)	0.42 (.002)
CATBUK1	0.17 (NS)	0.13 (NS)	- 0.10 (NS)	0.06 (NS)	- 0.01 (NS)	- 0.36 (.010)	0.03 (NS)	0.46 (.002)

B. Retest

	extraversion				neuroticism			
	JEPIE2	CATEXK2	JPQE2	TRSE2	JEPIN2	CATANXK2	JPQN2	TRSN2
IQ	0.01 (NS)	0.15 (NS)	0.02 (NS)	- 0.01 (NS)	0.09 (NS)	0.31 (.032)	0.10 (NS)	- 0.13 (NS)
RACA	0.04 (NS)	0.20 (NS)	0.18 (NS)	- 0.15 (NS)	- 0.01 (NS)	- 0.08 (NS)	- 0.05 (NS)	- 0.31 (.022)
CATBUK2	- 0.02 (NS)	0.09 (NS)	- 0.13 (NS)	- 0.09 (NS)	0.06 (NS)	0.28 (.048)	0.10 (NS)	- 0.24 (NS)

lie scales etc.

	JEPIL2	JPQL2	JPQP2	JEPIIMP
IQ	- 0.28 (.042)	- 0.29 (.046)	0.20 (NS)	0.15 (NS)
RACA	- 0.04 (NS)	- 0.13 (NS)	0.22 (NS)	0.01 (NS)
CATBUK2	- 0.28 (.048)	- 0.12 (NS)	0.06 (NS)	- 0.02 (NS)

CHAPTER 3

SELF-REPORT DELINQUENCY

Problems with official convictions as a measure of delinquency

The most obvious measure of delinquency is the number of convictions that the offender has obtained. In this case there is no immediate problem of validation since criminality is being defined as adverse contact with the criminal justice system. There are, however, many disadvantages of this measure, particularly when it is envisaged using it in a study of personality and crime in young delinquents. In the U.S.A. it has been shown, as reviewed by Erickson (1972), that there is a lack of consensus regarding the definition of criminality, a lack of uniform methods of reporting and recording crime data and also differentials in law enforcement with respect to different racial and social class groups and geographical regions.

More importantly, youthful delinquent behaviour does not necessarily lead to criminal convictions. Those crimes that end in a conviction are only the tip of the iceberg. This may be because the delinquent was never caught, because the police decided not to pursue the matter, because they decided to give a formal caution rather than take the boy to court or because the case was thrown out of court due to insufficient evidence or other factors. The reduced manpower of the police and the unofficial policies of partial enforcement of the law that they adopt will ensure that the majority of delinquent acts will not reach the courtroom.

If, however, either the delinquents convicted or the offences dealt with were randomly selected from the total number of delinquents and delinquent behaviours, the only problem in using convictions would be that of too low figures for statistical analysis in young delinquents who will not have had time to be caught since reaching the age of criminal

responsibility. What is more difficult is that there is considerable evidence to indicate that there is selection of delinquents at each stage in the criminal justice system (Williams and Gold, 1972). It has been shown, for example, that style of dress, manner of walking and way of speech influences the probability of a youth in New York being questioned on the street or taken to the police station for questioning (Piliavin and Briar, 1964). The social class of the youth will influence whether he is booked after a police contact (Dentler and Monroe, 1961a); whether he is referred to the juvenile court after he has been booked (Dentler and Monroe 1961b); and, in the United States, whether he receives an official or an unofficial hearing (Erickson and Empey, 1965). These stages are open to empirical study, and it might be possible to compensate for the biases introduced by such screening. What can never be investigated, however, is the initial disposition of resources by the police and the judgement of the individual policeman as to what constitutes a suspicious situation.

These factors may affect a study of the relationship between personality and crime in two ways. First, the processes of screening may select for some personality characteristics and not for others such that the personality dimensions discriminating between convicted delinquents and controls may not be those discriminating between youths indulging in delinquent behaviour and youths not doing so. On sociological variables, Gold (1963) has found that boys apprehended for delinquent acts in an American town were five times as likely to appear subsequently in some official record if they lived in poor rather than wealthy neighbourhoods. Secondly, it is possible that, in a comparison of official delinquents with controls, the controls may turn out to have done a greater number of delinquent acts but never to have been caught for them. Short (1955) found that 20 per cent of the boys in a Washington reformatory were no

more delinquent than 90 per cent of a sample of public high school boys.

Cohen (1955) has neatly summarized these arguments:

"First and foremost, we must overcome the limitations inherent in all official or quasi-official data on juvenile delinquency. The defect of these data, of course, is not that they represent too small a sample but that we cannot tell what sorts of delinquents and delinquencies may be over-represented or under-represented. We can never lay to rest the ghost of unrepresentativeness as long as our statistical base of operations is delinquencies known to the courts, the police, or even the schools and the social agencies. Until this defect is remedied, comparisons between delinquents and non-delinquents with respect to their developmental histories, personalities and social position must be received with some sceptism and reserve. In order to remedy this defect, we must start, not with known delinquents, but with <u>representative samples of the juvenile population</u> drawn without regard to their known or probable delinquent histories. <u>Then</u>, on the basis of interviews, questionnaires and tests we must differentiate these samples into delinquents and non-delinquents of various degrees and kinds. In this manner alone can we achieve a valid conception to the distribution, by degree and kind, of delinquency within sectors and strata of the population."

Such self-report delinquency measures also have the advantage that they abolish the artificial dichotomy between delinquents and non-delinquents by which the latter are presumed 'innocent', and permit the formation of a scale of delinquency on which the involvement of an individual in delinquency may be measured as a continuous scale. Their other advantage is that if a random sample of the population is taken for the administration of the self-report measure, there is no problem with adequacy of controls. Such problems have arisen to a very large degree in studies of the personality of criminals in institutions (Passingham, 1972). Matching the controls with the criminals on all the relevant variables is impossible and the compromise of matching

them on only three or four exceedingly time-consuming and expensive.

Self-report delinquency measures: frequency of offences admitted

The majority of studies of self-report delinquency have concerned juvenile delinquency, although young adults have been extensively surveyed in Scandinavia. There has been one study of adults using a mail questionnaire in New York (Wallerstein and Wyle, 1947). Delinquent behaviour has been found to be much more widespread than official convictions might indicate. Wallerstein and Wyle found that 64 per cent of the men answering the questionnaire admitted committing a felony. The average number admitted since the age of 18 was 16. A similar position holds for delinquents. It has been estimated that between 10 and 20 per cent of the male population will have been convicted by a court of a criminal offence (Hood and Sparks, 1970). Self-report studies show that this represents only about a quarter of delinquent behaviour, even though figures based on these techniques are usually an under-estimate since persons in penal institutions are excluded.

In the U.S.A., Dentler and Monroe (1961a) found that between 38 and 46 per cent of 644 Kansas junior high school pupils admitted having committed a criminal offence. There were small differences according to whether the area was urban or rural in character. Empey and Erickson found that over 100,000 offences were admitted by their sample of boys aged 15 to 17, which comprised 50 high school boys who had never been to court, 30 once-only offenders, 50 recidivists and 50 in an institution. Over 90 per cent were undetected. Porterfield (1946), in a comparison between college students and juvenile delinquents, found that all the college students in his sample had committed offences comparable to the offences for which other people had been taken to court.

More recent studies show very similar trends. Williams and Gold (1972) found that 88 per cent of the 810 teenagers aged 13 to 16 in their national sample admitted in an interview situation at least one chargeable

offence. The number of adolescents, however, decreased sharply as the measures indicated more frequent and serious delinquent behaviour.

In the United Kingdom, the Cambridge Study in Delinquent Development (West and Farrington, 1973; Farrington, 1973) gave self-report interviews to 411 normal schoolboys in London at the ages of 14 to 15 and 16 to 17. The overwhelming majority of boys admitted the more trivial acts such as letting off fireworks on the street (93.2 per cent), going to X-rated films under age (91.7 per cent), travelling without a ticket (89.5 per cent) and riding a bicycle without lights (88.3 per cent.) On the other hand, only a small minority had committed the more serious acts such as planned house-breaking (7.1 per cent), unplanned house-breaking (9.3 per cent), store-breaking (9.5 per cent) and shop-breaking (12.7 per cent). As might be expected, almost every act was admitted by more boys at the later age. Frequencies of convictions in this sample were 11 per cent at age 14 to 15 and 19 per cent at age 16 to 17. Willcock (1966) found that less than 3 per cent admitted to none of the 40 types of offences in his studies of adolescents. Again, although 70 to 80 per cent admitted traffic violations and 16 to 20 per cent vandalism, gang fighting and larceny, only 1.7 to 3.3 per cent admitted serious offences such as breaking and entering, fighting the police and attacking unknown persons. In this study, however, 29 per cent of those approached refused to participate and there was some evidence that these were more likely to have committed more frequent and more serious delinquent behaviour. Belson (1969) found that between half and a third of his sample of 1400 London schoolboys had stolen in a variety of different situations.

The general tendency seems to be that although total frequency of admitted delinquent behaviour is very much higher than that of official convictions, the greatest amount of the variance in this difference is provided by the more minor crimes. Number of reported crimes increases with age. Hence, although it may be 'normal' behaviour for boys to commit one or two delinquent acts, it is rare for a boy to be involved in frequent

or serious criminal activity.

Types of self-report measures

Very good reviews of the types of self-report measures available and methodological issues has been given by Hood and Sparks (1970) and Farrington (1973). Here, I shall discuss issues that are pertinent to the development of the interview method that I have used and give the results of more recent studies.

All self-report measures contain a number of items, each of which represents some behaviour which is appropriate to the age of the respondent and some of which concern acts for which, if the respondent has been caught, would be judged criminal by a court of law. Very often, the measure will contain a sample from a population of deviant acts. This population may be the total delinquent spectrum (for example, West and Farrington, 1973) or some particular kind of deviant activity (for example, stealing in Gold, 1966). Respondents are either asked a straight yes/no question: "Have you ever done this in your life?" or asked to grade the act according to the frequency with which they have done it.

Questionnaire or interview?

Perhaps the most crucial difference between the proponents of self-report measures is whether they favour a questionnaire or an interview method. This discussion was apparently lent weight by the finding that those who used interview methods (e.g. Reiss and Rhodes, 1961) found social class differences in the frequency of admitted delinquent behaviour similar to those for official convictions, whereas those who used the questionnaire self-completion technique found no significant differences between the social classes (for example, Short and Nye, 1958; Dentler and Monroe, 1961a; Vaz, 1966; Akers, 1964; Voss, 1966; Christie et al, 1965).

Christie et al suggest that the differences between studies might be due to the 'seriousness of the acts themselves' being different or that the working class forgot more acts than the middle class. They found, however, that working-class offenders reported recent acts as well as middle-class boys. Support for the second hypothesis comes from Gold's study of 500 schoolchildren from Flint, Michigan. He found that one quarter of the admitted offences were very accidental or trivial in nature and that wealthier boys were more likely to declare these than working class boys. Official records exaggerated the difference between different status boys but lower class boys were more frequently and more seriously delinquent than middle class boys. So, if more serious offences are considered, then the social class differential found with official convictions holds also for self-report studies. Similar results were found by Reiss and Rhodes (1961). Tribble (1972) has recently tried to resolve the question by confining his list of delinquent acts in his questionnaire to those which would, from an inspection of the probation lists, lead to committal by the juvenile court. In a study of 60 households from four different status areas, he found significant negative correlations between both number of offenders and number of offences and socio-economic status. 61 per cent of his boys admitted one or more offences.

It has seemed strange that such an important issue as the relationship of socio-economic status to crime should be greatly affected by whether the self-report measure was an interview or a questionnaire. It is far more likely that different results were obtained from different definitions of crime - that middle-class children admitted more non-criminal misbehaviour and lower-class children more serious and more frequent crimes.

Problems of offence description

This is allied to the whole problem of producing a questionnaire

that means the same to each respondent. It is possible that middle-class and working-class children interpret items differently. This may be due to the different cultural norms in the groups towards, for example, stealing from work, or it may be due to different standards of reading and vocabulary. All such questionnaires depend on a common definition by the respondents of such words as 'stealing', 'weapon', etc. For some children, however, taking things from friends is not stealing and a weapon is a knife or a gun not a stick or a stone. As Blackmore (1974) says, "Problems of this sort would have been reduced considerably if the descriptions of the offences given in the self-report schedule had been more specific and less ambiguous. However, not every possibility could have been allowed for without an extensive list of delinquent acts that would have been impractical to administer." Such considerations, together with the very low reading ability of some secondary school boys, argue for an interview method, unless the study is so large that this would be impractical. The method should also contain both a probing session about each item admitted so that the interviewer is sure that the respondent has understood the scope of the item and instructions to ask at any time if the respondent is not sure whether some behaviour falls under that category or not. Of course, whether such behaviour would actually have been defined as criminal by the law-enforcement authorities can never be known. As Hood and Sparks (1970) say, "An act of violence against an unknown stranger would usually be classed as delinquent, a fight between two boys at school as 'troublesome'." Without a detailed investigation of the situation in which the act took place it is difficult to know whether it could be classed as delinquent.

One way out of this would be to have very detailed descriptions of offence categories but this, unless only a small section of the crime

universe were being studied, would make the questionnaire prohibitively long and expensive. Another might be a modification of the procedure used by Christie et al. (1965) to scale the seriousness of their various items. Here, two professors of criminal law were asked to rank-order the items according to seriousness of offence. Each respondent might then be asked to describe what he thought was a typical crime falling under this item that he had committed (or the only crime if it was only committed once). The descriptions could then be checked either by the experimenter or by outside lawyers. Perhaps what might be simpler, however, is for the experimenter, in an interview method, to probe each crime item admitted, asking how it came about. This would also yield valuable information on the function that that particular crime had for that individual at the time it was committed.

Anonymity

The other major issue regarding the decision between interview and questionnaire types of self-report methods is that of anonymity. Questionnaires may be anonymous, even to the extent of unnumbered ones being selected by the respondent from a pile and being put into a ballot box at the end (Nye, 1958). This, it was believed, would encourage truthful responding. Of course, in this case, comparisons could not be made with official criminal records or with any other measures taken on the respondents. The only measure that could be taken would be the frequency of admitting any particular item on the measure for the population as a whole. Voss (1966) was able to ascertain respondents' identities from other information on a supposedly anonymous questionnaire but this is a morally dubious procedure. Self-completion may be superior because respondents may be less willing to admit deviant acts vocally in a face-to-face situation. A comparison between anonymous and non-anonymous questionnaires found that the total scores in the two conditions

correlated 0.98 (Kulik et al, 1968), although they were significantly higher in the anonymous condition. If a study requires a knowledge of the identity of the respondent in order to compare his score on self-report delinquency with other factors, as the present study does and also requires measures of the frequency with which each type of crime was committed and various details about the offence, then the interview method must be preferable. In this case, honesty and rapport with the interviewer demands that respondents are not anonymous but the pressure of a face-to-face situation with such delicate topics can be lessened by screens between interview and interviewee as used by Belson (1968) or by the use of a preliminary card-sorting technique,in which the respondent is asked to sort the items, printed on cards, into boxes according to whether or not he has done them ever in his life. This removes the situation of initial admission of a crime from the interview situation while still allowing the interviewer to make sure the instructions have been understood and that the respondent can read the items.

Measures of self-report delinquency

Measures are often scored according to the number of different types of crimes that were admitted, the frequency of commission of these crimes and occasionally also by the seriousness of the crimes. If frequency is to be used, then a time limit should be set on the period during which the respondent must recall the crimes. There is considerable error, even with convictions, over longer periods. There is no very good way of measuring seriousness, primarily because different groups in the same country would weight the same crime differently. The police, the courts and the general public, let alone the subsection of the community from which the respondent comes, would all take a different view of a

crime such as football vandalism. Christie et al (1965), as mentioned above, uses two criminal law professors. Elmhorn (1965) had her items rated on an arbitrary basis by the research staff. Gold (1966) has used the method of Sellin and Wolfgang (1964) to weight each offence according to the amount of property damage done or the harm done to the victim of an assault. This method, however, has recently been attacked by Lesieur and Lehman (1975) on the grounds first, that seriousness is not a unidimensional scale, since crime cannot necessarily be treated as a single category in social investigation, and secondly, that neither a ratio nor an interval scale could be constructed in their data, as is required by the Sellin and Wolfgang procedure. In general, the procedures at present available for determining the seriousness of an item seem dubious.

Reliability

Reliability issues in self-report delinquency may be divided into those concerned with internal consistency, including factor analysis; those concerned with test-retest measures; and the possible response sets operating. As Farrington (1973) points out, statistical problems can arise with analyses based on product-moment correlations. Many scales of delinquency produce J-shaped distributions rather than normal distributions (Hindelang, 1969; Gold, 1970; Hindelang, 1972).

Internal consistency

Internal consistency has usually been assessed using a coefficient of reproducibility calculated by the Guttman scalogram analysis technique. This has many intrinsic defects (Farrington, 1973), but also one peculiar to self-reported techniques in that it encourages the use of trivial items of misbehaviour in scales in order to obtain the high levels of responding necessary. The ordinary psychological measures of internal consistency would seem to be better. Kulik et al.(1968)

found split-half reliability of 0.96 for a 52-item scale and Elmhorn (1965) one of 0.86 for a 21-item scale.

Correlation and factor analysis

There are several examples of correlation analyses, cluster analyses and factor analyses of self-report scales. Hindelang (1972) calculated that the mean correlation coefficient (across all intercorrelations of all items) for his 444 females in a Catholic co-educational high school in Oakland, California was 0.309 and that for his 319 males 0.195. Among the females, 244 of the 276 correlation coefficients were significantly and positively related to each other ($p<.01$). Of the 32 correlation coefficients not significantly related at the .01 level, 18 were accounted for by one item - cheating in examinations. For the males, 189 out of 276 correlation coefficients were significantly and positively related to each other. The Cambridge Study (Farrington, 1973) found a very high internal consistency coefficient of 0.89 (Kuder-Richardson formula 20 coefficient). They also tried to establish subscales of active theft, aggressive acts, underage acts and minor acts, the boy's score on each act being simply the number of different acts in the group which he admitted. The subscales were found to be rather less internally consistent than the full scale and were all significantly intercorrelated ($p<.001$). It may hence be either that the delinquents in these studies were very versatile in their delinquency or that delinquency is a unitary variable. Certainly, very few studies have found any specialization to occur into the types of delinquents posited by Cloward and Ohlin (1960).

Gibson (1971) has investigated the factorial structure of juvenile delinquency. He gave a self-report interview to 402 boys aged 14 to 15 as part of the Cambridge Study. 38 separate items were given. Each boy was also rated on social handicap (SH) and criminal convictions (CC) on 3-point scales. A principal components method gave 12 principal components with latent roots greater than 1, which accounted for 60.3 per cent of

the total variance. The first unrotated eigenvector accounted for 20 per cent of the total variance - more than three times that of any subsequent eigenvector. He found that the more serious offences were denied by greater percentages of the boys and had higher loadings on the first component. He suggests that this first component is a 'general' factor of delinquency, analogous to the factor emerging from a mixed battery of cognitive tests. Both SH and CC had positive loadings on this first factor. Hence the more handicapped boys admitted to more delinquency in general and were more liable to be convicted. The other components have, of course, already had the common variance of the first factor partialled out. The second component might be termed active theft versus cheating and pilfering incidental to normal activities and disorderly acts which are not dishonest. Boys admitting to items in the 'active theft' cluster tended to be more handicapped and to be very liable to conviction. The third component may be considered as maturity versus immaturity, the former containing acts such as frequenting pubs, driving cars, gambling etc., which Gibson considers are precocious activities. The fourth component contained mostly the serious items related to violence and the answers to those items loading positively on this component may well have been bravado as the factor was not related to CC. Three second-order factors were extracted which were correlated. From these, it was seen that the highest positive loading on the first factor was SH and the highest on the second CC. By looking at the loadings on the scale items on these two factors it was seen that for example, the predictive power of an affirmative answer to the shoplifting question for criminal conviction was dependent on the level of social handicap of the boy but that smoking, which had the same correlations with SH and CC as shoplifting, was predictive of criminal convictions independently of the level of social handicap. Such factor analyses can hence produce hypotheses about specific types of crimes or delinquents as well as showing a general factor of delinquency. A simple summed scale score would only

give the general factor score.

It seems that not only is the internal consistency of self-report methods very high but all boys are very varied in their criminal activity. Delinquency, as measured by self-report scales, seems to be primarily a unitary variable. More factor analyses of the items in scales, however, are needed to see whether the distinctions important in the social class research mentioned above, such as that between criminal acts and trivial misbehaviours, are also found in the responses given to the items in the scales.

Test-retest reliability

As Farrington (1973) points out, very little is known of the test-retest reliability of self-reports of deviant behaviour. Dentler and Monroe (1961a) found at least 92 per cent stability for their 5 items over a two-week period. Belson (1969) obtained 88 per cent over one week with a larger number of items. The only longer interval reported has been by Farrington for the Cambridge Study. The period of time involved was from age 14 to 15 to age 16 to 17, i.e. approximately two years. There was an increase in the percentage of almost every item admitted at the later age. For this reason, one would not expect test-retest reliability to be perfect. For the total number of delinquent acts admitted when the boys were divided into four quarters according to the number of acts admitted at age 14 to 15, only 45 (11.5 per cent) fell into a lower range of scores at age 16 to 17. The obviously inconsistent responses (admittals followed by denials) were investigated for the individual acts. The percentage of obviously inconsistent responses to all responses for both ages was 6.4 per cent. The lower bound of the error rate is hence 6.4 per cent of all responses. The boys who were particularly likely to respond in this way were found by calculating the

difference between the actual number of denials and their expected number from the denial probabilities of all the acts they admitted at age 14 to 15. This produced 182 boys who made more denials than expected. The less seriously delinquent boys were the most prone to denial. Inconsistent responding was also related to scores on the lie scales of the New Junior Maudsley Inventory (age 14 to 15) and the Eysenck Personality Inventory (age 16 to 17). Concealment may hence be an important factor in denial. Some self-report inventories have used checks for over-conformity built into the scale such as behaviour items considered by the public to be undesirable but considered by the authors (Nye and Short) to be universal. A response of 'no' to three or more of these was a sufficient reason for elimination of the respondent. These together with extreme boasters, non-cooperators who completed questionnaires in an inconsistent or haphazard manner and extremely poor readers comprised 1 per cent of the sample in this study and were eliminated. Dentler and Monroe (1961b) eliminated children who answered 'no' to all 14 items of misconduct in their scale including negative answers to the questions "Ever tell a lie" and "Ever disobey parents". This affected 302 out of the 912 youths in the study - an extremely high figure. Farrington and West (1971) used the lie scale they administered at age 14 to 15 to correct their self-report scores and found that these corrected scores had slightly greater predictive validity than the uncorrected scores.

Response sets

This brings us on to the question of honesty and response sets in self-report inventories. Most inventories are scored in a consistent direction throughout so that a halo effect can be obtained. This was found to be a problem by Himmelhoch (Hardt and Bodine, 1965) who administered a two-part questionnaire asking for more innocuous information first and then returned two weeks later to obtain information about misconduct. The second testing situation encountered some resistance.

This could be overcome by inserting items, a positive answer to which would gain social approval or which are neutral as regards social approval into the questionnaire. Nye (Hardt and Bodine, 1965) structured his questionnaire so that the self-report section followed items which were non-threatening but of high interest to his students. Possibly a better method might be to present a small number of neutral or positive items first to allow the instructions to be comprehended and the respondent to settle down and become less nervous and then to mix the delinquency items with both positive and neutral items such as 'Have you been fishing?' and also naughty but non-criminal items such as 'Have you knocked on a door or rung the bell and then run away?'.

Problems of exaggeration and of concealment may well occur. Methods of dealing with extreme cases of these were discussed above. There is very little direct evidence on this. The high test-retest correlations obtained mitigate against a high level of falsification occurring. Elmhorn (1965) has also found that the relative frequency with which different items were admitted varied very little between the various schools from which the respondents came. Despite the high figures for overconformity in the study of Dentler and Monroe, it has been found by several authors that respondents describe a very high proportion of the offences for which they have been charged when comparisons are made between self-report delinquency and official convictions. Clark and Tifft (1966) used both a follow-up interview and a polygraph lie-test to check the self-completed responses of 40 mid-western American university students. All changed their responding to some extent and three-quarters of the changes increased the amount of deviant behaviour admitted. The average accuracy of the self-completed test was 81.5 per cent for 35 items but the range was 47 to 97 per cent. Again, concealment rather than exaggeration was the problem. Possibly, the best solution is to eliminate very inconsistent or respondents by using two administrations of the questionnaire or a lie scale and then to reduce

concealment by probing the answers to each item. This again would require an interview technique.

Validity

Official convictions may be taken, by definition, as a measure of delinquency. It is difficult to know whether self-report delinquency studies may be accorded the same status a priori. The first problem is that the items concerned may not all refer to specific law-breaking activities. 'Smoking' in the Cambridge study questionnaire and 'defied parents' authority' and 'hurt someone to see them squirm' (Short and Nye,1958) are not necessarily illegal activities. Even with the law-breaking items, however, the situation and manner of occurrence of the activity may well have an effect on whether the activity would be considered illegal by the courts. The relation between trespassing, a non-criminal offence, and criminal damage is a case in point. If the boy is merely walking on someone else's property, he may not be prosecuted by the police. But if he breaks a branch off a tree or does any other damage, however minor, then the situation changes. So, even assuming that there is sufficient evidence available to prosecute successfully all the boys who admit any act on the questionnaire and that a policy of full enforcement of the law were being operated by the police, it may still be doubtful that the self-report scales may be called delinquency scales.

The problems of concealment and exaggeration of responses to the items also demand some form of empirical validation of the scales. Content validity, a reasonable sampling of the possible delinquent acts, would seem to be important when selecting the items in the scale. If all acts were normally committed in groups and no normally solitary crimes were included, then the scale will measure self-report group delinquency not delinquency as a whole. Another example here is the differential effect of social class on responses to self-report scales

which include many misbehaviour rather than delinquent items and to those which only include delinquent items.

Given correct sampling, two different strategies for validation present themselves. One is to try to ascertain whether the respondents really have committed the acts they say they have and have not left out any they did not admit to. The other is to see whether the self-report scores relate well to both present and future official convictions. In the latter case, convictions are being taken as a criterion measure of criminality and their biases, such as wrongful conviction or the judge's direction that the case should be dismissed (due to a failure in correct legal procedure), must be assumed to be unimportant.

The first method has been adopted by Clark and Tifft, as mentioned above, and by Gold (1966). Gold obtained the co-operation of a small group of 'informants' - "teenagers who seemed likely to have information about the delinquency of other boys and girls". Forty of these co-operated with the experimenter and supplied names of boys and girls whom they knew had committed delinquent acts for which they had not been caught, together with a description of the acts. It was found that 72 per cent of the 125 out of 522 respondents on which they had information had admitted the correct acts, 11 per cent had given doubtful answers which in some respects contradicted the spies' reports and 17 per cent had definitely concealed offences reported by the spies. These last tended to be the more serious offences such as breaking and entering and carrying concealed weapons. This method, however, is difficult to apply in many studies and does not tackle the problem of concealment. Jessor et al. (1968) had found that self-reports of deviant behaviour correlate significantly with reports by teachers and parents. The average accuracy from both the above studies is, however, high and since the main problem is thought to be concealment rather than exaggeration the results are hopeful.

Several investigaters have approached the problem by seeing whether respondents admitted those offences for which they had been convicted or had a police record of some sort. Erickson and Empey (1963) found no evidence of respondents failing to describe the offences for which they had been charged. Gibson et al (1970) found that 91.7 per cent of acts which had led to a conviction were admitted in the self-report delinquency questionnaire. Voss (1963) gave respondents apparently anonymous questionnaires but was able to identify 95 per cent of them from other information on the questionnaire. 52 of his 620 respondents had been apprehended by the police for a total of 83 offences, of which only 4 were not admitted on the questionnaire. Gould (1969), in the U.S.A., also found a significant positive relationship between official delinquency and later admissions on a self-report delinquency test. Blackmore (1974), in a replication of the Gibson, Morrison and West study, found that 81 per cent of possible affirmations of official delinquency were made at age 14 to 15 and 75.7 per cent at age 16 to 17. Of the 49 convicted boys interviewed at age 14 to 15,45 admitted at least one conviction. At age 16 to 17 the admission rate was even higher, 72 out of 74 admitting at least one conviction. Only 2 boys (0.6 per cent) at age 14 to 15 and three (0.9 per cent) at age 16 to 17 falsely claimed to have been convicted. As far as admitting official convictions is concerned, therefore, self-report delinquency scales may be considered to have high validity. One must remember, however, that people may be more able to remember and to admit to those of their acts which have received official or public recognition, even if they are not aware of the interviewer's knowledge of such.

The second approach is to relate self-report delinquency scores to present and future convictions. Nearly all studies have shown that convicted offenders admit a much greater frequency of offending than

non-official delinquents, as is reviewed by Hood and Sparks (1970) and Farrington (1973). Recent studies have confirmed this trend. Williams and Gold (1972) found that 9 per cent of their sample reported detection by the police in some delinquent act in the three years prior to their survey. The acts for which they were caught comprised less than three per cent of their total chargeable acts of delinquency. The frequency and,to a lesser degree, the seriousness of the teenager's delinquent behaviour was positively associated with their being caught. Frequency was more predictive of getting caught than seriousness, largely due, the authors think, to the fact that most of the offences detected were discovered by the police from someone else who happened to come by when the offences were being committed. Getting caught was hence, in this sample, a chance occurrence. The authors state, however, that "having a police record is only slightly related to the seriousness of teenagers' delinquent behaviour, is not related at all to its frequency, and is less indicative of both the frequency and seriousness of delinquent behaviour than having a number of contacts with the police". They also found, from other studies, ironically, that teenagers who were caught tended to commit more offences afterwards than control offenders of similar criminality who were not caught (Gold, 1970).

Erickson (1972) found intercorrelations of between 0.62 and 0.88 between official court records, self-reports of delinquent behaviour and the respondents' estimates of their likelihood of future convictions.

Farrington (1973), for the Cambridge study, found that the 47 early delinquents who had official convictions by the age of 14 to 15 admitted 15.5 acts on average compared to only 8.9 admitted by the remaining 358 boys ($p < .001$ by biserial correlation coefficient). Gibson (1971), using a factor analysis of the self-report delinquency scale of the Cambridge study, found criminal convictions to load 0.48 on his first general factor of delinquency, which accounted for 20 per cent of the total variance.

Another way of validating self-report scales is to see whether they

predict future convictions. In the Cambridge study (Farrington, 1973), 47 of the 405 boys given the self-report questionnaire at age 14 to 15 were already delinquents. In the three years subsequent to that time, a further 51 were found guilty in court. Omitting the 47 early delinquents, so that a sample of official non-delinquents at age 14 was obtained, it was found that the 51 late delinquents had admitted 12.1 acts on the self-report questionnaire on average compared to only 8.3 for the 307 non-delinquents ($p<.001$). This predictive analysis was repeated for the questionnaire administration at age 16 to 17. Only 23 boys were first found guilty after this time but again the mean score of these 23 was 16.0 as opposed to 11.6 for the 300 non-delinquents ($p<.001$). The predictive validity did not seem to be improved by attempts to take into account the seriousness of the acts committed and their frequency of commission. This may have been because these factors were found to be all intercorrelated. A measure of variety of acts admitted hence automatically measures frequency and seriousness. The most recent figures from this study (West and Farrington,1973) show that the 61 boys found guilty after age 14 to 15 admitted 11.6 acts on average, compared to only 8.3 admitted by the 297 non-delinquents (the 47 early delinquents again being omitted). This is highly significant ($r_{bis} = 0.34$, $p<.001$). The study has also found a significant difference between those with high self-report scores and those with low as regards police contacts (dealt with the police as juveniles but not convicted of a juvenile criminal offence).

Knight and West (1975) have followed up the 83 boys comprising the most delinquent fifth of the sample, according to a scale which combined both official and self-reported delinquency. The 83 were divided into two groups, one of 33 'temporary' delinquents who had acquired no criminal convictions between the ages of 17 and 18 to 19 and who denied committing any theft item in that time; and one of 48 'continuing' delinquents who had either committed a thieving offence or acquired a conviction since

becoming adult. A follow-up at age 20 showed that 25 (52.1 per cent) of the continuing delinquents had been reconvicted at least once compared with only three (10.0 per cent) of the temporary delinquents. Erickson (1972) has also found that self-report delinquency scores predicted official delinquency but did not distinguish between those self-report delinquents already convicted and those not.

Although self-report delinquency scales have been shown to be both concurrently and predictively valid, they still have biases as regards concealment or exaggeration of responding. They may be improved in the various ways outlined above but can never be ultimately proved to be a good measure of total delinquency, since there is no criterion measure for hidden delinquency. In any study, a decision must be made as to whether self-report delinquency, police contacts or convictions will be the measure of delinquency. Which is chosen depends upon the way in which the biases inherent in each method will affect the subject matter of the study. In a study of personality and delinquency, there are reasons to believe that the selection procedures of the police and the courts may be influenced by the personality of the offender such that a comparison of convicted offenders versus non-convicted controls from the same area would produce different results to a comparison of high scorers versus low scorers on a self-report delinquency scale. Another reason to choose self-report is that it has the capability of producing a continuous scale which both allows the more sensitive correlation analyses to be done and removes the necessity of finding adequate controls. Even if convictions were chosen, given the high percentage of self-reported crimes for which the person is never caught, there is a case for using a self-report technique as well, to make sure that the supposedly 'innocent' controls are not in fact more criminal than the criminals. It is possible that, with a greater knowledge of the bias introduced at each stage in the criminal justice process, such fears

will become unfounded. At the present, however, study should begin at the bottom of the iceberg of crime and work its way to the top rather than run aground on unknown and unconsidered selection agencies in the criminal justice system.

Group crime

The amount of group crime: convicted offenders

Nearly all available data suggest that the majority of delinquent acts for which male offenders are apprehended involve more than one person (Erickson, 1971). Group offences are considered to account for between 70 and 80 per cent of all offences known to official agencies in America. A similar position holds for early and mid-adolescent delinquency (Sveri, 1965). The normal number of persons involved is two or three. As delinquents grow older, they are more likely to commit offences alone but, even into the twenties, over half of all offenders are still likely to have known associates. In Stepney and Poplar, 17.8 per cent of the 13 to 16 age group commit lone offences, 42.0 per cent had one accomplice, 14.9 per cent two accomplices, 18.1 per cent three or four accomplices and 7.2 per cent five or more accomplices. The bias towards group crime in the eight to twelve age group waseven higher, the figures being 15.7 per cent (no accomplice), 27.8 per cent (1), 21.7 per cent (2), 28.6 per cent (3 or 4) and 6.1 per cent (5 or more) (Downes, 1966).

The same pattern holds for the subgroups of violent and damage offences. In Britain, Bottoms (1970) found that only 14.2 per cent of damage to property offenders and 33.3 per cent of those convicted of indictable crimes of violence (including robbery) under the age of 14 committed their crimes alone. By the age of 20, however, the figures had risen to 45 per cent and 67.3 per cent, respectively. If offences are considered, the proportion committed by one offender rises to 33.3 per cent for damage offences and 50.0 per cent for violent offences in the under 14 age group. Downes (1966), in his research in Stepney and

Poplar, found that, in the age range 13 to 16, 3.4 accomplices (average number per offender) were involved in offences of 'rowdyism' and 1.5 in offences of violence. 'Rowdyism' was defined as non-indictable malicious damage, insulting behaviour, obstructing police etc.

Self-reported group offenders

There have been some observational and self-report delinquency studies of group crime in America, though few in Britain. Miller (1967), in a detailed observational study of Boston gangs, found that the average incident of theft had two persons involved and that 40 per cent of thefts were committed by persons acting alone. One question that may be answered in studies using self-report delinquency techniques is whether committing offences in groups is a general characteristic of delinquent behaviour or whether there are types of offences that are predominately group offences.

Lerman (1967) has investigated both the self-reported normal patterns of interaction of his sample of 555 urban boys and girls aged 10 to 19 years and the number of people present during the commission of criminal offences. He found that, until the age of fourteen to fifteen, the dominant normal pattern was the pair or triad, a regular larger group being second and a small minority (11-12 per cent) perceiving themselves as 'loners'. From 14 to 16, there was a shift in the pattern of responding such that associating with a regular group was the majority response. When asked whether most of the illegal acts they reported had been done alone, with one or two others or with a regular group, it was found that the percentage reporting a regular group was very small and did not increase with age. Most boys said that they mostly committed crimes alone. In this study, however, specific types of offence were not investigated. It is unlikely that, even if a boy belongs to a delinquent group at the age of testing and does most of his delinquent activities with that group at that age, he will have done the majority of all the delinquent acts he has committed in his life with this group. The emphasis on solitary crime

may hence be a methodological fault.

A more rigorous method was adopted by Erickson (1971). His sample consisted of 50 boys from an institution for offenders, 50 boys on probation (community persistent offenders) and 50 official nondelinquents from a public high school. The total of 150 boys admitted 71,715 offences in a self-report delinquency interview, although these included drinking (11,033), traffic violations (7,972) and defying parents (7,111). Group violating rates (proportion of all self-reported offences involving more than one person) differed considerably from offence to offence, the maximum being 0.91 (destruction of property) and the minimum 0.17 (defying parents). Others of interest for the present study include auto theft (0.72), theft of $2 to $50 (0.71) and fighting (0.55). The overall rate for all offences combined was 0.65. Comparing these figures to the official arrest figures, striking differences were found. The overall group violating rate based on official statistics was by 20% higher than that based on the self-report delinquency interview. This may have occurred for two reasons: first, that certain types of offences are disproportionately represented in the two sorts of data; and secondly, that the person is more subject to being arrested if the crime is committed in a group than if it is committed alone, for example, if groups are more visible to the police. The offences were ranked on seriousness by probation officers and juvenile court judges and it was found that high group violation rates were highly correlated with seriousness (0.58) though negatively correlated with frequency. Hence, if arrest rates and conviction rates are related to seriousness of offence, this may be a partial explanation of the discrepancy between group violation rates of official arrests and self-reported delinquent activities. It cannot be the whole explanation since most of the offences dealt with in juvenile courts are not very serious. It thus

seems likely that committing offences in groups increases the likelihood of arrest.

Gold (1970) found that only 25 per cent of the 2,490 delinquent acts admitted by his 522 boys and girls were committed alone. Of these, about one quarter were soon after described to someone, usually a peer. He also found that there was a positive correlation between frequency of admission of type of offence and proportion of each type of offence committed in the company of others. Of the offences committed with companions, 41 per cent were with one other 23 per cent with two others, 15 per cent with three others, 9 per cent with four others and 12 per cent with five or more others.

Hindelang (1971) has examined a group of middle-class high school students in Berkeley, California with a mean age of 15.5 years. The subjects were asked to record the number of times in the last year that they had engaged in each delinquent activity. They were also asked to indicate whether they were always alone (solitary group), sometimes alone and sometimes with an accomplice (mixed group) or always with an accomplice (social group). The proportion of respondents in the solitary group to all respondents ranged from 0.11 (drinking alcohol) to 0.78 (forcing sexual attention on girl against her will). The proportion due to the social group ranged from 0.09 (theft of less than £10) to 0.36 (drinking alcohol). By far the largest percentage overall occurred for the mixed group. It is not possible to conclude from this, as Hindelang does, that "for the activities, and the subjects examined, there is considerable solitary involvement in delinquent activities," since the mixed group counted for 40 per cent of the offenders. It is necessary to consider the percentage involvement in solitary and group crime for each type of crime in order to be able to make such a statement.

The only British study of self-reported group delinquent involvement is the Cambridge study (West and Farrington, 1973). No direct investigation was made but, in the course of the self-report delinquency interview, the

boys were asked about the delinquent behaviour of their friends and acquaintances. These two scores were closely related to the boy's own self-report delinquency scores, to his present official convictions and to his future official convictions. It may be concluded that, as stated in the theory of differential association, the delinquency of a boy's friends provides a good index of the boy's own delinquency potential. These results have also been found by Short (1957, 1958) and Voss (1964). Here juveniles who claimed that their friends were delinquents tended to admit more delinquent behaviour than those who did not. Similarly Hardt and Peterson (1968) found that boys without police records, but with friends who were official delinquents, were likely to score highly on a self-report delinquency scale.

Investigating group crime

An adequate methodological approach to group crime would be to find out, for each type of crime, the percentage involvement of the respondents in self-reported peer-group crime and self-reported solitary crime. These two must be investigated separately since there is also the possibility of crimes committed with adults. The dynamics of a situation leading to the commission of a crime with an adult are likely to be very different to those leading to the commission of a crime with other members of a peer group. The fallacies inherent in a typological approach are illustrated in the study of Hindelang. A considerable proportion of offenders commit some crimes with a group and some crimes on their own. Some common ones, such as stealing from home and riding a bicycle without lights after dark, are exceedingly likely to be committed at least occasionally by the boy alone. Similarly, some types of crime such as littering are very likely to be committed at least occasionally in a group. Having a solitary, a mixed and a social group obscures the distinction between those who are 95 per cen

involved in group crime and those who are 5 per cent involved in it.

The purpose of studying group crime is succinctly expressed by Cohen (1971): "The need to supplement traditional causal explanations with more faithful accounts of the contexts and structures in which the action takes place and its meaning to the individuals involved". The analysis may be taken further than a simple group/solitary division to include who suggested the offence - whether it was the boy himself, another boy or an adult. For each of these categories and each type of offence, the boy can be placed on a scale of percentage involvement in that category of offence conditions. Taken together with interview and sociometric analysis of the different groups to which the boy has belonged, this technique may be used to supplement the necessarily limited accounts of crime and its occurrence given by those studies using participant observers or social workers with groups. These, because they are primarily concerned with one or more groups in the area, ignore the interplay between these crimes the boy may commit on his own or with one or two friends apart from the group, and those committed by the group. In such ways has the 'gang myth' arisen, the belief that, since most official delinquents are likely to commit officially prescribed acts with one or more persons rather than alone, offenders are likely to be members of gangs.

Gangs

Even with the prevalence of gangs in the literature on group crime, there is remarkably little agreement as to their organization and structure. Membership varies from 8 to 40 members in different gangs and few gang leaders or members have a definite idea of the size of the gang. Short and Strodbeck (1965), in their study of 16 Chicago gangs, rarely found more than 20 members gathered together, although formal membership might be as high as 60. The large gang, although it may come

together at moments of trouble, is not a permanent and cohesive entity (Hood and Sparks, 1970). Yablonsky's (1962) term 'near-group', which "stands midway on the mob - group (organized - unorganized) continuum" may well be preferable to the term 'gang' for the majority of delinquent groups studied in America. Within the group, however, there is usually a clique of 'core members' who have considerable interaction with each other over a period of time. Klein and Crawford (1967), for example, studied the contacts made by the boys in a Los Angeles gang with each other over a period of six months. Only 25 per cent of the possible combinations of contacts were made but there were two main cliques of 9 and 5 boys out of the total 32 boys. These were considerable more cohesive, more delinquent and remained together in a gang pattern of interaction over a longer period of time than did the less delinquent 'fringe members'.

There are very few studies on gangs in Britain which, according to many authors, indicates the lack of gangs rather than a lack of studies. "Research on delinquent gangs in England is a fair reflection of their absence" (Downes, 1966). Certainly, in the largest study of delinquent groups in Britain, Downes concludes that: "Delinquent groups in the East End lacked both the structured cohesion of the New York gangs described by Cloward and Ohlin, and the fissile impermanence of Yablonsky's near-group... The groups responsible for the bulk of delinquency were simply small cliques whose members committed illegal acts sometimes collectively, sometimes in pairs, sometimes individually, in some cases regularly, in others only rarely... Average group size was 4-5, with a few individuals on the periphery. While these street-corner groups persisted over time, and invariably possessed a dominant personality, all the other features commonly attributed to the delinquent 'gang' were absent: i.e. leadership, role allocation, hierarchical structure, consensus on membership, uniform and name."

Three different types of gangs have been posited by Cloward and Ohlin (1960): the 'criminal' subculture existing primarily for criminal means in stable working-class areas where juvenile delinquency is integrated with adult organized crime; the 'conflict' subculture in disorganized areas of new immigrants where no stable illegitimate opportunity structure exists, which gives its members status by a reputation for toughness in fighting for one's territory; and the 'retreatist' subculture of drug users existing for the 'double failure' who can gain status in neither the criminal nor the conflict manner. Neither the first nor the third is widespread among adolescent working-class boys in Britain. Groups of the criminal type probably exist in the major towns, but these are mainly comprised of ex-Borstal companions rather than constituting avenues to successful crime for the boys of that area. The lack of community-based organized crime in this country may well be the reason why such groups have developed in America but not here.

In Downes' study, 'conflict' groups were mentioned by the boys but apparently did not exist in the fairly stable working-class areas of the study. Similar results are reported by Wilmott (1966). The growth of new housing estates on the edge of cities, however, would be expected to produce such groups. In this respect it is interesting that the two main reports of gang fighting in the British literature concern the new development areas in large cities - in Birmingham and Glasgow.

In Birmingham, White (1971) has investigated the 'mobs' in the suburbs of semis and tower blocks built to rehouse people from the old slums. The mobs vary considerably in composition and activity, there being little cohesion or distinction between core and fringe members. The dominant activity is fighting, which concerns 'territories'. Most of the mob have been in borstal or the local prison. There are also

smaller satellite mobs, usually junior branches of the mobs. To the members of the mobs, the mob functions as a group of mates who look after one another, obey 'mob law' rather than 'society law' and share loyalty to a leader and the defence of territorial rights.

In Glasgow, Patrick (1973) became a member of one of the violent gangs in a suburb of Glasgow for a limited period. Here again, the main goal was fighting and defence of territory by a loosely-knit group of boys, although the abuse hurled and the slogans painted on walls contained more violence than the actual fighting.

Although adolescent crime in Britain appears to involve a considerable amount of group crime by loosely-committed street groups and 'gangs' and groups of friends, there are few reports of any organization and none of any illegal activity superintended by or modelled on adult criminals. Only Cloward and Ohlin's conflict subculture appears to exist.

The self-report delinquency method The present study

At the time that the present study began, there was no published self-report schedule for use with 11 to 12-year-old boys. Given the considerations discussed in the previous section, particularly the probability that further questions about the offences admitted would need to be asked and the low level of literacy of the boys, it was decided to use an interview method. This immediately poses problems due to the pressures of a face-to-face confrontation when the subject to be discussed concerns illegal behaviour. The interview schedule was hence designed to minimize tension. Since it was necessary that the responses to the interview should be able to be matched up with scores derived from the personality and behavioural measures, it was not possible for the respondents to remain anonymous. The method of Belson *et al* (1968), employing a screen between the interviewer and respondent, was considered but rejected since it was thought that this would create an artificial situation and that a friendly, relaxed

situation, as far as this could be achieved in a school setting, would be the best solution.

The delinquency items were taken from the schedule developed by Gibson and reported in West and Farrington (1973). This study is the closest to that of the present population in terms of age and social class and the schedule covers the greatest range of delinquent acts. Since a heterogeneous rather than homogeneous criminal career has been shown to be the case with boys of this age, it was considered that as many delinquent acts as possible should be included. Certain of the items in the Cambridge study were excluded. Some of these would have been beyond the ability of the boys to understand, such as 'obtaining money by false pretences'. Others, such as 'gambling' or 'driving cars without a licence' were considered inapplicable to 11-year-olds. Yet others, the more serious offences, were only admitted by a very small percentage of the 14-year-olds in the Cambridge study. These were omitted because it was considered that they would worry the children unduly, although some of them were included in a retest (see later). The question about drugs was omitted at the request of the school. The wording of some of the more archaically expressed items was changed, 'pedal cycle', for example, being retermed 'bicycle'. The list of acts used in the West and Farrington study, together with the percentage number of boys admitting them, and those used in the present study are given in Tables 3.1 and 3.2. The first 27 delinquency items in Table 3.2 were the ones used in the first testing (test) at age 11 to 12.

It was also decided to include 13 non-delinquent items, making a total of 40 items. These would have the dual function of providing some idea of the activities that the boys indulged in in their spare time and making the boys less nervous. These were taken from the study of Belson (1968), the selection being based on what the author already knew of spare-time pursuits in the area. The first five of these were always presented first in the interview. This provided a non-contentious

Table 3.1 Self-reported delinquency admission rates (from West and Farrington 1973)

Item	Act	% admit age 14-15	% admit age 16-17	% admit either age
1	Riding a bicycle without lights (or with no rear light) after dark	77.0	78.8	88.3
2	Driving a car, motor bike or motor scooter under the age of 16	20.3	40.1	43.5
3	Belonging to a group of ten or more people who go around together, making a row, and sometimes get into fights or cause a disturbance	16.8	23.4	31.1
4	Playing truant from school	54.3	80.9	82.2
5	Deliberately travelling without a ticket or paying the wrong fare	71.6	84.4	89.5
6	Letting off fireworks in the street	84.2	86.7	93.2
7	Taking money from home - with no intention of returning it	9.4	11.3	17.1
8	Taking an unknown person's car or motor bike for joyriding (with no intention of keeping it for good)	7.4	15.6	18.3
9	Smashing, slashing or damaging things in public places - in streets, cinemas, dance halls, railway carriages, buses	11.9	18.1	25.4
10	Annoying, insulting or fighting other people (strangers) in the street	23.0	23.4	35.9
11	Breaking into a big store, garage, warehouse, pavilion etc.	4.0	7.3	9.5
12	Breaking into a small shop (private tradesman) (whether or not anything was stolen)	6.4	8.6	12.7
13	Stealing things out of cars	8.9	9.6	14.2
14	Carrying some kind of weapon like a knife or cosh in case it is needed in a fight	20.7	25.4	35.0
15	Attacking an enemy or someone in a rival gang (without using any sort of weapon) in a public place	18.8	24.4	32.8
16	Breaking the windows of empty houses	68.9	66.8	82.2
17	Using any kind of weapon in a fight - knife, cosh, razor, broken bottle, etc.	12.1	17.1	22.0
18	Drinking alcoholic drinks in pubs under the age of 18	26.4	79.1	79.0
19	Going into pub bars under the age of 16	51.4	74.6	80.7
20	Stealing things from big stores, supermarkets, multiple shops (while shop open)	19.3	28.2	36.2
21	Stealing things from small shops or private tradesmen (shop open)	36.8	39.8	53.3
22	Deliberately littering the street or pavement by smashing bottles, tipping dustbins etc.	24.2	27.0	38.9
23	Buying cheap, or accepting as a present, anything known or suspected of being stolen	36.3	57.4	64.6
24	Planning well in advance to get into a house, flat etc. and steal valuables (and carrying the plan through)	4.7	5.5	7.1

Table 3.1 Cont.

Item	Act	% admit age 14-15	% admit age 16-17	% admit either age
25	Getting into a house, flat, etc. and stealing things. (Don't count cases here where stealing results from planning well in advance)	5.4	7.3	9.3
26	Taking a pedal cycle belonging to an unknown person, and keeping it	8.4	10.6	14.7
27	Struggling or fighting to get away from a policeman	6.9	12.9	15.9
28	Attacking or fighting a policeman who is trying to arrest someone else	1.7	5.0	5.6
29	Stealing school property worth more than about 5p	29.1	53.2	58.7
30	Stealing tools, materials or any other goods worth more than 50p from employers (all in one go) (in working hours - don't count breaking in here)	2.2	12.6	14.2
31	Trespassing anywhere you are not supposed to go, e.g. railway lines, goods yards, private gardens, empty houses	63.5	66.8	80.9
32	Going to 'X' films under age	64.0	89.7	91.7
33	Often spending £1 or more a week on gambling under the age of 16	7.9	19.7	22.0
34	Regularly smoking cigarettes under the age of 15	31.9	41.8	47.9
35	Stealing goods or money from slot machines, juke boxes, telephones etc.	14.6	17.9	25.2
36	Stealing from people's clothes hanging up anywhere	3.5	5.8	8.1
37	Obtaining money by false pretences	10.4	9.8	17.4
38	Taking illegal drugs like purple hearts or smoking reefers	0.5	6.3	6.1
All acts		25.4	34.0	39.7

Table 3.2 Items used in self-report delinquency interview

No.	No. in West Study	Item	% admit test	% admit retest	% admit either	% D/A*
1		I have been fishing				
2		I have played a musical instrument				
3		I have collected stamps or coins				
4		I have been train-spotting				
5		I have played football				
6		I have done some photography				
7		I have been to a football match				
8		I have looked after a pet				
9		I have gone specially to see some famous buildings				
10		I have acted in a play				
11		I have been skating				
12		I have been to a theatre to see a play				
13		I have been to a museum				
14	36	I have stolen from people's clothes	7.27	15.69	23.53	100.00
15	35	I have stolen goods or money from slot machines, juke boxes, telephones etc.	23.64	39.22	47.06	36.36
16	34	I have smoked cigarettes	49.09	62.75	62.75	0.00
17	32	I have gone to an 'X' film	14.55	19.61	25.49	66.67
18	31	I have trespassed somewhere I am not supposed to go e.g. railway lines, goods yards, private gardens, empty houses, factories etc.	81.82	90.20	96.08	4.88
19	26	I have taken a bicycle belonging to someone I didn't know and kept it	9.09	19.61	19.61	0.00
20	29	I have stolen school property worth more than about 5p	23.64	62.75	64.71	16.67
21	27	I have struggled or fought to get away from a policeman	20.00	23.53	27.45	37.50
22	23	I have bought cheap or accepted as a present something I suspected was stolen	30.91	45.10	52.94	26.67
23	22	I have deliberately littered the streets or pavement by smashing bottles, tipping dustbins etc.	56.36	58.82	76.47	32.14
24	21	I have stolen things from small shops or private tradesmen	41.82	47.06	62.75	42.11
25	20	I have stolen things from big stores, supermarket or multiple shops	27.27	33.33	43.14	41.67

Table 3.2 Cont.

No.	No. in West Study	Item	% admit test	% admit retest	% admit either	% D/A*
26	18	I have drunk alcoholic drinks in pubs	21.82	31.37	41.18	60.00
27	19	I have gone into a pub (under the age of 14)	61.82	58.82	80.39	34.38
28	17	I have used any kind of a weapon in a fight	43.64	37.25	62.75	54.55
29	16	I have broken the windows of empty houses	43.64	49.02	60.78	30.00
30	15	I have attacked an enemy or someone in a rival gang in a public place	45.45	37.25	56.86	45.45
31	13	I have stolen things out of cars	7.27	9.80	11.76	0.00
32	9	I have smashed, slashed or damaged things in public places - in streets, cinemas, dance halls, railway carriages, buses etc.	29.09	45.10	50.98	23.08
33	7	I have taken money from home - with no intention of returning it	27.27	21.57	31.37	45.45
34	10	I have annoyed, insulted or fought other people (strangers) in the street	58.18	58.82	70.59	20.69
35	6	I have let off fireworks in the street	50.91	60.78	68.63	16.00
36	5	I have deliberately paid the wrong fare on a bus, train, coach or tube	54.55	70.59	80.39	18.52
37	5	I have deliberately travelled without a ticket on a bus, train coach or tube	69.09	72.55	80.39	11.43
38	4	I have played truant from school	34.55	52.94	58.82	18.75
39	3	I belong (or have belonged) to a group of ten or more people who go round together, making a row, and sometimes get into fights	63.64	45.10	64.71	31.25
40	1	I have ridden a bicycle without lights (or with no rear light) after dark	78.18	96.08	100.00	5.00
41		I have knocked on a door or rung the bell and then run away				
42		I have dialled 999 just for a joke				
43		I have been out at night just fooling around after I was supposed to be home.				

Table 3.2 Cont.

No.	No. in West Study	Item	% admit test	% admit retest	% admit either	% D/A*
44	2	I have driven a car, motor bike or motor scooter on the roads	43.14			
45	8	I have taken a car, motor bike or moped from someone else whom I didn't know just to go for a ride (with no intention of keeping it for good)	13.73			
46	11 or 12	I have broken into a shop, store or garage	7.84			
47	14	I have carried some kind of weapon (such as a stick, knife, etc) in case it was needed in a fight	52.94			
48	24 or 25	I have got into a house or flat and stolen things	1.96			
49		I hang around with a group of boys out of school				
All items			39.80	46.84	56.28	25.68

* % D/A = % of items admitted on test which were denied on retest

beginning to the interview situation and enabled the interviewer to make sure that the boys had understood the instructions and that they could read the items. If they could not read, all the items were read out to them. The subsequent delinquent and non-delinquent items were presented in random order to the subjects.

The procedure was taken very largely from the very thorough and illuminating work of Belson on self-report techniques. It was decided to use a card-sorting method to reduce tension. The items were printed on 8" by 5" white cards, each item being printed in opposite directions at the top and the bottom of the card so that it did not matter which way up the card was held and so that the interviewer could read the card while the boy was holding it. A number was put on each card to assist scoring. A sample card is illustrated in Figure 3.3. The slots in Belson's study were changed into free-standing boxes ('Yes' and 'Never'), made of black perspex, as shown in Figure 3.4.

The various drafts of the survey and the reasons for including the various parts of the survey are given in Appendix B.

The boys were interviewed individually in a room in the school. The average time of interviewing was 40 minutes.

The frequency with which the items were admitted was scored in the following manner:

if between one and 6 times in the person's life scored 1

if greater than 6 times scored 2

except question 40 ('I have ridden a bicycle without lights (or with no rear light) in the dark'), which was scored 2 if the boy had not had lights for his bicycle and 1 if the act only occurred when the lights broke down.

Elmhorn (1965), for example, scored for frequency of commission of offences in the following manner:

Figure 3.3

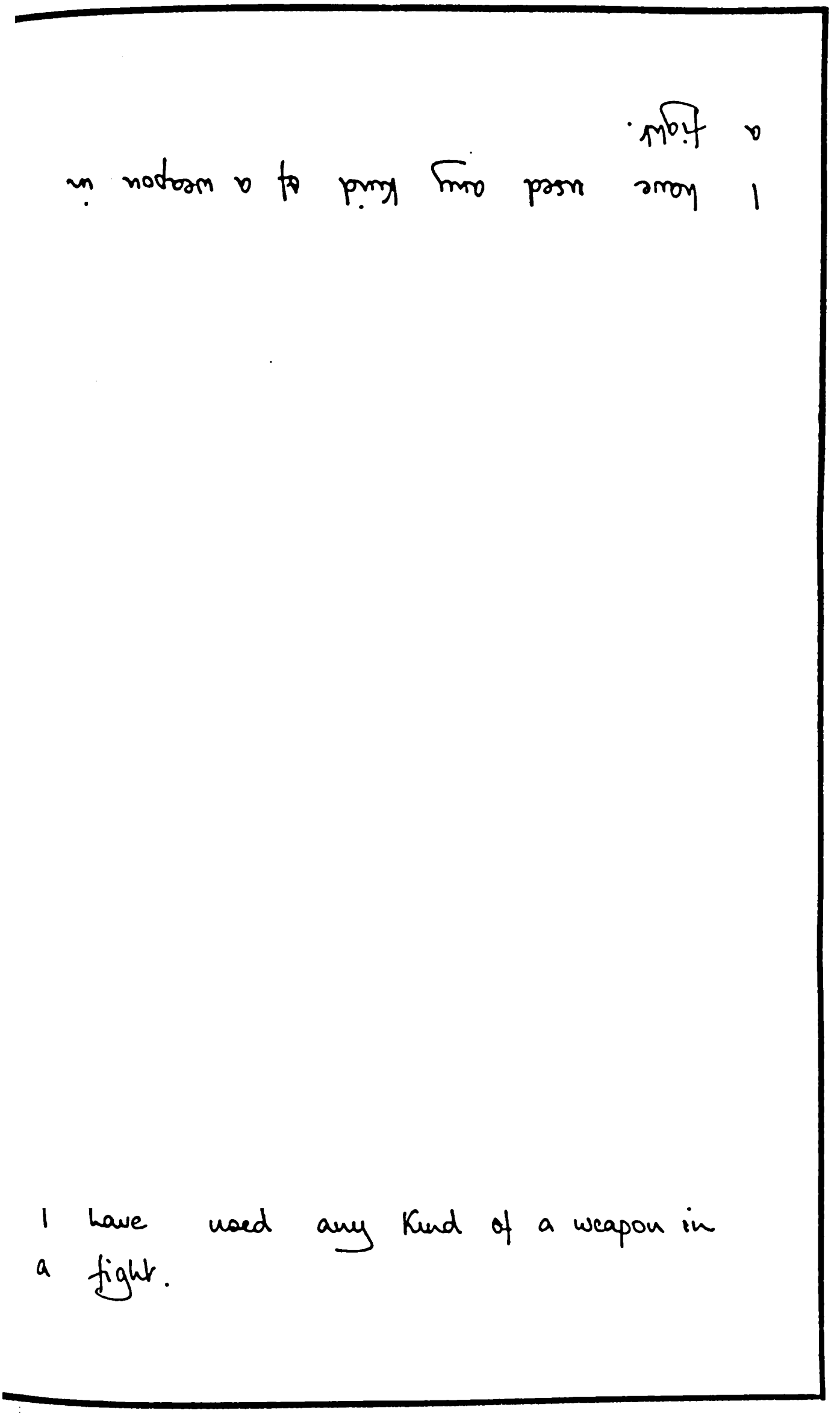
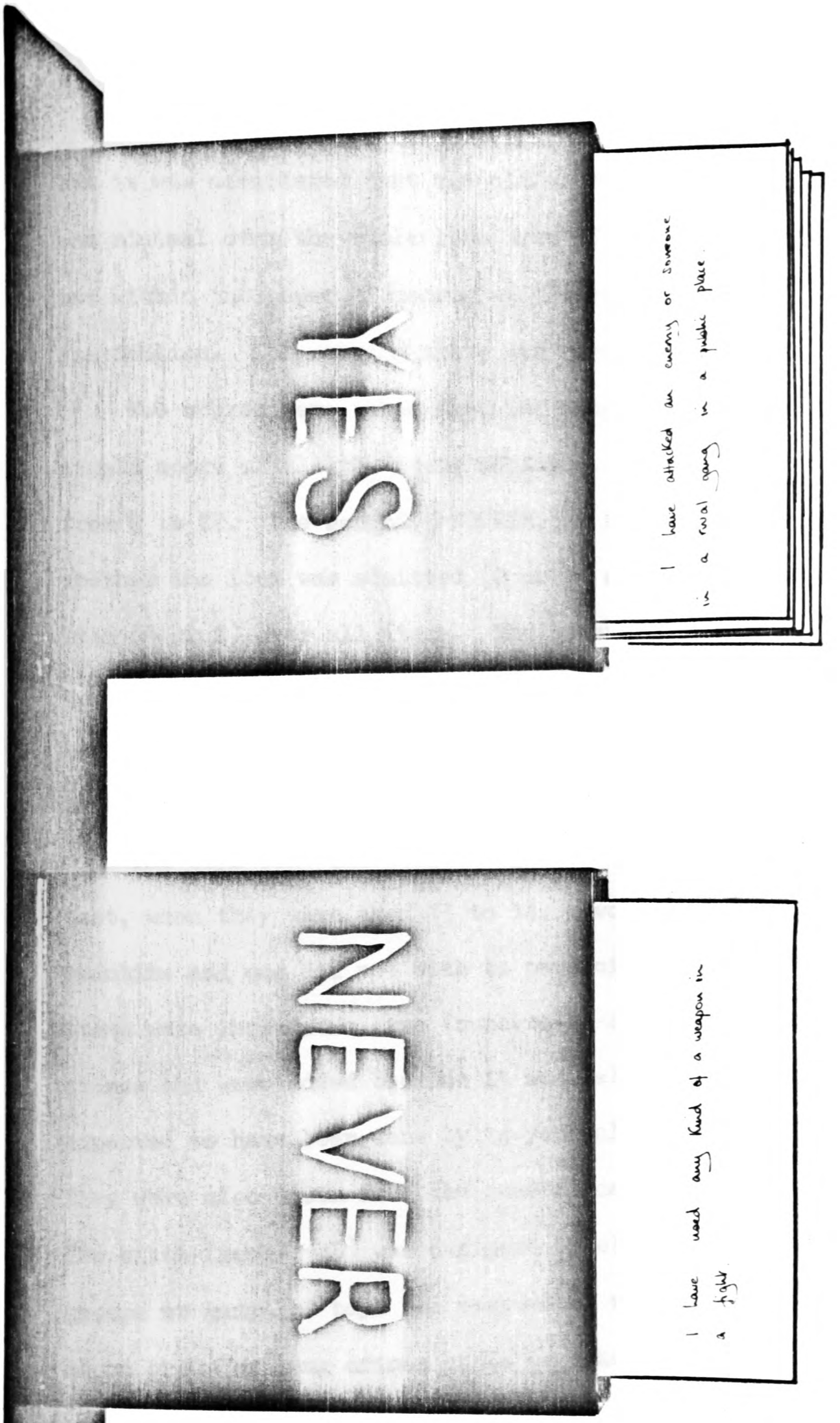


Figure 3.4


YES
I have attacked an enemy or someone
in a rural gang in a public place.
NEVER
I have used any kind of a weapon in
a fight

0 for 0 times

1 1 time

2 2-3 times

3 greater than 3 times

but it was considered that the difference between once and 2-3 times was minimal over the whole life span of the respondent and that it was not within the power of memory of the subject to be able to make this distinction. The scoring above was hence adopted.

Two scores were taken from the interview. The first, NOCRIM, is a simple score of all the items admitted. The possible range is hence from 0 to 27. The second, FNOCRIM, is the sum of the product of whether the item was admitted (0 or 1) and the frequency score for that item (1 or 2) over all items. The possible range for FNOCRIM is hence 0 to 54. This last was included since it was felt that some boys might have done the more minor acts only once and yet get the same score as those who had made a practice of doing them.

The boys were interviewed again (retest) two years after the first test, when they were aged 13 to 14. Two boys had left the school in the meantime and one did not wish to participate in testing. Six additional items were included. Five (numbers 44-48) of these represent more serious crimes and were added because it was felt that they could reasonably be expected to have been done by 14-year-olds though not by 12-year-olds. They were also taken from the questionnaire used in the Cambridge study. The sixth (number 49) was designed to elicit information about the possible groups or gangs of boys the respondent went round with so that questions about group or gang crimes could be asked regarding the other items. It was placed sixth in order of presentation, immediately after the five non-delinquent preliminary items.

The survey used on retest is also given in Appendix B. Up to the point of asking questions about the cards placed in the 'Yes' box, it is

very similar to that used on test. A slightly more natural wording has been included in a few places.

The questions asked about the crimes admitted on retest include whether the boy had committed the crimes in a group or on his own etc., and whether he had suggested the crime himself or whether it had been suggested by others. Details of these questions and the scoring system for them are also given in Appendix B.

Results

Frequency of admission of the items

Table 3.2 gives the percentage of boys admitting each type of crime at each age. As might be expected, almost every act was admitted by more boys at the later age, the average percentage for all items on test being 39.80 and on retest 46.84. The larger increases occurred in stealing from people's clothes (up from 7.27% to 15.69%), taking a bicycle and keeping it (9.09% to 19.61%), stealing school property (23.64% to 62.75%) and playing truant (34.55% to 52.94%). It is mainly the more serious acts that are admitted with a very much greater frequency at the later age.

The more trivial acts were admitted by a very large percentage of the boys at either age. These included trespassing (96.08%), littering (76.47%), going into a pub under age (80.39%), paying the wrong fare or travelling without a ticket on the public transport system (80.39%) and riding a bicycle without lights after dark (100.00%). The seriously deviant acts were mostly only included on retest, and, as expected, very few of the boys endorsed such items as taking a car or motorbike for joyriding (13.73%), breaking into a shop, store or garage (7.84%), getting into a house or flat and stealing things (1.96%) and stealing things out of cars (11.76%). Similar results were shown in the Cambridge study (see Table 3.1). The general level of delinquency,

both serious and trivial, however, is much higher in the present study than even the level found in the testing at age 16-17 in the West and Farrington study.

Reliability: inconsistent responders

One measure of the reliability of the interview is given by the number of acts admitted on test and denied on retest (the last column in Table 3.2). This varies greatly from item to item, the highest figures mainly occurring for the more serious delinquent acts (100.00% for stealing from people's clothes, 54.55% for using a weapon in a fight) and the lowest for the more minor delinquent acts or misdemeanors (0.00% for smoking cigarettes, 4.88% for trespassing, 5.00% for riding a bicycle without lights after dark, 16.00% for letting off fireworks in the street), although there are exceptions to the latter rule (0.00% for stealing a bicycle and stealing things from cars). Over all 27 acts, the average percentage of initial admissions turning into denials was 25.67%. These findings are again very similar to those of West and Farrington. This figure of a quarter obviously inconsistent responses seems high but an analysis of all admissions and denials at both ages shows the percentage of obviously inconsistent responses to total responses at both ages to be quite low. If all admission and denials are considered for the two testings, then the number of admissions followed by denials is 133 and the number of denials followed by denials 602 (Table 3.5). The percentage of obviously inconsistent responses to all possible responses is 9.66. This refers to responses that are known to be incorrect at one or both ages and so the percentage error at any one age could be as low as 4.84. It is impossible to establish from the data whether the error is due to exaggeration at the earlier age or to concealment at the later age. The figure of 9.66% must be taken as the lower bound of the error rate as there is no way of knowing how many of the responses were in fact incorrect.

Table 3.5 Total admissions and denials at both ages

Age 11-12	Age 13-14 Admit	Deny	Total
Admit	386	133	519
Deny	256	602	858
Total	642	735	1,377

It is possible to try to identify the boys who were likely to respond in this inconsistent way. This could be done in three ways: by counting the number of denials following admissions, by calculating the probability of an admission being followed by a denial or by finding the difference between actual number of denials on retest and expected number, calculated by adding the denial probabilities for the total sample of all the acts the boy admitted on test. The first and second ways are related to the initial number of admissions, the first directly and the second because the more admissions the boy makes on test, the more likely he is to admit serious offences, which tend to have high denial rates. The third method was hence adopted. For each delinquent item, the percentage of denials following admissions (the last column in Table 3.2) was converted to a probability and a score for each boy of the total probability of denial on retest was calculated by adding the probabilities for the items admitted on test. The expected probability for a boy admitting the first 5 delinquent items on test would be:

1.00 + 0.36 + 0.00 + 0.67 + 0.05 = 2.08 items.

If he actually made more admissions on test followed by denials on retest than this figure, he was termed as inconsistent responder. This method of calculation will lead to about 50% of the boys being made inconsistent responders since the expected probability was calculated from the same sample and the quantity was normally distributed. There were 24 such boys out of a total of 51 (47%).

The relationship between inconsistent responding and number of delinquent acts admitted was investigated using χ^2 and splitting the delinquency score at the median and excluding the very few boys at the median for both test and retest scores. The results are shown in Table 3.6. The result on test is just non-significant but the result on retest is significant at the .001 level in the direction of inconsistent responders admitting fewer crimes. This is a similar result to that of Farrington (1973).

Table 3.6 Relationships of inconsistent responding to numbers of delinquent acts admitted and scores on lie scales

A. Number of delinquent acts admitted

Test (NOCRIM)

	inconsistent responders	non-inconsistent responders
high delinquency score 10	6	17
low delinquency score	14	10

$\chi^2 = 3.764$

$.05 < p < .10$

Retest (NOCRIM 2)

	inconsistent responders	non-inconsistent responders
high delinquency score 12	4	21
low delinquency score	17	4

$\chi^2 = 16.876$

$p < .001$

B. Scores on lie scales

JEPIL (test)

	inconsistent responders	non-inconsistent responders
high JEPIL score 2	11	8
low L score	6	15

$\chi^2 = 2.412$

non-significant

JEPIL2 (retest)

	inconsistent responders	non-inconsistent responders
high L score 2	11	9
low L score 1	13	15

$\chi^2 = 0.086$

non-significant

JPQL2 (retest)

	inconsistent responders	non-inconsistent resps.
high L score 4	17	5
low L score	5	13

$\chi^2 = 7.901$

$p < .01$

χ^2 tests were also computed between inconsistent responding and scores on the lie scales (the JEPI on both test and retest and the JPQ on retest), again dividing the scores on the scales at the median. Neither of the tests using the JEPI gave significant results but that with the JPQ is significant at the .01 level, in the direction of inconsistent responders producing high lie scale scores. It may be remembered that doubt was cast on the validity of the JEPIL scale. The results, which are in line with those of the Cambridge study (Farrington 1973), indicate that concealment is an important factor in denial and that lie scores are a useful instrument to detect inconsistent responders. They also indicate that the high negative correlations found between the lie scale scores and number of delinquent acts admitted reflect a genuine phenomenum of concealment to present oneself in a socially desirable light.

One may also investigate the relationship of the score of number of delinquent acts admitted to inconsistent responding. The boys were divided as nearly as possible into four equal groups according to their score on test and the number of boys falling into a lower score group on retest found (Table 3.7). It may be seen that only 2 boys out of 51 (3.92%) fall into a lower group on retest, and that these come from the two highest groups. There are hence less obvious inconsistencies when the total score is used than when individual items are considered.

Delinquency scores and reliability

Another way of measuring the retest stability of the questionnaire is to calculate the correlations between the score of number of different acts admitted on test (NOCRIM) and the score of number of different acts admitted on retest (NOCRIM2). This is 0.73 ($p<.002$), a high figure. At this point, it might be worth discussing the merits of the simple score

Table 3.7 Differences in number of delinquent acts admitted between test (NOCRIM) and retest (NOCRIM2)

NOCRIM	NOCRIM2 0-6	7-10	11-15	16-27	Total
0-6	8	3	2	1	14
7-10	0	8	5	2	15
11-15	0	1	6	3	10
16-27	0	1	0	11	12
Total	8	13	13	17	51

as compared to a frequency score. Frequency scores were calculated for the test questionnaire, the retest questionnaire using the 27 items used on test and the full 32-item retest questionnaire (FNOCRIM, FNOCRIM2, FNOCRIS2 respectively). Similar simple scores were also calculated (NOCRIM, NOCRIM2, NOCRIS2). The means and standard deviations of these scores are shown in Table 3.8 and the correlations between the scores in Table 3.9.

Delinquency scores on retest are higher than those on test (Table 3.8), as might be expected. There are similar difference between the scores on the 32-item questionnaire (NOCRIS2, FNOCRIS2) and the corresponding scores on the 27-item questionnaire (NOCRIM2, FNOCRIM2). Table 3.9 shows that, within the test or retest situation, the various measures of delinquency correlate very highly (all greater than 0.96). Very similar figures are also found for the correlations between one test measure and one retest measure (0.73-0.77). It would hence seem that, in this sample, the simple score and the frequency score produce the same results. This implies that a measure of heterogenity of criminal career is similar to one of frequency of commission of offences, i.e. that boys become more varied in their offences as they commit more offences. The simple score, NOCRIM on test and NOCRIM 2 on retest, will hence be used as the delinquency measure in this study.

Internal consistency and factor analysis

The next question is to investigate the internal consistency of the test scale, the 27-item retest scale and the 32-item retest scale. As the items represent very different crimes, and as any split-half analysis could not be random, since the more trivial crimes have a high frequency of endorsement and the serious ones a low frequency of endorsement, it was decided to use the Kuder-Richardson (Richardson and Kuder, 1939) measure with the Hoyt (1941) correction. This investigates whether the items in a test are homogeneous in terms of how the individuals respond

Table 3.8 Means and standard deviations of crime variables

Variable	Sample Size	mean	SD
NOCRIM	54	10.61	5.70
FNOCRIM	54	15.72	9.81
NOCRIM2	51	12.65	6.39
FNOCRIM2	51	20.37	11.04
NOCRIS2	51	13.84	7.20
FNOCRIS2	51	22.18	12.12
PERG	49	59.68	15.66
PERS	50	30.02	16.43
PERSS	48	60.04	16.94
PERGS	49	31.28	16.51

Table 3.9 Correlations between crime measures

	NOCRIM	FNOCRIM	NOCRIM2	FNOCRIM2	NOCRIS2	FNOCRIS2
RIM						
OCRIM	0.98 (.001)					
RIM2	0.73 (.002)	0.74 (.002)				
OCRIM2	0.74 (.002)	0.76 (.002)	0.97 (.001)			
CRIS2	0.74 (.002)	0.74 (.002)	0.99 (.001)	0.97 (.001)		
OCRIS2	0.75 (.002)	0.77 (.002)	0.97 (.001)	0.99 (.001)	0.97 (.001)	

to the items. A high reliability coefficient means that the test measures accurately some characteristic of the individuals taking it and that the individual items on the test produce similar patterns of responding in different people. The test questionnaire had a reliability coefficient of 0.88, the 27-item retest questionnaire one of 0.94 and the 32-item questionnaire one of 0.91. These are very high and so one may conclude that the items are homogeneous.

Finally, the delinquency scores were subjected to factor analysis to discover whether there were any subfactors which might clarify patterns of criminal behaviour. Separate factor analyses were performed on the test questionnaire, the 27-item retest questionnaire and the 32-item retest questionnaire. For each, the delinquency items were intercorrelated and the resulting matrix factor analysed using the principal components method. Those principal components which had latent roots greater than 1, following Guttmann's criterion, were orthogonally rotated using the Varimax criterion. Pawlik (1973), however, has shown that Guttmann's criterion is liable to overestimate the number of common factors in an analysis with 100 or less subjects by a factor of 2-3. The higher numbered factors must hence be interpreted with caution.

The loadings of the items of the test questionnaire on the first four unrotated eigenvectors are shown in Table 3.10. The first unrotated eigenvector accounted for 25.3% of the variance, the second for 7.6%, the third for 7.0% and the fourth for 6.4%. There were eight unrotated eigenvectors with latent roots greater than 1. These accounted for 65.5% of the variance. It may be seen that the first component accounts for over three times as much of the variance as any succeeding component. The following items have low loadings on the first component (less than 0.4): stealing from clothes, going to 'X' films, drinking alcohol in pubs, going into pubs, using weapon in a fight and taking money from home.

Table 3.10 List of items and their loadings on the first four unrotated eigenvectors for test administration of questionnaire (decimal points omitted)

No.	Brief description	headings 1	2	3	4
14	Stealing from clothes	27	44	50	06
15	Stealing from slot machines	44	11	26	-43
16	Smoking	63	-17	-04	-28
17	Going to 'X' film	36	11	18	16
18	Trespassing	58	11	-34	-04
19	Stealing bicycle	51	-46	08	09
20	Stealing school property	64	04	18	23
21	Struggling to escape from police	49	24	-15	36
22	Receiving stolen property	43	16	42	-11
23	Littering	47	01	-29	-46
24	Stealing from small shops	66	-08	-09	33
25	Stealing from big stores	69	-32	11	25
26	Drinking alcohol in pubs	24	57	-16	51
27	Going into pubs	01	62	-44	12
28	Using weapon in fight	15	51	32	-20
29	Breaking windows	59	-05	-31	16
30	Attacking an enemy	53	-26	12	36
31	Stealing from cars	60	02	57	04
32	Vandalism of public property	73	13	02	-04
33	Taking money from home	29	-14	-32	13
34	Assaulting strangers	53	-25	-21	09
35	Fireworks in street	48	-26	-13	-27
36	Paying wrong fare	52	23	-14	-36
37	Not paying fare	50	18	-16	-14
38	Playing truant	49	-20	18	-05
39	Group hooliganism	52	22	-08	-09
40	Riding cycle without lights	50	09	-24	-34

The 'pub' items have the highest loadings on the second component and may be taken to be a separate cluster. Since almost all the illegal offences load highly on the first component it may be termed a general delinquency component. This is very similar to the results of Gibson (1971) and Amelang and Wantoch (1971). Considering the subsequent eigenvectors, it must be remembered that a partialling out operation for general delinquency has already taken place. The second is dominated by the 'pub' questions and by using a weapon in a fight. The third contains high positive loadings from the items of stealing from clothes, receiving stolen property and stealing from cars, all of which are predominately committed by small rather than large groups, and negative loadings mostly from the trivial crimes committed in large groups. It might be termed a serious theft/minor group delinquency component. The fourth has no immediately discernable structure.

Table 3.11 shows the Varimax rotated factor matrix. This gives a somewhat clearer picture of the groupings of the delinquent items. Considering the items loading on the factors with a value of greater than 0.5, factor 1 is determined by items 26 and 27, the 'pub' items. Factor 2 is determined by items 14, 17, 22 and 31, which might, apart from item 17, which has the lowest loading, be termed a serious stealing factor. Factor 3 is determined by items 15, 16, 23 and 36, which are all group activities of not very great seriousness. Factor 4 is determined by items 18, 35 and 40 which are all trivial misbehaviours. Factor 5 is determined by item 33, taking money from home, which does not load significantly on any other factor. Factor 6 is determined by items 24, 25 and 30, stealing from shops and attacking an enemy. Factor 7 is determined by items 20, 21 and 32 from which few conclusions may be drawn. Factor 8 is determined by item 19, stealing a bicycle. The analysis has successfully separated the more serious delinquent items from trivial misbehaviours.

Table 3.11 Varimax rotated factor matrix - test (decimal points omitted)

No.	Brief Description	Factors 1	2	3	4	5	6	7	8
14	Stealing from clothes	17	70	-02	-01	-07	25	-09	-26
15	Stealing from slot machines	-21	36	53	07	09	10	04	-23
16	Smoking	-03	25	50	30	10	20	06	33
17	Going to an 'X' film	28	54	17	34	-04	-01	12	35
18	Trespassing	30	17	18	52	44	17	08	06
19	Stealing a bicycle	-21	16	17	09	08	28	19	60
20	Stealing school property	-04	31	17	00	11	22	67	08
21	Struggling to escape from police	23	01	02	12	05	09	84	-03
22	Receiving stolen property	-02	69	10	18	13	-05	11	-03
23	Littering	02	-10	82	07	20	04	10	07
24	Stealing from small shops	07	08	16	02	22	70	26	17
25	Stealing from big stores	-11	24	16	05	11	65	19	47
26	Drinking alcohol in pubs	71	14	-02	-26	17	33	19	-11
27	Going into pubs	83	-05	06	10	-01	-18	06	-04
28	Using weapon in fight	-05	33	15	00	-02	05	13	-73
29	Breaking windows	04	-07	18	22	47	28	44	02
30	Attacking an enemy	-28	12	-14	11	22	66	30	00
31	Stealing from cars	-17	68	18	-01	-05	21	34	14
32	Vandalism of public property	02	19	47	15	-04	22	66	07
33	Taking money from home	10	00	06	06	78	07	-02	04
34	Assaulting strangers	-14	02	-03	46	45	30	22	03
35	Fireworks in street	-15	13	17	64	13	-09	20	28
36	Paying wrong fare	14	08	66	17	-05	13	20	-03
37	Not paying fare	13	04	34	28	03	56	-05	-17
38	Playing Truant	-18	38	31	-06	45	03	17	19
39	Group hooliganism	20	08	32	32	-31	49	15	04
40	Riding cycle withought lights	03	06	22	76	-00	26	01	-12

Turning next to the retest administration of the questionnaire, a similar factor analysis was performed on the same 27 items as those in the test questionnaire. The first eigenvector accounted for 28.4% of the variance and there were again 8 eigenvectors with latent roots greater than 1, accounting for 68.5% of the total variance. The second, third and fourth unrotated eigenvectors accounted for 8.8, 6.9 and 6.0% of the variance respectively. The loadings of the questionnaire items on the first four eigenvectors are given in Table 3.12. Again, almost all items have high loadings on the first component which may again be termed a general factor of delinquency. The exceptions this time are stealing from cars and riding a cycle without lights. These are the items with the lowest and highest percentages of admissions, respectively, and this result may be due to the consequent lack of variability in scores rather than any intrinsic property of the items. The items loading most highly on the second component are, in the positive direction, struggling to escape police and using weapon in fights and, in the negative direction, stealing from clothes and taking money from home. This would suggest an aggressive crime/stealing label. With eigenvectors 2, 3 and 4, however, almost all items load euqally on more than one eigenvector and so the picture is somewhat confused. Any interpretation must hence be very tentative. No conclusions may be drawn from the pattern of loadings on the third unrotated eigenvector. Items loading positively on the fourth eigenvector include struggling to escape police, receiving stolen property and using weapon in fights. Those loading negatively are mostly the more trivial crimes and misbehaviours. This component may hence possibly be termed a serious/nonserious crime component.

The loadings of the items on the eight orthogonal rotated factors are given in Table 3.13. The items determining the first factor are stealing from clothes, receiving stolen property, taking money from home and group

Table 3.12 List of items and their loadings on the first four unrotated eigenvectors for retest administration of questionnaire - 27 items (omitting decimal points)

No.	Brief description	eigenvectors 1	2	3	4
14	Stealing from clothes	52	-54	-10	19
15	Stealing from slot machines	73	-14	-09	-24
16	Smoking	68	-09	-22	-23
17	Going to 'X' films	32	-04	-36	21
18	Trespassing	34	19	-34	-15
19	Stealing bicycle	55	21	-36	-16
20	Stealing school property	72	12	33	11
21	Struggling to escape police	48	51	-07	43
22	Receiving stolen property	40	-27	14	53
23	Littering	51	09	42	-31
24	Stealing from small shops	53	-28	-21	-37
25	Stealing from big stores	64	-21	-23	-06
26	Drinking alcohol in pubs	42	38	-33	04
27	Going into pubs	35	45	-12	23
28	Using weapon in fights	38	51	13	37
29	Breaking windows	48	47	22	-26
30	Attacking an enemy	49	-04	-14	30
31	Stealing from cars	25	29	-37	-32
32	Vandalism of public property	71	-15	07	03
33	Taking money from home	44	-53	-08	22
34	Assaulting strangers	60	-29	38	-14
35	Fireworks in street	71	03	32	-00
36	Paying wrong fare	45	05	58	-06
37	Not paying fare	64	30	11	-24
38	Playing truant	54	05	-13	25
39	Group hooliganism	73	-27	-05	08
40	Riding cycle without lights	19	-23	-18	-14

Table 3.13 Varimax rotated factor matrix - 27-item retest analysis

No.	Brief description	Factors (omitting decimal points) 1	2	3	4	5	6	7	8
14	Stealing from clothes	83	11	11	02	02	11	-03	-06
15	Stealing from slot machines	37	41	42	-08	-08	22	11	12
16	Smoking	36	25	66	11	11	-00	13	28
17	Going to 'X' film	03	-00	09	16	16	83	-08	09
18	Trespassing	01	-00	74	20	21	15	02	-13
19	Stealing bicycle	19	10	15	11	11	18	21	11
20	Stealing school property	32	63	13	36	36	-01	25	-03
21	Struggling to escape police	11	13	08	66	66	16	42	-23
22	Receiving stolen property	50	18	-36	18	18	22	28	20
23	Littering	09	73	-10	09	09	-06	-08	-02
24	Stealing from small shops	43	24	38	04	04	-04	-22	27
25	Stealing from big stores	43	25	38	18	18	32	-09	14
26	Drinking alcohol in pubs	10	-02	35	62	62	-14	20	20
27	Going into pubs	-07	15	09	83	83	14	00	04
28	Using weapon in fights	-03	17	-05	25	25	01	75	-09
29	Breaking windows	-09	51	09	12	12	-15	31	-11
30	Attacking an enemy	21	14	12	-06	-06	69	31	-14
31	Stealing from cars	-09	-01	03	05	05	09	01	01
32	Vandalism of public property	38	50	-01	15	15	35	06	20
33	Taking money from home	84	03	03	-03	-03	-04	09	02
34	Assaulting strangers	37	72	-01	09	09	16	-23	05
35	Fireworks on street	17	65	21	-03	-03	23	37	10
36	Paying wrong fare	-01	69	18	-04	-04	-04	27	05
37	Not paying fare	-06	55	49	18	18	16	17	-01
38	Playing truant	26	09	18	11	11	12	57	36
39	Group hooliganism	56	32	24	-07	-04	26	25	13
40	Riding cycle without lights	04	04	01	00	00	01	01	90

hooliganism (primarily belonging to a large group of delinquents). This is mainly a stealing factor. The items for the second factor are stealing school property, littering, breaking windows, vandalizing public property, assaulting strangers, fireworks in street, paying wrong fare and not paying fare - all fairly minor hooligan activities of the boy going around with a few friends. The third factor is determined by smoking and trespassing, the minor misbehaviours. The fourth factor is determined by struggling to escape police and going into pubs. The fifth is mainly struggling to escape police, drinking alcohol in pubs and going into pubs, the going into pubs item being the major one. This may again be the separation of the 'pub' items from the other delinquent items, in spite of the fact that these items were corelated with the first component on retest. The sixth factor is determined by going to 'X' films and attacking an enemy - again a hard combination to evaluate. The seventh factor is mainly using weapon in fight and to some extent playing truant. The eighth factor has one very high loading, that of riding a cycle without lights. This may again be due to the very high incidence of admission of this item.

Compared to the results obtained on test, the results on retest show that delinquent activity has become more fragmented. There is still a large first component, which this time, also includes the 'pub' items. The stealing activities also separate from the aggressive activities (as was found by Gibson (1971)). The Varimax matrix, however, is less clear on retest. Stealing, group activities of not very great seriousness and trivial misbehaviours again appear. The other factors are very difficult to interpret in both analyses, but there are more high loadings on these on retest than on test.

Finally, one may turn to the 32-item retest analysis. Since this includes the more serious items, it may well delineate some of the factors more successfully. Table 3.14 shows the loadings of the items on the first 4 unrotated eigenvectors. There are 10 eigenvectors with

Table 3.14 Loadings of the items on the first 4 eigenvectors from 32-item retest analysis (omitting decimal points)

Number	Brief description	Components 1	2	3	4
14	Stealing from clothes	53	50	-27	02
15	Stealing from slot machines	74	15	01	-14
16	Smoking	65	15	12	-48
17	Going to 'X' film	36	-03	-44	-01
18	Trespassing	32	-14	07	-58
19	Stealing bicycle	60	-26	-29	-10
20	Stealing school property	69	-04	37	13
21	Struggling to escape from police	51	-52	-07	15
22	Receiving stolen property	42	-24	-15	45
23	Littering	48	-02	39	19
24	Stealing from small shops	49	30	01	-39
25	Stealing from big stores	66	19	-17	-16
26	Drinking alcohol in pubs	41	-35	-04	-41
27	Going into pubs	34	-41	05	-16
28	Using weapon in fight	38	-50	13	28
29	Breaking windows	48	-43	31	07
30	Attacking an enemy	52	-01	-22	22
31	Stealing from cars	29	-33	-32	-13
32	Vandalism of public property	71	16	02	16
33	Taking money from home	42	53	-09	03
34	Assaulting strangers	59	35	26	18
35	Fireworks in street	69	04	34	15
36	Paying wrong fare	43	03	54	16
37	Not paying fare	61	-22	36	-20
38	Playing truant	53	-03	-02	-04
39	Group hooliganism	71	28	-01	-00
40	Riding cycle without lights	18	22	-05	-23
44	Driving vehicle on roads	57	-03	-10	06
45	Joyriding	55	-16	-25	40
46	Breaking into store etc.	52	-02	-50	05
47	Carrying weapon	37	-03	-01	-07
48	Breaking into house and stealing	36	-25	-49	10

latent roots greater than 1, accounting for 71.5% of the variance. The first eigenvector accounts for 27.2% of the variance, over three times as much as any succeeding eigenvector. Almost all the items have high loadings on the first unrotated eigenvector, including the added items. The only items with low loadings are stealing from cars and riding cycle without lights, probably due to the extreme frequencies of admission of these items. Stealing from clothes and taking money from home have high positive loadings on the second component and struggling to escape from police, using weapon in fight and breaking windows have high negative loadings. This component may hence be one of theft/ aggression, as in the 27-item analysis. Those items loading positively on the third include stealing school property, littering, breaking windows in street, fireworks in street, paying wrong fare and not paying fare. Those loading negatively include going to 'X' film, stealing from cars, breaking into stores and breaking into house and stealing. All but two of the other stealing items also have negative loadings. This component may now be clarified into a mixed group delinquency/active theft component. The fourth component is determined by positive loadings from receiving stolen property and joyriding and by negative loadings from smoking, trespassing, stealing from small shops and drinking alcohol in pubs.

The Varimax factor matrix for the 32-item analysis is shown in Table 3.15. The first factor is determined by stealing school property, littering, vandalism, assaulting strangers, letting off fireworks and not paying the fare on public transport, all group offences of not very great seriousness. The second has struggling to escape from police, using weapon in fight and, to some extent, playing truant. The third has smoking, trespassing and drinking alcohol in pubs, the minor misbehaviours. The fourth has stealing from clothes, taking money

Table 3.15 Varimax factor matrix for 32-item retest analysis

No.	Brief description	Factors (decimal points omitted)									
		1	2	3	4	5	6	7	8	9	10
14	Stealing from clothes	14	-10	06	78	39	10	17	02	-04	-08
15	Stealing from slot machine	34	01	21	24	09	19	62	07	14	12
16	Smoking	22	09	55	29	01	13	45	-09	00	26
17	Going to 'X' film	06	-03	15	05	33	-03	04	83	05	10
18	Trespassing	-02	04	76	06	-03	11	15	18	01	-12
19	Stealing bicycle	05	26	09	07	16	-02	61	01	52	12
20	Stealing school property	59	38	18	24	16	26	11	-08	-07	-04
21	Struggling to escape from police	10	71	19	-01	36	06	15	05	01	19
22	Receiving stolen property	11	32	-36	34	32	20	21	02	-29	20
23	Littering	80	08	-04	06	-01	-09	06	-03	25	-00
24	Stealing from small shops	33	-18	34	33	14	-13	30	-15	13	28
25	Stealing from big stores	18	-00	25	18	36	13	61	06	-12	16
26	Drinking alcohol in pubs	01	44	52	06	27	-02	05	-16	14	21
27	Going into pubs	21	46	43	-16	37	-09	-12	09	-13	08
28	Using weapon in fight	13	77	-04	01	-06	10	07	01	16	-06
29	Breaking windows	44	33	08	-03	-00	32	02	-10	55	-05
30	Attacking an enemy	05	19	-02	17	01	21	47	58	02	-16
31	Stealing from cars	02	03	04	-01	20	-01	14	07	82	04
32	Vandalism of public property	58	19	-01	29	12	-13	31	29	05	21
33	Taking money from home	11	06	01	91	-03	00	02	04	-00	05
34	Assaulting strangers	71	-12	-01	18	21	06	34	-01	-19	00
35	Fireworks in street	59	28	09	17	-11	23	29	23	-03	08
36	Paying wrong fare	48	08	05	-05	01	71	12	-09	-18	-00
37	Not paying fare	52	19	46	-00	-04	27	09	25	18	01
38	Playing truant	09	51	13	31	-12	-01	23	17	03	37
39	Group hooliganism	31	15	13	56	03	19	29	22	06	17
40	Riding cycle without lights	03	-06	-01	04	04	13	01	02	03	90
44	Driving vehicle on roads	21	12	05	02	03	-04	79	10	10	-13
45	Joyriding	18	38	-28	06	26	08	43	24	16	07
46	Breaking into store etc	06	14	08	06	70	-02	18	21	06	05
47	Carrying weapon	09	07	10	18	08	80	05	14	19	18
48	Breaking into house and stealing	02	06	-06	00	70	10	10	11	37	-02

from home and to some extent, group hooliganism. This factor was also apparent in the earlier analyses. The fifth is determined by the two breaking and entering offences. The sixth is determined by paying the wrong fare and carrying a weapon. The seventh is concerned with stealing from slot machines, stealing a bicycle, stealing from big stores and driving a vehicle on the roads. These may be considered the serious theft items. The eighth is concerned with going to an 'X' film and attacking an enemy - minor group behaviour. The ninth is mainly stealing a bicycle, breaking windows and stealing from cars - another serious factor. The tenth is almost exclusively determined by riding a cycle without lights. This analysis replicates the general factor of delinquency obtained from the first unrotated eigenvector. The more serious items also have high loadings on this component. The other components may be considered to be active theft/aggression, mixed group delinquency/active theft of a more serious nature and one in which the negative loadings come primarily from the more trivial misbehaviours but for which the positive loadings are more difficult to interpret. On rotation, the positive and negative loadings of the unrotated eigenvectors become separated and factors of mixed group offences, aggressive offences, minor misbehaviours, stealing and breaking and entering appear. These indicate that, although there is a large general component, so that the construction of total delinquency scores is appropriate, it is possible to separate different patterns of delinquent behaviour using the behavioural items. What is also interesting is that the mixed group activities, which are performed by a large group of youngsters roaming the streets, separate from the theft items and the more serious offences of breaking and entering. This indicates that there may be different patterns of criminal career, although it is likely, given the large first components and the high internal consistency of the questionnaire, that the boys who perform the more serious theft and breaking and entering activities have also, probably at an earlier stage,

taken part in group activities. The increase in the number of factors required for the 32-item analysis, without a corresponding increase in the total variance accounted for, also indicates that the more serious items further delineate the patterns of activity in the 27-item questionnaire and provide a more detailed picture of the differences in behaviour patterns of the boys. The analysis also provides confirmation of inclusion in the questionnaire of items which are not illegal such as smoking and trespassing. Although these tend to form a common factor of minor misbehaviour, they do illustrate one part of the behaviour of the group of boys and it is interesting that they are linked with some of the more serious items (truancy with factor 2, for example). As Gibson (1971) says: "However, many fringe-delinquent acts such as trespassing are meaningful events in the lives of boys and study of their relations with criminal acts, conviction and social class may lead to greater understanding of how behaviour may best be classified meaningfully." Christie (1968) commented that 'the major problem has not to do with getting the informants to give honest answers, but to know what to ask them to be honest about. Basically it is a problem of sampling ... of acts". Such analyses indicate that juvenile delinquent activity is both varied and widespread and that, although few homogeneous criminal careers are found, there are differences in the patterning of criminal behaviour. Personality research, if it is to make a contribution to the problem of the 'good boy in a high delinquency area' (Reckless et al, 1957), must explore the differences between delinquents as well as the differences between delinquents and non-delinquents.

Contact with the Police

At this point, it is interesting, in view of the large number of criminal offences admitted, to consider the contacts that the boys have had with the police as admitted by the boys. Responses to the retest question 'Have you had any contact with the police' were divided into

categories of no contact, informal contact (warnings, bookings etc.), formal cautions and convictions. 17 boys said they had not had contact with the police. 27 boys said that they had been booked or warned by the police. These were primarily offences to do with bicycles, such as having no lights or no brakes or carrying two people. They did, however, include offences such as breaking into an empty house, trespassing on the railway lines, smashing windows, shoplifting, receiving stolen goods and stealing a bicycle. For the last two, the boys were made to give the stolen articles back. Three of the boys had received formal cautions, one twice, for breaking into a school and smashing a fire alarm, cutting down a school fence, stealing off a lorry and throwing stones at cars. Four of the boys had been convicted, one for stealing two mopeds, one for carrying a weapon and causing injury (possibly grievious bodily harm), one for trespassing on the railways (causing criminal damage) and for receiving stolen property and one for trespassing on the railways (causing criminal damage).

From this it may be seen first, that a considerable number of the boys admitting fairly serious criminal offences have never been in official contact with the police and secondly, that considerable police discretion is exercised as to whether to bring the boys to court. The mean number of crimes admitted by those with no contact is 8.94, by those with only informal contact 13.56, by those with formal cautions 15.33 and by those with convictions 20.25. A t-test between the first two groups gives a value of 2.647 (d.f. = 42), which is significant at the $p<.02$ level. Since there are so few boys in the last two groups, these were amalgamated and a t-test between the second group and this amalgam gives a value of 2.010 (d.f. = 32) which is just not significant (for 30 d.f., $t < 2.042$ for $p<.05$). The criminal justice process is hence, as in the Cambridge study (Farrington and West, 1971), picking up those who engage in more frequent and hence more serious delinquent activity, on

average. The number of convictions and formal cautions by the age of 14, however, is small and a considerable number of the boys who have not been convicted (5) have delinquency scores above the mean score of the convicted boys. Convictions would thus not provide a very good measure of the delinquency of these boys. It must be remembered that these are, of course, self-reported convictions. From other work in the field, however, there is no reason to believe that the boys would conceal their convictions or falsely claim some. It is hoped to make a search for the criminal records of the boys in the sample when they are 18 and so have amassed a number of convictions which will be large enough to permit of statistical analysis.

Group crime

From the answers to question 49, it was possible to form an impression of group and gang crime in the area. The typical pattern of delinquent activity varied according to the age of the boy. Most boys belonged to a group between the ages of 10 and 12. Some of these were non-delinquent groups of 5 or 6 friends, the primary activities being fishing, riding bicycles and visiting each other's houses. Others were based on the school or on the street - some boys belonging to two groups, one for school and one for home. The ones at school were year- and class-based and there would be rivalry between groups in the playground involving fighting and stealing school property. The street groups, which ranged from 3 to over 15 boys in size, and were flexible in membership, took their street or area as a territory to be defended. Children of the same age or younger would be challenged and sometimes required to pay small sums in order to come down the street. There were fights between neighbouring streets, usually, however, involving at most sticks and stones. The groups would roam the streets at night, playing 'knick-knock-nanny' (knocking on a door or ringing the bell and then running away) and games of catch with milk bottles (which results eventually in someone

missing and the milk bottle smashing on the ground). Slot machines would sometimes be tried and adults would be subjected to catcalls and verbal insults but not physical assaults. Most activities were impulsive in nature such as trespassing on railways or 'scrumping' (stealing fruit from gardens). There were, however, foci of trouble such as after sessions at the community centre or youth club at the school. Stealing would generally also be unplanned and done in smaller groups of 2 or 3 boys.

By the age of 12-13, most boys no longer belonged to these groups. Several had given up delinquent activity, often after being caught by a shopkeeper shoplifting and being warned that, if caught again, they would be given over to the police. Others continued to engage in the same kind of delinquent activities, but the groups were smaller (between 3 and 7 boys) and groups of friends rather than being street-based. Some continued to steal from shops and stores, usually on their own or with one friend, but were much more careful and professional in their activities. Of these a very few expanded their activities into breaking into cash and carry stores, receiving stolen goods and stealing mopeds. These boys often went around with older boys and adults. The exception to these activities was football, which produced a complete schism among the boys, half saying that they would not go to matches because 'it's too rough up there' and the other half definitely going in large groups and accepting the possibility of violence. The fall in delinquent activity may have been due to many of the boys acquiring jobs before or after school. There was an association between committing the more serious delinquent acts and truancy (as shown in factor 2 of the 32-item analysis), although this was very much clamped down on in the school.

Two of the boys said that they belonged to the white gang in the area, which was primarily composed of 16 to 19-year-old boys. This had a definite leader and second-in-command and membership was limited. The leader would go to other areas, mostly other housing estates, and meet

the leader of the gang of the other area. A fight would be arranged at a specific time and location (disused railway tunnel, lots, etc.) and the gangs would turn up to do battle. Weapons would be carried, mostly knives, but were rarely used. The fights, according to another research worker, involved mainly ritual threats. Little damage is actually done although the potential is there. Conflicts of the same sort between the white gang and the black gang of the area occur at the Speedway stadium on the outskirts of the area. This gang thus fulfills the conditions for a gang discussed in the previous section. Although these boys were among the most delinquent in the sample, their other activities were not carried out within the structure of the gang but usually with one or two other people, who were usually members of the gang. They had never been caught for anything except riding a bicycle without lights after dark. The gang may be classified as a 'conflict gang', according to the terminology of Cloward and Ohlin (1961) since its activities were entirely confined to fighting and aggression. As a result of the activities of the gangs, many boys admitted to carrying a weapon whenever they went out after dark, in case they were challenged by any other boy or youth. These boys were very often the non-delinquents, but considered it more important to be able to deter other boys from fights than to run the risk of being picked up by the police for carrying an offensive weapon.

Manner of committing crime

Five measures of the manner in which the delinquent acts of the boys were committed were taken. These were all expressed as percentages of the number of types of delinquent acts admitted for which a response to that question could be obtained (i.e. the items to which a response of 'don't know' was not recorded). They consisted of involvement in group or gang crimes (a group being defined as being more than one person of approximately the same age) (PERG), involvement in solitary crimes (PERS),

involvement in crimes suggested by the boy himself (PERSS), involvement in crimes suggested by other boys (PERGS) and planned crimes (PERP). The method was a pilot one, as no previous quantitative work had been done in this area, and several problems were encountered. There was, however, no difficulty in getting the boys to answer these questions, which they considered to be meaningful. This was thought to be one of the main problems in using such a technique but, by stressing that names of group members were not required, the boys retained their trust in the confidentiality of the interview. The boys found it difficult to remember where the activities had taken place and also whether they had been planned in advance. In subsequent work, it would probably be better to ask if the activities had taken place on the spur of the moment, and, if the answer is no, whether any tools or special equipment had been brought along. As it is, answers were scored according to whether the activities were planned or not, in the sense of being thought out beforehand. The distribution of percentage planning (PERP) was positively skewed. It did not have significant rank-order correlations with any of the other crime measures, NOCRIM2 or personality and so was dropped as a measure. The place of commission of the crime was also dropped from the analysis as there was a very high percentage of 'don't know' answers.

The distributions of the other four measures (PERG, PERS, PERSS and PERGS) were plotted and found to be normal. The means and standard deviations of these are shown in Table 3.8. It may be seen, first, that group crime plus solitary crime accounts for almost all the crime admitted, so that crime committed with adults or parents is very infrequent. Criminal involvement at this age is hence primarily delinquent involvement, there being little contact with the adult criminal culture. Secondly, the amount of involvement in group crime is very much greater than that with solitary crime. This concurs with the criminal statistics on convictions, which show that only 10 to 20% of convictions in the 9 to 16 age group in two East London boroughs were for crimes committed alone

(Hood and Sparks ,1970).

It is also possible to calculate from the responses to the questions on the manner in which the crime was committed the percentage involvement in group crime for each type of crime. This is shown in Table 3.7. Two offences have been omitted, one (no. 39) because being in a group is contained in the definition of the offence and one (no. 48) because there was only one affirmative reply to the item. It may be seen that the percentage involvement ranges from zero (taking money from home) to 91.40 (letting off fireworks in the street). Those offences having a higher percentage involvement include trespassing (85.19), littering (90.32), breaking windows (90.67), vandalism of public property (91.30) and fireworks. These are all minor offences of 'street-corner groups'. It may be remembered that they were separated out in the factor analysis. Offences committed with adults are not included in the group which explains the low figures for the 'pub' questions.

Comparing these findings with those of Erickson (1971), the only previous study to provide figures for each type of offence, it may be seen that the peroentages are very similar. He obtained an overall percentage of 65.0, compared to 59.7 in the present study. The comparable items, destruction of property (91.0), auto theft (72.0), theft of £2 to £50 (71.0) and fighting (55.0) are also similar. It is a great pity that no study giving detailed figures for each type of crime has sampled adequately the range of delinquent behaviour patterns.

Before discussing the suggestion measures (PERSS and PERGS), it must be pointed out that PERSS includes those crimes committed alone, the vast majority of which are 'suggested' by the boy himself. This is another point which should be rectified in subsequent work, when suggestion measures should include self-suggestion of group crimes, other-suggestion of group crimes and other-suggestion of all crimes. The first and second of these would indicate the balance between 'leading' the group and being amenable to others' suggestions, possibly as a result

of group pressures and norms. The third might give a measure of susceptibility to persuasions and ideas from others. Analysis of suggestion of solitary crimes would probably only be useful in as far as adult models were influential in setting the pattern of crime in the district. In the present area, suggestion by adults almost always went together with commission with adults and applied almost entirely to the 'pub' and 'X-film' items. These problems only became apparent after a considerable number of the interviews had been finished and so the analyses indicated above could not be performed. It was unfortunately not possible to retest the boys.

The considerably greater mean of PERSS than PERGS may be due to the inclusion of solitary crimes in PERSS. The correlations between the measures (Table 3.16), however, provide some means of separating out the variables. The high negative correlations between PERG and PERS and between PERSS and PERGS are probably due to the manner of computing the variables, since both were expressed as percentages of total number of items admitted with answers to that question and there were very few crimes committed with or suggested by adults. The correlations with total number of items admitted (NOCRIM2) are more interesting. It may be seen that involvement in group crime is significantly positively correlated with total delinquency score whereas involvement in solitary crime is significantly negatively related. In this area, then, the more delinquent the boy the greater his percentage involvement in group crime. Self-suggested crime and other-suggested crime, however, are not so correlated with NOCRIM2. If PERS is partialled out in the correlation between PERSS and NOCRIM 2, this becomes 0.04 (non-significant). The independence between self-suggestion and delinquency is hence not affected by the methodological inadequacy of including solitary crime in self-suggested crime. Other-

Table 3.16 Correlations between measures of manner of committing crime

Pearson product-moment correlations

	NOCRIM2	PERG	PERS	PERSS	PERGS
)CRIM2					
PERG	0.30 (.038)				
PERS	-0.24 (NS)	-0.82 (.001)			
PERSS	-0.07 (NS)	-0.33 (.020)	0.45 (.002)		
PERGS	0.13 (NS)	0.44 (.002)	-0.20 (NS)	-0.85 (.001)	

Table 3.17 Percentage involvement in group crime for each type of crime

Number	Brief description	Percentage group involvement
14	Stealing from clothes	43.75
15	Stealing from slot machines	71.21
16	Smoking	64.52
17	Going to 'X' film	89.39
18	Trespassing	85.19
19	Stealing bicycle	54.55
20	Stealing school property	31.25
21	Struggling to escape from police	81.82
22	Receiving stolen property	31.82
23	Littering	90.32
24	Stealing from small shops	63.04
25	Stealing from big stores	75.44
26	Drinking alcohol in pubs	16.67
27	Going into pubs	16.67
28	Using weapon in fight	73.68
29	Breaking windows	90.67
30	Attacking an enemy	85.08
31	Stealing from cars	80.00
32	Vandalism of public property	91.30
33	Taking money from home	0.00
34	Assaulting strangers	84.48
35	Fireworks in street	91.40
36	Paying wrong fare	49.52
37	Not paying fare	56.31
38	Playing truant	57.41
40	Riding cycle without lights	31.29
44	Driving vehicle on roads	47.62
45	Joyriding	62.50
46	Breaking into store etc.	75.00
47	Carrying weapon	56.79

suggested crime is positively correlated with group crime - more group crimes are committed on suggestion from others, probably those in the group, than by the boy himself. As indicated above, solitary crime is highly correlated with self-suggested crime. This probably produces the negative correlation between self-suggestion and group crime. When PERS is partialled out, the correlation of PERSS with PERG becomes 0.08 (non-significant). Other-suggestion is hence the main concomitant of involvement in group crime. The low negative correlation between PERGS and PERS shows that involvement in solitary crime has little relationship with taking suggestions from others. Solitary crime, which is not the norm in the area, is very much a product of the boy himself and probably has little relation to group norms and pressures.

If NOCRIM2 is partialled out for the correlation of PERG and PERS, one obtains an estimate of the influence of self-suggestion and other-suggestion on group and solitary crime independent of how delinquent the boy is. This does not alter greatly the relationship between other-suggestion and group crime (0.43) or that between other suggestion and solitary crime (-0.18). If both NOCRIM2 and PERS are partialled out from the correlations of PERSS with PERG and PERGS, the correlations become 0.07 and -0.90. Again there is very little difference from the original correlations. The relationships discussed above hence hold independently of the total delinquency score of the boy.

CHAPTER 4

PERSONALITY AND CRIME

Eysenck's theory

Perhaps the best-known theory of the personality of criminals is that of Eysenck, as presented in Crime and Personality (1970). It is intended to cover a very diverse group of behaviours and offenders: "certain similarities *among* people who transgress against the rules of their society, whether formalized in law or not."

Its basic postulates are very simple and may be expressed as follows. The quotes are from Crime and Personality.

1) Being socialized, i.e. not committing crimes, depends on having a conscience ("that it is conscience which is, in the main, instrumental in making us behave in a moral and socially acceptable manner").

2) This conscience is developed throughout life by a process of conditioning, mainly classical conditioning ("that this conscience is the combination and culmination of a long process of conditioning; and that failure on the part of the person to become conditioned is likely to be a prominent cause in his running a-foul of the law and of the social mores generally").

3) There are individual differences in conditionability, which is considered to be a unitary factor, which determines how antisocial a person will become ("if we studied groups of criminals, we would also expect to find that they would be more difficult to condition than non-criminals").

4) Conditionability is positively related to introversion.

5) Hence criminals should be more extraverted. ("Another deduction from our theory is, of course, the more general one that people who commit crimes and other antisocial or asocial acts would, on the whole, be more extraverted than people who refrain from carrying out such acts").

6) Neurotics are high on emotionality or anxiety, which, on a Hullian view, acts as a drive which multiplies with habit.

7) Hence neurotics who have habitual antisocial responses will tend to perform these responses more strongly than non-neurotics.

8) Hence criminals will also tend to be neurotic.

Recently, a third factor of psychoticism, orthogonal to the factors of extraversion and neuroticism, has also been posited to be related to criminality. This prediction is based on the link between psychotism, schizophrenia and criminality, such that relatives of schizophrenics tend to be criminals.

There have been many studies and reviews on the theoretical basis of Eysenck's work and a considerable number of criticisms. I shall not attempt to delineate the theoretical arguments here, expect to clear up one problem concerning the populations to which Eysenck's theory may be applicable.

Eysenck does not define what he means by a 'criminal', although he has used various forms of unselected inmates of prisons and other institutions in his own studies. He has also stated that it is important to match criminals and controls on such variables as age and social class. This last condition is fulfilled admirably by self-report studies, in which there need be no dichotomy between criminals and controls but a continuum of criminality. Of course, he acknowledges that there will be subsections of the community to which his general theory will not apply. "We must now consider those people who have had imposed on them an 'antisocialization process'... Now it will be the introverted child, the child who conditions well, who will condition to the precepts emerging from this 'Fagin's kitchen'. Instead of becoming conditioned to be a good and law-abiding citizen, we now have our introvert being conditioned to be a 'good' law-breaking thief or prostitute." The number of cases in which this will happen, however, is very small (Short and Stodbeck, 1965).

Investigations of Eysenck's theory

The studies investigating Eysenck's theory may be divided into two types, those which aim to test the postulate that criminals have a low susceptibility to conditioning, and those which explore whether criminals are more extravert, neurotic and psychotic than the general population. The latter will be reviewed in this chapter.

Passingham (1972) has given a very good review of the theoretical basis of Eysenck's theory and of the studies that have aimed to test it. He concludes that "The empirical data on the personality and conditionability of delinquents and criminals is inadequate. Most of the studies are open to criticism on the methods used. Furthermore, there are several examples of different studies providing contradictory conclusions, perhaps because of differences in the samples or controls used. Even when the inadequacy of the studies is taken into account, this review indicates that the evidence on Eysenck's theory is only partially confirmatory, suggesting that the theory applies only, if at all, to a subgroup of offenders."

Criticisms of the studies may be divided into two groups, those concerning the suitability of the personality measures used and those concerning the composition of the samples of criminals and controls.

Problems with the studies:

1. The Personality Questionnaires

In studies aimed at testing the predictions that the mean scores of criminals on the dimensions of extraversion, neuroticism and psychotism should be significantly higher than the mean scores of control groups, one of the problems has been that the questionnaires used have been of varying reliability and validity. Although Eysenck and Eysenck (1969) have shown that the second-order factors of extraversion and neuroticism can be extracted from the Cattell 16PF scale, it is not clear how the results of studies using such scales can easily be interpreted. This is partially due to the fact that there are considerable differences between groups of different social

class and groups from different urban or rural environments in mean scores on the dimensions, let alone groups from different countries. Norm tables for calculating the second-order factors in English populations are not available for all Cattell's scales. Other scales, such as the MMPI psychopathic (Pd) scale or the Taylor Manifest Anxiety Scale, are factorially complex and load both on E and on N. Ratings by teachers or parents are even more open to objection (see the discussion of the Teacher's Rating Scale in the chapter on personality questionnaires). If Eysenck's theory is to be tested in the most appropriate way, then his own scales should be used. If the predictions are confirmed using these scales, then others may be used.,

2. Contamination with faking

Several studies (e.g. West and Farrington, 1973) have emphasized the importance of taking lie scale scores into account. Very often there are correlations between lie scale score and criminality and between lie scale score and scores on extraversion and neuroticism. Both West and Hoghughi and Forrest (1970) have shown that 10 to 11 year old delinquent boys produced significantly low lie scores which, in the study of West and Farrington, correlated negatively with future delinquency. By the age of 12 to 16, however, average scores were obtained and there was a positive though insignificant relation to delinquency. West considers that the future delinquents tended to respond honestly at the age of 10 to 11 and confess their own shortcomings, thereby producing low lie scores. Buikhuisen and Hemmel (1972) found that there was no difference in lie-score between their group of 'drunken drivers' and their control group but that a group of 'economic offenders' had a significantly lower lie-score. West (1969) showed that extraversion predicted future delinquency only in the group with low "Suppressor Scale" scores. As discussed in the chapter on self-report delinquency, problems of concealment of offences rather than exaggeration are prominent. It would, therefore, seem necessary to include a lie scale in

any test of Eysenck's theory and to examine the correlations between lie scale score and criminality.

3. Extraversion or impulsivity?

Another issue which has figured prominently in the literature is whether it is the second-order factor of extraversion or the first-order factor of impulsivity that should be related to criminality. Eysenck (1974) says that "Cochrane (1974) mentions the repeated finding that it is the impulsivity items on the E scale, not the sociability items, which seem to be positively correlated with criminality. This fits in well with the finding that eye-blink conditioning, too, correlates with the impulsivity, not with the sociability items on the E questionnaire (Eysenck and Levey, 1972). It is well in line with my theory that ease of conditioning is causally related to criminality." There are two parts to the argument: first, that impulsivity is the correct measure on theoretical grounds as stated above and secondly, that certain items loading on sociability, such as those about parties, are of doubtful validity when used on a prison population. There is no published factorial division of extraversion into sociability and impulsivity for any of the Maudsley scales except the Eysenck Personality Inventory and the Personality Inventory, both of which are for adults. Several studies, however, have tried to isolate the contributions of the first-order factors to the scores obtained from offenders. Field (1959) divided the extraversion (E) scale of the Maudsley Personality Inventory (MPI) into 11 social E items, 7 behavioural E items and 6 items which could not be classified and found that his 400 recidivists scored lower than 100 apprentices on social E and higher on behavioural E. Sanocki (1967) found that his prison sample differed from his matched controls on 5 items in the MPI, of which the E items referred to liveliness. Schalling and Holmberg (1969) found prisoners to be higher than controls in impulsivity and lower on sociability. Eysenck and Eysenck (1971a) performed an item analysis on the psychoticism (P), neuroticism (N) and E scales of the Personality Inventory

and found that the items which differentiated prisoners from controls on the E scale were mostly those which loaded on the first-order factor of impulsivity. There is, however, a relationship between impulsivity and class structure: the studies on personality in slum subcultures, from which a large number of prisoners come, suggest that the norm here is for high levels of impulsivity and neuroticism. Of the studies mentioned above, only that of Sanocki controlled for class. A scale of impulsivity has also been developed at Broadmoor Hospital (Black, personal communication) and has been found to be of value in predicting progress of treatment and future offences in psychopaths.

Burgess (1973) has attempted to test Eysenck's prediction that criminals differ from normals on the component of impulsivity, as defined by the items identified by Eysenck and Eysenck (1968) as loading strongly on this component. He tested three groups of criminal subjects, one from a local prison, one from a central psychiatric prison and one from a long-term prison, on the Eysenck Personality Inventory (EPI). The prisoners were found to be higher on N and no different on E as compared to a control group of volunteers. Impulsivity was found to differentiate clearly between criminal and control groups for all three samples, sociability producing results in both directions. There were, however, correlations between impulsivity and neuroticism in the criminal samples which suggested that highly neurotic groups would be expected to yield high impulsivity and low sociability scores whether or not they were criminal. Sociability and impulsivity were found to be completely independent. Burgess considers that it is hence misleading to refer to 'extraversion' when dealing with criminal subjects, since this variable is made up of two quite independent factors. Results obtained would be dependent on the relative preponderance of sociability and impulsivity items in the questionnaires administered.

As to the question whether there is a reluctance among incarcerated criminals to endorse items referring to activities at parties which load on

the sociability component, thus artificially decreasing sociability scores, Sanocki (1969) found that prisoners were more likely to report that they enjoyed a party. Burgess (1972b) failed to find any differences between long-term prisoners and normal controls in the rate of endorsements of the party' items in the PEN inventory.

Using behavioural tests of impulsivity, a number of studies have shown that institutionalized delinquents are less likely to invest the time and effort necessary to attain goals via conventional paths and are more likely to seek immediate gratification (e.g. Porteus, 1965; Gibbens, 1958; Mischel, 1966).

The majority of studies of impulsivity in criminals, although having major methodological shortcomings, show that impulsivity is related to criminality. Some of the same studies find that extraversion is not so related. It is a pity that item analyses have not been performed for all the Maudsley questionnaires so that scales of impulsivity and sociability could more readily be used. Until this occurs, the problem noted by Burgess of the different correlations between the components in criminal groups cannot be resolved. The evidence must be regarded as suggestive but not conclusive.

4. Possible intercorrelations of extraversion and neuroticism.

Burgess (1972) has also raised the problem of controlling for the neuroticism dimension when mean scores of criminal and control groups are compared on extraversion. Passingham (1972) argues that, while E and N are independent in the general population, at high levels of N, for example, in mental patients, the regression lines bend and quite high negative correlations appear. This could cause an artificial lowering of E scores in the high N criminals in an unmatched population. Burgess (1972b) first compared criminal and control groups on E and N as per normal and found that the prisoners were significantly more neurotic but not significantly more extraverted than the control groups. He then matched the prisoners and

controls on N and found that, although the results moved in the direction predicted by Eysenck, they could in no way be called significant. Negative correlations between E and N were found in the criminal population but were not found among high N scorers in the normal population. There is, hence, little support for the above hypothesis.

Burgess (1972a), however, has shown that while his criminal samples were again no different on E and N from his control samples, on performing a quadrant analysis of the Eysenckian two-dimensional space, the neurotic extravert quadrant was found to contain an excess of criminals as compared to controls. This would follow from Eysenck's theory, since it is only likely that criminals would have higher mean scores on E and N than controls if (A) no other factors were conducive to the development of criminality and (B) most individuals who were neurotic extraverts and undersocialized tended to end up as convicted criminals. West (1969), in the earliest testing of boys in the Cambridge Study at the age of 8, performed similar quadrant analyses on a modified version of the Junior Maudsley Personality Inventory and conduct ratings by psychiatric social workers and teachers. The neurotic extravert quadrant was again found to contain the majority of badly-behaved boys. Later testing of the same boys on a self-report delinquency questionnaire produced a slightly higher percentage of delinquents than non-delinquents in the neurotic extravert quadrant, but the excess was never statistically significant (West and Farrington, 1973). Hoghuighi and Forrest (1970), in their review of studies of approved school boys, found that the group of neurotic introverts were more delinquent than the group of neurotic extraverts. The evidence on this issue is equally divided, although there are sound theoretical reasons for performing quadrant analyses on the E and N scores.

5. Controls

One may now turn to the problems involved in the choice of suitable criminal and control groups on which to test the theory. The first and major problem is that of finding matched controls. The necessity for this is shown

in the correlation between criminality and social class, shown both in studies using official convictions and in studies using self-report delinquency. If personality is also related to social class then a failure to use adequate control groups may mean that relationships tend to decrease or spuriously appear. A similar situation holds for the relationship between intelligence and criminality, since criminality is negatively related to social class and intelligence is positively related. Studies of the relationship between intelligence and criminality found conflicting results until social class factors were taken into account. Personality norms show that there is wide variation between various subgroups of the population. For the Personality Inventory, the means for non-offenders on E range from 23.900 (clerks) to 29.288 (engineering apprentices) and on N from 16.638 (professionals) to 22.714 (skilled working class). There is also a tendency for E, N and P to correlate negatively with age. These tendencies will reach their maximum in the socially disorganized areas from which many criminals come. Klein (1965) suggests that here the norm is for high levels of impulsivity and neuroticism. Gibson (1969) reports a relationship between social handicap and high N score. Interactions between personality and environmental variables are shown by Thomas et al., (1968) in their study of the personality traits of behaviourally disordered children with different home and school environments. The most satisfactory way of resolving this problem is, as Eysenck has suggested, to collect a sample of children in schools and to study the value of personality measures in correlating with and predicting delinquency and crime. This is what the present study attempts to do for self-report delinquency. Follow-up studies of official delinquency will be performed when the children are older and have been convicted of sufficient crimes to make conviction not just a chance process.

6. Institutionalization and the criminal justice system

Another problem is whether institutionalized criminals provide an adequate test of Eysenck's theory. Both Franks and Eysenck have argued that

it would be predicted that recidivists rather than all offenders would be found to be extraverted. Farrington and West (1971) have also shown that those who come before the courts tend to have committed more frequent and more serious offences than those who have not been convicted. However, there are still two reasons why institutionalized offenders may differ in personality characteristics from non-institutionalized offenders of the same self-reported criminality. The first is the selection processes of the criminal justice system, discussed in the chapter on self-report delinquency. The second is the possible effect of institutionalization on personality. Fitch (1962) showed that prisoners on remand, and hence in a highly-anxiety-producing situation had higher N scores than those who had been sentenced. Most of the studies reviewed by Passingham (1972) obtained their data while the delinquents or prisoners were being classified, sentenced or remanded. The higher N scores found in most of the studies may be a result of this. Burgess (1972a) used a population of youngish short-term prisoners to get round the effects of institutionalization and also the possible biasing effect of the presence of a considerable number of 'inadequates' in the prison population, to whom Eysenck's theory could not be expected to apply. Unfortunately one of his populations was taken from Grendon Underwood, the psychiatric prison, which has a large percentage of neurotics. Only the data from the other prison, Pentonville, are hence appropriate to the point in question. He found that again the prisoners showed higher neuroticism scores than the controls but did not differ on extraversion.

All the studies reviewed by Passingham were performed on institutionalized offenders. Although some have controls matched on age and social class, none have controls specifically matched on the area from which the criminals come. One of the major determinants of criminality in general and particularly type of crime committed is the opportunities for criminality provided in the area. Police coverage and prosecution policy, especially for juveniles, also varies greatly from area to area. It is also possible that, without a self-report

delinquency study of both institutionalized criminals and controls, the controls may turn out to have committed as many potentially criminal actions as the official criminals, and so the only thing the study may be measuring is the effect of institutionalization. Providing suitably matched controls, let alone self-report techniques, has only been a major concern of researchers in the field for the last few years.

Recent studies

Given the results of earlier studies that it is neuroticism rather than extraversion which discriminates between 'criminals' and controls, it may now be instructive to look at the more recent studies and see how these have met the methodological problems and what findings they have produced.

There have been several studies using institutionalized samples. Eysenck and Eysenck (1971b) compared 606 male criminals, a random population from several of the main British prisons, with 518 trainee railwaymen, approximately matched on age, sex and social class. The prisoners were significantly higher than the controls on P and N and significantly lower on E, a result in the opposite direction from Eysenck's prediction, and produced no difference in lie scale score (L) using the PEN scale. Item analysis gave substantially the same results: prisoners were more likely to give answers indicative of psychoticism, of neuroticism, and, to a lesser extent, of lack of sociability. Similar results on psychoticism and neuroticism were found in the study by Eysenck and Eysenck (1970) but here the three control groups used were not really suitable. The psychoticism results, unfortunately, may be due to criterion contamination since questions such as 'having had trouble' (a prison word for being caught by the police), 'bad luck' (being in prison) and 'hostility to others' (there is much hostility in prisons) are included. Similar criticisms apply to the junior version, the Junior Personality Questionnaire, as is discussed in the chapter on personality questionnaires.

Buikhuisen and Hemmel (1972) had one sample of 'drunken drivers' and

one sample of 'economic offenders' and matched control groups on sex, age and profession. The EPI was given to all these. It was found that drunken drivers were significantly more extravert and economic offenders slightly more extravert ($p<.07$) than controls. Economic offenders were significantly more neurotic and had a significantly lower lie score than controls. Drunken drivers did not differ from controls on these two aspects. Details of time of testing and type of institution are not given.

A. Maclean and S. B. G. Eysenck (quoted in Eysenck, 1974) have also collected data on prisoners and controls, matching for age and social class. In both investigations, prisoners had higher scores than controls on P, E and N ($p<.001$ in all instances, $n = 1,300$ and 575 respectively). The studies by Burgess have already been discussed.

On younger offenders, Eysenck and Eysenck (1974) have compared those Borstal boys who were reconvicted during the three years after release with those who were not. The assumption is that the "more severely criminal" a group, the more Eysenck's theory will apply. Obviously, as the authors point out, other environmental factors will play a large part in the recidivism. Of the original 187 boys, 122 had been sentenced a second time and so were deemed recidivists and 56 were non-recidivist. Recidivists obtained higher scores than non-recidivists on P, E and N but only the difference on E was significant. (at the $p<.05$ level). The number of non-recidivists was, however, small.

West and Farrington (1973) have followed up about 400 boys in London for the Cambridge study. Both official convictions and self-report delinquency scores were obtained. On official convictions, no significant relationships with either extraversion or neuroticism at either age of testing personality (10-11 and 14-15) was found. On self-report delinquency the same results were obtained. It must be remembered, however, that the boys in this study came from several different areas and schools and that the delinquents were probably over-represented in some areas and under-represented in others, although data on this are not given.

Hindelang (1971b) has studied self-report delinquency and personality in 234 middle-class boys in a Catholic high school in Oakland, California. He found that extraversion was significantly related to total delinquent involvement, expressed as the total number of delinquent acts admitted and also to various individual items such as theft of more than 10 dollars, drunkeness, individual and gang fist-fights, marijuana use, forcing sexual attention, drag racing, drunken driving, hit and run accidents, cheating and presenting a false identity card. For neuroticism, however, the relationship was curvilinear, the most delinquent group being those scoring in the middle part of the neuroticism scale, although total delinquent involvement correlated at the $p<.06$ level with neuroticism.

John Allsopp (personal communication) has studied self-reported delinquency in groups of grammar school boys aged 11 to 16, girls from a comprehensive school aged 11 to 15 and younger children aged 9 to 10 years. He found that psychoticism was more predictive of delinquency than either extraversion or neuroticism but significant relationships were found with all three.

Campbell (Campbell and Rushton, 1975) has studied self-reported delinquency in a small sample of 16 year-old girls from the same school as the present study. She found correlations with extraversion of 0.67 ($p<.001$) on the Eysenck Personality Inventory, 0.22 with a Teachers' Rating Scale (the TRS) and 0.15 with Cattell Exvia (the HSPQ). Correlations with neuroticism were 0.11 on the EPI, 0.16 on the TRS and 0.43 with HSPQ Anxiety ($p<.01$).

Amelang and Wantoch (1971) have studied the differences in personality and self-report delinquency and victimization (being a victim of a crime) between two samples of 78 boys, one of the samples consisting of convicted offenders and the other of non-convicted offenders. They found that their questionnaire, all the items of which represented illegal acts, differentiated between the two groups to a significant extent on both delinquency and

victimization. The two groups were also differentiated by neuroticism and a measure of aggressive tendency but not by extraversion. Factor analyses of the responses of the two groups to all the questions produced about 11 factors, only one of which (criminal damage) loaded on neuroticism and none of which loaded at greater than the 0.30 level on extraversion.

It may be seen that the more recent studies which have more closely matched controls, do not entirely replicate the positive findings on N and impulsivity and the negative ones on extraversion found in older studies. Unfortunately, none of the recent studies used impulsivity measures. For convicted offenders, the economic offender sample of Buikhuisen and Hemmel and 3 of the 5 other studies showed significant positive relationships with N. However, the drunken driver sample of Buikhuisen and Hemmel and 2 of the 5 other studies also showed significant positive relationships with E. Psychoticism has been found to be a significant factor in almost all the studies in which it has been used. For self-report delinquency studies, in which almost all the methodological criticisms are met, the results are more confused. This is not surprising, given the small number of such studies and the abnormal populations on which they have been done. If Eysenck's theory is to hold at all, then it will be given the most chance in a self-report study on a sample in which environmental variables are, as far as possible, held constant. It is the aim of the present study to test this.

Typologies of offenders

It is very likely that not all criminals will be neurotic extraverts. The problem of the heterogenity of criminality may be approached in several ways. One is to see whether a reliable typology of criminals according to personality may be constructed. This method is subject to the limitations of creating typologies discussed in the chapter on groups and crime. The most powerful typologies, those of Peterson et al., (1959); Peterson and Quay, 1961) and Hewitt and Jenkins (1956), were found to account for only about half the delinquents in an English replication of the Hewitt and

Jenkins study (Simon, 1971). Passingham (1972) and Hood and Sparks (1970) have reviewed these studies. Passingham concludes "that it is possible to isolate within the delinquent, criminal and psychopathic populations, a subgroup which is high on impulsivity and neuroticism; this subgroup may be termed "unsocialized aggressive" (delinquent), "active aggressive" (criminal) and "aggressive psychopath" (psychopath), although other groups can be found in all quadrants of the two-factor-space."

Sinclair and Chapman (1973) have attempted to join this typology with the personality dimensions of Eysenck. Using a somewhat atypical sample of male prisoners aged 40 or less who had served not more than one previous sentence, they used association analysis and component analysis on 45 dichotomous attributes of the prisoners. These included age, family circumstances, occupation, religion, mental illness, drunkeness, type of offence and E, N and L scores on the Maudsley Personality Inventory. Association analysis produced 7 types of delinquent, the occasional delinquent, the late delinquent, the professional delinquent, the aggressive delinquent, offenders with skilled employment status, socially integrated unskilled offenders and social inadequates. Component analysis produced two components, one of working class criminality, a high scorer on this dimension tending to be young, not particularly intelligent, given to drink, violence and committing offences with his mates, a truant from school and Catholic and to have low occupational status; and one of social inadequacy, a high scorer tending to be older, neurotic and introverted, have a psychiatric history and poor contact with his wife and family, and commit his offences on the spur of the moment and sometimes violently and while drunk. Extraversion was loaded positively on working class criminality and negatively on social inadequacy.

Another way is to try and investigate the personalities of offenders committing different types of crimes. It is, unfortunately, difficult to do this using any typological or extreme groups method, as a heterogeneous

criminal career as regards judicial labels of convictions is the rule rather than the exception, The attempts, which have generally been unsuccessful, are discussed by Kraus (1973).

The other way, which is the one chosen in the present study, is to investigate the manner in which the crimes are committed and the functions they may have had for the offenders at the time of commission of the offence. One example of this is the study by Robinson (1971), who compared young offenders with frustration-instigated crimes with those with motivation-instigated crimes, both groups coming from a Training School in Australia. The two concepts are derived from Maier's (1949) theory of the effect on future behaviour of the consequences of a particular response. Frustration-instigated behaviour is considered to be emotional, compulsive and non-constructive and to consist mainly of crimes of violence. Motivation-instigated behaviour tends to involve selective learning and adaptation and to be crimes for material reward. The mean age of the sample was 16 years 10 months. Using the Junior Eysenck Personality Inventory, it was found that subjects who had committed frustration-instigated crimes were significantly more extraverted than those who had committed motivation-instigated crimes. No significant differences were found on neuroticism.

The concept of working-class criminality seems very near that of group crime employed in the present study, whereas the concept of social inadequacy seems somewhat more similar to that of solitary crime. One might thus predict, both from the above and from the sociability component of the extraversion scale, that group criminals will tend to be extravert and solitary criminals introvert. One might also predict that those who suggest crimes will be less impulsive and more motivated by gain (motivation-instigated crimes) than those who take part in crimes suggested by others, for whom the main purpose may be the interaction in the group setting rather than the crime itself. The self-suggested criminals might thus be more introvert and more stable than the other-suggested criminals.

The Present Study

In the present study both personality and delinquency scores were obtained on both test and retest. As the need for an adequate control group is met in this sample, since a full range of delinquency scores was obtained, the hypothesis that it is the neurotic extraverts who should be the most criminal may be tested in two ways, by correlation coefficients and by quadrant analyses.

Since the number of different acts admitted (NOCRIM) was found to be highly correlated with the weighted frequency scale of number of acts admitted (FNOCRIM) on both test and retest and the longer inventory used on retest (NOCRIS and FNOCRIS), only data for NOCRIM (test) and the corresponding measure NOCRIM2 (retest) will be presented here. There are no differences in the correlations with personality and development between the measures NOCRIM, FNOCRIM, NOCRIS and FNOCRIS.

The correlations between NOCRIM and personality measures on test, and NOCRIM2 and personality measures on retest are given in Table 4.1. It may be seen that, on test, a significant correlation with extraversion appears for one out of the three measures. On retest, all the correlations with extraversion are significant. Correlations with neuroticism are lower, only one on either test or retest reaching significance. This concerns TRSN. It will be remembered that there is a high correlation between TRSN and TRSE, so that this result may well be due to the dubious validity of the TRSN scale. It must be concluded that, unlike the results in prison studies, the present study finds significant correlations with extraversion not neuroticism.

Correlations with the lie scales are negative, those with the JEPI on test and the JPQ on retest being significant. It is interesting that these are the two occasions of testing on which honesty instructions were not given. The correlations of JEPIE on retest with NOCRIM2, however, is as large as those of the other scales. The reduction in size of the correlation with the lie scale does not seem to have affected the magnitude of the correlation with extraversion. If JEPIL is partialled out on test, the correlations of

Table 4.1 Pearson product-moment correlations between number of different types of crime admitted and personality

Test	Extraversion	JEPIE	0.07	(NS)
		CATEXKI	0.24	(NS)
		TRSE	0.56	(.002)
	Neuroticism	JEPIN	0.21	(NS)
		CATANXKI	0.15	(NS)
		TRSN	0.13	(NS)
	Lie scale	JEPIL	- 0.37	(.006)
	Impulsivity	JEPIIMP	0.38	(.008)
Retest	Extraversion	JEPIE2	0.38	(.010)
		JPQE2	0.40	(.004)
		CATEXK2	0.39	(.006)
		TRSE2	0.39	(.004)
	Neuroticism	JEPIN2	0.10	(NS)
		JPQN2	0.20	(NS)
		CATANXK2	0.25	(NS)
		TRSN2	0.32	(.018)
	Lie scales	JEPIL2	- 0.07	(NS)
		JPQL2	- 0.48	(.002)
	Psychoticism	JPQP2	0.57	(.002)
	Impulsivity	JEPIIMP2	0.37	(.008)

NOCRIM with JEPIE and JEPIN become -0.02 (nonsignificant) and 0.20 (nonsignificant) respectively. There has been no change in the correlations. If JPQL is partialled out on retest, however, the correlations of NOCRIM2 with JPQE, JPQN and JPQP become 0.32 (.025), -0.05 (ns) and 0.44 (.010) respectively. If JEPIL2 is partialled out on retest the correlation of NOCRIM2 with JEPIE2 becomes 0.38 (.019). The correlation is again not changed very much. The problem is that a negative correlation between crime and the lie scales means that there may be a certain amount of faking in the answers to the self-report delinquency interview. Although the results as regards the JEPIL scale must be regarded with some suspicion given the doubts cast on the nature of this scale (see above), the similar correlation with JPQL is worrying, although when the lie scale is partialled out, the correlation between the delinquency score and extraversion does not change very much. A similar correlation between self-report delinquency and lie scale score was found by West (1973) in the Cambridge study. He considers this reflects the tendency of self-report scales to produce concealment rather than exaggeration of responding.

Impulsivity on retest does not have higher correlations with crime than does extraversion although it does on test. If Eysenck's theory is correct, it would be expected that impulsivity, which should be aligned along the neurotic extravert diagonal, should have higher correlations. The higher correlation on test may reflect the fact that the JEPI is somewhat different from the other tests in not having a high correlation with extraversion. On retest, however, it is obvious that extraversion, rather than neuroticism, is the important variable.

Psychotism has a very high correlation with crime on retest. Part of this result may be due to the possible criterion contamination with delinquency noted above. The result, however, concurs with that of John Allsopp (personal communication) that psychoticism is a better predictor of delinquency than either extraversion or neuroticism in his sample of London schoolboys.

Eysenck (1974) has pointed out, in agreement with Burgess (1972), that a more suitable test of his theory than looking for mean differences in extraversion or neuroticism between a criminal sample and a control sample is to look for an abnormally high density of criminals in the neurotic extravert quadrant of the Eysenckian two-dimensional space defined by neuroticism and extraversion-introversion. Such quadrant analyses may be performed in three ways, first by producing two by two contingency tables on the mean number of crimes admitted to in each quadrant; dichotomizing the extraversion and neuroticism scores at the median; secondly, by dichotomizing the extraversion and neuroticism scores at the sample mean; and thirdly, by looking at the number of delinquents per quadrant, a delinquent being defined as one who has performed more than the median (or mean) number of delinquent acts. Sample means must be used rather than standardized means since the standardized means were obtained on populations very different from the present one and all the questionnaires are affected by this. The JEPIE scores are dependent on social class and urban-rural environment. The Cattell test was standardized on an American population and British figures for exvia and anxiety are not available. The Teacher's Rating Scale does not possess adequate standardization data.

Quadrant analyses of the mean number of crimes admitted in each quadrant on test are presented in Table 4.2. It may be seen that there is no evidence that a larger number of crimes occurs in the neurotic extravert quadrant. Equivalent analyses for retest are presented in Table 4.3. Again, it may be seen that there is no significant difference between quadrants in mean number of crimes confessed. The same analyses may be done dichotomizing the extraversion and neuroticism scores at the sample mean. These are also presented in Tables 4.2 and 4.3. There is no difference in the result.

The third way of analysing the difference between the quadrants is to calculate the number of delinquents in each quadrant, where a delinquent is defined as a boy admitting more than the median or mean number of crimes and

Table 4.2 Contingency table showing mean number of crimes as a function of extraversion and neuroticism for (1) JEPI (2) Cattell HSPQ (3) Teacher Ratings on test

A. Dichotomizing the measures of E and N at the median

JEPI

	LOW E	HIGH E
LOW N	8.5	9.5
HIGH N	13.0	11.0

CATTELL

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	9.4	13.0
HIGH ANXIETY	10.0	12.0

TEACHER RATINGS

	LOW E	HIGH E
LOW N	8.0	15.0
HIGH N	8.0	13.0

B. Dichotomizing the measures of E and N at the sample mean.

1) JEPI

	LOW E	HIGH E
LOW N	8.75	9.62
HIGH N	12.0	11.80

$X^2 = 0.17$
non-significant

2) HSPQ

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	10.4	13.2
HIGH ANXIETY	9.4	10.8

nonsignificant

3) TRS

	LOW E	HIGH E
LOW N	8.0	14.5
HIGH N	6.3	12.7

$X^2 = 1.67$
nonsignificant

Table 4.3 Contingency tables showing mean number of crimes as a function of extraversion and neuroticism for (1) JEPI (2) JPQ (3) HSPQ (4) TRS on retest

A. Dichotomizing the measures of E and N at the median and excluding the very few children at the median.

1) JEPI

	LOW E	HIGH E
LOW N	6.78	14.75
HIGH N	13.33	14.56

$X^2 = 0.052$ non-significant

2) JPQ

	LOW E	HIGH E
LOW N	11.48	14.42
HIGH N	11.50	14.50

$X^2 = 0.071$ non-significant

3) HSPQ

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	10.22	11.63
HIGH ANXIETY	11.82	15.43

$X^2 = 0.208$ non-significant

4) TRS

	LOW E	HIGH E
LOW N	11.13	12.38
HIGH N	9.43	16.19

$X^2 = 0.013$ non-significant

B. Dichotomizing the measures of E and N at the sample mean

1) JEPI No change from table A 1.

2) JPQ

	LOW E	HIGH E
LOW N	11.83	13.88
HIGH N	10.50	14.26

$X^2 = 0.015$ non-significant

3) HSPQ No change from table A 3.

4) TRS No change from table A 4.

the personality scores are dichotomized at the median. These contingency tables are presented in Table 4.4. It may be seen that the only significant result is obtained with the TRS on retest, high numbers of delinquents being found in both the lowElowN quadrant and the highEhighN quadrant. The latter would be predicted by Eysenck but the former is somewhat strange. To see whether the result is due mainly to the highEhighN quadrant or the lowElowN quadrant, two further contingency tables of highEhighN/other quadrants versus delinquent/nondelinquent and lowElowN/other quadrants versus delinquent/nondelinquent were constructed. These are presented in Table 4.5. It may be seen that, although the value of X^2 for the highEhighN quadrant is higher than that for the lowElowN quadrant, neither approaches significance. It is hence the combined effect of high scores in both quadrants that produced the significant result. One may hence conclude that, although extraversion has been shown to be strongly related to delinquency, there is no evidence that it is the neurotic extraverts rather that the stable extraverts who account for this result.

It is interesting, at this point, to go back to the findings of Burgess (1972) and see whether such results would have been obtained with his h (E x N) measure for criminality. h scores were calculated for each boy. Applying the analysis used by Burgess, the number of delinquents falling into the top third of the combined distribution was compared with that of nondelinquents by X^2. The results for the retest scales are shown in Table 4.6. It may be seen that only one of the tables approaches significance. One may conclude that Burgess' technique has also failed to produce any evidence that it is the neurotic extravert quadrant that produces the largest number of criminals in this population.

The other way one could use the h measure would be to calculate correlations between it and delinquency. This, however, would give positive results not because it was the neurotic extravert who is the most delinquent but because it is the extravert that is the most delinquent. This is a danger

Table 4.4 Contingency tables showing number of delinquents as a function of extraversion and neuroticism where a delinquent is a boy scoring a) above median number of delinquent acts admitted; b) above mean number of delinquent acts admitted for test and retest.

a) test median no of crimes = 10

JEPI

	LOW E	HIGH E
LOW N	5	2
HIGH N	6	5

non-significant by the Fisher test

HSPQ

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	5	8
HIGH ANXIETY	5	5

non-significant by X^2 (0.017)

TRS

	LOW E	HIGH E
LOW N	5	7
HIGH N	3	9

non-significant by the Fisher test

b) test mean number of crimes = 10.61

	LOW E	HIGH E
LOW N	5	2
HIGH N	6	5

non-significant by the Fisher test

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	5	8
HIGH ANXIETY	5	5

non-significant by X^2 (0.017)

	LOW E	HIGH E
LOW N	5	7
HIGH N	3	9

nonsignificant by the Fisher test

Table 4.4 con.

a) retest median number of crimes = 12

JEPI

	LOW E	HIGH E
LOW N	2	6
HIGH N	6	5

non-significant by Fisher test

JPQ

	LOW E	HIGH E
LOW N	7	6
HIGH N	2	5

non-significant by Fisher test

HSPQ

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	4	3
HIGH ANXIETY	7	9

non-significant by Fisher test

TRS

	LOW E	HIGH E
LOW N	8	4
HIGH N	2	11

p<.025 by Fisher test

b) retest mean number of crimes = 12.6

	LOW E	HIGH E
LOW N	2	6
HIGH N	6	5

non-significant by Fisher test

	LOW E	HIGH E
LOW N	7	6
HIGH N	2	5

non-significant by Fisher test

	LOW EXVIA	HIGH EXVIA
LOW ANXIETY	4	3
HIGH ANXIETY	7	9

non-significant by Fisher test

	LOW E	HIGH E
LOW N	8	4
HIGH N	2	11

p<.025 by Fisher test

Table 4.5 Contingency tables of number of delinquents and nondelinquents for the highEhighN and lowElowN quadrants of the TRS on retest

highEhighN quadrant

	highEhighN	others
delinquents	11	14
nondelinquents	4	15

X^2 = 1.61 nonsignificant

lowElowN quadrant

	lowElowN	others
delinquents	8	17
nondelinquents	7	12

X^2 = 0.0002 nonsignificant

Table 4.6 Comparison of delinquents and non-delinquents on h on retest (after Burgess, 1972)

JEPI

	h ⩾ 266	h < 266
delinquents	7	15
nondelinquents	7	11

nonsignificant

JPQ

	h ⩾ 242	h < 242
delinquents	11	12
nondelinquents	6	12

$X^2 = 0.379$ nonsignificant

TRS

	h ⩾ 11.98	h < 11.98
delinquents	8	15
nondelinquehts	6	15

nonsignificant

HSPQ

	h ⩾ 34.81	h < 34.81
delinquents	11	12
nondelinquents	3	16

$X^2 = 3.58$ nonsignificant

with Burgess' technique. If either extraversion or neuroticism but not both show high correlations with delinquency in a population, then Burgess' technique will give misleading results. Quadrant analyses should always be done.

In the introduction to the thesis, it was hypothesized that, if criminals are more susceptible to reward and less susceptible to punishment than noncriminals, they should be more extraverted but not necessarily more neurotic than noncriminals. Such has been shown to be the case. In this respect then (the third way of testing the main hypothesis) the hypothesis that criminals should be more susceptible to reward and less susceptible to punishment than noncriminals has been upheld.

Manner of committing crime

One may now explore the correlations of the measures of the manner in which the crimes were committed with personality. These measures were only taken during the retest self-report delinquency interview and so the correlations will only be presented with retest personality scores (Table 4.7).

Considering first the correlations with extraversion, it may be seen that crimes committed with a group (PERG) and crimes suggested by others (PERGS) are both positively correlated with extraversion on all four measures whereas crimes committed alone (PERS) is negatively correlated on all but one measure and self-suggested crimes (PERSS) is negatively correlated on all four measures. A similar situation holds for all four measures of neuroticism, for psychoticism and for impulsivity. The correlation coefficients for neuroticism are in general higher than those for extraversion. There are high negative correlations between PERG and PERS so that correlations of PERG with personality and PERS with personality would be expected to be of opposite signs. A similar situation holds for PERGS and PERSS. There are fairly high positive correlations between PERS and PERSS and between PERG and PERGS. One would, therefore, expect the correlations of PERG and PERGS to be of similar sign and opposite to those of PERS and PERSS.

Table 4.7 Correlations of the manner in which the crimes were performed with personality

	PERG	PERS	PERSS	PERGS
E				
JEPIE2	0.02 (NS)	- 0.11 (NS)	- 0.14 (NS)	0.13 (NS)
JPQE2	0.17 (NS)	- 0.22 (NS)	- 0.26 (NS)	0.27 (NS)
CATEXK2	0.05 (NS)	- 0.10 (NS)	- 0.10 (NS)	0.05 (NS)
TRSE2	0.02 (NS)	0.02 (NS)	- 0.40 (.006)	0.38 (.008)
N				
JEPIN2	0.25 (NS)	- 0.10 (NS)	0.05 (NS)	0.10 (NS)
JPQN2	0.22 (NS)	- 0.14 (NS)	- 0.14 (NS)	0.25 (NS)
CATANXK2	0.34 (.022)	- 0.26 (NS)	- 0.35 (.018)	0.37 (.012)
TRSN2	0.24 (NS)	- 0.22 (NS)	- 0.26 (NS)	0.21 (NS)
L				
JEPIL2	- 0.32 (.026)	0.23 (NS)	0.35 (.016)	- 0.38 (.008)
JPQL2	- 0.22 (NS)	0.16 (NS)	0.28 (NS)	- 0.31 (.036)
P				
JPQP2	0.11 (NS)	- 0.03 (NS)	- 0.16 (NS)	0.21 (NS)
IMP				
JEPIIMP2	0.23 (NS)	- 0.20 (NS)	- 0.18 (NS)	0.17 (NS)

What may not be deduced from the intercorrelations of the crime measures, however, is the direction of the correlations of these with personality. It may be seen that the boy who tends to commit his crimes in a group tends to be neurotic but not to lie. PERG is the only measure of the four to be significantly positively correlated with the total number of crimes committed (NOCRIM). It will be remembered that NOCRIM was correlated with extraversion and psychoticism rather than neuroticism. The higher correlation coefficients of PERG with neuroticism than those with extraversion or psychoticism argue that the tendency to commit crimes in a group independent of the number of crimes committed reflects neuroticism whereas the amount of delinquency reflects extraversion. In order to test this, partial correlation coefficients were calculated for PERG partialling out NOCRIM. These are presented in Table 4.8. It may be seen that the sizes of the correlations with neuroticism are in general unimpaired. It will be remembered that the lie scales were highly negatively correlated with NOCRIM. The correlations of the lie scales with PERG are somewhat reduced on partialling out NOCRIM. One may conclude that the tendency to commit crimes in a group, independent of the number of crimes committed, is related to neuroticism rather than any of the other scales.

Considering now the correlations of PERS with personality if NOCRIM is partialled out, the size of the correlations do not change greatly. There is still a very slight tendency for the committing of solitary crimes to be related to stability. The possible relationship with introversion seems to be mainly a result of those committing solitary crimes committing less crime rather than being due to the solitary nature of the crimes. There are no significant relationships with the lie scales or psychoticism on partialling out NOCRIM. One must remember, however, that the number of crimes committed alone is much smaller than the number committed in a group. The correlation coefficients may hence be lower.

As mentioned above, there are high correlations between PERG and PERGS

Table 4.8 Partial correlation coefficients for crime measures with personality

A. PERG with retest personality partialling out NOCRIM2

Extraversion	JEPIE2	- 0.10 (NS)	Neuroticism	JEPIN2	0.23 (NS)
	JPQE2	0.08 (NS)		JPQN2	0.21 (NS)
	CATEXK2	- 0.10 (NS)		CATANXK2	0.28 (NS)
	TRSE2	- 0.12 (NS)		TRSN2	0.16 (NS)
Lie scales	JEPIL2	- 0.26 (NS)	Psychoticism	JPQP2	- 0.04 (NS)
	JPQL2	- 0.06 (NS)			

B. PERS with retest personality partialling out NOCRIM2

Extraversion	JEPIE2	- 0.02 (NS)	Neuroticism	JEPIN2	- 0.07 (NS)
	JPQE2	- 0.15 (NS)		JPQN2	- 0.12 (NS)
	CATEXK2	0.00 (NS)		CATANXK2	- 0.21 (NS)
	TRSE2	0.14 (NS)		TRSN2	- 0.16 (NS)
Lie scales	JEPIL2	0.17 (NS)	Psychoticism	JPQP2	0.10 (NS)
	JPQL2	0.03 (NS)			

C. PERSS with personality partialling out PERS

Extraversion	JEPIE2	- 0.10 (NS)	Neuroticism	JEPIN2	0.11 (NS)
	JPQE2	- 0.19 (NS)		JPQN2	- 0.09 (NS)
	CATEXK2	- 0.06 (NS)		CATANXK2	- 0.27 (NS)
	TRSE2	- 0.46 (.002)		TRSN2	- 0.19 (NS)
Lie scales	JEPIL2	0.28 (NS)	Psychoticism	JPQP2	- 0.17 (NS)
	JPQL2	0.23 (NS)			

and PERS and PERSS. The first is likely to be a function of being in a group - others as well as oneself will suggest crimes. The second, however, may partly be an artefact of the measurement technique, as solitary crimes suggested by the boy himself were included in PERSS. To examine the correlations of those crimes not committed alone but suggested by the boy himself with personality, the variance due to PERS was partialled out from the correlations of PERSS with personality. These are also presented in Table 4.8. Although the correlation coefficients have been slightly reduced, possible relationships with introversion (only with the Teacher's Rating Scale) and stability remain. Suggesting a crime oneself appears to be related to both introversion and stability although the relationships with introversion, considering the dubious validity of the Teachers Rating Scale, may reflect the relationship with stability. This is interesting since committing a crime in a group tends to be related to neuroticism and to some extent extroversion. The leaders of the group, those who suggest the crimes to others, would seem to be more stable than the followers, who score highly on other-suggested crime.

Turning now to other-suggested crime, the correlations show this to be related to extraversion and neuroticism and to the tendency not to lie. These characteristics are very similar to those of belonging to a group and tend to bear out the leader/follower distinction suggested above.

One may conclude that committing a crime in a group is related to neuroticism rather than extraversion and that this tendency is independent of the number of types of crimes committed. Committing a crime alone is related to stability. Suggesting a crime oneself is related to stability and possibly introversion whereas those taking part in group crime are neurotic, the leaders being more stable than the followers. Those performing solitary crimes, the minority of crimes committed, tend to be stable. In spite of the pilot nature of the measures of manner of committing crimes, it would seem that they produce some significant results with personality. This reinforces the

suggestion of heterogenity of personality in criminals made in the review section and indicates that the main proposition needs to be modified to take account of differences between group criminals and solitary criminals and between the leaders and the followers of the group.

CHAPTER 5

BEHAVIOURAL CONTRAST

If an organism is exposed to more than one stimulus array, such that each stimulus array is consistently associated with a certain reinforcement condition and the stimulus arrays presented are changed at certain intervals, its behaviour is said to be under the control of a multiple schedule (MULT). In successive discriminations with multiple schedules, two or more clearly discriminable stimuli are alternated regularly or randomly. Each stimulus and its associated schedule comprise a separate component. The qualitative aspects of behaviour to each component, the patterns of responding, are appropriate to the reinforcement schedule of that component (Ferster and Skinner, 1957), but the quantitative aspects of behaviour, such as rates or latencies of responding, depend on the reinforcement schedules of the other components as well as that component. These last effects are called interactions. If the schedule of reinforcement on one component is changed and that in the other component remains constant, and if changes in rate of latency of response occur in the same direction in both components, the phenomenon is called generalization or induction. If the change in one component is in the opposite direction to that in the other component, the effect is called contrast. The phenomenon to be studied in this chapter is positive behavioural contrast (Reynolds, 1961a). Here, a decrease in response rate or increase in latency of response in the changed component is accompanied by an increase in rate or decrease in latency in the unchanged component. The counterpart of this, negative behavioural contrast, where an increase in responding to the changed component is accompanied by a decrease in rate to the unchanged component, is more elusive and does not appear to reflect the same processes as positive

behavioural contrast (Dunham, 1968; Schwartz, 1975). It will hence not be discussed here.

The typical paradigm for producing positive behavioural contrast in animals contains two parts. First, the animals are exposed in a free-operant situation to two stimuli presented successively, each of which is associated with the same schedule of reinforcement (typically, a multiple variable interval one minute-variable interval one minute schedule - MULT VI. lmin VI lmin). Reinforcement in one component is then downshifted to zero (extinction, EXT) so that the schedule in operation is MULT VI lmin EXT. Another variation is for the preliminary phase to consist of single-stimulus training, another component associated with a different schedule of reinforcement then being introduced and alternated with the first component (e.g. Bloomfield, 1966; Nevin and Shuttleworth, 1966). This procedure hastens the formation of a discrimination but still produces clear behavioural contrast.

Contrast effects may also be demonstrated in discrete trial runway situations, when a change in the amount of reinforcement given to a group of animals at the end of one trial is reflected in the mean group running speed on a subsequent trial (the Crespi 'elation' and'depression' effects - Crespi, 1942). It is not certain that these incentive contrast effects reflect the same processes as behavioural contrast effects. They will hence not be discussed further.

Positive behavioural contrast must also be distinguished from the simultaneous paradigm with concurrent schedules in which two or more schedules of reinforcement are simultaneously in operation, each associated with a separate response.

Finally, behavioural contrast must be distinguished from the transient contrast effects (Nevin and Shuttleworth, 1966). These are initial changes in response rate in the unchanged component immediately following exposure to the changed component, provided that this initial rate differs from the terminal

rate in the unchanged component in a direction increasing the difference between levels of responding in the two components. I shall use the term 'behavioural contrast' to describe a sustained contrast effect involving rate changes persisting over successive cycles or even successive sessions. It has been proposed (Scull et al., 1970) that transient and behavioural contrast are one and the same. There is considerable evidence, however, that transient contrast is akin to Pavlovian induction and Amsel's primary Frustration Effect. They may all be 'rebound effects', unconditioned reactions to the frustrative properties of nonreward (Nicholson, 1972; Mackintosh, 1974). There is good evidence that this transient contrast disappears with continued discrimination traning (Nevin and Shuttleworth, 1966), whereas behavioural contrast does not (Bloomfield, 1966; Dukhayyil and Lyons, 1973; Selekman, 1973).

Behavioural contrast has been demonstrated using many different schedules (Nicholson, 1972; Mackintosh, 1974) and in several different species including rats (Mackintosh et al., 1972), turtles (Pert and Gonzalez, 1974), monkeys (Lattal and Griffin, 1972), and humans (Nicholson and Gray, 1971, 1972; Waite and Osborne, 1972; Terrace, 1974). The vast majority of work, however, has been done with pigeons.

Clear and concise reviews of the topic have been given by Nicholson (1972), Rachlin (1973) and Mackintosh (1974). Here, I shall give a brief summary of the various explanations put forward to describe the phenomenon to show why, in humans, it may be used as a measure of susceptibility to frustrative non-reward.

Before proceeding to an analysis of the evidence for each theory, however, it is necessary to discuss one important methodological point. Since contrast is defined as a change in responding, it is necessary to have some measure of the rate or latency of response in the unchanged component after the same amount of time in the free-operant situation on baseline training. This may be done either by having a control group which

receives training only on the original schedule or, at the end of discrimination training, changing the schedule back to the original schedule to ensure that any increase in rate in the unchanged component is due to the introduction of the change in the changed component rather than continued experience on the reinforcement schedule of the unchanged component. That this is a necessary precaution is shown by the findings of several experimenters (e.g. Yarczower, 1970; Mackintosh et al., 1972) that rats or pigeons trained on VI schedules continue to increase their rate of responding for at least 15 or 20 sessions. This precaution has, unfortunately, been neglected in most studies of behavioural contrast. In any experiment measuring the amount of behavioural contrast shown by individual subjects it is obviously necessary to use a within-subjects control rather than a between-subjects comparison with a control group.

The first explanations of behavioural contrast were concerned with specifying the necessary or sufficient conditions to produce the phenomenon. A parsimonious list is conspicuously absent. The first theory was that the animal sought to maintain an optimum absolute level of responding (Smith and Hoy, 1954), so that contrast was due to the redistribution of these responses during presentation of the positive (S^D) and negative (S^Δ) components. This hypothesis of response constancy, however, was rapidly disproved by, amongst others, Herrick et al. (1959). The next demonstration was that behavioural contrast is a result of discrimination training and the interaction between the two components rather than either component alone. Jenkins (1961), using pigeons, has shown, by using the appropriate controls, that the behavioural contrast shown using response latencies in his discrete trial experiment could not be explained by either repeated reward in S^D or by repeated non-reward in S^Δ in isolation but only by exposure to both components together. It was then considered that contrast was a result of suppression of responding to S^Δ. This description is capable of including the results of early experiments on errorless discrimination learning (Terrace, 1963).

In this procedure, the second component is introduced in a very attenuated form and then gradually increased in intensity and duration until it is equal in these properties to the unchanged component. Pigeons trained in this manner both make no, or very few, errors and, in the original series of experiments, showed no behavioural contrast. It was hence hypothesized that the S^{Δ}, in this paradigm, was a neutral stimulus whereas, in normal discrimination training with errors, the S^{Δ} would acquire aversive properties as a result of either nonreinforcement or the suppression of responses to it. Additional evidence for this view comes from the fright reaction shown by pigeons to S^{Δ} and their learning of an escape reaction from S^{Δ} in discrimination training with errors, and the lack of both of these to date in errorless discrimination training (Terrace, 1972). Halliday and Boakes (1974), however, have shown pronounced behavioural contrast in spite of minimal responding in the changed component and Boakes (1973) has shown that no greater amount of behavioural contrast was shown when a quicker decrease in response rates was manifested to S^{Δ}. Similar disconfirmatory evidence has come from studies in which S^{Δ} was a differential reinforcement of low rates (DRL) or differential reinforcement of other behaviour (DRO) schedule (see Mackintosh, 1974).

Suppression of responding to S^{Δ} is normally linked with differential frequency of reinforcement in most discriminations. It is likely that this second is of considerably more importance than responding to S^{Δ} in the production of behavioural contrast but again it has not been shown to be either a necessary or a sufficient condition. Reynolds (1961b) first gave an explanation of positive behavioural contrast by saying that the rate of responding during S^{D} increases as the relative frequency of reinforcement associated with the stimulus increases, even though the absolute frequency of reinforcement in the component remains the same. Evidence for this position comes from the absence of contrast in most experiments where S^{Δ} is associated with DRL, DRO, free reinforcement, or variable time schedules, in all of which the relative frequency of reinforcement is the same in both

components (e.g. Thomas and Cameron, 1974). There is, however, considerable evidence against the necessity or sufficiency of this factor. Brethower and Reynolds (1962), Terrace (1968) and Lattal and Griffin (1972), using various species, have shown that contrast is produced if the same relative frequency of reinforcement obtains in both components but responses in S^{Δ} are punished. Small amounts of contrast have been shown in studies in which S^{Δ} is associated with DRL (see Nicholson, 1972; Mackintosh, 1974) such that the frequency of reinforcement was the same in both components. These experiments, however, suffer from a lack of controls and so the evidence is somewhat inconclusive. Behavioural contrast also does not occur when S^{Δ} is associated with a smaller reward rather than a reduced probability of reward (e.g. Mackintosh et al., 1972; Hulse, 1973), although, in rats, the technique of Baltzer and Weiskrantz (1970) may be considered to have overcome this problem.

Perhaps a more adequate, though more vague, alternative than either response suppression or relative frequency of reinforcement is the aversiveness of S^{Δ} to the subject. As Mackintosh (1974) says, "A decrease in the probability of reinforcement, the delivery of shock, or a requirement for paced responding, might all produce contrast effects because they all constitute a change for the worse". If the worse component is defined as the less preferred component, however, the position does not become much clearer. Halliday and Boakes (1974) report that pigeons preferred an ordinary VI schedule to one delivering free, response-independent, reinforcement at the same rate. Pigeons prefer a large reinforcement to a smaller one. Yet there is no behavioural contrast shown if S^{Δ} is associated with free reinforcement or a smaller reinforcement. The only conclusion that may be drawn is that the search for clearly defined operational conditions for the production of behavioural contrast is fruitless. There remain several more general theories. The first, that behavioural contrast is the result of conditioning transient contrast (Mackintosh, 1974) receives support from longitudinal investigations of contrast by Terrace (1966b) and Mackintosh

et al. (1972). The conditioning process, however, is not well understood, given that the magnitude of transient contrast reflects the number of responses to S^{Δ} whereas the magnitude of behavioural contrast does not.

The second theory, autoshaping, has been very prominent in the recent literature but its prominence may well be due to the experimental animal usually used in demonstrations of behavioural contrast, the pigeon, rather than to any general explanatory power it may possess. Gamzu and Schwartz (1973) provided free reinforcement to pigeons in both components of a multiple schedule. When the rates of reinforcement in both components were equal, little or no pecking was observed. When they differed, however, the pigeons pecked the key frequently during the component associated with the higher rate of reinforcement. Contrast is hence considered to be produced by a combination of instrumental responding appropriate to the schedule of reinforcement and extra responses (autoshaped responses) due to the relations between the signal and reinforcement. Recently it has been proposed that contrast (the increase in rate of response in the unchanged component) is entirely due to autoshaped responding. Evidence for this is that, if the signal allied to reinforcement is separated from the instrumental response key, no contrast occurs on the response key. This may be done by using nonlocalized stimuli, such as the houslight (Redford and Perkins, 1974; Schwartz, 1975) or by having two keys (Keller, 1974; Schwartz, 1975). In the experiment of Redford and Perkins, the difference in the amount of key pecking generated during a variable time (VT) extinction schedule signalled on the key compared to that during a VT-VT time schedule (autoshaping) was equal to the difference in key pecking generated during a key-signalled variable interval-extinction schedule and that generated during a variable interval-variable interval schedule (contrast). No contrast was shown during a variable interval-extinction houselight-signalled schedule in both experiments. In the second case, the sum of the responses to the instrumental key, on which no contrast was shown, and the stimulus key (responses on which were correlated with extinction) was equivalent to the contrast

shown if the stimulus key was also the instrumental key. That reinforcement dependent on responding to the stimulus key is not a necessary condition for the occurrence of behavioural contrast in pigeons is indicated by the 'contrast' shown using variable time-extinction schedules and the failure to find contrast using variable interval-variable time schedules. Other evidence for the autoshaping explanation in pigeons is the failure to obtain behavioural contrast using bar-pressing as opposed to bar-pecking in pigeons (Westbrook, 1973; Scull and Westbrook, 1973). Autoshaping is considered to occur only if the stimulus and response are related biologically, i.e. the response is a 'reflexive' behaviour which resembles topographically the operant response required by the contingencies of the situation.

Unfortunately, there are a number of lines of evidence which do not fall within the body of evidence accounted for under the autoshaping explanation of behavioural contrast. The first of these concerns the ease of obtaining behavioural contrast and amount of behavioural contrast obtained when the ease of discrimination between the stimuli signalling the two components is varied. There is considerable evidence that a larger amount of behavioural contrast is obtained when the stimuli are closer on the same stimulus dimension than when they are further away (e.g. Hearst, 1969) although not if they are very close (Mackintosh et al., 1972). This would be predicted from the model of Gray and Smith (1969 - see later). There is also evidence that, in the more 'difficult' discrimination, contrast appears less often and takes longer to build up to a stable plateau (Mackintosh et al., 1972) and that, when this plateau has been reached, peak responding occurs at stimuli separated by a greater distance along the continuum (Farthing, 1974). An autoshaping theory does not give any explanation of these effects.

Secondly, autoshaping has been widely demonstrated using pigeons, but behavioural contrast has been observed in many other species besides pigeons. Attempts to show autoshaping by superimposing free reinforcement on behaviour maintained by a multiple VI schedule of reinforcement produce the effect in

pigeons using key pecking (Gamzu and Schwartz, 1973) but do not in rats using bar pressing (Wilkie, 1972). Although the occurrence of behavioural contrast in rats has been disputed, and is certainly not such a large or reliable an effect as that shown with pigeons, instances have still been obtained (see Mackintosh, 1974). Behavioural contrast has also been obtained by Lattal and Griffin (1972) with monkeys using a punishment contrast effect (addition of punishment to one component of a multiple VI schedule) similar to the technique used by Brethower and Reynolds (1962). It has also been obtained in man (Nicholson and Gray, 1971, 1972; Waite and Osborne, 1972; Terrace, 1974). Autoshaping has been shown to occur in monkeys (Sidman and Fletcher, 1968) but there is as yet no demonstration with humans. Even if this were to occur, however, if autoshaping is a 'biological' response requiring the stimulus and measured response to be connected 'topographically', it is difficult to see how contrast would be obtained using bar pressing in monkeys and humans, in neither of which can pressing and releasing a bar be imagined to be a biologically 'pre-programmed' response. If autoshaping is not a topographically programmed response, then the autoshaping explanation is reduced to a description of the conditions under which autoshaping may occur. It is, of course, possible that autoshaped responses may add to a 'contrast' effect produced in some other way.

Thirdly, an autoshaping explanation does not attempt to account for the reactions of the animals to S^{Δ}, indicating that it is an aversive stimulus. These include emotional responses in the presence of S^{Δ} (wing-flapping in pigeons, Terrace, 1972); the learning of a new response that allows the subject to escape from S^{Δ} (Terrace, 1971); the production of contrast under conditions which are aversive such as delay of reinforcement, where the amount of behavioural contrast shown increases with greater delay of reinforcement (Richards, 1972); the occurrence of extinction-induced aggression during errorless discrimination learning (Rilling and Caplan, 1973), possibly due to the aversive properties of time-out, which also produces behavioural contrast,

used during the initial phase of training (Sadowsky, 1973); and during normal discrimination training (Azrin et al., 1966; Kelly and Hake, using humans, 1970); the demonstration that the magnitude of behavioural contrast varies directly with the magnitude of reinforcement employed and diminishes progressively in the course of discrimination training, as does the aversiveness of S^{Δ} (Gonzalez and Champlin, 1974); the production of behavioural contrast when punishment is added to a component (Brethower and Reynolds, 1962; Lattal and Griffin, 1972); and the production of 'antagonistic' responding (behaviour incompatible with the instrumental response) during S^{Δ} in humans, such that the amount of behavioural contrast obtained in S^{Δ} is a positive function of the amount of antagonistic responding in S^{Δ} (Terrace, 1974).

The third general theory is the matching theory of Rachlin (1973), although again it is doubtful how this theory may be applied to humans. Rachlin posits that behavioural contrast is formed by the interaction of at least two processes with different time courses, autoshaping and matching. He discusses the similarities between behavioural contrast and behavioural induction and concludes that, in pigeons, the contradiction between free reinforcement alternated with less or zero reinforcement increasing response rate (autoshaping) and free reinforcement inhibiting pecking on the same key (Catania, 1963; Rachlin and Baum, 1972) may be resolved by positing that pigeons respond in a free-operant situation in burst of responding, interspaced with periods of not-responding. Activities occurring in periods of not-responding such as grooming are considered to have some intrinsic reinforcement value. The pigeon may then be considered to be operating on an irregular concurrent schedule of periods of responding (experimenter reinforced) and not-responding (intrinsically reinforced). If reinforcement non-contingent on the instrumental response is then programmed, Rachlin proposes that they are assigned to periods of not-responding, either by the schedule in the case of reinforcement contingent on another response or by

the animal in the case of free reinforcement. Rachlin then considers that the contrast found in such experiments is the same phenomenon as the matching found with concurrent schedules, i.e. adjusting the duration of the component to equalize rate of reinforcement. If now pigeons are exposed to a multiple schedule of two alternating components, A and B, and A represents a VI 2min schedule whereas B represents a VI 2min schedule with free reinforcements on average every 15 seconds (variable time 15 seconds), the question is whether rate of pecking will be greater on A or B. An autoshaping hypothesis indicates that it should be greater on B, since B has a greater reinforcement density. A matching explanation, whereby the extra reinforcement should increase the value attached to periods of not-pecking, should have the effect of the pigeon spending more time not-pecking and so decrease pecking on B. These two effects are posited to have different time courses, such that the autoshaping effect is transient whereas the matching effect is steady-state. With increasing component duration, therefore, one would expect rate of response to B compared with rate of response to A first to be greater than one, and then the ratio to decrease until eventually the rate for B is less than the rate for A. This has been found to occur with 2 pigeons (Rachlin, 1973). Contrast is hence explained as due to the transition between components of different reinforcement value, such that the autoshaping effect adds to the matching effect. Unfortunately, it is not at all clear that either autoshaping or the adoption of the strategy of matching can necessarily be applied to humans producing behavioural contrast.

Finally, there is the frustration theory of behavioural contrast. This has been developed from the general frustration theory of Amsel (1958, 1962). Amsel proposes that there are three types of 'goal events', rewarding events, punishing events and frustrative events - "the absence of or delay of a rewarding event in a situation where it had been present previously" (Amsel, 1958). All learned, instrumental responses are considered to depend on classically-conditioned implicit responses. These responses together with

the response-produced stimulation associated with them, are called the fractional anticipatory goal reaction. In the case of frustration, Amsel proposes that a) under certain conditions nonreward is an active factor which may be termed frustrative nonreward; b) such frustrative events are antecedents to a primary aversive, motivational condition, frustration; and c) secondary (learned) form of this primary aversive condition, called fractional anticipatory frustration (r_F-S_F) develops through classical conditioning and is the inhibitory mechanism in nonreward. Frustrative nonreward events are considered to determine drive effects which may be measured as an increase in the vigour of the behaviour immediately following the frustrative event (the energizing effect of frustrative nonreward). They also are responsible for inhibitory effects which may produce a decrease in the strength of the instrumental behaviour terminated by the frustrative event. This will be termed the directive effect of frustrative nonreward.

This theory has been used to explain a considerable number of phenomena including the effects of partial reinforcement on extinction and performance in the double runway, behavioural contrast and peak shift (Terrace 1966; Gray and Smith, 1969). For behavioural contrast, it is considered that frustration generated through the presence or introduction of nonreward becomes conditioned to S^{Δ} and then generalizes to S^{D}. The observed contrast in S^{D} is then due to the energizing effect of conditioned frustration. Several extensions of the original formulation of frustration theory have been made, particularly by Terrace and Gray. Terrace (1968, 1972) considers that it is not necessary for responses to S^{Δ} not to be rewarded for frustration to occur - it is sufficient that there be an active withholding or suppression of responding in one of the alternating stimuli. Wagner (1966) and Gray (1967, 1975) consider that frustrative nonreward is functionally equivalent to punishment. It is, however, not clear that Terrace's withholding or suppression of responding is equivalent to Gray's aversiveness producing frustration as a condition for the occurrence of behavioural contrast.

The evidence for the general theory of frustration is adequately reviewed elsewhere (e.g. Gray, 1975) and will not be discussed here. The particular application of the theory to behavioural contrast, however, has been very fruitful, such that the theory is capable of accounting for most of the results discussed above which cannot be accounted for under the other theories of behavioural contrast.

The frustration theory postulates that frustrative nonreward is an aversive event and so is able to account for the production of behavioural contrast when S^{Δ} is aversive to the subject. It also predicts that both punishment and frustrative nonreward will produce contrast. Transient contrast is considered, under the theory, to be an unconditioned reaction to nonreward occurring immediately after reward (the evidence for this is given in Mackintosh, 1974), and so the evidence that behavioural contrast is the result of conditioning transient contrast may be subsumed under the hypothesis that behavioural contrast is due to a conditioned frustration effect whereas transient contrast is an unconditioned frustration effect. The occurrence of induction when S^{D} and S^{Δ} are very close on the stimulus dimension but contrast when they are further apart has been predicted by Gray and Smith (1969) using a mathematical model of the energizing and directive effects of frustration. From Gray's theory of the physiological basis of frustrative nonreward and its relations with a theory of individual differences in personality (Gray, 1973), predictions as to the personality correlates of susceptibility to frustrative nonreward have been developed which were found to occur in samples of maladjusted and normal children (Nicholson and Gray, 1972; Nicholson, 1974). A more detailed discussion of these is given below in the section on behavioural contrast and personality in humans.

Terrace (1972) has also produced an explanation for the lack of behavioural contrast normally shown under errorless discrimination learning Frustration, he considers, only occurs if there are unreinforced responses

to S^{Δ}. The errorless procedure, which tends to minimize responding to S^{Δ}, will hence not tend to produce frustration.

It is, however, possible that, especially in pigeons, autoshaped responses may add to the contrast effect produced by frustrative nonreward with short component durations. It is also possible that matching may play a role with long component durations, although humans, for example, tend to choose between several strategies in solving discriminations and matching may not be the one chosen. It is, however, the case that a frustration explanation of behavioural contrast would seem to be the most adequately developed theory for experiments with humans.

Behavioural contrast and personality in humans

Behavioural contrast has been demonstrated using young children (Nicholson and Gray, 1971, 1972; Waite and Osborne, 1972), older maladjusted children (Nicholson, 1972) and adults (Terrace, 1974). Both Nicholson and Gray and Terrace have measured the magnitude of behavioural contrast shown, Nicholson and Gray using a logarithmic percentage increase in the rate of response over baseline rate of response and Terrace a percentage increase in rate of response over baseline rate of response.

Nicholson and Gray (Nicholson and Gray, 1972; Nicholson, 1972; Gray, 1975) have proposed that behavioural contrast may be used as a measure of susceptibility to frustrative nonreward (FNR). On the hypothesis that FNR has the same behavioural effects as punishment, supported in the case of behavioural contrast by the fact that both FNR (frustrative explanation of behavioural contrast - see above) and punishment (Brethower and Reynolds, 1962; Lattal and Griffin, 1972) may produce contrast, it is proposed that the personality characteristics underlying susceptibility to punishment are the same as those underlying susceptibility to frustrative nonreward. The evidence that frustrative effects can occur in children is documented in Nicholson (1972). Behavioural contrast is especially valuable as a technique for measuring susceptibility to FNR as it is a within-subjects

technique. It is, therefore, a great pity that, given the successful quantitative work on humans indicated above, most workers with animals remain concerned to show the presence or absence of the effect rather than explore its nature in a more discriminating fashion by using quantitative techniques.

A full account of the personality and developmental variables investigated in the behavioural contrast experiments with children is given in Nicholson (1972). Here, I shall merely summarize the results.

1. The amount of behavioural contrast shown has been found to be related to increasing neuroticism on the Teachers' Rating Scale (TRS).
2. It has also been found to be correlated with decreasing extraversion on the Junior Eysenck Personality Inventory (JEPI).
3. It has been related to decreasing developmental maturity as measured by chronological age, reading age and (reading age - chronological age).

The first two of these relationships are as predicted by Gray's theory of personality (Gray, 1972). The third is in line with the evidence that susceptibility to frustration declines with age (Lawson, 1965).

The present study is designed to fulfill three functions: a) to see whether these results can be replicated using older children and a very much wider selection of personality tests; b) to test the hypotheses that delinquents, particularly group delinquents, will be less susceptible to FNR than nondelinquents or solitary delinquents; and c) to explore further the nature of the phenomenon of behavioural contrast by including both extradimensional and intradimensional discriminations, each child being exposed to both discriminations, and by introducing measures of the time taken to describe the discrimination contingencies and then to perform the discrimination to criterion.

The present study

Method

Subjects

The behavioural sample of 31 boys was used in this experiment. Two of the boys had to be excluded as discrimination training could not be carried to criterion due to absences and school holidays. The sample hence comprised 29 boys.

Apparatus

The children, who were tested singly, sat in front of a wooden operant conditioning cabinet within easy reach of a lever and a hole in the cabinet out of which Green Shield Stamps were extruded. Pressing the lever sometimes resulted in the delivery of a strip of five of these stamps which were used as one reward unit. Schedules of reinforcement were controlled by a tape timer connected to Behavioural Research and Development solid-state logic units. 30dB white noise from a white noise generator was used to drown the clicks from the tape-timer which could, otherwise, have been used as signals of impending reward. Lever-presses and rewards were recorded on a print-out counter. The stimuli were back-projected from an automatically-operated Kodak Carousel projector onto a 9" by 9" translucent Perspex screen on the front of the cabinet. They consisted of coloured drawings of a space rocket oriented at various angles against a sky-blue background. The subject was sheltered from the experimenter by a screen. Throughout the experiment, the number of responses made by the subject and the number of reinforcements obtained per 30 sec. were counted on a print-out counter.

Procedure

All sessions were of 20 minutes duration and no more than one session was ever held on one day. No difficulty was experienced in maintaining interest and a steady response rate over the period.

Two different discriminations were learnt, the average interval between testings of the same boy being 6 months. The first was an extradimensional discrimination, the S^D stimulus being a coloured space rocket oriented at 32.5^o to the vertical on a sky-blue background and the S^Δ stimulus being the plain sky-blue background. For half of the boys the rocket was to the left of vertical and for half the boys to the right of vertical. Total sessions per child varied from 5 to 17 and were run successively.

Instructions were kept to a minimum, emphasizing mainly that pressing the lever was somehow related to the delivery of reinforcements and encouraging the boys to try to work out the relationship and to obtain as many stamps as possible. The boys were allowed to keep the stamps they had earned.

Extradimensional discrimination

The first phase of the discrimination consisted of baseline training on a schedule of V130" for the first session and VIlmin. subsequently to the S^D stimulus. The stimulus was shown for periods of 30" separated by 4" during which the projector switched to the next slide and the screen was blank. Criterion for stabilised baseline was, after a minimum of three sessions, no change in average response rate from one session to the next greater than 5%. The total number of baseline sessions ranged from 3 to 5 for different subjects. The average response rate per 30" for the last session of baseline training (INITRATE) and the number of sessions taken to criterion (BASELINE) were measured.

The second phase consisted of discrimination training. Reinforcement continued at VIlmin. in the presence of S^D, but no reinforcement was given during S^Δ, a plain sky-blue background. There was an approximately equal number of 30 sec. presentations of S^D and S^Δ, intermixed randomly subject to the proviso that not more than 3 successive presentations of S^D or S^Δ occurred in each session. During this phase, the boys were asked at the end of every

session whether they had found anything out about the task. This continued until they could verbalize the discrimination conditions. The number of sessions needed for this was measured (KNOWNO). Training was continued until the minimum criterion for discrimination, a 6:1 discrimination ratio (i.e. the ratio of mean response rate in S^D to that in S^Δ: Dinsmoor, 1951) was reached for two successive sessions. 2 to 9 sessions were required for subjects to learn the discrimination (CRITNO). If the subject failed to learn the discrimination after 14 discrimination sessions, he was judged not to learn it.

Intradimensional discrimination

After the extradimensional discrimination training had been completed for all boys, they were then exposed to an intradimensional task which was similar to that for the extradimensional discrimination. The S^D stimulus was identical to that used for the subject in the extradimensional discrimination, but the S^Δ stimulus was the space rocket oriented at 32.5° to the other side of vertical. The dimension was hence that of orientation. Baseline training with the S^D only was carried out as before, the number of trials needed ranging from 3 to 5. A single session of generalisation testing was then given. This formed part of a peak shift experiment, being run concurrently. The procedure for this was the same for each boy and only S^D stimuli were rewarded during this session, all other orientations of the space rocket not being rewarded. The phase of discrimination training was then carried out in a similar manner to before. Number of trials required to reach criterion varied from 2 to 10. 1 subject who had failed to learn the extradimensional discrimination also failed to learn the new discrimination and 4 further subjects did not wish to take any further part in the experiment at this stage. It was intended to use a control group of boys, treated in the same way as the experimental group except that reward would continue to be available on VI 1min. in both S^D and S^Δ. For the reasons

discussed in the Results section below this proved to be impossible. It was, therefore, necessary to rely on a within-subject control based upon response rate on subsequent return to baseline reinforcement conditions (see Results).

Results[1]

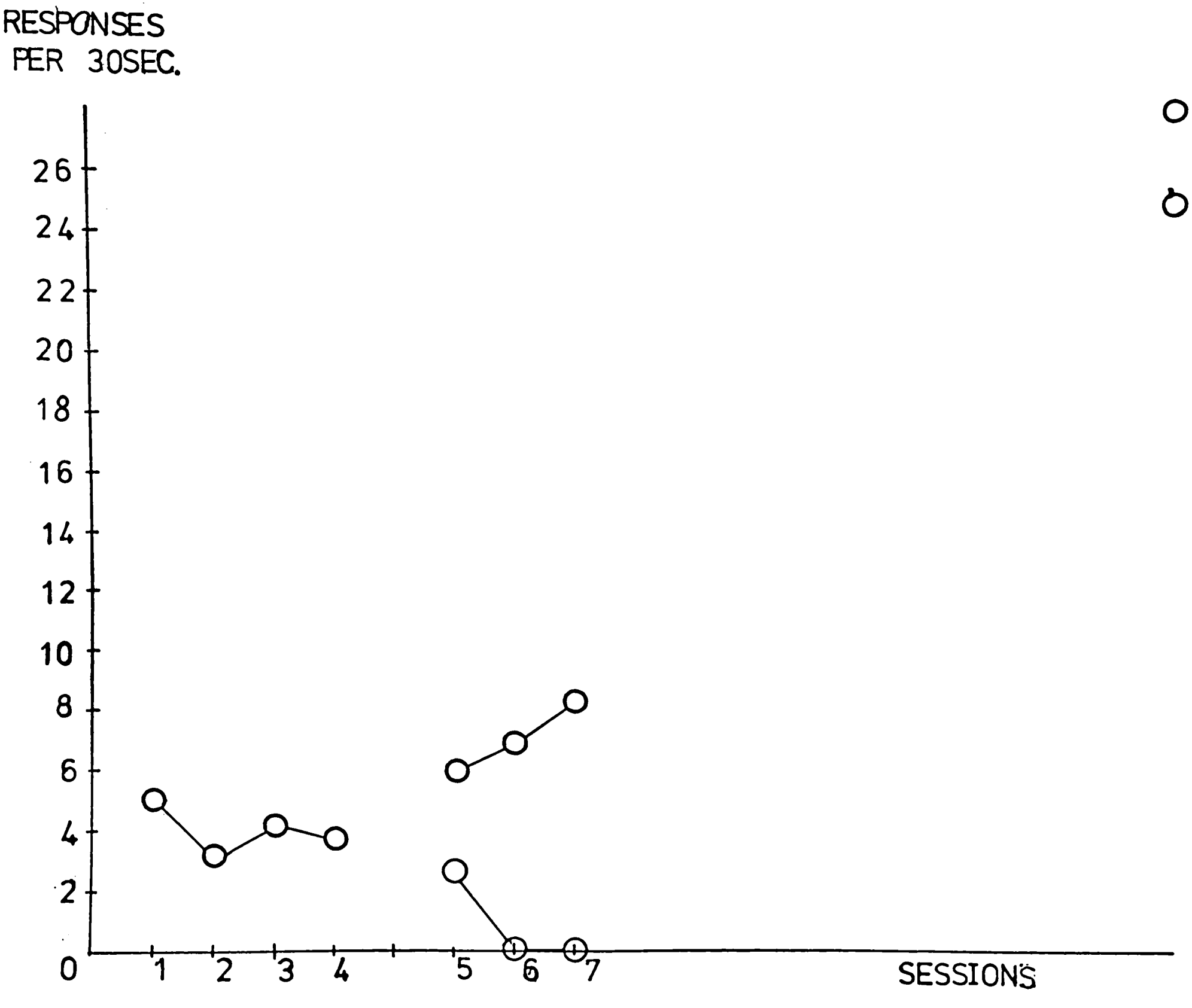
The distributions of all the variables were plotted. Those which may not have normal distributions are indicated in the text. Correlation measures used were product-moment correlations for relationships between variables with normal distributions and Spearman rank order correlations if one or both variables did not have a normal distribution.

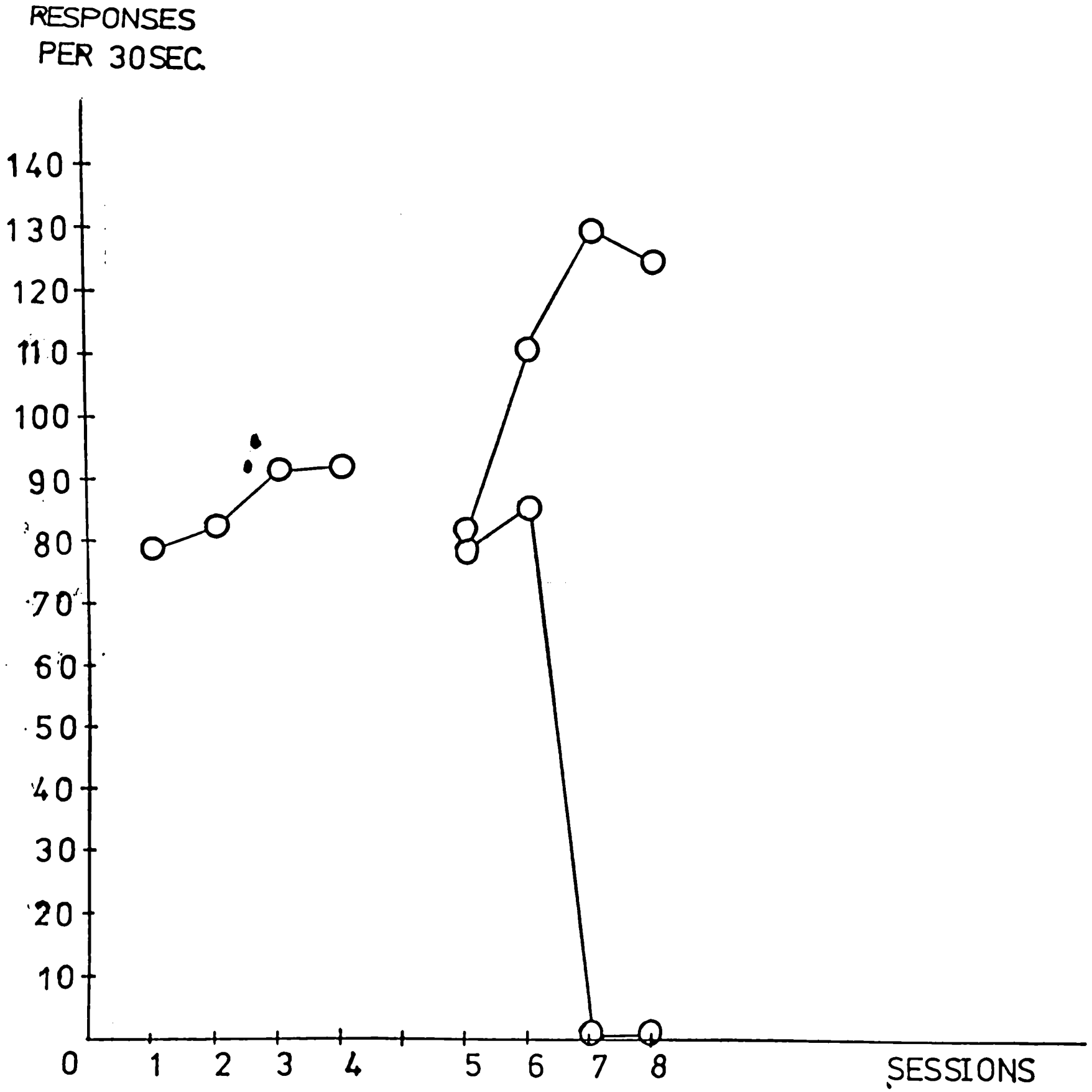
Measures of behavioural contrast

Two examples of the occurrence of behavioural contrast in subjects from the sample are given in Figures 5.1 and 5.2. Contrast in the present study is measured from the last session of baseline training to the last session of discrimination training.

(A) Both the extradimensional and the intradimensional discrimination learning test allow measures of behavioural contrast to be calculated for each of the boys. At the conclusion of baseline training, the number of lever presses per 30" ranged from 2.4 to 104.3, mean 44.58, for the extradimensional discrimination (INITRATE) and from 2.56 to 108.38, mean 42.17, for the intradimensional discrimination (NITRATE2). This difference is not statistically significant (using the t-test for matched pairs, $t = 0.009$). At criterion for discrimination learning, 22 of the 28 subjects on the extradimensional discrimination showed response rate increases during S^D over baseline. These increases may be measured as an absolute figure (ABSSD), as a percentage of the baseline rate (ABSSD/INITRATE X 100 = PERSD), or as a logarithm of the percentage (log PERSD = CORLOGSD). The variables ABSSD and PERSD do not have normal distributions.

1. The marginal references e.g. (A) refer to the comparison of the results of the present study, the Rushton study and the Nicholson studies at the end of the Results section.


RESPONSES
PER 30SEC.
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
SESSIONS
KEY
S^b
S^a


RESPONSES
PER 30SEC.
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
SESSIONS
KEY
S♂
S♀

For the intradimensional discrimination, 20 of the 24 subjects showed a contrast effect (A). Measures equivalent to those for the extradimensional discrimination were calculated (ABSSD2, PERSD2, ORLOGSD2). ABSSD2 and PERSD2 do not have a normal distribution. Only one of the four subjects not showing a contrast effect failed to show it in the extradimensional discrimination as well. One of the subjects failing to show contrast in the extradimensional discrimination did not complete the intradimensional discrimination. Hence three subjects showed contrast in the intra- as opposed to the extradimensional discrimination and three subjects showed the opposite pattern. Those boys not showing a contrast effect were given missing values for the contrast variables (ABSSD, PERSD, CORLOGSD, etc.) for the appropriate discrimination. This seemed the better alternative to either giving these subjects negative scores or dropping them from the analysis of discrimination learning as, although they did not show the phenomenon of behavioural contrast (a rise in response rate in the presence of S^{Δ} during discrimination training relative to the rate obtaining before discrimination training has begun: Nicholson and Gray, 1971), they did learn the discrimination and so their performance in that respect should be included in the analysis.

Means and standard deviations for those behavioural variables having a normal distribution and medians for those not having a normal distribution are presented in Table 5.3. t-tests were computed for the nine variables of most interest to see whether there were any differences on the behavioural measures due to the position of the rocket in the S^{D} stimulus (the rocket being either 32.5^{o} to the right or left of vertical). No significant differences were found. The data for the two S^{D} positions were, therefore combined.

Controls

Before these measures can be considered measures of the phenomenon of behavioural contrast it is necessary, as discussed in the review section at the beginning of the chapter, to consider the question of controls. There are two

Table 5.3. Statistical parameters for the behavioural variables

Variable	Mean (n)	Standard Deviation	Median (n)	Value of t between test and retest.
INITRATE	44.58(22)	37.96		0.006
*ABSSD			36.13(22)	-
*PERSD			23.60(22)	-
CORLOGSD	2.21(22)	0.26		18.68***
BASELINE	3.41(22)	0.61		2.38
CRITNO	4.32(22)	1.62		0.54
TOTALNO	7.73(22)	1.72		0.65
KNOWNO	1.70(20)	0.80		-
PERFNO	2.70(20)	1.69		0.25
*RATIO			36.31(22)	-
NITRATE2	42.17(18)	35.88		
*ABSSD2			8.40(15)	
*PERSD2			32.13(15)	
ORLOGSD2	1.33(15)	0.52		
ASELINE2	3.67(18)	0.59		
CRITNO2	5.00(18)	2.47		
TOTALNO2	8.67(18)	2.50		
*KNOWNO2			2.00(18)	
PERFNO2	2.94(18)	1.83		
*RATIO2			13.48(15)	

EST

* non-normal distribution

*** significant at $p<.001$ level.


RESPONSES
PER 30 SEC.
110
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
SESSIONS

sorts of controls for the phenomenon of behavioural contrast. One of these uses a between-subjects design in which a control group is run under the same conditions as the experimental group, except that it receives single stimulus training throughout. The magnitude of behavioural contrast is calculated as the difference between the rate of response of the experimental group and that of the control group after the same amount of time in the experimental situation. This is obviously inapplicable in a study investigating individual differences in the amount of behavioural contrast shown. There is a sense, however, in which such a control group would be useful - to show that the phenomenon of behavioural contrast has occurred at all, i.e. that the change in rate of response to S^D upon introducing S^Δ is not just an effect of continued exposure to S^D. For this reason, it was planned to run a control group for the present study of 10 boys for 10 sessions, the boys being part of the total sample but not having been involved in any behavioural experiments. The first session, as with the experimental group, was run on a VI30 sec. schedule and the subsequent sessions on a V160sec. schedule, the same schedule as was correlated with S^D for the experimental group. Two of these boys were run but it was then found that the boys became so bored with the experiment that their response rates fluctuated considerably from session to session and an atmosphere of dissatisfaction occurred in the school. It was decided that the inclusion of such a control group did not warrant the possible jeopardization of the rest of the study. The graph of rate of response of one of the two subjects is shown in figure 5.4.

The second type of control is to include one or more sessions of baseline training after discrimination training has been completed for each boy. This has the advantage of being a within-subjects test but the literature contains contrary views as to its effectiveness. Bloomfield (1967), for example, found no decline in rate of response to S^D when the VI schedule was reinstated in S^Δ after 20 sessions of VI-extinction discrimination training, but, when the discrimination training was reintroduced after 40 sessions of further baseline

training, there was a further increase in rate of response to S^D.

In the present study, the baseline rate established before the intradimensional discrimination may serve as a control for the contrast shown in the previous extradimensional discrimination and that established before differential reinforcement of low rates training for the contrast shown in the previous intradimensional discrimination. These measures are not ideal as there was a time lapse of between 2 and 6 months between the same subject receiving extradimensional training and intradimensional training and one of 2 weeks to 4 months between the same subject receiving intradimensional training and differential reinforcement of low rates training. Nevertheless, if the difference between rate of response to S^D at the end of extradimensional discrimination training and that at the beginning of intradimensional discrimination training is calculated, only 3 subjects out of the 19 for which the measure is available fail to show 'contrast' on this measure. All three of these subjects showed contrast in the subsequent intradimensional discrimination. They behaved like the pigeons in Bloomfield's experiment. For this reason, it is not possible to test the magnitude of contrast shown adequately.

The fact that the behavioural contrast shown by all the boys was either greater than baseline rates of response both before and after discrimination training or conformed to the pattern indicated by Bloomfield, indicates that the increase in rate of response to S^D in this study was a genuine contrast phenomenon. Whether the magnitude of contrast shown was genuine or partly composed of baseline rate changes must be tested by looking at the predicted correlations with personality since there is no effective control for this. If the contrast was primarily a baseline change effect, then no specific correlations with personality would be expected to occur.

For the contrast shown in the intradimensional discrimination, the difference between the rate of response to S^D shown at the end of intradimensional training and that at the beginning of differential reinforcement of low rates

training was calculated. This 'contrast' measure was found to be positive (the rate of response to S^D at the end of intradimensional training being the greater) for only 10 out of the 18 boys, the average difference for the 10 boys showing positive 'contrast' being 16.66 and that for the 8 showing negative 'contrast' being 10.86. Contrast shown in the intradimensional experiment was lower than that shown in the extradimensional experiment. If boys are increasing their baseline rates to the level of the rate of response to S^D of the last discrimination, then a larger number not showing positive 'contrast' would be expected. Since there is no reported study involving repeated measures of contrast in humans, the question of baseline rate changes in the intradimensional discrimination must remain open.

It may be concluded that, as far as it is possible to test the matter in the present study, the contrast effects found in the study are genuine and not due to changes in baseline rate of response.

<u>Comparison of the measures of behavioural contrast in the extradimensional discrimination and the intradimensional discrimination</u>

(B) In Tables 5.5 and 5.5A, the correlations between the various measures of behavioural contrast for the extradimensional (test) and intradimensional (retest) discriminations are given. For the test situation the correlations are all high and positive, the range being 0.67 to 1.00. For the retest, although the correlation between PERSD2 and ORLOGSD2 is high, as might be expected, the correlations between the absolute measure and the percentage measures are much lower.

Table 5.6 gives the correlations between the test and the retest measures. Here it can be seen that initial rate is a very stable measure over time. Response rate is hence a reliable characteristic of a given child. The behavioural contrast measures do not show significant stability over time. Most of the measures are, however, as can be seen in Tables 5.5 and 5.5A, related to initial rate. The absolute rate change is positively related to initial

Table 5.5. Intercorrelations of behavioural contrast variables - test

(Spearman rank-order correlations where marked *)

	INITRATE	ABSSD	PERSD	CORLOGSD
INITRATE				
ABSSD	0.18* (ns)			
PERSD	- 0.47* (.028)	0.68* (.002)		
CORLOGSD	- 0.53 (.012)	0.67* (.002)	1.00* (.001)	

Table 5.5A Retest

	NITRATE2	ABSSD2	PERSD2	ORLOGSD2
NITRATE2				
ABSSD2	0.73* (.001)			
PERSD2	- 0.21* (ns)	0.44* (ns)		
ORLOGSD2	- 0.14 (ns)	0.44* (ns)	1.00* (.001)	

Table 5.6 Behavioural contrast test - retest. (Spearman rank-order correlations where marked *)

	NITRATE2	ABSSD2	PERSD2	CORLOGSD2
INITRATE	0.83 (.001)			
ABSSD		0.33* (ns)		
PERSD			0.04* (ns)	
CORLOGSD				0.07 (ns)

	CRITNO2	KNOWNO2	PERFNO2	RATIO2	ASELINE2	TOTALNO2
CRITNO	0.61 (.006)					
KNOWNO		0.02* (ns)				
PERFNO			0.65 (.004)			
RATIO				0.85 (.001)		
BASELINE					- 0.06 (ns)	
TOTALNO						0.52 (.022)

rate, a finding which mitigates against any ceiling effect of a high initial rate of bar-pressing being operative in the experiments.

(C) t-tests were computed between INITRATE, CORLOGSD and their corresponding variables on the intradimensional discrimination. A significant difference was obtained for CORLOGSD with ORLOGSD2, less behavioural contrast being shown for the intradimensional discrimination. There was, however, a decrease in the other behavioural contrast variables on retest. These results may be due either to a practice effect or the difference between extradimensional and intradimensional discrimination learning.

Discrimination Ratio

The discrimination ratio is the ratio of the average number of responses in S^D per 30" period to average number of responses in S^Δ per 30" period at criterion for discrimination learning (RATIO or RATIO2). The correlation between RATIO and RATIO2 (Table 5.6) shows considerable stability of individual performance.

In the extradimensional discrimination, RATIO correlated 0.26 (nonsignificant) with initial rate, the corresponding correlation for the intradimensional discrimination being 0.32 (nonsignificant).

Measures of discrimination learning

(D) One may next consider the times taken by the boys to reach the various criteria for discrimination learning. The total process may be divided into three parts: the time taken to reach criterion for baseline training (BASELINE - test, or ASELINE2 - retest); the time required from the beginning of discrimination training to be able to describe the discrimination criteria (KNOWNO - test, or KNOWNO2 - retest); and the time required to be able to perform the discrimination to criteria after having described it (PERFNO - test, or PERFNO2 - retest). KNOWNO and KNOWNO2, by definition, were always at least one session long. It is extremely interesting that being able to verbalize always occurred before being able to perform the

discrimination. KNOWNO2 does not have a normal distribution. Two composite measures were also used; the time taken for the whole of discrimination training (CRITNO - test or CRITNO2 - retest) and the total time taken for the whole experiment (TOTALNO - test or TOTALNO2 - retest = BASELINE + CRITNO). All these are measured in units of one session. The means and standard deviations are given in Table 5.3, together with the value of t between test and retest. The only significant difference is that between BASELINE and ASELINE2. It may, however, be seen that the boys found the intradimensional discrimination more difficult to learn than the extradimensional discrimination. This might well be expected in view of the greater discriminability of the stimuli in the extradimensional discrimination.

Test-retest correlations for the times to criteria are given in Table 5.6. The stability of discrimination learning times is remarkable. The stability of the total time taken (TOTALNO) is due primarily to discrimination training (CRITNO) rather than baseline training (BASELINE) performance. The stability in CRITNO is due primarily to stability in performance time (PERFNO) rather than description time (KNOWNO). The low value for the correlation of KNOWNO with KNOWNO2 may well reflect the greater difficulty in discriminating cognitively between stimuli in an intradimensional discrimination. The stability in PERFNO mitigates against the possibility of a large practice effect in the time required to perform a discrimination of this type and indicates that this may be a stable characteristic of an individual.

(E) One may next look at the correlations between these various times to criteria for both discriminations, as given in Tables 5.7 and 5.8. It may be seen that the single stimulus training times (BASELINE or ASELINE2) are only correlated to any significant extent with TOTALNO or TOTALNO2. This result is, of course, due to the definition of TOTALNO (BASELINE + CRITNO). BASELINE is not related to any of the other times for discrimination learning. The other significant correlations are also definitional in nature. The correlations of test description time (KNOWNO) with performance time (PERFNO)

Table 5.7 Intercorrelations of times to various criteria (extradimensional BC) n = 22

	INITRATE	BASELINE	CRITNO	TOTALNO	KNOWNO	PERFNO n = 20
INITRATE						
BASELINE	0.01 (ns)					
CRITNO	- 0.37 (ns)	- 0.08 (ns)				
TOTALNO	- 0.34 (ns)	0.36 (ns)	0.91 (.001)			
KNOWNO	- 0.21 (ns)	0.21 (ns)	0.21 (ns)	0.29 (ns)		
PERFNO n = 20	- 0.22 (ns)	- 0.15 (ns)	0.89 (.001)	0.76 (.001)	- 0.26 (ns)	

Table 5.8 Intercorrelations of times to various criteria (Intradimension BC) n = 24

	NITRATE2	ASELINE2	CRITNO2	TOTALNO2	KNOWNO2	PERFNO2
NITRATE2						
ASELINE2	- 0.14 (ns)					
CRITNO2	- 0.24 (ns)	0.04 (ns)				
TOTALNO2	- 0.27 (ns)	0.30 (ns)	0.97 (.001)			
KNOWNO2	- 0.21 (ns)	0.07 (ns)	0.71 (.001)	0.69 (.002)		
PERFNO2	- 0.11 (ns)	0.03 (ns)	0.79 (.001)	0.76 (.001)	0.16 (ns)	

(F) and the equivalent on retest (KNOWNO2 with PERFNO2) are also nonsignificant. This implies a dissociation between the time need to be able to describe the conditions of the discrimination and the time required to give an adequate behavioural performance. This suggests that different factors may be operative in the two processes.

In this regard, it may be instructive to look at the relationships between KNOWNO, PERFNO and changes in rate of response to S^D and S^Δ. These are shown in Tables 5.9 and 5.10. From these it can be seen that, in the extradimensional discrimination, CRITNO is significantly positively correlated with behavioural contrast (CORLOGSD) and negatively correlated with changes in S^Δ. This means that the longer the boy takes to reach criterion on the discrimination, the larger his eventual contrast and the smaller his eventual decrease in response rate to S^Δ. These correlations are an effect due to the time he takes to perform the discrimination (PERFNO) rather than the time he takes to be able to describe the conditions of the discrimination (KNOWNO). This would suggest that it is the number of responses to S^Δ during performance time rather than description time that is responsible for the frustration-inducing effect which is considered to lead to the production of behavioural contrast. It would also suggest that behavioural contrast is not, in this discrimination, due to any cognitive difficulties in perceiving the discrimination conditions but to difficulties in adjusting rates of response to S^D and S^Δ to perform the discrimination i.e. it supports a frustration rather than a cognitive explanation for behavioural contrast.

In the intradimensional discrimination, however, the picture is not as clear. Here, the time taken in learning the discrimination, CRITNO2, is independent of changes in rate of response to S^D, but positively related to changes in rate of response to S^Δ. The time required to describe (KNOWNO2) is positively, if non-significantly, related to behavioural contrast and significantly related to changes in response rate to S^Δ. The time required

Table 5.9 Times to various criteria with changes in rate of response to S^D and to S^Δ

(Spearman rank-order correlations where marked *)

1. Test

	ABSSD	PERSD	CORLOGSD	ABSSO	PERSO	LOGPERSO
BASELINE	- 0.35* (ns)	- 0.20* (ns)	- 0.21 (ns)	0.02 (ns)	0.28 (ns)	0.23 (ns)
CRITNO	0.31* (ns)	0.44* (.040)	0.52 (.012)	- 0.12 (ns)	- 0.34 (ns)	- 0.49 (.020)
TOTALNO	0.14* (ns)	0.34* (ns)	0.40 (ns)	- 0.10 (ns)	- 0.19 (ns)	- 0.36 (ns)
KNOWNO	- 0.35* (ns)	- 0.19* (ns)	- 0.22 (ns)	- 0.01 (ns)	0.27 (ns)	0.26 (ns)
PERFNO	0.55* (.012)	0.51* (.020)	0.31 (ns)	- 0.02 (ns)	- 0.45 (.044)	- 0.60 (.004)

Table 5.10 Times to various criteria with changes in rate of response to S^D and S^Δ

(Spearman rank-order correlations where marked *)

2. Retest

	ABSSD2	PERSD2	ORLOGSD2	ABSSO2	PERSO2	OGPERSO2
ASELINE2	- 0.11* (ns)	0.03* (ns)	- 0.01 (ns)	0.01 (ns)	- 0.05 (ns)	- 0.08 (ns)
CRITNO2	- 0.05* (ns)	0.04* (ns)	0.08 (ns)	0.31 (ns)	0.33 (ns)	- 0.33 (ns)
TOTALNO2	- 0.05* (ns)	0.04* (ns)	0.08 (ns)	0.30 (ns)	0.31 (ns)	0.29 (ns)
KNOWNO2	0.13* (ns)	0.38* (ns)	0.38* (ns)	0.27* (ns)	0.53* (.044)	0.53* (.044)
PERFNO2	- 0.14* (ns)	- 0.28* (ns)	- 0.18 (ns)	0.29 (ns)	0.17 (ns)	0.20 (ns)

to perform the discrimination is not significantly related to either. This may be due to the fact that the intradimensional discrimination is a more difficult discrimination in the sense of distinguishing between the two stimuli so that one would expect more responses to S^{Δ} and hence more frustration occurring in the description part of this discrimination than in the corresponding part of the extradimensional discrimination. It is also useful, in this respect, to recall the low coefficient of stability obtained for KNOWNO as opposed to PERFNO between the two discriminations. Another possible complication as regards the description time for the intradimensional discrimination is the presence of the generalization test before discrimination learning. This included nonrewarded stimuli similar to both S^{D} and S^{Δ} as regards the shape of the space rocket, though not as regards the orientation. This, of course, is the only feature differentiating S^{D} and S^{Δ}. This might well add to the difficulty of discrimination. One must also consider the fact that the process involved in fulfilling the discrimination criterion of a 6:1 discrimination ratio is the same in both discriminations and so one would expect any practice effects to be operative in the intradimensional discrimination. One way to test between a difficulty of discrimination hypothesis and a practice hypothesis would be to run a similar population on an intradimensional discrimination without generalization test followed by an extradimensional discrimination.

One may also note that BASELINE and ASELINE2 are not significantly correlated with contrast. The amount of contrast shown is hence independent of the length of baseline training. This is also a control for the amount of behavioural contrast shown.

Correlations of behavioural measures with personality, development and crime

(F) 1. Initial rate

Tables 5.13 and 5.14 give the correlations of INITRATE and NITRATE2 with personality both on test and retest. Both measures of initial rate are

Table 5.11 Behavioural contrast measures and personality - test

(Spearman rank order correlations where marked *)

	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	JEPIIMP	JEPIL	AGE	RACA	IQ	NOCRIM
ABSSD*	- 0.22 (ns)	- 0.12 (ns)	- 0.19 (ns)	0.02 (ns)	0.12 (ns)	- 0.20 (ns)	0.12 (ns)	0.18 (ns)	- 0.24 (ns)	- 0.09 (ns)	0.24 (ns)	0.25 (ns)
ABSSD2*	0.30 (ns)	- 0.16 (ns)	0.08 (ns)	- 0.09 (ns)	0.20 (ns)	0.38 (ns)	- 0.35 (ns)	0.05 (ns)	0.27 (ns)	0.34 (ns)	0.32 (ns)	- 0.27 (ns)
PERSD*	- 0.32 (ns)	- 0.20 (ns)	- 0.08 (ns)	0.06 (ns)	- 0.25 (ns)	- 0.20 (ns)	0.31 (ns)	0.06 (ns)	- 0.36 (ns)	- 0.18 (ns)	- 0.25 (ns)	0.35 (ns)
PERSD2*	0.03 (ns)	- 0.40 (ns)	- 0.08 (ns)	- 0.07 (ns)	- 0.15 (ns)	0.39 (ns)	0.48 (ns)	0.17 (ns)	- 0.01 (ns)	- 0.03 (ns)	0.27 (ns)	- 0.34 (ns)
CORLOGSD	- 0.40 (ns)	- 0.21 (ns)	- 0.04 (ns)	0.02 (ns)	- 0.25 (ns)	- 0.19 (ns)	0.24 (ns)	- 0.03 (ns)	- 0.35 (ns)	- 0.17 (ns)	- 0.25 (ns)	0.40 (ns)
ORLOGSD2	- 0.15 (ns)	- 0.24 (ns)	- 0.15 (ns)	- 0.14 (ns)	- 0.24 (ns)	0.31 (ns)	- 0.39 (ns)	- 0.03 (ns)	0.03 (ns)	- 0.09 (ns)	0.22 (ns)	- 0.23 (ns)
RATIO*	0.18 (ns)	0.01 (ns)	- 0.17 (ns)	0.05 (ns)	- 0.09 (ns)	- 0.00 (ns)	0.07 (ns)	0.11 (ns)	0.01 (ns)	0.34 (ns)	0.03 (ns)	- 0.19 (ns)
RATIO2*	0.13 (ns)	- 0.13 (ns)	0.14 (ns)	- 0.13 (ns)	0.14 (ns)	0.14 (ns)	- 0.14 (ns)	0.31 (ns)	0.02 (ns)	0.51 (ns)	0.10 (ns)	- 0.33 (ns)

Table 5.11A Behavioural contrast measures and personality -test, controlling for INITRATE on test behavioural contrast and NITRATE2 on retest behavioural contrast

	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	JEPIIMP	JEPIL	AGE	RACA	IQ	NOCRIM
CORLOGSD	- 0.29	- 0.09	- 0.04	- 0.08	- 0.09	- 0.19	0.18	- 0.00	- 0.20	- 0.09	- 0.12	0.31
ORLOGSD2	0.14	- 0.22	0.01	- 0.16	- 0.19	0.49	- 0.50	- 0.01	0.09	0.02	0.28	- 0.23

For n = 15, the correlation is significant at p<.05 if greater than .42
p<.02 .49
p<.01 .54

Table 5.12 Behavioural contrast measures and personality and crime - retest

	JEPIE	CATEX	JPQE	TRSE	JEPIN	CATANX	JPQN	TRSN	JEPIL	JPQL	JPQP	NOCRIM2	PERG2	PERS2	PERSS2	PERGS2
ABSSD*	0.23 (ns)	0.15 (ns)	0.31 (ns)	- 0.11 (ns)	- 0.20 (ns)	- 0.16 (ns)	- 0.02 (ns)	0.15 (ns)	0.44 (.040)	- 0.01 (ns)	0.16 (ns)	- 0.04 (ns)	0.13 (ns)	- 0.17 (ns)	0.16 (ns)	- 0.17 (ns)
ABSSD2*	0.20 (ns)	0.24 (ns)	0.23 (ns)	- 0.07 (ns)	- 0.24 (ns)	0.15 (ns)	0.44 (ns)	- 0.43 (ns)	- 0.11 (ns)	- 0.06 (ns)	- 0.33 (ns)	- 0.14 (ns)	- 0.18 (ns)	- 0.16 (ns)	- 0.11 (ns)	- 0.03 (ns)
PERSD*	- 0.22 (ns)	0.02 (ns)	- 0.03 (ns)	- 0.12 (ns)	0.21 (ns)	- 0.07 (ns)	0.15 (ns)	0.31 (ns)	0.37 (ns)	0.17 (ns)	0.24 (ns)	0.09 (ns)	0.08 (ns)	- 0.08 (ns)	0.22 (ns)	- 0.21 (ns)
PERSD2*	- 0.50 (.050)	- 0.33 (ns)	- 0.49 (ns)	- 0.07 (ns)	- 0.04 (ns)	- 0.01 (ns)	- 0.14 (ns)	- 0.11 (ns)	0.27 (ns)	0.38 (ns)	- 0.48 (ns)	- 0.15 (ns)	- 0.01 (ns)	0.01 (ns)	0.14 (ns)	- 0.24 (ns)
CORLOGSD	- 0.28 (ns)	- 0.11 (ns)	- 0.15 (ns)	0.08 (ns)	0.24 (ns)	- 0.03 (ns)	0.23 (ns)	0.29 (ns)	0.47 (.026)	0.17 (ns)	0.10 (ns)	0.10 (ns)	0.13 (ns)	- 0.06 (ns)	0.24 (ns)	- 0.27 (ns)
ORLOGSD2	- 0.50 (ns)	- 0.23 (ns)	- 0.53 (ns)	- 0.14 (ns)	- 0.02 (ns)	- 0.12 (ns)	- 0.01 (ns)	0.01 (ns)	0.15 (ns)	0.41 (ns)	- 0.44 (ns)	- 0.08 (ns)	0.05 (ns)	- 0.19 (ns)	0.18 (ns)	- 0.29 (ns)
RATIO*	0.03 (ns)	- 0.01 (ns)	0.32 (ns)	0.03 (ns)	- 0.45 (ns)	- 0.09 (ns)	- 0.46 (ns)	- 0.10 (ns)	0.21 (ns)	- 0.06 (ns)	- 0.17 (ns)	0.01 (ns)	0.22 (ns)	- 0.14 (ns)	- 0.05 (ns)	0.05 (ns)
RATIO2*	- 0.07 (ns)	- 0.01 (ns)	0.07 (ns)	- 0.09 (ns)	- 0.53 (ns)	- 0.15 (ns)	- 0.63 (.040)	- 0.26 (ns)	0.03 (ns)	- 0.00 (ns)	- 0.20 (ns)	- 0.11 (ns)	- 0.17 (ns)	- 0.01 (ns)	0.11 (ns)	- 0.11 (ns)

Table 5.12A Behavioural contrast measures and personality and crime-retest, controlling for INITRATE on extradimensional contrast measures and for NITRATE2 on intradimensional

	JEPIE	CATEX	JPQE	TRSE	JEPIN	CATANX	JPQN	TRSN	JEPIL	JPQL	JPQP	NOCRIM2	PERG2	PERS2	PERSS2	PERGS2
CORLOGSD	- 0.08	0.02	0.16	0.06	- 0.06	- 0.11	- 0.07	0.15	0.46	0.07	0.06	- 0.01	0.09	0.02	0.08	- 0.05
ORLOGSD2	- 0.49	- 0.17	- 0.55	- 0.14	- 0.09	- 0.15	- 0.04	- 0.05	0.16	0.39	- 0.45	- 0.09	0.04	- 0.22	0.15	- 0.26

for n = 15 correlations are significant at p<.05 if values greater than .42
p<.02 .49
p<.01 .54

Table 5.13 Times to various criteria with personality - test

	JEPIE	CATEX	NEWAVE	JEPIN	CATANX	NEWAVN	JEPIL	JEPIIMP	AGE	IQ	RA-CA	NOCRIM
INITRATE n = 20	0.32 (ns)	0.26 (ns)	- 0.03 (ns)	- 0.17 (ns)	0.34 (ns)	- 0.01 (ns)	0.05 (ns)	- 0.18 (ns)	0.36 (ns)	0.29 (ns)	0.18 (ns)	- 0.28 (ns)
NITRATE2 n = 24	0.21 (ns)	0.17 (ns)	0.11 (ns)	- 0.12 (ns)	0.32 (ns)	0.13 (ns)	0.20 (ns)	- 0.05 (ns)	0.36 (ns)	0.12 (ns)	0.27 (ns)	- 0.27 (ns)
BASELINE n = 20	0.18 (ns)	0.50 (.020)	0.17 (ns)	- 0.12 (ns)	0.07 (ns)	0.30 (ns)	- 0.03 (ns)	0.00 (ns)	- 0.00 (ns)	- 0.06 (ns)	0.21 (ns)	- 0.17 (ns)
ASELINE2 n = 24	0.05 (ns)	0.03 (ns)	- 0.23 (ns)	- 0.38 (ns)	- 0.04 (ns)	- 0.42 (.042)	- 0.36 (ns)	0.00 (ns)	- 0.17 (ns)	0.11 (ns)	- 0.26 (ns)	- 0.07 (ns)
CRITNO n = 20	- 0.64 (.002)	- 0.43 (ns)	- 0.13 (ns)	- 0.08 (ns)	- 0.12 (ns)	- 0.19 (ns)	0.10 (ns)	- 0.04 (ns)	- 0.70 (.001)	- 0.36 (ns)	- 0.22 (ns)	0.28 (ns)
CRITNO2 n = 24	- 0.16 (ns)	- 0.35 (ns)	- 0.24 (ns)	- 0.15 (ns)	- 0.15 (ns)	0.10 (ns)	- 0.06 (ns)	- 0.18 (ns)	- 0.31 (ns)	- 0.37 (ns)	- 0.15 (ns)	0.09 (ns)
TOTALNO n = 20	- 0.53 (.012)	- 0.22 (ns)	- 0.05 (ns)	- 0.13 (ns)	- 0.09 (ns)	- 0.05 (ns)	0.08 (ns)	- 0.04 (ns)	- 0.66 (.002)	- 0.37 (ns)	- 0.12 (ns)	0.20 (ns)
TOTALNO2 n = 24	- 0.14 (ns)	- 0.34 (ns)	- 0.29 (ns)	- 0.24 (ns)	- 0.15 (ns)	- 0.01 (ns)	- 0.15 (ns)	- 0.18 (ns)	- 0.34 (ns)	- 0.33 (ns)	- 0.21 (ns)	0.07 (ns)
KNOWNO n = 20	- 0.18 (ns)	- 0.35 (ns)	- 0.05 (ns)	- 0.16 (ns)	- 0.09 (ns)	0.36 (ns)	0.04 (ns)	- 0.35 (ns)	- 0.55 (.012)	- 0.35 (ns)	- 0.12 (ns)	- 0.37 (ns)
KNOWNO2 n = 20	- 0.04 (ns)	- 0.51 (.036)	- 0.62 (.006)	- 0.18 (ns)	- 0.06 (ns)	0.10 (ns)	0.33 (ns)	- 0.20 (ns)	- 0.30 (ns)	- 0.37 (ns)	- 0.06 (ns)	- 0.29 (ns)
PERFNO n = 20	- 0.55 (.012)	- 0.25 (ns)	- 0.08 (ns)	0.02 (ns)	- 0.01 (ns)	- 0.34 (ns)	0.04 (ns)	0.11 (ns)	- 0.45 (.048)	- 0.16 (ns)	- 0.15 (ns)	0.45 (.044)
PERFNO2 n = 20	- 0.19 (ns)	- 0.13 (ns)	- 0.14 (ns)	- 0.22 (ns)	- 0.18 (ns)	0.02 (ns)	- 0.07 (ns)	- 0.10 (ns)	- 0.18 (ns)	- 0.34 (ns)	- 0.31 (ns)	0.21 (ns)

Table 5.14 Times to various criteria with personality and crime - retest

	JEPIE	CATEX	JPQE	TRSE	JEPIN	CATANX	JPQN	TRSN	JEPIL	JPQL	JPQP	NOCRIM2	PERG2	PERS2	PERSS2	PERGS2
INITRATE	0.42 (ns)	0.24 (ns)	0.50 (.034)	- 0.05 (ns)	- 0.53 (.024)	- 0.11 (ns)	- 0.53 (.024)	- 0.32 (ns)	- 0.18 (ns)	- 0.22 (ns)	- 0.08 (ns)	- 0.21 (ns)	- 0.11 (ns)	0.14 (ns)	- 0.32 (ns)	0.43 (ns)
NITRATE2	0.54 (.026)	0.47 (ns)	0.63 (.006)	- 0.02 (ns)	- 0.37 (ns)	- 0.14 (ns)	- 0.19 (ns)	- 0.36 (ns)	0.03 (ns)	- 0.22 (ns)	-0.07 (ns)	- 0.05 (ns)	-0.06 (ns)	- 0.15 (ns)	- 0.19 (ns)	0.25 (ns)
BASELINE	- 0.09 (ns)	0.12 (ns)	0.01 (ns)	0.05 (ns)	- 0.08 (ns)	0.02 (ns)	- 0.21 (ns)	0.33 (ns)	- 0.25 (ns)	- 0.04 (ns)	- 0.07 (ns)	0.02 (ns)	- 0.04 (ns)	0.05 (ns)	- 0.36 (ns)	0.39 (ns)
ASELINE2	- 0.22 (ns)	0.06 (ns)	- 0.13 (ns)	0.14 (ns)	- 0.34 (ns)	0.39 (ns)	- 0.32 (ns)	- 0.10 (ns)	0.30 (ns)	0.18 (ns)	- 0.12 (ns)	- 0.07 (ns)	- 0.20 (ns)	0.15 (ns)	0.03 (ns)	- 0.11 (ns)
CRITNO	- 0.38 (ns)	- 0.29 (ns)	- 0.37 (ns)	- 0.14 (ns)	0.33 (ns)	0.05 (ns)	0.28 (ns)	0.05 (ns)	0.18 (ns)	0.30 (ns)	- 0.03 (ns)	- 0.13 (ns)	0.36 (ns)	- 0.52 (.018)	0.10 (ns)	- 0.29 (ns)
CRITNO2	- 0.23 (ns)	- 0.35 (ns)	- 0.11 (ns)	- 0.18 (ns)	0.23 (ns)	- 0.05 (ns)	0.29 (ns)	- 0.13 (ns)	0.16 (ns)	0.15 (ns)	- 0.30 (ns)	- 0.32 (ns)	0.31 (ns)	- 0.47 (.048)	0.00 (ns)	- 0.16 (ns)
TOTALNO	- 0.38 (ns)	- 0.22 (ns)	- 0.33 (ns)	- 0.10 (ns)	0.26 (ns)	0.06 (ns)	0.15 (ns)	0.18 (ns)	0.06 (ns)	0.25 (ns)	- 0.06 (ns)	- 0.10 (ns)	0.30 (ns)	- 0.46 (.042)	- 0.09 (ns)	- 0.10 (ns)
TOTALNO2	- 0.28 (ns)	- 0.34 (ns)	- 0.14 (ns)	- 0.15 (ns)	0.15 (ns)	0.05 (ns)	0.21 (ns)	- 0.15 (ns)	0.23 (ns)	0.19 (ns)	- 0.32 (ns)	- 0.33 (ns)	0.26 (ns)	- 0.43 (ns)	0.01 (ns)	- 0.18 (ns)
KNOWNO	- 0.30 (ns)	- 0.32 (ns)	- 0.53 (.034)	- 0.12 (ns)	0.45 (ns)	- 0.00 (ns)	0.21 (ns)	0.09 (ns)	- 0.33 (ns)	0.48 (ns)	- 0.52 (.032)	- 0.12 (ns)	0.40 (ns)	- 0.40 (ns)	0.09 (ns)	- 0.11 (ns)
KNOWNO2	- 0.50 (.040)	- 0.43 (ns)	- 0.21 (ns)	- 0.13 (ns)	- 0.10 (ns)	- 0.04 (ns)	0.02 (ns)	- 0.16 (ns)	0.38 (ns)	0.32 (ns)	- 0.27 (ns)	- 0.40 (ns)	0.29 (ns)	- 0.16 (ns)	0.05 (ns)	- 0.07 (ns)
PERFNO	- 0.19 (ns)	- 0.11 (ns)	- 0.04 (ns)	- 0.04 (ns)	0.16 (ns)	0.12 (ns)	0.19 (ns)	0.01 (ns)	0.29 (ns)	- 0.01 (ns)	0.19 (ns)	- 0.04 (ns)	0.19 (ns)	- 0.34 (ns)	- 0.05 (ns)	- 0.14 (ns)
PERFNO2	0.09 (ns)	- 0.14 (ns)	- 0.04 (ns)	- 0.09 (ns)	0.34 (ns)	0.07 (ns)	0.44 (ns)	0.05 (ns)	0.06 (ns)	0.07 (ns)	- 0.11 (ns)	- 0.13 (ns)	0.32 (ns)	- 0.53 (.024)	0.03 (ns)	- 0.17 (ns)

significantly positively correlated with self-report measures of extraversion (JEPI, Cattell, JPQ) but are independent of teacher-rated extraversion. The fact that the TRSE and TRSN scales are highly correlated may affect the pattern of correlations for teacher ratings.

The correlations with neuroticism are less clear, significant negative correlations being found for JEPIN and JPQN with retest personality but not with test personality. No significant correlations are found with the lie scales or with psychotism. Positive correlations are, however, found with age. This may be just an effect of strength and stamina. There are no significant correlations with the crime variables.

(G) 2. Behavioural contrast measures

Tables 5.11, 5.11A, 5.12 and 5.12A give the correlations for both extradimensional and intradimensional behavioural contrast measures with personality on test and retest. Concurring with the results of Nicholson (Nicholson and Gray, 1972), behavioural contrast (CORLOGSD) is found to be to a considerable degree negatively related to extraversion as measured by the JEPI. The pattern does not hold up so well for the other measures of behavioural contrast, only 1 out of 8 correlations being significant and positive correlations also appearing. If initial rate is partialled out, since this is also related to extraversion, the correlation between CORLOGSD and introversion is not increased.

Almost all the correlations of the behavioural contrast measures with CATEX and JPQE are negative. There are no significant correlations with teacher-rated extraversion. One may conclude that there is a slight tendency for introversion to be related to behavioural contrast but that this tendency does not hold across all methods of measuring personality.

The impulsivity component of extraversion, as measured by JEPIIMP, does contribute to a relationship with behavioural contrast to a greater extent than does the second-order extraversion factor, JEPIE, for the

intradimensional discrimination. Both when NITRATE2 is partialled out and when it is not, 2 out of 3 correlations are significantly negative. One must remember, though, that JEPIMP is not a measure devised by factor analysis and may only be said to have face validity. No effect is found in the extradimensional discrimination.

Nicholson's finding that behavioural contrast is independent of self-rated neuroticism is borne out in this study but his finding that it is related to teacher-rated neuroticism is not replicated in the first-order correlations. There are no significant first-order correlations with neuroticism. One partialling out initial rate, however, the correlation between ORLOGSD2 and TRSN becomes significantly positive. This correlation is equivalent to that found by Nicholson, i.e. between intradimensional contrast and teacher-rated neuroticism.

There are some significant correlations with the lie scales on retest, but not test. 2 out of 12 correlations are significantly positive, liers hence tending to show more behavioural contrast. The correlations remain constant on partialling out initial rate. Intradimensional behavioural contrast is highly related to the absence of psychoticism both on first-order correlations and on partialling out initial rate for ORLOGSD2. This may reflect the correlations between psychoticism and extraversion. If JPQE2 is partialled out in the correlation between JPQP2 and ORLOGSD2, this becomes - 0.36 (ns). Psychoticism hence affects the amount of intradimensional contrast shown independently of extraversion.

There is, again, a divergence between extradimensional and intradimensional discriminations as far as the developmental measures are concerned. Extradimensional contrast is negatively related to age, RACA and IQ whereas intradimensional contrast is, in the main, positively related to these variables. This may, again, reflect the greater role of perceptual discrimination as opposed to performance in the intradimensional discrimination.

The measures of number of types of crimes committed (NOCRIM and NOCRIM2)

show the opposite pattern of correlations to the developmental variables, extradimensional contrast being positively related to crime and intradimensional contrast being negatively related. The more detailed crime measures do not show significant correlations, although there is a slight tendency for solitary and other-suggested crime to be negatively related to contrast whereas group and self-suggested crime are independent or very slightly positively related to contrast.

3. Discrimination ratio

RATIO and RATIO2 (Tables 5.10 and 5.11) are independent of extraversion but related in a somewhat contradictory fashion to neuroticism. A significant negative correlation is found for JPQN2 with both RATIO and RATIO2 and a significant positive one for TRSN.

(H) 4. Times to various criteria

The correlations for these are set out in Tables 5.13 and 5.14. The time required to reach criterion for baseline training is significantly related to extraversion on one measure (CATEX) and to stability on one measure (TRSN). The time required to learn the discrimination (CRITNO or CRITNO2) is significantly related to introversion on 1 measure (JEPIE) and approaches significance on 4 others (JEPIE2, CATEXK2, JPQE2, CATEX). One may hence say that there is a tendency for length of discrimination training to be related to introversion. It is not correlated with neuroticism, with the lie scales or with psychoticism. It is strongly negatively related to the developmental measures of AGE and IQ. Of the crime measures, the only consistent pattern is for the percentage of crimes committed alone (PERS), which is negatively and significantly correlated with CRITNO. The pattern for TOTALNO or TOTALNO2 with personality etc. is formed from the correlations for BASELINE and CRITNO or ASELINE2 and CRITNO2 respectively, the contribution of CRITNO or CRITNO2 being the greater.

Negative correlations are found, as would be expected, with age and IQ,

that between KNOWNO and AGE being significant. Negative but nonsignificant correlations are found with the number of types of crime committed. Correlations with the more detailed measures of crime are nonsignificant. One may conclude that the boy who tends to be able to describe the discrimination conditions faster tends to be the extravert, older, intelligent boy who may be stable.

The time required to perform the discrimination is not significantly related to many personality variables. The correlations with extraversion are all negative, although only that between PERFNO and JEPIE is significant. Correlations with neuroticism are mainly positive. PERFNO and PERFNO2 are unrelated to either the lie scales or psychoticism. Correlations with age are again negative, although not as high as with KNOWNO. That between PERFNO and AGE is significant. There is, however, a significant positive correlation between PERFNO and NOCRIM. Correlations with group crime are positive, those with solitary crime being negative (1 significant). The boy who learns to perform the discrimination faster tends to be the extravert, older, noncriminal boy, and tends to commit solitary rather than group crime.

A Comparison with the studies of Rushton and Nicholson

Personality measures

It is first useful to compare the means and standard deviations of the personality measures of the present study (JMS) and the Rushton study (JPR) where the measures used are the same. This may be done using the t-test for those variables having a normal distribution and the Mann-Whitney U-test for those variables not having a normal distribution in either or both samples. These last are starred in the table (Table 5.15).

It may be seen that the JMS sample is less neurotic and less prone to lying on the JEPI than the JPR sample. It is also more extravert on the TRS. Since the TRS extraversion and neuroticism scales are correlated in both samples, this may explain the discrepancy between the measures of neuroticism, the JEPI indicating that the younger children were the more neurotic and the TRS giving no significant difference.

Table 5.15 Comparison of the JMS and JPR variables

A. Personality

Variable JMS / JPR	t or U(*)	sig
JEPIE with JEPIE	+ 1.652	NS
JEPIE2 with JEPIE	+ 1.340	NS
TRSE with TRSE	+ 0.073	NS
TRSE2 with TRSE2	+ 2.925	.05
JEPIN with JEPIN	+ 0.103	NS
JEPIN2 with JEPIN	- 1.741	.05
TRSN with TRSN	+ 1.105	NS
TRSN2 with TRSN	+ 1.401	NS
JEPIL with JEPIL	- 3.295	.01
JEPIL2 with JEPIL	- 2.251	.05

(*)

+ represents JMS sample greater

- " JPR " "

Table 5.15 con.

B. Behavioural

	Variables JMS / JPR	t or U(*)	sig
	INITRATE with INITRATE	- 0.625	NS
	NITRATE2 with INITRATE	- 0.826	NS
*	ABSSD with ABSSD	240 (178)	NS(NS)
*	ABSSD2 with ABSSD	214 (166)	NS(NS)
*	PERSD with PERSD	245 (154)	NS(NS)
*	PERSD2 with PERSD	218 (162)	NS(NS)
	CORLOGSD with CORLOGSD	+ 20.240	.001
	ORLOGSD2 with CORLOGSD	- 4.032	.001
	BASELINE with BASELINE	- 7.988	.001
	ASELINE2 with BASELINE	- 4.037	.001
	CRITNO with CRITNO	- 6.402	.001
	CRITNO2 with CRITNO	- 4.716	.001

Figures in brackets represent U calculated with respect to JMS sample.

Table 5.15B con.

	Variables JMS JPR	t or U(*)	sig
	TOTALNO with TOTALNO	- 7.121	.001
	TOTALNO2 with TOTALNO	- 5.055	.001
	KNOWNO with KNOWNO	- 3.120	.01
*	KNOWNO2 with KNOWNO	350 (106)	NS (.02)
	PERFNO with PERFNO	- 4.114	.001
	PERFNO2 with PERFNO	- 3.677	.001
*	RATIO with RATIO	281 (175)	NS (NS)
*	RATIO2 with RATIO	203 (177)	NS (NS)

Values of U less than 127 are significant at .05 level.
" " " " " 114 " " " .02 "
" " " " " 88 " " " .01 "

For 40 df t is significant at .05 level if greater than 1.684
.01 level 2.423
.0005 level 3.551

Behavioural measures

The means and standard deviations for the behavioural variables in the JPR study are given in Table 5.16, in as far as these can be ascertained from his tabulated results of the study. The t- and U- values for the comparison with the results of the JMS study are given in Table 5.15. From this it may be seen that the JMS study sample showed considerably more behavioural contrast (CORLOGSD) than the JPR sample, but took significantly less time to reach each of the discrimination criteria.

In the comparison of the relationships of the behavioural measures of the various studies that follows, the indices (A), (B), etc. refer to the results of the present study discussed above. The Rushton study is termed the JPR study and the Nicholson studies with normal children (Nicholson and Gray, 1972; Nicholson, 1972) and maladjusted children (Nicholson, 1972, 1974) the JNN studies. The populations used in these studies are discussed in the introduction.

Measures of behavioural contrast

(A) The number of subjects showing behavioural contrast varies from 10 out of 17 for the JNN Normal group (Nicholson, 1974) through 20 out of 24 for the JMS intradimensional and 22 out of 28 for the JMS extradimensional discrimination to 15 out of 17 for the JNN Maladjusted group and 19 out of 20 for the JPR extradimensional discrimination. There does not, therefore, appear to be any simple effect of age, type of discrimination training or maladjustment in the proportion of children showing behavioural contrast.

(B) The values of the correlation coefficients between the various measures of behavioural contrast are lower than those in the JMS extradimensional discrimination and more similar to those of the JMS intradimensional discrimination (see Table 5.17). The correlations of the initial rate of response with the measures are also very alike those of the JMS

Table 5.16 Means and standard deviations for behavioural variables n = 20

JPR study

Variable	Mean (and n)	S.D.
INITRATE	51	32
ABSSD	-	-
PERSD	47	11
CORLOGSD	1.54	-
BASELINE	3.95	0.76
CRITNO	9.25	3.1
TOTALNO	13.2	3.0
KNOWNO	3.4	2.3
PERFNO	5.9	3.0
RATIO	89	-

Table 5.17 JPR study. Intercorrelations of behavioural contrast measures

	INITIAL RATE	ABSSD	PERSD	CORLOGSD
INITIAL RATE				
ABSSD	0.48*			
PERSD	- 0.61**	0.28		
CORLOGSD	0.66***	0.38	0.88***	

* $p<.05$
** $p<.01$
*** $p<.001$

intradimensional discrimination, as is the effect of partialling out the initial rate. This produces much higher, significant, positive correlations between the measures - a similar picture to that obtained in the JMS extradimensional discrimination with or without partialling out the initial rate.

(C) The JNN studies found mean rates of response for behavioural contrast (CORLOGSD) of 1.71, S.D. 0.31, in normal children (mean age 9.35 years) and 2.21, S.D. 0.49, in maladjusted children (mean age 13.32 years) in an intradimensional discrimination task using the same stimuli. Rushton (see Table 5.16) found a mean value for CORLOGSD of 1.54 for normal children (aged 7 to 11 years) in an extradimensional discrimination using the same stimuli. Since the means in the JMS study are 2.21 for the extradimensional discrimination and 1.33 for the intradimensional discrimination, it seems likely that the drop in contrast shown in the JMS study is due to the second attempt at discrimination learning producing less frustration than the first and hence less contrast rather than to any difference between extra- and intradimensional discriminations. It may also be noted that the present study (extradimensional discrimination) has produced a mean contrast value equal to the highest previously shown. This tends to cast doubt upon the hypothesis that contrast, being a frustration effect, decreases with age. It also makes more unlikely Nicholson's ascription of the large amount of contrast shown by his maladjusted sample as being due to their maladjustment since the same amount of contrast is shown by the normal, older boys in the present study. It is true, however, that Nicholson's sample received intradimensional discrimination training, which may produce less contrast, and that the present sample were more neurotic than the standardization samples for the personality tests.

(D) Table 5.16 presents the means and standard deviations for the behavioural variables in the JPR population. It can be seen that the mean

discrimination ratio in his data is very much lower than that for the JMS extra- or intradimensional discriminations. The time required to learn the discrimination (CRITNO) is significantly longer in the JPR study. This consists primarily in an increase in performance time rather than verbalization time, although both are increased. The increase in KNOWNO may reflect the greater difficulty younger children have in learning discriminations. The increase in PERFNO is not accompanied by an increase in the amount of behavioural contrast shown between the JMS and JPR studies. It may also reflect a learning difficulty.

Measures of discrimination learning

(E) The correlations between the various times to criteria for the JPR data are given in Table 5.18. It may be seen that single-stimulus training (BASELINE) does not have any effect on the values for total time (TOTALNO), discrimination learning time (CRITNO) providing almost all the variance. As in the JMS studies, BASELINE is not related to any of the other times to criteria. The other significant correlations are, as in the JMS study, definitional in nature. Hence the time spent in baseline training does not affect any of the subsequent times spent in learning the discrimination.

(F) Description time (KNOWNO) is correlated negatively, though non-significantly, with performance time (PERFNO). The correlations of the various times to criteria with behavioural contrast are presented in Table 5.19 for the JPR study. It may be seen that the correlations of KNOWNO and PERFNO with CORLOGSD are nonsignificant. CRITNO and TOTALNO are, however, significantly related to changes in the response rate to S^{Δ} as in the JMS experiment. In the JPR study, as in the JMS study, the amount of baseline training does not affect the amount of contrast shown. In both studies, therefore, the amount of behavioural contrast shown is genuine.

Table 5.18 JPR study. Intercorrelations of times to various criteria

	INITRATE	BASELINE	CRITNO	TOTALNO	KNOWNO	PERFNO
INITRATE						
BASELINE	- 0.09 (NS)					
CRITNO	- 0.39 (NS)	- 0.20 (NS)				
TOTALNO	- 0.42 (NS)	0.05 (NS)	0.97 (.001)			
KNOWNO	- 0.40 (NS)	0.07 (NS)	0.41 (NS)	0.43 (NS)		
PERFNO	- 0.07 (NS)	- 0.25 (NS)	0.71 (.001)	0.66 (.001)	- 0.35 (NS)	

Table 5.19 JPR study. Times to various criteria with changes in response rate to S^D and S^Δ.

	ABSSD	PERSD	CORLOGSD	ABSSO	PERSO	LOGPERSO
BASELINE	- 0.22 (NS)	- 0.06 (NS)	- 0.29 (NS)	- 0.10 (NS)	0.20 (NS)	0.21 (NS)
CRITNO	- 0.39 (NS)	0.26 (NS)	0.16 (NS)	- 0.45 (.050)	- 0.46 (.048)	- 0.47 (.044)
TOTALNO	- 0.45 (.050)	0.25 (NS)	0.09 (NS)	- 0.49 (.034)	- 0.42 (NS)	- 0.42 (NS)
KNOWNO	- 0.36 (NS)	0.27 (NS)	0.19 (NS)	- 0.37 (NS)	- 0.18 (NS)	- 0.18 (NS)
PERFNO	- 0.12 (NS)	0.06 (NS)	0.01 (NS)	- 0.18 (NS)	- 0.34 (NS)	- 0.34 (NS)

Correlations of behavioural contrast with personality and developmental measures

1. Initial rate

(F) Table 5.20 gives the correlations of INITRATE with personality for the JPR study. INITRATE is correlated with introversion in this study as opposed to the correlations with extraversion in the JMS study, although none of the correlations are significant.

As in the JMS studies, the JPR correlations with neuroticism and the lie scales are nonsignificant. A significant positive correlation is again found with age.

2. Behavioural contrast measures

(G) The correlations of behavioural contrast with extraversion in the JPR study do not show the same trends as those in the JMS and JNN studies. No significant correlations are found.

For neuroticism, the JNN correlation of teacher-rated neuroticism with behavioural contrast is upheld in the JPR data. This is only true in the JMS data if NITRATE2 is partialled out in the intradimensional discrimination. The independence of behavioural contrast from self-rated neuroticism is shown in all three studies. The correlations of age with behavioural contrast are in the main, negative (JNN, JMS extradimensional, JPR), although significant figures are only found in the data of JNN.

3. Measures of discrimination learning

(H) The correlations of the various times to criteria with personality for the JPR study are set out in Table 5.20. No significant correlations are found with BASELINE, a similar result to that of JMS. The whole of Table 5.20 is, in fact, remarkable for its lack of significant correlations, compared to that of JMS. The only tendency apparent is that of CRITNO, TOTALNO and PERFNO to be related to stability on the two self-report neuroticism measures. This does not appear in the data of JMS.

Table 5.20 JPR study. Times to various criteria with personality. n = 20

	JEPIE n = 20	CATEX n = 20	TRSE n = 20	JEPIN n = 20	CATANX n = 20	TRSN n = 20	JEPIL n = 20	AGE n = 20	RQ n = 20
INITRATE	- 0.40 (NS)	- 0.19 (NS)	- 0.17 (NS)	- 0.14 (NS)	0.10 (NS)	- 0.04 (NS)	0.20 (NS)	0.45 (.046)	- 0.13 (NS)
BASELINE	0.03 (NS)	0.28 (NS)	0.16 (NS)	0.18 (NS)	- 0.11 (NS)	0.16 (NS)	- 0.24 (NS)	- 0.18 (NS)	- 0.02 (NS)
CRITNO	0.00 (NS)	0.05 (NS)	0.17 (NS)	- 0.32 (NS)	- 0.68 (.002)	- 0.16 (NS)	0.23 (NS)	- 0.22 (NS)	0.11 (NS)
TOTALNO	0.01 (NS)	0.12 (NS)	0.21 (NS)	- 0.28 (NS)	- 0.72 (.001)	- 0.12 (NS)	0.17 (NS)	- 0.27 (NS)	0.11 (NS)
KNOWNO	0.04 (NS)	- 0.13 (NS)	0.18 (NS)	0.02 (NS)	- 0.19 (NS)	0.17 (NS)	- 0.08 (NS)	- 0.11 (NS)	0.17 (NS)
PERFNO	- 0.04 (NS)	0.14 (NS)	0.07 (NS)	- 0.35 (NS)	- 0.57 (.008)	- 0.28 (NS)	0.30 (NS)	- 0.13 (NS)	- 0.02 (NS)

Discussion

The present study and that of Rushton have replicated the work of Nicholson (1972), Waite and Osborne (1972) and Terrace (1974) in showing that positive behavioural contrast occurs in humans. The number of subjects showing behavioural contrast, however, does not seem to show any systematic relation with age, type of discrimination training or maladjustment. As far as the problem of controls is concerned, the present study and that of Terrace are the only ones who attempted to run a control group or return the subjects to baseline training after having learnt the discrimination. The success of the second control measure in the present study indicates that the phenomenon obtained was genuine but neither method is very successful in acting as controls for the magnitude of behavioural contrast shown. The present study and that of Rushton, however, have found that the amount of baseline training given (BASELINE) is independent of the magnitude of behavioural contrast shown. It would, therefore, seem that the measures used in these studies are measures of behavioural contrast.

Nicholson, Terrace, Rushton and the present study have all used equivalent measures of the amount of behavioural contrast shown, either the percentage increase in rate of response over baseline rate of response (PERSD) or the logarithm of the percentage (CORLOGSD). The inter-correlations of the measure of contrast used in the present study and the intercorrelation in the Rushton study are almost all significant although they reach a high level only in the extradimensional discrimination in the present study (JMS).

The present study poses problems of interpretation not considered in studies using animals. This is due to the intradimensional discrimination being given after the extradimensional discrimination. Any differences between the two may hence be a result either of a practice effect or of the nature of the discriminations plus the effect of the generalization test. The differences found in the behavioural measures may be summarized as follows:

1. The magnitude of behavioural contrast shown was significantly lower in the intradimensional discrimination.

2. There was no correlation between contrast (CORLOGSD) shown in the extradimensional discrimination and that shown in the intradimensional discrimination.

3. In the extradimensional discrimination, the discrimination time (CRITNO) was significantly positively correlated with contrast and negatively correlated with changes in S^{Δ}. These results were due more to performance time (PERFNO) than to description time (KNOWNO). In the intradimensional discrimination, discrimination time was independent of contrast and positively related to changes in rate of response to S^{Δ}. Description time was positively related to behavioural contrast and to changes in S^{Δ}. Performance time was not related to either.

These three differences may be explained if two additional assumptions are made. The first is that the child learns to 'cope with' frustration during the first, extradimensional discrimination and so tends to show less frustration in the second task. In the sense that the child has already learnt to stop responding to S^{Δ} once, of course, the second discrimination will be easier. The second is that the stimuli used in the second intradimensional discrimination are harder to distinguish than those used in the first discrimination. Taking both assumptions together, this means that the description part of the second discrimination will be harder and the performance part easier than the corresponding parts of the first discrimination. Evidence for the first assumption is very scarce, since the effects of giving repeated frustration tasks in either children or humans have not been previously studied. There are indications from the unpublished work of Rawlins (personal communication) that when medial septal lesioned rats and controls are given several tasks considered to induce and show the effects of frustration, the amount of the effects decreases as more tasks are given. Evidence for the second assumption occurs in the present study and that of Rushton. In the present study the description and performance times were

longer in the intradimensional than the extradimensional discrimination. The discrimination times in the Rushton study, which used younger children, were all significantly longer than those in the present study. Discrimination time in the present study is strongly negatively related to the developmental variables, with description time accounting for rather more of the variance than performance time. These results tend to show that the measures of times taken to the discrimination criteria are related to the developmental variables and that, although they are very stable properties of the individual, they do vary in such a manner that the intradimensional discrimination would appear to be harder to discriminate cognitively than the extradimensional discrimination.

Taking these two assumptions then, the first difference, that the magnitude of behavioural contrast shown was significantly lower in the intradimensional discrimination may be ascribed to a practice effect. This may also be the case for the second difference, that there was no correlation between contrast shown in the extradimensional discrimination and that shown in the intradimensional discrimination, since the absolute increase in response rate measure of behavioural contrast does have a small positive correlation between the two discriminations. The second difference, however, does tend to show that either the practice effect is very large, as is indicated by Rawlins' results with rats, or that the magnitude of behavioural contrast is not a unitary measure. In the latter case, it is difficult to hold the position that behavioural contrast in general is an adequate measure of susceptibility to frustrative nonreward. This question will be discussed in the final chapter. The third difference, concerning the relative contributions of description and performance time to the amount of contrast shown, may be explained by taking the second assumption. With this, performance time in the extradimensional discrimination would be expected to contain most of the frustration-producing responses to S^{Δ}. In the intradimensional discrimination, responding to S^{Δ} would be expected to be

more equally divided between description time and performance time, or even concentrated in description time since the stimuli are considered to be harder to distinguish. From this one would predict that, in the extradimensional discrimination, PERFNO would be positively related to contrast whereas, in the intradimensional discrimination, KNOWNO would be positively related to contrast. This was found to occur.

Correlations with personality

From Gray's theory of personality and the results of Nicholson, one would predict that, if behavioural contrast is a measure of susceptibility to frustrative nonreward, the magnitude of behavioural contrast shown should correlate positively with introversion and neuroticism and negatively with the developmental variables.

Taking the developmental variables first, the fact that the magnitude of behavioural contrast shown was significantly greater in the extradimensional discrimination of the present study than in the extradimensional discrimination of the Rushton study, which used younger children, tends to contradict the prediction. If a practice effect was occurring in the intradimensional discrimination of the present study, then it is not possible to compare this with the Nicholson study. Within each study, the effects of age were variable. In the JMS extradimensional study, contrast was negatively related to the developmental measures whereas, in the intradimensional study, it was positively related. This last, however, may reflect the greater difficulty of this discrimination. The Rushton study finds negative nonsignificant correlations between contrast and the developmental measures. Nicholson's position is hence largely supported.

On introversion, the results are more confused. All studies agree that there are no significant correlations with teacher-rated extraversion. The measure of self-reported personality that Nicholson used, the JEPI, gives some moderate but not significant correlations with introversion in the JMS study but none in the Rushton (JPR) study. The other measures of

personality, the Cattell HSPQ or CPQ and the Eysenck JPQ, again give some significant correlations between introversion and contrast in the JMS study but the picture is not homogeneous as with the JEPI. The significant correlations are mainly found with the JMS intradimensional discrimination. Nicholson used an intradimensional discrimination.

Again, on neuroticism, the exact correlation found by Nicholson, that between teacher-rated neuroticism and CORLOGSD, is also found in the JMS intradimensional study if initial rate is partialled out, and in the extradimensional JPR study. Behavioural contrast, however, is independent of self-rated neuroticism in all three studies. In an earlier chapter, however, it was concluded that the Teachers' Rating Scale was not a valid instrument for measuring extraversion and neuroticism separately. For both introversion and neuroticism, therefore, the results of the Nicholson study may be considered replicated as far as the precise measures used in that study are concerned, but the results do not generalize to other measures of personality.

Correlations with Crime

In the present study, the correlations of contrast with crime again reflect the discrepancy between the extradimensional and intradimensional discriminations. JMS extradimensional contrast is positively related to crime and JMS intradimensional contrast negatively related. This will be discussed in the final chapter. No very significant results are found with the more detailed crime measures.

Measuring susceptibility to frustrative nonreward

Perhaps the most striking result of the present study on behavioural contrast is the stability of the times required to reach various criteria and of the baseline rate of response as opposed to the instability of the magnitude of behavioural contrast shown. If behavioural contrast is a measure of susceptibility to frustrative nonreward, as is indicated by the results of the study, then the possibility arises that this susceptibility is not a

constant characteristic of the individual or that the phenomenon is the product of two or more sources of variance. The first need not run counter to the theory of Gray, since although there it is presumed that the reward and punishment centres of the brain function in a biological and stable way, the inputs to the system, as to how much reward, punishment, etc., has been experienced, will obviously depend upon the previous reinforcement history of the individual. If two individuals perceive a reward or lack of reward in different ways, i.e. if Green Shield Stamps have a different value for these individuals, then their susceptibility to frustrative nonreward as measured by their response to tasks involving Green Shield Stamps will differ according to their subjective perception of reward as well as their 'biological' susceptibility to frustrative nonreward. It is unfortunately the case that neither the autoshaping nor the frustration experiments on behavioural contrast in animals provide any clues as to how to deal with the magnitude of behavioural contrast shown. It must be said that the present study, although replicating the results of the Nicholson study, does not provide much further support for his theory. It is also the case that the correlations with personality are not sufficiently high for the measure to be recommended as a useful measure of susceptibility to frustrative nonreward in children, at least until there is more work on the processes involved in producing behavioural contrast. The question of the processes involved in the production of behavioural contrast will be discussed in the final chapter in relation to mean shift.

CHAPTER 6

PEAK SHIFT, MEAN SHIFT AND GENERALIZATION OF REWARD

If successive discrimination training is carried out between two stimuli which lie on the same stimulus dimension, for example, the dimension of orientation (an intradimensional discrimination) then the subsequent pattern of responses to a series of non-reinforced stimuli also on the same dimension (a generalization test) may show a peak shift. In this, the peak of the curve drawn between the rates of response to the stimuli in the generalization test is displaced away from the positive discriminative stimulus (S^D) in the direction away from the negative discriminative stimulus (S^Δ). This was first shown by Hanson (1959). He trained pigeons on the dimension of wavelength of light on a variable interval-extinction schedule of reinforcement and gave generalization tests both before and after discrimination training. He found that the postdiscrimination gradient showed initially zero rate of response to the region of S^Δ, that there was an increase in response rate to S^D (behavioural contrast) and that peak shift occurred, the magnitude of which increased as the physical difference between the two stimuli decreased. Thomas (1962) replicated Hanson's experiment using three different drive levels (states of deprivation of the animal of 60, 70 or 80 per cent of ad-lib body weight) and found that peak shift occurred gradually during the acquisition of the discrimination regardless of drive level.

Peak shift has been shown to occur using many different schedules of reinforcement, stimulus dimensions and species. Purtle (1973) has provided a comprehensive survey of the conditions under which peak shift may occur. Here I shall summarize some which have a bearing on the theories which purport to account for the production of peak shift. It is not necessary for S^Δ to be correlated with extinction for peak shift to occur. Guttmann (1959)

suggested that, since different VI schedules produced different generalization gradients, a VI1min.-VI5min. schedule would show a peak shift. This was found to be the case. This shows that the negative discriminative stimulus may be negative only in relation to the positive discriminative stimulus. Frieman and Thomas (1970) used a chained reinforcement schedule and found a peak shift occurring away from the stimulus furthest from food. Peak shift may hence be shown using conditioned reinforcement as well as unconditioned reinforcement. Peak shift has also been obtained using different reinforcement durations (Mariner and Thomas, 1969). Terrace (1968) and Grusec (1968) found that punishment (shock) in S^{Δ} produced peak shifts comparable to those shown using extinction in S^{Δ}. Grusec (1968) and Gerry (1971) found that shock increased the magnitude of an existing peak shift produced on a variable interval 1 min.-extinction schedule. Dimensions used include the wavelength of light, auditory intensity, frequency of auditory clicks, frequency of auditory tones, orientation and floor tilt. Stevenson (1966) has found that reducing the stimulus range, changing the number and spacing of stimuli and omitting S^{Δ} from the generalization test did not greatly affect the production of peak shift. Omitting S^{Δ} also shows that the shift is conditioned rather than unconditioned, since peak shift has been shown to occur at least 24 hours after the subject has been exposed to S^{Δ}. Peak shift is, however, affected by the number of generalization tests administered and the amount of training (see Purtle, 1973). Species used include pigeons, on which most of the work has been done, rats, guinea pigs, goldfish, chickens and humans.

Although peak shift has been produced using many different stimulus dimensions, in some studies the shift shown may have been due to the peculiar properties of the dimension chosen. Perhaps the most common dimension is that of the wavelength of light. With human subjects this poses obvious problems. The spectrum, though physically continuous, is psychologically categorical. That this may be true for animals as well was first shown by

Blough (1961). He used single stimulus training with three wavelengths, 530, 550 and 570 nanometers. Pigeons in the first group responded more on the short-wavelength side of S^D, pigeons in the middle group on the long-wavelength side and pigeons in the last group gave a symmetrical gradient. Wright and Cumming (1971), using a matching-to-sample paradigm, found that the pigeon makes three qualitative spectral divisions with response peaks at 500 nanometers, 570 nanometers and 640 nanometers, and breaks at 540 nanometers and 595 nanometers. Generalization hence seems to take place towards the peak of the spectral division. Similar evidence has been found in bees (von Frisch, 1964), monkeys (Ganz, 1962) and humans (Bornstein, 1974).

For humans it has been considered (Purtle, 1973) that for the wavelength dimension, the asymmetrical response to the generalization stimuli after discrimination training which may be termed a peak shift is perhaps due to verbal labelling rather than just perceptual categories. If a hue on the boundary of two verbal categories is presented and the subject asked to remember it, subsequent recognition testing with various wavelengths results in asymmetric generalization. Verbal mediation alone, however, cannot account for these shifts. Tomie and Thomas (1974) tested whether shifts occur within or between hues. Using groups given different ranges of stimuli on generalization after being asked to remember a stimulus lying within all the ranges, they found that the amount of displacement produced depended on the range of the stimulus. There was no reason to believe that the verbal label originally produced to the first stimulus was different from the different groups of subjects. Verbal labelling, however, may be of importance in ambiguous cases, such as blue-green stimuli, but such problems can be discovered by using a prediscrimination generalization test.

Similar problems exist with the dimension of line-tilt if vertical or horizontal lines are used as either S^D or S^Δ. There is considerable evidence to suggest that both vertical and horizontal lines are conceptual categories, even to the extent that lines tilted up to 10 degrees off

axis are consistently perceived and reproduced as being either vertical or horizontal (see Bornstein, 1974). As yet, however, no single stimulus training studies have been performed with humans to investigate the degree of verbal mediation as opposed to adaptation which may be taking place. Another problem with line tilt is that lines orientated at equal but opposite angles to the vertical are prone to confusion (Corballis and Beale, 1970). This 'mirror-image' effect may possibly suppress peak shift if S^D and S^Δ are mirror-images of each other.

It has been thought that peak shift is due entirely to properties intrinsic to the stimulus dimensions used, such as perceptual and linguistic categorization (Purtle, 1973). Peak shift and especially mean shift, which is the shift in the mean of the frequency distribution of the generalization gradient away from S^D in the direction away from S^Δ, have been shown, however, using continua on which it is unlikely that any categorization could occur. Nicholson and Gray (1971, 1972) used line tilt with children, S^D and S^Δ being a rocket ship oriented at 32.5 degrees to left and right of vertical, the direction of S^D being left for half the children and right for the other half. Since the angle between stimuli in the generalization test was 13 degrees, no vertical/horizontal confusion could occur. Their failure to find peak shift in all their subjects may have been due to the mirror-image problem, especially since they used young children (7 to 10 years) in whom the problem is more acute. They did, however, find mean shift in almost all their children (14 out of 17). Baron (1973) trained young adults using a pure tone continuum. There is evidence that human subjects find it difficult to perform absolute judgements on tones and hence to label them. He found area shifts (similar to mean shifts) in his groups trained with 1,300Hz as S^D and either 1,000, 1,200, 1,400 or 1,600Hz as S^Δ, but no area shift in the groups with the same S^D and white noise (extradimensional discrimination) as S^Δ or the group given single-stimulus training throughout. Shifts were also inversely related to the distance between S^D and S^Δ on the

stimulus continuum. It is likely that subjects able to label the tones on an absolute basis (those possessing 'absolute pitch') would produce different generalization gradients which might vary according to the closeness of the S^D used to the centre of one of their conceptual categories of tone labelling within octaves, and might contain peak as well as mean shifts. Nevertheless, shifts have been produced with humans under conditions in which either perceptual or verbal categories are unlikely to be present. It is unfortunately the case that most of the studies of the peak shift have used pigeons and the wavelength of light continuum. In the discussion of the theories put forward to account for peak shift which follows, it must be remembered that perceptual categorization may have occurred in such experiments.

The first theories put forward to account for peak shift were those of Pavlov and Spence. Using the Pavlovian notion of excitatory and inhibitory stimuli, the excitatory or inhibitory processes established to these stimuli generalizing to other, similar stimuli, Spence (1937) describes the formation of a discrimination in terms of two developing gradients of excitation and inhibition, centred on S^D and S^Δ. The gradient of inhibition is postulated to be both lower and steeper than that of excitation so that the post-discrimination generalization gradient, derived by algebraic summation of the two gradients, would be expected to be displaced away from S^D in the direction away from S^Δ. This is also the definition of peak shift. This process of summation, however, must mean that the rate of response to the positive stimulus must decline as the discrimination proceeds. That the opposite is the case is shown by the phenomena of behavioural contrast and Pavlovian induction. Although Spence used the concept 'frustration' to describe inhibition, he did not conceive the process to have an energizing as well as a disruptive function. Spence's theory is, however, able to predict that the amount of peak shift shown should be inversely related to the distance between S^D and S^Δ along the stimulus continuum.

Calculation of the proposed independent excitatory and inhibitory gradients and comparison of these with experimental results (e.g. Hearst, 1968) shows that the experimental gradients have peaks higher than those of the excitatory gradients, let alone the summed gradient. They are also considerably more peaked than the summed gradients. It is, however, possible to calculate relative postdiscrimination generalization gradients from a combination of the relative excitatory and inhibitory gradients which agree to a large degree with the experimental gradients, although the experimental gradients remain somewhat steeper than the theoretical gradients. This last may, however, be due to the occurrence of transient contrast effects during the generalization test (Donahoe et al., 1970). One explanation of peak or mean shift may hence be a modification of Spence's theory to encompass the relational nature of the discrimination. In this case, the stimulus conditions determining peak shift must be such as to allow perceptual integration along a dimension of the subject. Experiments in which S^{Δ} is correlated with a schedule of reinforcement less favourable than that of S^{D} would be predicted to produce inhibitory gradients around S^{Δ} and hence peak or mean shift. As a corollary, any procedure which does not produce an inhibitory gradient about S^{Δ} should not produce peak shift. Although Terrace (1964, 1966a) has argued that errorless discrimination learning does not produce either inhibitory gradients around S^{Δ} or peak shift, it does not seem to be possible to test this hypothesis directly. Inhibitory gradients may only properly be measured using an extradimensional discrimination, so that there is no contamination of responding around S^{Δ} by responding around S^{D}. Lyons (1969) and Karpicke and Hearst (1975) have both found inhibitory gradients around S^{Δ} using errorless discrimination learning by this method. It is not, however, possible to presume that results obtained on an extradimensional discrimination may be transferred to an intradimensional discrimination. Although peak shift has not as yet been found with errorless learing, it is not possible to say definitely that the S^{Δ} in this paradigm does not exert inhibitory control. In relational terminology, though,

the errorless procedure does not allow relational responding to S^D and S^Δ.

It is necessary, at this stage, to separate out three slightly different aspects of relational theory. One proposes that it is the formation of an inhibitory gradient at S^Δ which produces peak shift; this encompasses the notion that S^Δ is inhibitory and so possibly aversive (Terrace, 1966a). The second proposes that it is necessary that S^D and S^Δ should be perceptually related for peak shift to occur and so responding to both is necessary (Purtle, 1973). The third, also put forward in Purtle (1973), goes somewhat further in linking peak shift to the phenomenon of transposition. Stimuli far removed from S^D (in a direction away from S^Δ) are successfully discriminated as being different from S^D and so are accompanied by lower rates of response. Stimuli far removed from S^Δ (away from S^D) are discriminated as being different from S^Δ and so may be linked with increased responding. The whole time, the pigeon is attempting to maintain the S^D-S^Δ separation or relation during generalization testing.

The second of these is negated by the failure of simultaneous discrimination training to produce a peak shift. The possibility of responding to S^Δ and developing a comparison between S^D and S^Δ occurs as well in simultaneous as in successive training. Grusec (1968) has also shown that after errorless training, which produced no peak shift, the addition of response-independent shock to S^Δ then gave a peak shift on subsequent discrimination training. Shock has also been shown to yield peak shifts comparable to those yielded by extinction, to increase the magnitude of existing peak shift and to produce marked recovery of peak shift eliminated through extended discrimination training (Grusec, 1968; Terrace, 1968; Gerry, 1971). The effects of shock indicate that responding to S^Δ is not a necessary prerequisite for the production of peak shift.

The third hypothesis, that the occurrence of peak shift is due to relational responding to the S^D-S^Δ difference when presented with generalization stimuli must require memory of the S^D-S^Δ difference and the

absolute position of S^D or S^Δ given the experiment by Stevenson (1966). He showed that the necessity for successive presentation and stimulus comparison occurred during discrimination training rather than generalization testing. Ellis (1970) has developed this further by showing that both contrast and peak shift occurred if an S^Δ trial was followed by an S^D trial but contrast without peak shift occurred if an S^D trial was followed by an S^Δ trial. The S^Δ-S^D sequence is hence necessary to peak shift. Postdiscrimination generalization gradients were obtained without presenting either S^Δ or the stimuli adjacent to it. Peak shift was still obtained. Honig (1962) found that peak shift occurred concurrently with transposition. This is the phenomenon that, after learning a discrimination between two stimuli along a dimension, the subject will choose the stimulus furthest along the dimension towards the pole defined by the previous S^D if the stimuli are transposed along the dimension. This, however, only held for successive discrimination training. There is no necessary relation between preferring a stimulus and responding more strongly to it. Subsequent results have not supported Honig's conclusions. Transposition has been found to occur with simultaneous discrimination training (see Mackintosh, 1974). The discrepancy may be explained by procedural differences. In Honig's experiment, the choice tests were given after the single-stimulus tests to measure peak shift. In the experiments giving divergent results, separate groups of subjects were used to measure transposition and peak shift. If peak shift occurs following successive training, which provides a smaller possiblility of using relational cues than does simultaneous training, then a subsequent transposition test will be biased by the generalization test and transposition will be seen to occur. Simultaneous training may well result in little inhibition round S^Δ, and hence in no peak shift. Since relational cues are available during simultaneous training, transposition will occur. It seems that transposition is no explanation for peak shift but the processes involved in peak shift may be an explanation for some instances of transposition.

One is left with the first hypothesis, that peak shift is due to S^{Δ} becoming an inhibitory stimulus relative to S^{D}. This is congruent with the difference between simultaneous and successive discrimination training and with the effect of shock. It also encompasses the results of experiments showing that it is not the distance between S^{D} and S^{Δ} per se which influences the magnitude of shift shown but the difficulty of discriminating between S^{D} and S^{Δ}. Thomas (1962) found that S^{D}-S^{Δ} differences only exerted their effect via the amount of training demanded by the relative ease or difficulty of the discrimination.

The simple statement, that S^{Δ} becomes an inhibitory stimulus with respect to S^{D}, is not an explanation of the processes lying behind the inhibition. It has been extended by Terrace and by Gray and Smith who suggest that S^{Δ} becomes an aversive stimulus and that peak shift is produced, like behavioural contrast, from the directive and energizing effects of frustration from exposure to and responding to S^{Δ}.

Frustration theory is discussed in the last chapter. One of its assumptions is that inhibitory control develops to S^{Δ}. If S^{D} and S^{Δ} are on the same stimulus dimension, then the development of an inhibitory gradient round S^{Δ} will tend to produce a peak shift as described below.

Frustrative nonreward is considered to have both the function of decreasing the probability of performance of the reinforced response and increasing the vigour of performance of the response if it occurs. These two processes interact in a multiplicative fashion. If there is only one measure of the outcome of the multiplication, which is the case in a peak shift experiment, the model of Gray and Smith predicts that, when frustration is high, the net outcome will be a decrease in the number of observed responses; when it is very low, there will be no change; and, at some intermediate value, there will be a maximum number of responses which will be greater than that observed in a nonfrustrative baseline condition. The degree of generalized frustration produced by S^{D}, according to the model, is a joint function of

a) the discrepancy between received and expected reward in S^{Δ} and b) the distance between S^{D} and S^{Δ} along the continuum. Given certain combinations of the values of these two parameters, the maximum response rate is predicted to occur at a stimulus removed from S^{D} in the opposite direction to S^{Δ}, i.e. peak shift should occur. It may also be predicted (Gray & Smith, 1969) that the amount of peak shift shown should depend on the separation of the stimuli on the dimension. With increasing stimulus separation, peak shift should be reduced such that eventually the peak might move away from S^{D} in the direction of S^{Δ}. The study of Hanson (1959) supports this prediction. There is considerable other evidence to support the frustration interpretation of peak shift: the similar effects of punishment and non-reward on the production of and increase in peak shift, the errorless discrimination learning studies, the successive versus simultaneous discrepancy and the production of peak shift using aversive schedules of reinforcement. In Honig's experiment, successful successive discrimination learning required up to seven times as many responses to S^{Δ} than did successful simultaneous discrimination learning. If it is assumed that responses to S^{Δ} become aversive, the successive procedure generates more aversiveness and so more peak shift than the simultaneous procedure. Learning the successive task requires learning 'respond if S^{D}, don't if S^{Δ},' whereas simultaneous and errorless procedures require only 'respond to S^{D}' (Bloomfield, 1969). The inhibitory gradients round S^{Δ} (extinction) found by Terrace (1966a), using training with errors are also similar to those obtained using response-contingent shock in S^{Δ}.

Delayed reinforcement in one component of a multiple VI1min.-VI1min. schedule has also been shown to produce peak shift (Richards, 1973), as has blackout (Wildemann and Holland, 1973). These are aversive conditions which also produce behavioural contrast. Chlorpromazine, a tranquillizer, abolishes peak shift shown on both line-tilt and floor-tilt dimensions. It may well have the effect of making responding to S^{Δ} less aversive (Lyons et al., 1973).

Perhaps a more direct test of whether S^{Δ} is aversive is provided by Thomas (1966). He found that pigeons would learn a new response to avoid returning to the component furthest from reinforcement in a chained schedule of reinforcement. Such a schedule also produces peak shift. This suggests that S^{Δ} is directly aversive but, unfortunately, Thomas' results may also be due either to prolonging the duration of the component nearest primary reinforcement or a desire for stimulus change. These problems have been resolved by Terrace (1966a) for behavioural contrast but the equivalent experiment has not been done for peak shift.

The effects of extended training, which would be expected to produce a decrease in peak shift, according to Terrace (1966b), are unfortunately not clear. Gerry (1971) and Terrace (1966b) report gradual loss of peak shift with extended duration of training. On the other hand Dukhayyil and Lyons (1973) and Lawrence (1973) found no decrease. It may be that the peak shift depends on the precise slope of the inhibitory gradient around S^{Δ}. If this is either too flat or too steep, no peak shift will appear. The evidence on change in inhibitory gradients with continued training is also confused - Farthing and Hearst (1968) reporting that they become steeper and Yarczower (1970) that they become flatter.

The weight of evidence on the occurrence of peak shift favours a provisional interpretation in terms of an aversive S^{Δ} with inhibitory stimulus control properties. The aversion may be due to frustrative non-reward (if S^{Δ} is correlated with extinction) or punishment upon responding to S^{Δ}.

Mean Shift

It is notable that studies with humans have not succeeded to date in producing peak shift in all subjects. A more sensitive measure of the shift was suggested by Terrace (1966a) and developed by Grusec (1968). In this the generalization gradient is treated as a frequency distribution and the shift in the mean of the distribution used as a measure of peak shift. This was also used by Nicholson (Nicholson and Gray, 1971, 1972; Nicholson, 1972)

in his experiments on children. A similar measure, area shift, was used by Baron (1973) with adults using a tone continuum and Dysart et al., (1974) with pigeons. The sensitivity of the measure of peak shift is obviously dependent on the interval between the stimuli given in the generalization test. If the stimuli are say 30 degrees apart on a dimension of orientation, one would not expect to find peak shift (e.g. Landau, 1968). Either peak or mean shift has been found in every published study using humans which has used a sufficiently large number of generalization stimuli and a dimension which does not permit of conceptual labelling (see Baron, 1973).

It may be argued, however, that the mean shift measure does not reflect the same processes as Hanson's original peak shift measure (Hanson, 1959), since a mean shift can be produced by a depression of responding at stimuli located between S^D and S^Δ as well as by an elevation of responding beyond S^D on the opposite side of the stimulus continuum from S^Δ, whereas the peak shift is unaffected by the former of these two possible effects of discrimination training (Nicholson, 1972). It is hence necessary to examine the relations between mean shift and measures of responding at the stimulus values beyond S^D in the direction away from S^Δ and at the stimuli between S^D and S^Δ. In Nicholson's data, although mean shift was greater the lower the response rate between S^D and S^Δ and the higher the response rate beyond S^D, which suggests the similarity of his mean shift and peak shift measures, the relationships were weak and not statistically significant. It may be said though that mean shift is hence not primarily a measure of the depressant effects of exposure to S^Δ oh responding in the presence of stimuli close to S^Δ. In Nicholson's study, both mean shift and peak shift appear to reflect responding beyond S^D in the direction away from S^Δ. It is interesting that the seven subjects who showed peak shift had mean shift scores within very close limits, those not showing peak shift but producing mean shift having scores on both sides of this range. The relationship between mean shift and peak shift appears to be curvilinear.

Generalization of reward

Nicholson has taken another measure from the generalization test, that of the degree of generalization to the stimuli round S^D. This may be considered to be a measure of generalization of an approach response. From Gray's (1970) model of personality, Nicholson and Gray have argued that the more susceptible a subject is to reward (ex hypothesi the more neurotic and extraverted he is), the more generalization he should show. They have thus proposed the use of generalization as a measure of susceptibility to reward.

Early experiments mostly used inadequate measures of generalization which included an obvious intellectual component such as Osgood's semantic differential. London (1958), however, in a comparison of normal and maladjusted boys, found that quality of discrimination performance improved with advancing chronological age and that maladjusted boys who were more neurotic than normals, tended to overgeneralize. In Nicholson's study with normal children (Nicholson and Gray, 1972; Nicholson, 1972), he found that generalization was significantly correlated with a teacher's rating scale measure of neuroticism and with extraversion as measured by the Junior Eysenck Personality Inventory when developmental variables were partialled out. In his study with maladjusted children (Nicholson, 1974; Nicholson, 1972), the inverse relationship between generalization and developmental variables was supported and maladjusted children also found to show more generalization than normals. The relationships with personality, however, did not appear. This may be either because the maladjusted children were not capable of self-rating themselves or because the relationships only hold up to a certain level of neuroticism which was exceeded in this population. Given the small number of personality measures used in the study with normal children, the use of generalization as a measure of susceptibility to reward cannot, as yet, be considered validated.

Generalization measures and personality

If it is assumed that peak shift and mean shift may be used as measures of susceptibility to frustrative nonreward, then, as with behavioural contrast, the following predictions may be made:

1. Peak shift and mean shift should covary, with those children showing peak shift also showing mean shift.
2. Mean shift should correlate positively with introversion and neuroticism.
3. Since the effects of exposure to frustration are considered to decline with advancing age, mean shift should be negatively correlated with developmental measures.
4. If susceptibility to frustrative nonreward is considered to be equivalent to susceptibility to punishment, delinquency, particularly group delinquency, should be negatively correlated with mean shift.

If generalization of reward is considered a measure of susceptibility to reward, then:

1. Since susceptibility to frustrative nonreward and susceptibility to reward are hypothesized to be independent, mean shift should have a zero correlation with generalization.
2. Generalization should correlate positively with extraversion and neuroticism.
3. Since delinquents are considered to be susceptible to reward, delinquency, particularly group and self-suggested delinquency, should be correlated with generalization.
4. Since discrimination performance improves with age, generalization should be negatively correlated with the developmental measures.

The Present Study

Method

Subjects

The experiment was performed on the same subjects as took part in the

behavioural contrast experiment. The boys had already learnt the extradimensional discrimination task described in chapter 5. Four of the 29 boys in the behavioural sample dropped out of the experiment as they did not wish to take any further part due to difficulties with school work.

Procedure

The apparatus was identical to that in the behavioural contrast experiment. All sessions were of 20 minutes duration and no more than one session was ever held on one day. No difficulty was experienced in maintaining interest and a steady response rate over the period.

The task concerned an intradimensional discrimination. The procedure for this was described in the behavioural contrast report (chapter 5). After the minimum of 3 sessions of baseline training, a prediscrimination generalization test was given. In this, reinforcement continued at VI1 min. in the presence of S^D, the S^D for each boy being the same as the rewarded stimulus in the extradimensional discrimination and in baseline training. No reinforcement was given to any other stimulus. The generalization test consisted of 12 test stimuli presented three times each in random order interspersed with 24 additional presentations of S^D to maintain response rate and the interest of the subject. The test stimuli consisted of the same rocket ship oriented at every angle encompassed by 13^o steps between 18.5^o and 161.5^o. The S^D was hence included in the test stimuli. Stimulus presentations lasted 30 sec. and were interspersed with a 2sec. period of time-out.

Intradimensional discrimination training then took place as described in the behavioural contrast report. One boy failed to learn the discrimination, the same boy as failed to learn the previous extradimensional discrimination.

Finally, each subject was given a postdiscrimination generalization test, conducted over two sessions. The same 12 stimuli (including S^D and S^Δ) as in the prediscrimination generalization test were presented seven times each in random order, without reinforcement. They were interspersed with

18 additional presentations of S^D which were reinforced on a VI1 min. schedule and 18 additional presentations of S^Δ which were not reinforced. Stimulus presentations lasted for 30 sec., presentations being separated by a 2 sec. period of time-out.

The average rate of response for each generalization stimulus was calculated for both the prediscrimination and postdiscrimination generalization tests.

Treatment of Data

The generalization curves of the boys were plotted. Two examples of these are given in Figures 6.1 and 6.2. From these curves it was seen that 7 out of the 24 boys learning the discrimination showed a peak shift. Grusec (1968) describes a method of treating the data in which the generalization curve is treated as a frequency distribution and the mean of the distribution is calculated in units of the stimulus continuum to produce a 'mean shift'. This entails comparing the response rates to S^D and to the three stimuli on each side of S^D and weighting them according to their position on the stimulus continuum. The formula is

$$(S_1x1 + S_2x2 + S_3x3 + S_4x4 + S_5x5 + S_6x6 + S_7x7)/\ (S_1 + S_2 + \ldots\ S_7),$$

where S_1 is the mean response rate to stimulus 1 on the continuum etc. and S_4 is S^D. A mean shift value of less than 4 implies a shift in the frequency distribution from S^D in the direction away from S^Δ. This is the same direction as for the peak shift. The distributions of pre- and post-discrimination generalization test mean shift scores (PREMS and POSTMS) were plotted and found to have normal distributions. The amount of mean shift shown may also be calculated in degrees.

Results

Measures of mean shift, peak shift and generalization

Using the above measures for mean shift, the prediscrimination mean shift, PREMS, (a control measure for postdiscrimination mean shift) was found to have a mean of -0.65° and standard deviation of 4.10°. Postdiscrimination

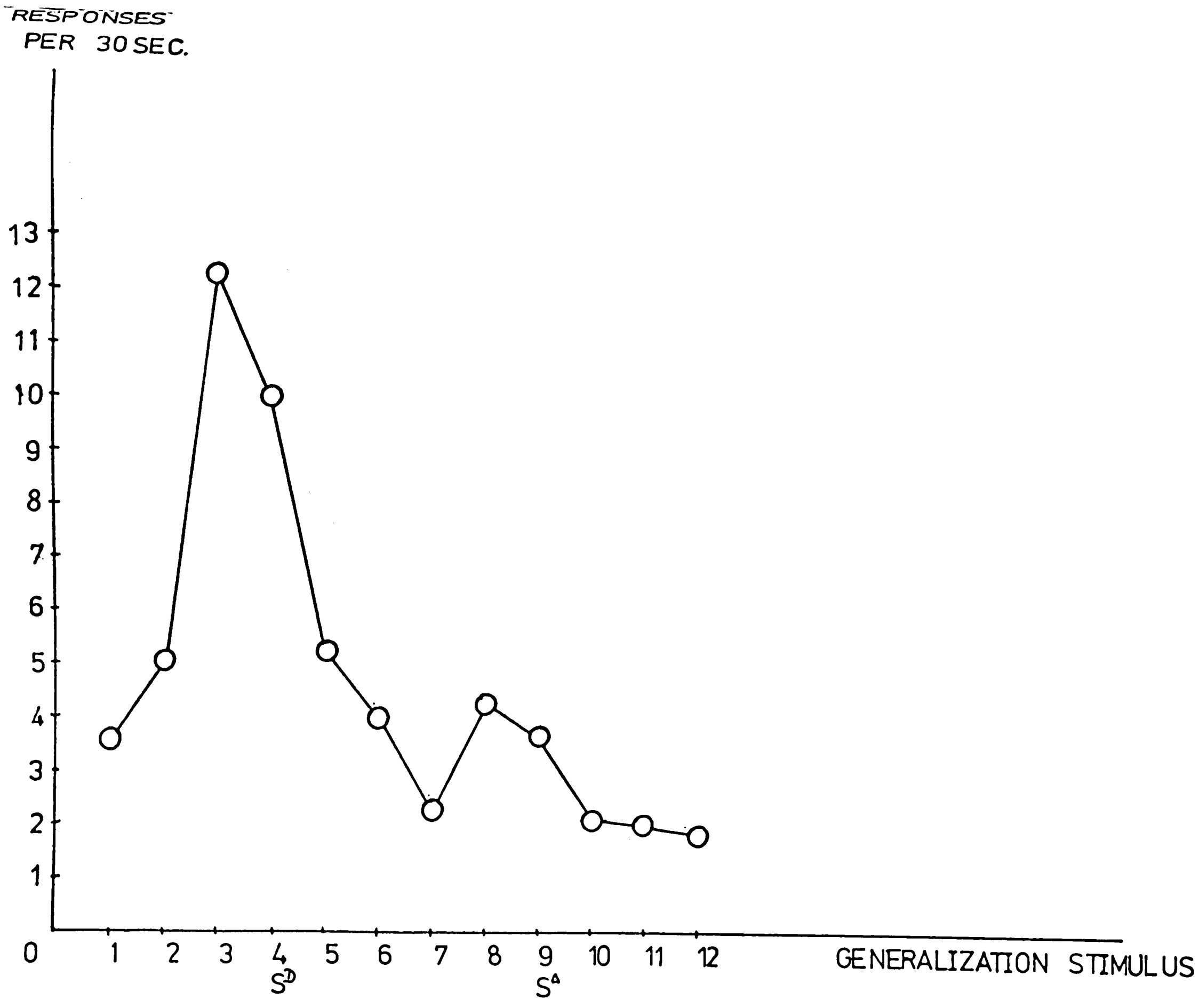
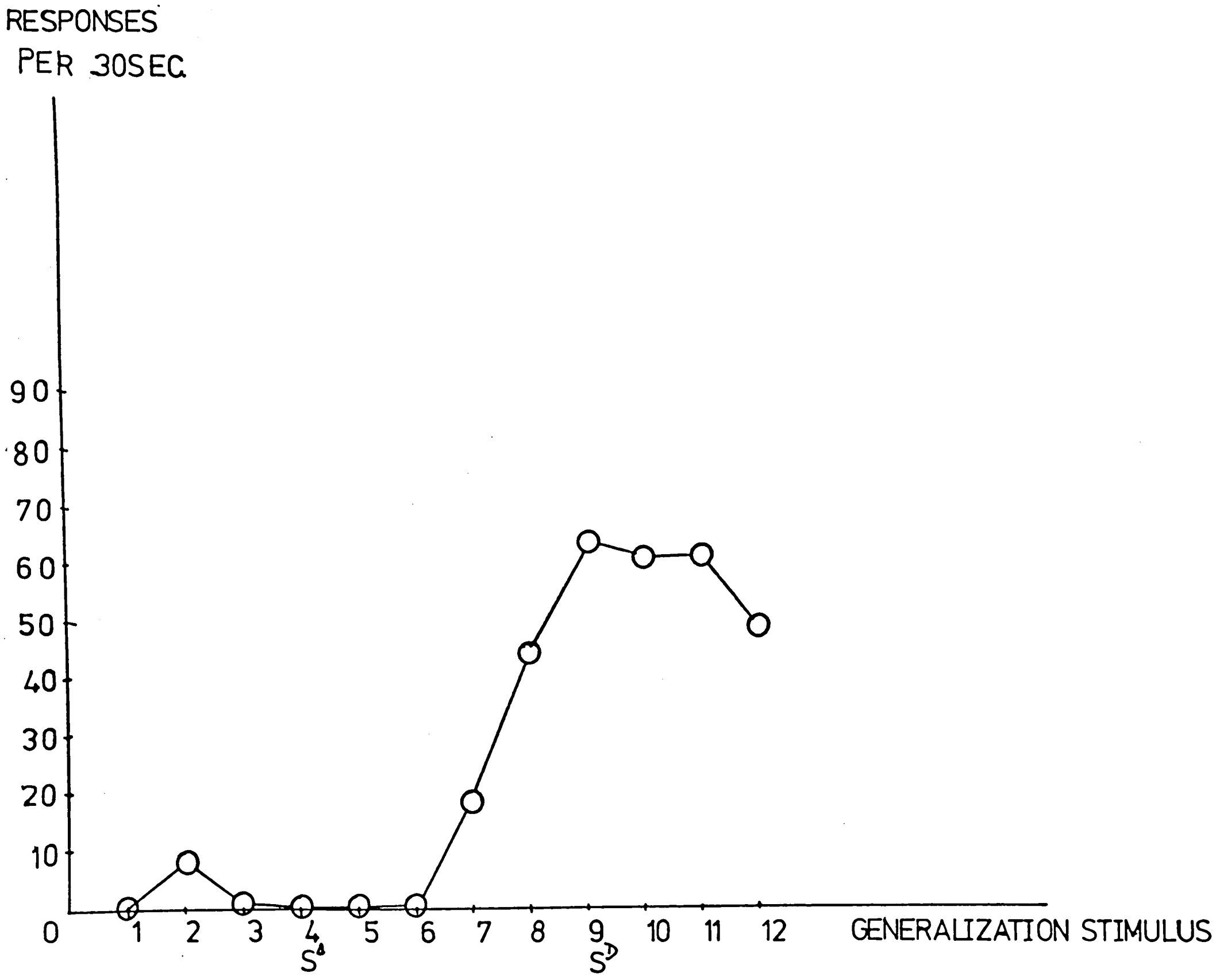

RESPONSES
PER 30 SEC.
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
11
12
S^D
S^Δ
GENERALIZATION STIMULUS

Figure 6.2 Postdiscrimination-generalization-gradient-



mean shift, POSTMS, had a mean of 2.47 and standard deviation of 4.30°. A t-test between these shows that the difference is significant at the .05 level, ($t = 2.43$, $n = 24$). These figures are for all the boys tested, a sample of 24, including 6 boys who did not show a mean shift in the direction away from S^{Δ}. It may be seen that the PREMS mean is not significantly different from the S^{D} point (4) whereas the POSTMS figure is in the direction away from S^{Δ}. If the 6 boys are excluded the figures become: PREMS mean -0.52°, standard deviation (S.D.) 4.58°; POSTMS mean 4.42°, S.D. 3.06°. A t-test of the difference between the PREMS and POSTMS scores of these boys gives a value of t of 12.52 ($p < .001$). This difference is highly significant.

One may now look at the boys who did not show mean shift. Of these two showed peak shift and four did not. Two of the subjects that did not show behavioural contrast in the extradimensional discrimination out of 6 did not show mean shift. This was true of 1 out of 4 subjects in the intradimensional discrimination. This only partial dependence of behavioural contrast on mean shift and vice versa has been found in other studies (Nicholson and Gray, 1972). The 6 boys not showing mean shift were compared with the 18 who did on the personality, developmental and crime measures both on test and retest and no significant pattern was seen to emerge. The 7 boys who showed peak shift were also compared with the 21 who did not on the various personality, developmental and crime measures. The results are presented in Table 6.3. It may be seen that there are only two significant differences between the two groups. The boys showing peak shift were more anxious on test (CATANXKI) and showed less discrepancy between their reading and chronological ages than did the boys who did not show peak shift. As, however, these results were not replicated on retest or in any of the other developmental measures, they cannot be taken to be of great importance!

The mean shift measure may not reflect the same processes as Hanson's

Table 6.3 Comparison of boys showing peak shift and boys not showing peak shift on personality, developmental and crime variables

	Variable	Boys showing peak shift (n)	mean	(SD)	Boys not showing peak shift (n)	mean	(SD)	t
TEST PERS.	JEPIE	(7)	18.43	(2.149)	(21)	19.10	(3.192)	- 0.626
	CATEX	(7)	4.91	(1.808)	(20)	6.09	(1.850)	- 1.477
	TRSE	(7)	3.184	(0.400)	(21)	3.27	(0.541)	- 0.449
	JEPIN	(7)	15.43	(2.878)	(21)	14.62	(3.879)	0.588
	CATANX	(7)	7.10	(0.974)	(20)	5.91	(1.193)	2.613*
	TRSN	(7)	3.12	(0.771)	(21)	3.04	(0.549)	0.264
	JEPIL	(7)	1.86	(1.069)	(21)	2.29	(1.953)	- 0.732
	JEPIIMP	(7)	5.71	(0.951)	(21)	5.90	(1.091)	- 0.441
	AGE	(7)	158.0	(6.830)	(21)	155.3	(5.170)	0.953
	RACA	(7)	2.69	(1.148)	(21)	3.93	(1.850)	- 2.093*
	IQ	(7)	91.57	(12.38)	(21)	91.62	(9.129)	- 0.010
	NOCRIM	(7)	11.14	(3.716)	(21)	11.95	(7.103)	- 0.368
RETEST PERS.	JEPIE	(6)	17.00	(4.940)	(18)	19.72	(3.953)	- 1.224
	CATEX	(6)	5.68	(1.991)	(20)	6.43	(2.343)	- 0.776
	JPQE	(6)	19.17	(2.137)	(18)	19.78	(2.861)	- 0.553
	TRSE	(7)	3.51	(0.418)	(21)	3.37	(0.525)	0.718
	JEPIN	(5)	13.80	(3.347)	(19)	11.63	(6.121)	1.057
	CATANX	(6)	5.83	(0.922)	(20)	5.84	(1.131)	- 0.022
	JPQN	(6)	12.33	(3.615)	(18)	10.72	(4.156)	0.909
	TRSN	(7)	3.30	(0.521)	(21)	3.21	(0.702)	0.361
	JEPIL		-			- †		
	JPQL	(6)	4.83	(1.835)	(18)	4.67	(3.742)	0.138
	JPQP	(6)	6.167	(1.835)	(19)	7.474	(3.405)	- 1.251
	NOCRIM	(7)	15.71	(8.28)	(19)	13.16	(6.890)	0.727

† abnormal distribution

For 24 df on a 2-tailed t-test, t will be significant at $p<.05$ if $t>2.06$ (*)
$p<.01$ if $t>2.80$ (**)
$p<.001$ if $t>3.75$ (***)

(1959) original peak shift measure, since a mean shift can be produced by a depression of responding at stimuli located between S^D and S^Δ as well as by an elevation of responding beyond S^D on the opposite side of the stimulus continuum from S^Δ, whereas the peak shift is unaffected by the former of these two possible effects of discrimination training. It was hence decided to use Nicholson's (1972) procedure to examine the relationships between the mean shift and measures of responding (a) at the three stimulus values beyond S^D in the direction away from S^Δ, i.e. the stimuli for which an elevation of responding would contribute to a classical peak shift (stimuli 1, 2 and 3, POSTBYSD); and (b) at the three stimuli located between S^D and S^Δ(POSTSDSO). To eliminate the effects of individual boys' absolute response rates on these measures, average response rates at each of these stimuli were expressed as a simple proportion of response rate at S^D for each boy and summed to give (a) and (b) above. A measure of the tendency to generalize (POSTGENR), obtained by adding (a) to (b), was also calculated.

The correlations between POSTMS, POSTBYSD, POSTSDSO, POSTGENR, PREMS and a measure of the initial rate of the boy at the end of baseline training (NITRATE2) are given in Table 6.4. All these variables have normal distributions. The boys who did not show mean shift are omitted in this table. The correlations are presented so that a high value for either PREMS or POSTMS implies a large amount of shift in the direction away from S^Δ. It may be seen that, although PREMS has negative correlations with both POSTBYSD and POSTSDSO, POSTMS has a positive, if non-significant, correlation with POSTBYSD and a negative one with POSTSDSO. The correlation of POSTMS with POSTBYSD has a greater value than that of POSTMS with POSTSDSO. One may hence consider that mean shift is not primarily a measure of the depressant effects of exposure to S^Δ on responding in the presence of stimuli close to S^Δ. The correlation between PREMS and POSTMS is negative, if non-significant. It is, therefore, not the case that those boys who show mean shift do so because they have a prior tendency to respond at a maximum

Table 6.4 Intercorrelations of behavioural measures of generalization tests

	NITRATE2	PREMS	POSTMS	POSTBYSD	POSTSDSO	POSTGENR
NITRATE2						
PREMS	- 0.01 (NS)					
POSTMS	0.16 (NS)	- 0.37 (NS)				
POSTBYSD	- 0.34 (NS)	- 0.25 (NS)	0.32 (NS)			
POSTSDSO	- 0.41 (NS)	- 0.11 (NS)	- 0.23 (NS)	0.81 (.001)		
POSTGENR	- 0.39 (NS)	- 0.20 (NS)	0.07 (NS)	0.16 (.001)	0.94 (.001)	

rate in the direction of a mean shift. It may also be seen that POSTMS is not significantly related to initial rate.

POSTSDSO and POSTBYSD, the response rates on either side of S^D, are highly positively correlated with each other and with the overall tendency to generalize responding (POSTGENR) showing that the tendency to generalize responding to stimuli similar to S^D is a reliable characteristic of a given boy. The tendency to generalize, POSTGENR, however, is independent of mean shift. If the tendency to generalize is a measure of susceptibility to reward and mean shift a measure of susceptibility to frustrative non-reward, then one would expect from Gray's (1970) theory that these would be independent. It is interesting that the correlation between PREGENR and POSTGENR is 0.44 (NS), which shows that the potential of the boy to generalize is, to some extent, stable over time. If one wishes to consider solely the generalization produced after discrimination learning, it will be necessary to partial out the effect of PREGENR, although this is unlikely to affect the correlation of generalization with mean shift since the correlation of PREGENR with POSTMS is - 0.14 (ns). If this is done, the correlations of POSTGENR with the other measures of generalization testing remain very much the same: correlations with POSTMS, POSTBYSD and POSTSDSO being - 0.03 (NS), 0.96 (.001), and 0.94 (.001) respectively.

It is doubtful, however, whether PREGENR provides a better measure of the boy's susceptibility to reward than POSTGENR. Before the prediscrimination generalization test, the boy had already received positive reinforcement for pressing the lever to the S^D stimulus in baseline training. Although, by the time of the postdiscrimination generalization test, he had obtained more reinforcement to S^D, the generalization shown in the postdiscrimination generalization test should be less since he will also have received negative reinforcement for responses to S^Δ, which is on the same stimulus dimension (at point 9). Generalization shown in the postdiscrimination test, therefore, will reflect both the susceptibility to respond to S^D and the stimuli round S^D on the dimension and the susceptibility not to

respond to S^{Δ} and the stimuli round S^{Δ}. If the second, a susceptibility to frustrative non-reward, is pronounced over a wide range of stimulus values, then it would be expected to lower the measure of susceptibility to reward. It is also likely that continued practice of receiving positive reinforcement to S^{D} may concentrate responding to stimulus values close to S^{D}, especially since the stimuli round S^{D} were not reinforced in the prediscrimination generalization test.

If initial rate is partialled out, the correlations between these variables may be seen, from Table 6.5, not to alter to any great degree.

Correlations with personality, developmental measures and crime

Tables 6.6 and 6.7 show the correlations between the mean shift variables and the personality, developmental and crime measures for the boys who did show mean shift.

Taking first the prediscrimination generalization test measures, it may be seen that the mean shift measure, PREMS, is consistently related to introversion on all 7 measures, although only two of the correlation coefficients are significant (CATEX on test and retest). The other significant correlations are with stability, as measured by teachers' ratings on both test and retest.

The generalization measure, PREGENR, shows a mixed pattern of correlations with personality measures. A significant positive correlation is found with JPQE on retest, but other correlations with extraversion are both positive and negative in sign. No other significant correlations occur.

As regards the postdiscrimination generalization test measures, mean shift, POSTMS, shows no significant correlations with any of the personality or developmental measures on test but there is a significant negative correlation with JEPIN on retest and a moderate negative correlation with JPQN on retest. One may say that mean shift does show a slight relationship with self-reported stability. There is also a slight negative relationship with the percentage number of crimes committed in a group.

Table 6.5 Intercorrelations of behavioural measures of generalization tests with NITRATE2 partialled out

	PREMS	POSTMS	POSTBYSD	POSTSDSO	POSTGENR
PREMS					
POSTMS	- 0.38 (NS)				
POSTBYSD	- 0.27 (NS)	0.41 (NS)			
POSTSDSO	- 0.13 (NS)	- 0.19 (NS)	0.78 (.001)		
POSTGENR	- 0.22 (NS)	0.15 (NS)	0.95 (.001)	0.93 (.001)	

Table 6.6 Mean shift measures and personality - test

	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	JEPIIMP	JEPIL	AGE	RACA	IQ	NOCRIM
PREMS	- 0.43 (NS)	- 0.53 (.014)	- 0.38 (NS)	0.02 (NS)	0.40 (NS)	- 0.51 (.030)	- 0.38 (NS)	0.02 (NS)	- 0.00 (NS)	- 0.32 (NS)	0.03 (NS)	0.03 (NS)
PREGENR	0.11 (NS)	- 0.29 (NS)	- 0.12 (NS)	0.22 (NS)	0.38 (NS)	0.18 (NS)	- 0.00 (NS)	0.04 (NS)	- 0.04 (NS)	0.17 (NS)	- 0.31 (NS)	- 0.37 (NS)
POSTMS	0.10 (NS)	0.32 (NS)	0.08 (NS)	- 0.27 (NS)	0.06 (NS)	- 0.02 (NS)	0.12 (NS)	0.06 (NS)	0.00 (NS)	0.27 (NS)	- 0.13 (NS)	- 0.01 (NS)
POSTBYSD	0.07 (NS)	0.11 (NS)	- 0.45 (NS)	- 0.03 (NS)	- 0.12 (NS)	0.04 (NS)	0.19 (NS)	- 0.07 (NS)	- 0.26 (NS)	- 0.24 (NS)	- 0.57 (.014)	0.06 (NS)
POSTSDSO	0.16 (NS)	0.08 (NS)	- 0.48 (.044)	0.13 (NS)	- 0.23 (NS)	0.08 (NS)	0.17 (NS)	- 0.06 (NS)	- 0.21 (NS)	- 0.30 (NS)	- 0.50 (.034)	0.08 (NS)
POSTGENR	0.13 (NS)	0.10 (NS)	- 0.49 (.042)	0.06 (NS)	- 0.17 (NS)	0.07 (NS)	0.19 (NS)	- 0.07 (NS)	- 0.24 (NS)	- 0.27 (NS)	- 0.56 (.016)	0.06 (NS)

Table 6.7 Mean shift measures and personality - retest

	JEPIE	CATEX	JPQE	TRSE	JEPIN	CATANX	JPQN	TRSN	JEPIL	JPQL	JPQP	NOCRIM2	PERG2	PERS2	PERSS2	PERGS2
PREMS	- 0.20 (NS)	- 0.52 (.032)	- 0.05 (NS)	- 0.16 (NS)	0.09 (NS)	0.38 (NS)	0.10 (NS)	- 0.61 (.008)	0.08 (NS)	0.16 (NS)	- 0.37 (NS)	- 0.28 (NS)	0.23 (NS)	0.03 (NS)	- 0.05 (NS)	- 0.34 (NS)
PREGENR	0.24 (NS)	0.16 (NS)	0.51 (.036)	0.11 (NS)	- 0.10 (NS)	- 0.04 (NS)	0.07 (NS)	- 0.14 (NS)	0.07 (NS)	- 0.31 (NS)	- 0.10 (NS)	0.02 (NS)	- 0.03 (NS)	- 0.21 (NS)	0.06 (NS)	- 0.18 (NS)
POSTMS	- 0.11 (NS)	0.24 (NS)	0.21 (NS)	0.12 (NS)	- 0.59 (.016)	- 0.22 (NS)	- 0.42 (NS)	0.24 (NS)	0.21 (NS)	- 0.12 (NS)	0.11 (NS)	0.19 (NS)	- 0.43 (NS)	0.17 (NS)	- 0.13 (NS)	- 0.10 (NS)
POSTBYSD	- 0.11 (NS)	0.03 (NS)	0.03 (NS)	0.20 (NS)	- 0.12 (NS)	0.03 (NS)	- 0.06 (NS)	0.52 (.028)	0.15 (NS)	- 0.07 (NS)	0.23 (NS)	0.27 (NS)	0.16 (NS)	- 0.08 (NS)	- 0.16 (NS)	0.03 (NS)
POSTSDSO	0.03 (NS)	- 0.06 (NS)	- 0.04 (NS)	0.11 (NS)	0.15 (NS)	0.05 (NS)	0.20 (NS)	0.38 (NS)	0.02 (NS)	- 0.07 (NS)	0.25 (NS)	0.17 (NS)	0.47 (.050)	- 0.18 (NS)	0.01 (NS)	- 0.09 (NS)
POSTGENR	- 0.04 (NS)	- 0.01 (NS)	0.01 (NS)	0.17 (NS)	0.01 (NS)	0.05 (NS)	0.07 (NS)	0.47 (.050)	0.09 (NS)	- 0.09 (NS)	0.27 (NS)	0.25 (NS)	0.31 (NS)	- 0.12 (NS)	- 0.08 (NS)	- 0.03 (NS)

The three generalization measures (POSTBYSD, POSTSDSO and POSTGENR) show very similar correlations with personality, as might be expected from their high intercorrelations. They have mostly significant negative correlations with TRSE on test but not on retest and consistent negative correlations with all three developmental measures, the correlations with IQ being significant. They also have significant positive correlations with TRSN on retest and moderate positive correlations with percentage number of crimes committed in a group.

The correlations of mean shift with self-reported stability are not equivalent to the correlations of PREMS with teacher-rated stability. Neither do the correlations of PREMS with introversion reappear in the correlations of POSTMS. One may deduce from this that pre- and post-discrimination generalization test measures of mean shift do not reflect the same processes and so that shifting maximum rate of responding away from the S^{Δ} position on the stimulus continuum was not a property of the individual prior to discrimination training. One might expect that mean shift, if it is a measure of susceptibility to frustrative non-reward, would show correlations with introversion and neuroticism. This has not occurred.

One may consider the correlations of mean shift with personality when both POSTSDSO and POSTBYSD, i.e. response rates on both sides of S^{D} are partialled out. This should give a pure measure of central tendency in the generalization distribution around S^{D}. This produces results in the opposite direction to those predicted, positive correlations being found with extraversion (JEPIE, CATEX on test) and stability (JEPIN, CATANX on retest) (Table 6.8).

If generalization is a measure of susceptibility to reward, then it should show correlations with extraversion and neuroticism. Correlations with extraversion are shown by PREGENR but not by POSTGENR. It may be, as suggested above, that POSTGENR is being affected by susceptibility to frustrative non-reward. If this were so, one would expect correlations of

Table 6.8 Correlations of mean shift with personality when both beyond S^D response rate and between S^D and S^Δ response rate are partialled out.

Extraversion

Test			Retest			
JEPIE	CATEX	TRSE	JEPIE	CATEX	JPQE	TRSE
0.51 (.050)	0.63 (.028)	0.17 (NS)	0.20 (NS)	0.24 (NS)	0.24 (NS)	- 0.02 (NS)

Neuroticism

Test			Retest			
JEPIN	CATANX	TRSN	JEPIN	CATANX	JPQN	TRSN
- 0.12 (NS)	- 0.22 (NS)	0.09 (NS)	- 0.49 (NS)	- 0.45 (NS)	- 0.13 (NS)	0.07 (NS)

Lie scales

JEPIL	JEPIL	JPQL
0.15 (NS)	0.03 (NS)	- 0.27 (NS)

Psychoticism

JPQP
0.18 (NS)

Impulsivity

JEPIIMP
0.20 (NS)

Development

AGE	RACA	IQ
0.18 (NS)	0.49 (NS)	- 0.02 (NS)

Crime

Test	Retest				
NOCRIM	NOCRIM2	PERG	PERS	PERGS	PERSS
0.03 (NS)	0.08 (NS)	- 0.01 (NS)	0.08 (NS)	0.27 (NS)	0.16 (NS)

POSTBYSD with extraversion to be higher than those of POSTSDSO. There is no evidence for this. All three measures are, however, correlated with initial rate of response, which is known to be also correlated with extraversion. Tables 6.9 and 6.10 present the correlations of the generalization measures with personality on test and retest when initial rate is partialled out. It may be seen that now correlations of the post-discrimination measures with extraversion (apart from teacher-rated extraversion on test) become positive and increase in magnitude, although they do not reach significance.

Correlations with self-rated neuroticism are low and mixed in sign. Correlations with teacher-rated neuroticism on retest, however, are positive and high whether or not initial rate is partialled out. Correlations with the impulsivity component of extraversion (JEPIIMP) are disappointingly low. The negative correlations with the developmental measures, also found by Nicholson (1972), are also found when initial rate is partialled out.

One may hence conclude that the expected positive correlations of mean shift with introversion and neuroticism have not been found in this study. If anything, mean shift appears to be slightly related to stability. This is in spite of the expected pattern of correlations found between mean shift and the other generalization test measures.

Generalization is, as predicted, independent of mean shift. It shows some significant positive correlations with neuroticism as found in earlier studies (see Nicholson, 1972), and positive correlations with extraversion if initial rate is partialled out. It is also consistently negatively related to the developmental measures as has been found in previous studies.

A further discussion of the correlations of beyond-S^D and between S^D and S^Δ responding is given below in the comparison of the data from the various studies that have investigated these techniques in children.

Table 6.9 Correlations of generalization measures with personality on test when NITRATE2 is partialled out

	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	JEPIIMP	JEPIL	AGE	RACA	IQ	NOCRIM
PREGENR	0.06 (NS)	- 0.39 (NS)	- 0.25 (NS)	0.18 (NS)	0.29 (NS)	0.17 (NS)	0.00 (NS)	- 0.01 (NS)	- 0.30 (NS)	- 0.02 (NS)	- 0.46 (NS)	- 0.36 (NS)
POSTBYSD	0.12 (NS)	0.18 (NS)	- 0.40 (NS)	0.02 (NS)	- 0.01 (NS)	0.07 (NS)	0.20 (NS)	- 0.04 (NS)	- 0.11 (NS)	- 0.10 (NS)	- 0.53 (.044)	0.03 (NS)
POSTSDSO	0.24 (NS)	0.17 (NS)	- 0.43 (NS)	0.20 (NS)	- 0.12 (NS)	0.12 (NS)	0.19 (NS)	- 0.02 (NS)	- 0.02 (NS)	- 0.13 (NS)	- 0.45 (NS)	0.04 (NS)
POSTGENR	0.20 (NS)	0.18 (NS)	- 0.43 (NS)	0.13 (NS)	- 0.05 (NS)	0.11 (NS)	0.21 (NS)	- 0.03 (NS)	- 0.06 (NS)	- 0.10 (NS)	- 0.51 (NS)	0.02 (NS)

Table 6.10 Correlations of generalization measures with personality on retest when NITRATE2 is partialled out

	JEPIE	CATEX	JPQE	TRSE	JEPIN	CATANX	JPQN	TRSN	JEPIL	JPQL	JPQP	NOCRIM2	PERG2	PERS2	PERSS2	PERGS2
PREGENR	0.04 (NS)	- 0.03 (NS)	0.37 (NS)	0.13 (NS)	0.05 (NS)	0.02 (NS)	0.17 (NS)	- 0.00 (NS)	0.06 (NS)	- 0.25 (NS)	- 0.09 (NS)	0.04 (NS)	- 0.01 (NS)	- 0.16 (NS)	0.15 (NS)	- 0.31 (NS)
POSTBYSD	0.09 (NS)	0.23 (NS)	0.34 (NS)	0.20 (NS)	- 0.29 (NS)	- 0.01 (NS)	- 0.13 (NS)	0.45 (NS)	0.17 (NS)	- 0.16 (NS)	0.26 (NS)	0.27 (NS)	0.15 (NS)	- 0.14 (NS)	- 0.25 (NS)	0.13 (NS)
POSTSDSO	0.32 (NS)	0.16 (NS)	0.30 (NS)	0.11 (NS)	0.00 (NS)	- 0.01 (NS)	0.14 (NS)	0.28 (NS)	0.03 (NS)	- 0.18 (NS)	0.25 (NS)	0.17 (NS)	0.49 (NS)	- 0.27 (NS)	- 0.08 (NS)	0.01 (NS)
POSTGENR	0.22 (NS)	0.22 (NS)	0.35 (NS)	0.18 (NS)	- 0.16 (NS)	- 0.00 (NS)	- 0.01 (NS)	0.38 (NS)	0.12 (NS)	- 0.19 (NS)	0.27 (NS)	0.25 (NS)	0.31 (NS)	- 0.20 (NS)	- 0.18 (NS)	0.07 (NS)

A comparison of the results of the present study (JMS), Rushton (JPR) and Nicholson (JNN)

One may first consider the number of children showing the phenomenon of peak shift or mean shift in the various samples. In Nicholson's first experiment (Nicholson and Gray, 1971, JNN1), 2 out of 4 children showed peak shift, and 3 out of 4 mean shift. In his second experiment, again on normal children aged 7 to 11 years (Nicholson and Gray 1972, JNN2), only 1 out of 14 children showed peak shift but all 14 showed mean shift. In his third experiment on older maladjusted boys (Nicholson, 1974, JNN3) 7 out of 10 boys showed peak shift and 15 mean shift. In Rushton's study (JPR) of 20 boys and girls aged 7 to 11 years, 5 children showed peak shift and 17 mean shift. In the present study (JMS) of older boys, 7 out of 24 showed peak shift and 18 mean shift. The number showing peak shift is always considerably lower than the number showing mean shift but there seem to be very few consistent differences between the samples in the proportions showing either peak shift or mean shift when considered with respect to personality, developmental or crime variables. In all 5 studies, there was only partial correspondence between those subjects that showed mean shift and those that showed behavioural contrast.

One may next examine the nature of the mean shift produced. In JNN2, JNN3, JPR and JMS, the differences between discrimination generalization tests were all significant, the direction of the post mean shift being away from S^{Δ}. In the JMS study, there was no significant correlation between mean shift as shown in the prediscrimination generalization test (PREMS - a control measure) and mean shift as shown in the postdiscrimination generalization test.

The correlations between postdiscrimination mean shift (POSTMS), rate of response to stimuli beyond S^{D} (POSTBYSD), rate of response to stimuli between S^{D} and S^{Δ} (POSTSDSO) and generalization (POSTGENR) for JNN2, JNN3, JPR and JMS are shown in Table 6.11. It may be seen that there is remarkable uniformity across studies. In both JNN studies and in the JMS study, the correlation

Table 6.11 Correlations of generalization test measures for various studies

1. POSTMS
2. POSTBYSD
3. POSTSDSO
4. POSTGENR

Correlation	JNN2	JNN3	JPR	JMS
1.2	+ 0.26 (NS)	+ 0.32 (NS)	+ 0.06 (NS)	+ 0.32 (NS)
1.3	- 0.22 (NS)	- 0.11 (NS)	- 0.50 (NS)	- 0.23 (NS)
1.4	+ 0.14 (NS)	+ 0.22 (NS)	- 0.30 (NS)	+ 0.07 (NS)
2.3	+ 0.87 (.001)	+ 0.86 (.001)	+ 0.81 (<.001)	+ 0.81 (<.001)
2.4	+ 0.90 (.001)	+ 0.93 (.001)	+ 0.91 (<.001)	+ 0.96 (<.001)
3.4	+ 0.86 (.001)	+ 0.91 (.001)	+ 0.96 (<.001)	+ 0.94 (<.001)

between POSTMS and POSTBYSD is positive and higher than the value of the correlation between POSTMS and POSTSDSO. In these studies, one may say that the mean shift measure is not a measure of depressed rate of response to the stimuli around S^{Δ} and so may, provisionally, be taken as equivalent to the peak shift measure of Hanson (1959). In the JPR study, however, POSTMS has a considerable negative correlation with POSTSDSO and is not significantly related to POSTBYSD. Doubt must thus be thrown upon this measure in this sample being an equivalent measure to peak shift.

In all four studies, POSTMS is not significantly correlated with POSTGENR. The high positive correlations between the measures of responding at stimuli beyond S^{D}, between S^{D} and S^{Δ}, and the sum of these (generalization) are remarkably uniform in all four studies and confirm the suggestion that the tendency to generalize responding to stimuli similar to S^{D} is a reliable characteristic of a given child.

The means and standard deviations in degrees of the mean shifts found in the four studies are: JNN2, 3.90 (2.51); JNN3, 5.98 (2.68); JPR, 4.90 (2.63); JMS, 4.42 (3.06), if the subjects not showing a mean shift in the direction away from S^{Δ} are excluded. The maladjusted boys in the JNN3 experiment hence show the greatest amount of mean shift.

The correlations of the generalization measures with a measure of initial rate of response have been studied in the JPR and JMS studies. In the JPR study, mean shift was negatively related to initial rate and the other measures positively and significantly related when the children not showing a mean shift were excluded. Partialling out initial rate, however, does not make any difference to the general pattern of intercorrelations of the behavioural measures. In the JMS study, mean shift is positively related to initial rate and more strongly and negatively related to the other measures. Again, however, the previous pattern of intercorrelations does not change when initial rate is partialled out.

Correlations of behavioural measures with personality, developmental and crime measures

Gray's (1970) theory treats neurotics as having high susceptibility both to reward and to frustrative non-reward and extraverts as having high susceptibility to reward but low relative susceptibility to non-reward. If mean shift is a measure of susceptibility to frustrative nonreward, it should show positive correlations with neuroticism and introversion. Similarly, if generalization is a measure of susceptibility to reward, it should show positive correlations with neuroticism and extraversion.

A highly neurotic child should have a strong tendency to generalize and a strong tendency to shift his responses away from S^D in the direction opposite to S^Δ. These tendencies will summate at stimuli beyond S^D, but oppose each other at stimuli between S^D and S^Δ. A highly extrovert child will also have a strong tendency to generalize but a weak tendency to shift his responding to stimuli beyond S^D. These tendencies will oppose each other at stimuli beyond S^D (relative to what would happen in an extreme introvert) and summate at stimuli between S^D and S^Δ. Beyond S^D response rate, therefore, should correlate with neuroticism rather than extraversion and response rate between S^D and S^Δ should correlate with extraversion rather than neuroticism.

Susceptibility to frustration is considered (Lawson, 1965; Nicholson, and Gray, 1972) to decline with age. Mean shift should hence have negative correlations with the developmental measures. Generalization is also thought to decline with age but to be greater in maladjusted children.

One may first consider the first-order correlations of mean shift with personality. The JNN2 study found a positive, though non-significant, correlation (0.37) between teacher-rated neuroticism and mean shift. Self-reported neuroticism on the JEPI, however, gave a negative non-significant correlation. In the JNN3 study (Nicholson, 1972), all first-order correlations between personality and behavioural measures were at chance level, possibly due to the facts that first, since this is a maladjusted population, the variance is reduced on every personality measure and secondly, both boys and

teachers used values of personality relative to differences within the school population rather than values appropriate to a normal population when filling in the tests. It is not possible, therefore, to examine the correlations between behaviour and personality in this study. The JPR study suffers from the correlations between the behavioural measures not being such as to encourage the belief that mean shift, in this study, reflects the same phenomenon as mean shift in the other studies. Correlations with both teacher- and self-rated neuroticism were negative and very low. In the JMS study, mean shift showed a slight relationship with self-reported stability. The prediction that mean shift should correlate with neuroticism has not been replicated.

Considering now the correlations with extraversion, the JNN2 study showed a small negative correlation with JEPIE, the only measure taken. The JPR study showed chance correlations with self-reported extraversion (JEPIE and CATEX) but a high negative correlation with teacher-rated extraversion (0.54). No significant correlations with extraversion were shown on any of the 7 measures taken in the JMS study. Again, one must say that mean shift does not consistently show correlations with introversion.

In the Nicholson study, significant correlations of mean shift with personality were only found if either beyond S^D response rate (POSTBYSD) or between S^D and S^Δ response rate (POSTSDSO) or both were partialled out. The last of these measures provides a pure measure of central tendency in the generalization test, and so may possibly be considered to be the best indication of shift. Nicholson found this measure to be significantly related to neuroticism on the Teachers' Rating Scale and introversion on the Junior Eysenck Personality Inventory. Even with this measure in the present study, however, no significant correlations with either neuroticism or introversion were found.

For generalization, the JNN2 study showed a high positive correlation with teacher-rated neuroticism (0.59) but again a small negative one with JEPIN.

The JPR study showed small negative correlations with the 3 measures of neuroticism. The JMS study showed significant positive correlations with TRSN on retest (the retest personality measures being taken closer in time to the behavioural testing than the test measures) but again non-significant correlations with self-rated neuroticism. Generalization may hence be considered as being linked with teacher-rated neuroticism.

As regards extraversion, the JNN2 study showed a very low positive correlation with JEPIE. The JPR study showed nonsignificant correlations, both positive and negative in sign, with extraversion. The JMS study showed correlations with extraversion for the prediscrimination generalization test measure (PREGENR) but not the postdiscrimination generalization test measure (POSTGENR). On partialling out the effect of initial rate of response, however, the POSTGENR correlations become positive in sign and increased in magnitude. Partialling out initial rate in the JPR study does not change the picture. They may, therefore, be some correlations between generalization and extraversion.

Considering now the beyond S^D response rate (POSTBYSD), the JNN2 study showed this to be highly related to TRSN (0.52) but negatively related to self-report neuroticism and to extraversion. The JPR study showed it to be negatively related to TRSN (- 0.35), and nonsignificantly related to self-reported neuroticism (JEPIN, CATANX).

In the JMS study there was a significant correlation with TRSN on retest but chance level correlations with self-report neuroticism and self-reported extraversion. There was also a significant negative correlation with TRSE on test but not on retest. There were no significant relationships with extraversion but all three coefficients were negative.

Since, in all three studies, POSTSDSO is highly correlated with POSTBYSD, the correlations of POSTSDSO with personality are similar to those of POSTBYSD.

A better test of the hypothesis that POSTBYSD should be correlated with

neuroticism rather than extraversion and POSTSDSO with extraversion rather than neuroticism would be to partial out the effect of POSTSDSO on POSTBYSD and vice versa. In the JNN2 study this gives correlations of 0.53 for POSTBYSD with neuroticism (TRSN) and - 0.41 with extraversion (JEPIE); and - 0.34 for POSTSDSO with neuroticism (TRSN) and 0.39 with extraversion (JEPIE). The data for the JPR and JMS studies are presented in Table 6.12. It may be seen that, when the larger number of personality measures used in the JPR and JMS studies are taken into account, the clearcut pattern of responding does not hold up. So, in the JPR study, the correlations of POSTBYSD with TRSN and JEPIE are 0.07 and 0.04 and those of POSTSDSO - 0.27 and - 0.26. There is obviously no difference. In the JMS study, the correlations of POSTBYSD with TRSN and JEPIE (retest) are 0.38 and - 0.23 and those of POSTSDSO - 0.06 and 0.20. There is some similarity here with the results of JNN but, on a further examination of the data, it may be seen that the other measures of extraversion and neuroticism taken do not correlate with POSTBYSD and POSTSDSO in the same way. It is, therefore, unclear whether the original results of JNN are a product of the specific test used, whether they are just not replicated in the JMS study or whether the TRSN and JEPIE measures of personality are, for some reason, the best measures of neuroticism and extraversion. The latter may be the case for TRSN as it is likely that neurotics are not capable of self-rating themselves as neurotic but it is surprising that the results obtained with the JEPIE scale are not equivalent to those of the JPQE scale seeing that the one has been derived from the other.

Finally, the JNN2 study showed negative correlations with developmental measures for all four behavioural measures although none of these are significant. The JPR study showed a significant negative correlation of mean shift with reading quotient, though not with age, and chance level correlations of generalization with the developmental measures. The JMS study showed no significant correlations between mean shift and developmental measures but consistent negative correlations between generalization and all three

Table 6.12 Correlations of POSTBYSD and POSTSDSO with personality controlling for each with respect to the other

A. JPR study

POSTBYSD controlling for POSTSDSO

N	JEPIN	CATANX	TRSN
	- 0.02 (NS)	0.07 (NS)	0.07 (NS)
E	JEPIE	CATEX	TRSE
	0.04 (NS)	0.18 (NS)	- 0.20 (NS)

POSTSDSO controlling for POSTBYSD

N	JEPIN	CATANX	TRSN
	- 0.18 (NS)	- 0.25 (NS)	- 0.27 (NS)
E	JEPIE	CATEX	TRSE
	- 0.26 (NS)	- 0.36 (NS)	0.05 (NS)

B. JMS study

POSTBYSD controlling for POSTSDSO

N test	JEPIN	CATANX	TRSN	
	- 0.22 (NS)	0.12 (NS)	- 0.04 (NS)	
retest	JEPIN	CATANX	JPQN	TRSN
	- 0.42 (NS)	- 0.01 (NS)	0.11 (NS)	0.38 (NS)
E test	JEPIE	CATEX	TRSE	
	- 0.10 (NS)	0.07 (NS)	- 0.13 (NS)	
retest	JEPIE	CATEX	JPQE	TRSE
	- 0.23 (NS)	0.14 (NS)	0.11 (NS)	0.18 (NS)

Table 6.12 cont..

POSTSDSO controlling for POSTBYSD

N test	JEPIN	CATANX	TRSN	
	0.25 (NS)	- 0.24 (NS)	0.08 (NS)	
retest	JEPIN	CATANX	JPQN	TRSN
	0.43 (NS)	0.04 (NS)	0.41 (NS)	- 0.06 (NS)
E test	JEPIE	CATEX	TRSE	
	0.18 (NS)	- 0.01 (NS)	- 0.22 (NS)	
retest	JEPIE	CATEX	JPQE	TRSE
	0.20 (NS)	- 0.15 (NS)	- 0.12 (NS)	- 0.08 (NS)

developmental measures, the correlation with IQ being significant. In this study one must remember that the age range is smaller than in the other three studies. There is some evidence to support the hypothesis that both mean shift and generalization decline with age.

Discussion

Peak and Mean Shift

The stimulus dimension chosen in the present study is one not susceptible to either perceptual or conceptual categorization if neither vertical nor horizontal lines are included in the generalization test. In order to be able to compare the results of the present study with those of Nicholson, it was decided to use exactly the same stimuli, although these are susceptible to the mirror-image confusion. Perhaps as a result of this, peak shift was not shown by a majority of the boys. Neither peak nor mean shift, however, were properties of the individual prior to the discrimination training, so that they may be considered to be genuine phenomena in this respect.

As to whether mean shift is an equivalent measure to peak shift, it is unfortunately not the case in this study that every child who showed mean shift showed peak shift (prediction 1). On the other hand, those not showing mean or peak shift were not found to be different from those showing them on any of the personality, developmental or crime measures. This is a similar result to that of Nicholson (1972). In the present study, though not in that of Rushton, mean shift was found to be primarily a measure of responding to the stimuli beyond S^D in the direction away from S^Δ (the region of peak shift) and not of responding to stimuli between S^D and S^Δ. Mean shift is hence not affected very much by depressant effects of exposure to S^Δ on responding in the presence of stimuli close to S^Δ. In as far as its correlations with measures of responding are concerned, therefore, mean shift may be considered an adequate and a more sensitive measure of the tendencies producing peak shift.

The predictions for personality, however, have not been fulfilled. Mean shift does not show correlations with introversion and neuroticism - if anything it shows a slight positive correlation with stability. Although there are tendencies shown towards the specific significant correlations originally found by Nicholson, the pattern does not hold up when more measures of personality are considered. In the present study there is also no evidence to show that mean shift declines with increasing age or intelligence, though this study used a very small and much older age range compared to the study of Nicholson. In the Rushton study, which is more comparable in these respects, there was some evidence that mean shift does decline with reading quotient. On crime, the correlations found with mean shift in the present study are not significant and, far from mean shift showing a negative correlation with crime, it in fact shows a positive one.

Although one may say that mean shift and the relationships it shows with other measures of responding in generalization tests are recurring phenomena, it is not possible to conclude on the basis of the correlations of mean shift with personality that it is a measure of susceptibility to frustrative nonreward.

Generalization

The picture as regards generalization as a measure of susceptibility to reward is somewhat more positive. The present study provides evidence that generalization is both a stable and a reliable characteristic of the individual. It is also independent of mean shift, which, if the latter is taken to be a measure of susceptibility to frustrative nonreward, it should be. If initial rate of response is partialled out, generalization becomes correlated with extraversion and with teacher-rated neuroticism. This last, however, may be a function of the high correlations between the teacher-rated extraversion and neuroticism scales. It is also found to be consistently negatively correlated with the developmental measures. These results are to some degree supported by the other studies considered. On crime, there are

moderate positive correlations with number of crimes admitted and tendency to take part in group crimes on retest. To some degree, therefore, all the predictions made about generalization have been confirmed and it may be considered to be, to some extent, a measure of susceptibility to reward.

CHAPTER 7

DIFFERENTIAL REINFORCEMENT OF LOW RATES OF RESPONSE

Differential reinforcement of low rates of response (DRL) is a schedule in which reinforcement is contingent upon responses which are spaced t seconds or more from the previous response, the time between two responses being called the interresponse time (IRT). IRTs less than t seconds are not reinforced but reset the timing contingencies. The schedule has been extensively investigated both from the point of view of how organisms mediate the passage of time and as a behavioural baseline, as it generates a rate of responding considerably below other intermittent reinforcement schedules with similar reinforcement rates (Richardson, 1973). The organism is hence under the control of the temporal parameters of the schedule rather than purely the rate of reinforcement. A few studies have also incorporated a limited-hold (LH) contingency which imposes an upper limit on the IRTs which will be reinforced.

The literature on the subject is very large but its primary concerns are with the presence and possible purpose of other behaviour taking place during the IRT (mediating behaviour) and with the sequential patterning of responding. As with almost all experiments on infrahuman organisms, it is the presence or absence of the phenomenon and the possible schedule control developed that is studied. There are very few studies which have attempted to look at individual differences in performance, although this is perhaps the schedule which most lends itself to such a study, in that, even in pigeons, responding is highly individual in patterning and any mediating behaviour found tends to vary greatly from subject to subject.

The progress of DRL training may be shown in two ways. The first is to group IRTs into intervals of 2, 3 or 4 seconds and plot the relative frequency of responses in the various class intervals. This usually produces a bimodal

curve with one peak at very short IRTs and one at about the modal point for optimum responding to the schedule in force once stable performance has been obtained. These very short IRTs are often due to bursts of responses defined as any sequence of two or more responses in which no consecutive responses are separated by more than 2 seconds (Sidman, 1956). It has been found that there is a relationship between probability of a burst and the length of the preceding IRT (Sidman, 1956) but this finding has not been replicated (e.g. Staddon, 1965; Kramer and Rilling, 1969), even after extended training. It has also been suggested (Blough, 1966) that bursts are patterned in a particular way peculiar to each subject so that they may best be considered as part of the response topography of the subject rather than individual responses. This is supported by the findings that, in pigeons, bursts of responses, as opposed to longer IRTs, were not sensitive to varying reinforcement probabilities and reinforced IRTs (Blough, 1966) and that bursting is rarely found in children of various ages extensively trained on DRL schedules (Weisberg and Tragakis, 1967; Weisberg, 1970). It would, therefore, seem to be a species and individual response.

The other way of plotting the result of DRL training is to calculate the probability of responding within any IRT category by dividing the number of responses falling in this category by the number of opportunities that the subject had to respond in that category. The number of opportunities for any category equals the number of responses falling within that category plus all responses with longer IRTs. This interresponse-time-per-opportunity (IRTs/OP) analysis (Anger, 1956, 1963) is more appropriate than the relative frequency analysis since it takes account of the fact that each time the subject responds with a given IRT, the opportunity for a response with a longer IRT is precluded. With this analysis, the curve of IRT responding shows an increasing probability of responding for IRTs up to the reinforced value with training. This indicates that the subject has succeeded in forming a temporal discrimination.

Measures taken of the progress of the individual subject in learning a DRL discrimination include the rate of responding, the rate of reinforcement and an efficiency ratio, the number of reinforced responses to the total number of responses. This efficiency ratio may be quite high for humans, Weisberg and Tragakis (1967) finding an average of 40 per cent after the first two sessions of training on a DRL 10 second schedule. In the same study it was found that the DRL schedule generated much lower rates of response in toddlers than fixed ratio, variable ratio or variable interval schedules. Perfect correlation between the various measures of DRL performance will not obtain because these indicators reflect different performance patterns. For example, a fairly high, erratic response rate may yield the same frequency of reinforcement as a low, steady rate. Weisberg (1970), however, found correlations of - 0.89 and + 0.84 for response rate with reinforcement rate and responses per reinforcement, respectively, and - 0.60 for these last two measures with each other in his study with toddlers and a DRL 18 second schedule.

A large part of the literature contains a discussion of the possibility of mediating behaviour. With this, however, this study is not concerned. Given that, if mediating behaviour occurs, its form may well be specific to the individual, since no other behaviour than the reinforced behaviour is specified by the schedule, it is unlikely, without careful observation, that, for example, the provision of a running-wheel for rats will produce consistent increases in running during IRTs, when gnawing, licking or walking around are as likely to occur. In an experiment with humans, however, Bruner and Revusky (1961) provided four telegraph keys, one of which was the instrumental key. Systematic response patterns were found to occur for all subjects during the DRL phase of the experiment such that responding on the other keys 'filled in' the necessary temporal delay between responses on the reinforced key. Extinction phases before and after the DRL phase produced very erratic response patterns on the other keys. Post-experimental interviews

suggested that subjects believed that reinforcements could only be obtained by a pattern of responses on at least one of the other keys before pressing the reinforced key. It is likely that successful recording of mediating behaviour may depend on the salience of the provided options to the subject.

DRL behaviour has been studied to a considerable degree in humans. Adult humans are found to perform well whether or not they are given instructions. Schedule control has also been found to be operative with toddlers and with older children (Stoddard, 1962; Weisberg and Tragakis, 1967; Weisberg, 1970). It has also been found, using toddlers, that prior experience on an easier DRL schedule improves performance on a harder schedule beyond the effects of no prior experience, experience on a fixed interval schedule or experience on a variable ratio schedule (Weisberg, 1970). This may be due partly to the effect of extended training on DRL, Staddon (1965) having shown that extended training sharpens temporal discrimination performance in pigeons. Stoddard (1962) and Weisberg and Tragakis (1967), however, emphasize the role of an easier schedule in suggesting that children adapt best to a DRL schedule with a relatively long pause length (e.g. 20 seconds) if first trained with a DRL interval one-half the value of the longer interval. Giving several DRL schedules also has the advantage that any initial puzzlement with the apparatus will not be reflected in the measures taken of the later schedules. This is of advantage if DRL performance is to be used as a measure of personality. For these reasons, it was decided to use three DRL schedules in the present study, the boy being transferred to a harder one immediately he reached criterion performance on an easier one.

The aspect of personality considered to be measured by DRL performance is inherent in the nature of the task - the ability to restrain behaviour. Bad DRL performance would hence characterize an impulsive person and good DRL performance a non-impulsive person. On Gray's (1972) model of personality, DRL performance would lie along the dimension of impulsivity from neurotic extraversion to stable introversion. It is interesting that the few studies

bearing on this question have treated DRL performance as indicating susceptibility to frustration, the opposite diagonal, and have found contradictory results. DRL training, by itself, sometimes produced inhibitory gradients on generalization testing, If DRL is alternated with a more 'preferred' schedule, an inhibitory gradient will occur (see Kramer and Rilling, 1970). If DRL is considered to induce frustration, it should both produce an inhibitory gradient and, when alternated with another 'better' component in a multiple schedule, produce behavioural contrast. Neither of these necessarily occurs. It is possible, however, that, for impulsive subjects, nonreinforcement will produce frustration and hence behavioural contrast. Non-impulsive subjects will both obtain more reinforcement in a given time and, possibly, also be less susceptible to frustration. The presence of behavioural contrast and inhibition will hence depend on the subjects (and species) used. The only previous study of DRL behaviour and personality is that of Singh (1970). He used high- and low-anxiety adults with a DRL-20 secondLH-5 second schedule and found that low-anxiety adults performed better than high-anxiety adults at criterion, whether given pretraining or not. For the first 50 minutes, however, high- and low-anxiety subjects given no pretraining did not differ in performance. The Manifest Anxiety Scale (Taylor, 1953) used to measure anxiety in Singh's experiment is correlated with neuroticism and, to some degree, introversion.

For the present study, the following would hence be predicted:

1. The various measures of DRL performance will show positive correlations.
2. Efficiency will increase as the DRL task becomes harder.
3. Performance on the first DRL task will show low correlations with personality but perhaps moderate ones with age and intelligence, since this will include an element of learning to adjust to the apparatus and the situation rather than just to the schedule.
4. As the DRL tasks become harder, greater correlations will be shown with personality measures, particularly those of stability and introversion.

5. Since stability and introversion may, using the terminology of Gray (1972), be considered to reflect low sensitivity to reward, DRL performance will correlate negatively with number of crimes admitted.

The Present Study

Method

Subjects

Those boys who had taken part in the behavioural contrast and mean shift experiments were then transferred to the differential reinforcement of low rates schedules. By this stage, 1 boy had left the school and 3 had dropped out of the experiment due to temporary school problems. The data for two further boys was unfortunately stolen from the school at the same time as some school property. The total number of boys completing the DRL tasks, therefore, was 25 of which data is available for 23.

Procedure

The apparatus was the same as that for the previous behavioural experiments. Details as to session length and general instructions are given in the chapter on behavioural contrast.

Pilot studies

The original pilot study was carried out by de Wit at Besselsleigh School, Oxfordshire, a school for maladjusted children, and analysed by the author. The present procedure was piloted by Rushton and the author at St. Nicholas County Primary School, Old Marston, Oxford.

DRL experiment

Each boy was first given two minutes baseline training on a variable interval schedule (VI 1min.). From this, the initial rate of response (NITRATE3) and the mean inter-response interval (IRT) were calculated. If the IRT was not an integer, it was increased to the nearest integer (IIRT). The IIRT cannot thus be less than 1 second. 17 boys had IIRTs of 1 second,

the range being from 1 to 8 seconds. The boy was then told that "there is a special way of pressing the lever in order to get lots of Green Shield Stamps. Try and work it out". Reinforcement was then contingent on the boy being able to increase his inter-response interval for three different and progressively more difficult criteria (first DRL task, second DRL task, third DRL task). The schedules were: first DRL task, minimum reinforced IRT = IIRT + 2 sec.; second DRL task, minimum reinforced IRT = IIRT + 9 sec.; third DRL task, minimum reinforced IRT = IIRT + 19 sec. Each session was divided into continuous one minute trials. Criterion for learning consisted of two consecutive trials in which the boy gained at least half the number of reinforcements possible in one minute. After learning one DRL schedule, the boy would immediately be put onto the next one, the instructions being "it's going to be somewhat different now. Try and work it out". After 40 one minute trials without learning to criterion, the boy was judged not to have learnt, and his part in the experiment would be over. The time taken for DRL learning ranged from 1 to 4 sessions, mean 1.96. Two subjects failed to learn the first DRL task. No subject, having learnt the first task, failed to learn the second or third tasks.

Treatment of data

Two measures were taken for each DRL schedule; a measure of time taken to learn the schedule in minute trials (the maximum number of trials on any one task was 40 and the scores were subtracted from 41 so that success on the task was scored in the positive direction: DRL1, DRL2, DRL3); and a measure of the efficiency of his DRL performance, consisting of the ratio of the total number of rewards obtained to total number of responses made (REWRESP1, REWRESP2, REWRESP3). A total efficiency measure over all three schedules of total rewards obtained to total responses made (REWRESPT) was also calculated. All measures were calculated so that a high score on any of them implies good DRL performance.

The distributions of all the variables were plotted, and it was found

that the DRL variables did not have normal distributions, being skewed. Rank-order correlations (Spearman's r) were hence computed as these do not presume normality of distribution.

Results

The ranges and medians of these variables are given in Table 7.1. It may be seen that there is very little difference in the medians between the DRL tasks.

The inter-correlations between the measures of initial rate of response (NITRATE3) and the various measures of DRL are given in Table 7.2. From this it may be seen that, although the time measure for each DRL task correlates highly with the efficiency measure for the same task (e.g. DRL1 with REWRESP1), the pattern of correlations between DRL tasks is not so homogeneous. DRL1 has no significant correlations with any measures of other DRL tasks. REWRESP1, however, correlates significantly with the time measure of performance of the second DRL task (DRL2). DRL2, in fact, correlates significantly with most of the measures of both the second and the third DRL task. REWRESP2, however, does not correlate with the measures of the third DRL task. There are no significant correlations between the first and third DRL tasks. The correlations for REWRESPT, the total efficiency measure, show the contribution of the various tasks to the total measure. Both REWRESP1 and REWRESP2 contribute in equal measure, REWRESP3 coming a poor third. There is also a high correlation between DRL2 and REWRESPT. This probably reflects the predominance of performance of the second task on the total experiment.

There is, therefore, some degree of correspondence of performance between the second DRL task and the other two, that for DRL1 being primarily mediated by the efficiency measure and that for DRL3 being mediated by the time measure. One may say that the boy who is efficient on the first DRL task will be both quick and efficient on the second; and that the boy who is quick on the second task will be both quick and efficient on the third. These two processes are, however, independent. It will, hence, be necessary to consider the measures

Table 7.1 Ranges and medians for DRL measures

Variable	Range	Median
DRL1 n = 23	1 - 38	33
DRL2 n = 21	15 - 38	35
DRL3 n = 21	16 - 38	32
REWRESP1 n = 23	0.0055 - 0.6667	0.1609
REWRESP2 n = 21	0.0088 - 0.6000	0.0777
REWRESP3 n = 21	0.0093 - 0.6667	0.0544
REWRESPT n = 21	0.0055 - 0.3462	0.0641

Mean and standard deviation for initial rate

NITRATE3 - range 5.00 - 233.75
n = 23 mean 66.46
S.D. 53.12

Table 7.2 Intercorrelations of initial rate and DRL measures

	NITRATE3	DRL1	DRL2	DRL3	REWRESP1	REWRESP2	REWRESP3	REWRESPT
NITRATE3								
DRL1	- 0.04 (NS)							
DRL2	- 0.35 (NS)	- 0.02 (NS)						
DRL3	0.42 (NS)	- 0.07 (NS)	0.36 (NS)					
REWRESP1	- 0.62 (.002)	0.57 (.004)	0.48 (.028)	- 0.16 (NS)				
REWRESP2	- 0.77 (.001)	- 0.28 (NS)	0.67 (.002)	- 0.11 (NS)	0.41 (NS)			
REWRESP3	0.06 (NS)	0.13 (NS)	0.47 (.030)	0.71 (.001)	- 0.08 (NS)	0.25 (NS)		
REWRESPT	- 0.73 (.001)	0.22 (NS)	0.82 (.001)	0.07 (NS)	0.76 (.001)	0.81 (.001)	0.32 (NS)	

separately when dealing with their correlations with other variables.

One may next look at the correlations between the DRL measures and the initial rate of response (also shown in Table 7.2). Although the time required to learn the first DRL task is independent of initial rate, this does not apply to the efficiency of performing the task which, like the corresponding measures for the second task and the tasks taken together (REWRESP2 and REWRESPT), is highly negatively correlated with initial rate. This means that the higher the initial rate of the child the less efficient his performance i.e. he makes a larger number of responses for the same number of rewards. This might be expected. Since, however, the time measure is independent of initial rate, it means that those boys with high initial rates were learning the DRL task to criterion (at least half the possible rewards) but performing in an inefficient manner.

DRL2, however, is slightly negatively related to initial rate. At this stage, then, the boys who made a considerable number of surplus responses to the first task (those with a high initial rate) may be being penalised in learning the second task. The high negative correlation between REWRESP2 and initial rate implies that having a high initial rate will penalize the boy in terms of efficiency to an even greater extent in learning the second task.

By the third DRL task, however, the pattern has completely changed. Initial rate is positively related to DRL3 and independent of REWRESP3. This may possibly reflect the effects of the previous two tasks in two ways. First, it is possible that boys who, because they have high initial rates, have had to restrict their response rate to a great degree to learn the second task, will find the cut in response rate necessary to learn the third task a much easier proposition than those whose initial rates were low. These last will not have had much difficulty with the second task. Secondly, it is possible that response rates in the boys learning the second task at the time of learning are so low that only those boys who have a high initial

rate (a stable response tendency of the individual - see later) will give enough responses to learn the third task quickly. Those with a low initial rate will, on finding that their stratagem for the second task does not work for the third, slow their response rate down to such a degree that it falls below the criterion for the third task. This is due to the nature of the DRL criterion which requires a decrease in response rate which does not fall below a certain level, (boys extinguishing on the task will never learn a DRL task to this criterion). The data show some cases of this somewhat paradoxical hypothesis.

The Pearson product-moment correlations between the various measures of initial rate used in the whole series of studies are given in Table 7.3. INITRATE is the first measure, taken before the first, extradimensional discrimination. NITRATE2 was taken before the intradimensional discrimination. NITRATE3 was taken before the DRL tasks. The three variables may all, from their plotted distributions, be assumed to have normal distributions. It may be seen that the initial rate response is a very stable characteristic of the individual.

Tables 7.4 and 7.5 present the correlations between the DRL variables and personality both on test and retest. Pearson correlation coefficients are given for NITRATE3 and rank-order coefficents for the other variables.

It may be seen that the initial rate measure (NITRATE3) correlates moderately with self-reported extraversion on retest (JEPI, JPQ) but not on test. The retest measures of personality were, of course, given considerably closer in time to the DRL measures than were the test measures and so probably reflect the personality of the boy at the time of DRL testing more accurately. There is also a significant negative correlation with self-report neuroticism on retest but not on test. The negative correlation with teacher-rated neuroticism on retest is considerable but not significant. Correlations with the lie scales, impulsivity, psychoticism and crime are not significant. There is a sizeable correlation with RACA but not with the

Table 7.3 Initial rate correlations - product-moment correlations

	INITRATE	NITRATE2	NITRATE3
INITRATE			
NITRATE2	0.83 (.001)		
NITRATE3	0.66 (.001)	0.87 (.001)	

Table 7.4 Rank-order correlations between DRL variables and personality-test

	JEPIE	CATEXKI	TRSE	JEPIN	CATANXKI	TRSN	JEPIIMP	JEPIL	NOCRIM	AGE	RACA	IQ
NITRATE3	0.18 (NS)	0.29 (NS)	- 0.09 (NS)	- 0.18 (NS)	0.18 (NS)	0.01 (NS)	0.08 (NS)	0.14 (NS)	- 0.23 (NS)	0.11 (NS)	0.33 (NS)	0.07 (NS)
DRL1	0.06 (NS)	0.40 (NS)	0.07 (NS)	0.38 (NS)	0.09 (NS)	- 0.32 (NS)	0.41 (NS)	0.01 (NS)	0.49 (.018)	0.28 (NS)	0.24 (NS)	0.45 (.032)
DRL2	- 0.21 (NS)	- 0.28 (NS)	0.22 (NS)	0.03 (NS)	- 0.09 (NS)	0.37 (NS)	- 0.37 (NS)	0.11 (NS)	- 0.21 (NS)	- 0.17 (NS)	- 0.09 (NS)	- 0.06 (NS)
DRL3	0.09 (NS)	- 0.06 (NS)	- 0.08 (NS)	- 0.19 (NS)	- 0.09 (NS)	0.07 (NS)	- 0.07 (NS)	0.28 (NS)	- 0.12 (NS)	- 0.10 (NS)	0.22 (NS)	0.11 (NS)
REWRESP1	- 0.03 (NS)	0.07 (NS)	0.29 (NS)	0.43 (.040)	0.05 (NS)	0.07 (NS)	- 0.02 (NS)	- 0.10 (NS)	0.36 (NS)	- 0.10 (NS)	0.01 (NS)	0.18 (NS)
REWRESP2	- 0.27 (NS)	- 0.28 (NS)	0.25 (NS)	- 0.02 (NS)	- 0.33 (NS)	0.15 (NS)	- 0.19 (NS)	- 0.01 (NS)	0.03 (NS)	- 0.35 (NS)	- 0.11 (NS)	- 0.16 (NS)
REWRESP3	- 0.01 (NS)	0.01 (NS)	0.05 (NS)	- 0.13 (NS)	- 0.37 (NS)	- 0.04 (NS)	0.16 (NS)	0.26 (NS)	0.09 (NS)	- 0.02 (NS)	0.24 (NS)	0.12 (NS)
REWRESPT	- 0.06 (NS)	- 0.00 (NS)	0.24 (NS)	0.19 (NS)	- 0.23 (NS)	0.16 (NS)	- 0.00 (NS)	- 0.06 (NS)	0.22 (NS)	- 0.27 (NS)	- 0.09 (NS)	- 0.03 (NS)

Table 7.5 Rank-order correlations between DRL variables and personality - retest

	JEPIE2	JPQE2	CATEXK2	TRSE2	JEPIN2	JPQN2	CATANXK2	TRSN2	JEPIL2	JPQL2	JPQP2	NOCRIM2	PERG	PERS	PERSS	PERGS
NITRATE3 (Pearson corrs)	0.32 (NS)	0.37 (NS)	0.18 (NS)	- 0.20 (NS)	- 0.49 (.026)	- 0.41 (NS)	- 0.36 (NS)	- 0.31 (NS)	0.12 (NS)	- 0.11 (NS)	0.02 (NS)	- 0.22 (NS)	0.04 (NS)	- 0.07 (NS)	0.14 (NS)	- 0.06 (NS)
DRL1	0.09 (NS)	0.06 (NS)	- 0.07 (NS)	0.11 (NS)	- 0.07 (NS)	0.16 (NS)	- 0.16 (NS)	- 0.14 (NS)	0.07 (NS)	- 0.32 (NS)	0.38 (NS)	0.33 (NS)	- 0.23 (NS)	0.23 (NS)	0.13 (NS)	- 0.11 (NS)
DRL2	- 0.61 (.004)	- 0.58 (.008)	- 0.38 (NS)	0.19 (NS)	- 0.08 (NS)	- 0.11 (NS)	- 0.19 (NS)	0.09 (NS)	0.15 (NS)	0.18 (NS)	- 0.05 (NS)	- 0.30 (NS)	- 0.13 (NS)	0.09 (NS)	- 0.20 (NS)	0.05 (NS)
DRL3	- 0.12 (NS)	0.07 (NS)	0.08 (NS)	- 0.23 (NS)	- 0.47 (.042)	- 0.41 (NS)	- 0.23 (NS)	- 0.49 (.022)	0.33 (NS)	- 0.02 (NS)	0.23 (NS)	- 0.03 (NS)	- 0.40 (NS)	0.40 (NS)	- 0.05 (NS)	- 0.05 (NS)
REWRESP1	- 0.24 (NS)	- 0.38 (NS)	- 0.33 (NS)	0.10 (NS)	0.14 (NS)	0.16 (NS)	- 0.09 (NS)	0.20 (NS)	- 0.11 (NS)	- 0.14 (NS)	0.17 (NS)	0.34 (NS)	- 0.06 (NS)	- 0.09 (NS)	- 0.02 (NS)	- 0.02 (NS)
REWRESP2	- 0.54 (.018)	- 0.58 (.008)	- 0.22 (NS)	0.13 (NS)	0.17 (NS)	0.02 (NS)	0.17 (NS)	0.31 (NS)	- 0.05 (NS)	0.27 (NS)	0.01 (NS)	- 0.09 (NS)	- 0.18 (NS)	0.05 (NS)	- 0.17 (NS)	0.12 (NS)
REWRESP3	- 0.30 (NS)	- 0.04 (NS)	- 0.07 (NS)	- 0.07 (NS)	- 0.48 (.038)	- 0.23 (NS)	- 0.17 (NS)	- 0.29 (NS)	0.45 (.020)	- 0.08 (NS)	0.39 (NS)	- 0.07 (NS)	- 0.48 (.028)	0.54 (.012)	0.04 (NS)	- 0.11 (NS)
REWRESPT	- 0.44 (.044)	- 0.45 (.034)	- 0.27 (NS)	0.11 (NS)	0.06 (NS)	- 0.04 (NS)	- 0.08 (NS)	0.31 (NS)	- 0.09 (NS)	- 0.05 (NS)	0.26 (NS)	0.15 (NS)	- 0.16 (NS)	0.06 (NS)	- 0.19 (NS)	0.09 (NS)

other developmental measures. The pattern for extraversion is similar to that found for the previous measures of initial rate (INITRATE and NITRATE2) except that significant correlations occurred for those measures with personality both on test and retest. There is complete agreement with the previous findings for neuroticism. The correlations with age found in the previous measures do not appear in this study. This may be due to the fact that the children were one year older at the time of DRL testing than at the beginning of behavioural testing and so any differences in strength and stamina required to press the lever may have been cancelled out. The similarity of the results for NITRATE3 to the results for the previous measures of initial rate is not surprising in view of the high correlations between the three measures. One may hence conclude that initial rate is a stable characteristic of the individual and that it is the extrovert, stable boy, as rated by himself, who shows a high initial rate.

One may next look at the correlations between the DRL variables and personality. These will be taken task by task, although one must bear in mind the differences between the time and efficiency measures discussed earlier.

The first DRL task does not show any significant correlations with extraversion on the time measure although the correlations tend to be positive. The efficiency measure, however, shows negative correlations. Correlations with neuroticism are exceedingly mixed in sign but generally very low. There are no significant correlations with the lie scales. There are, however, moderate positive correlations with psychoticism for both measures of DRL which, since no equivalent correlation exists with JPQE, cannot be contaminated by the extraversion-psychoticism interrelationship found in this study. There is a significant positive correlation of DRL1 with NOCRIM on test. There are also sizeable positive correlations of the time measure with the developmental measures, especially IQ. The picture is of a task not significantly affected by personality but with the time required to learn the task correlated with developmental measures. One may remember

that the time measure, unlike the efficiency measure, is not correlated with initial rate, and hypothesize that the first DRL task is primarily a cognitive task - trying to understand the conditions of the task - and that there is no great difficulty in its performance, having understood it. One would expect personality measures to be more highly correlated with measures reflecting the difficulty of performing a DRL task - of acquiring behavioural restraint. One may also consider that, since there is no very great amount of behavioural restraint involved in this first task, the rewards available, which were considerable (maximum efficiency would produce 5 stamps per 2 seconds) would tempt the more criminal boys, who are presumed to be more susceptible to reward than the less criminal boys. They may, therefore, learn the task more quickly and be able to perform it more efficiently, than the non-criminal boys.

For the second DRL task, the position is considerably different. Two out of the three correlations of the time measure with self-report introversion are significant on retest, the test correlations being more modest in value. The time measure is uncorrelated with teacher-rated extraversion. A similar picture holds for the efficiency measure, although here, only the correlations with JEPIE and JPQE on retest are significant. There is very little relationship with neuroticism for either measure on either test or retest. There is no relationship with the lie scales or psychoticism. The correlation with number of crimes found for the first DRL task does not hold for the second one. Correlations with developmental measures are all negative, though nonsignificant. One may thus see that the pattern of personality correlations has completely changed from the first to the second DRL tasks. This supports the interpretation of the first task being primarily of cognitive one where the boy has to learn to understand the conditions of the task but where difficulty of performing the task, having understood it, is not very great. The reverse might be expected for the second task. The principle behind the task, that of lowering response rate,

remains unchanged between the two tasks, but difficulty of performance is considerably increased. Both time and efficiency measures might be expected to reflect this and so to be correlated with personality measures in the second task as opposed to developmental measures in the first task. The only consistent significant correlations for the first task are with developmental and crime measures. The only ones for the second task are with introversion. Since extraversion is related to impulsivity, one might expect that those boys better at performing a DRL task would be introverts. This hypothesis is also supported by the higher correlation of JEPILP than JEPIE on test with DRL2.

The pattern for the third task is again different. Here there are no significant correlations with the developmental measures or extraversion. There are, however, some significant correlations with both self- and teacher-rated neuroticism in the direction of stability. The values are higher for retest personality than test personality, probably again reflecting the greater applicability of the retest personality measures. The other significant correlations are positive ones with JEPIL on retest (RETRESP3 only), and percentage of crimes committed with a group. A significant negative correlation is found with percentage of crimes committed alone. These correlations may reflect the difficulty that the boys would find in bringing down their response rates to the very low level required by this third task. They had to acquire 3 rewards per 2 minutes. To obtain each reward they had to press the lever after 20 seconds had elapsed since the last response. Any tendency to neuroticism and possibly bursting of responses would be penalized in this task to a very much greater degree than in the two previous tasks. Percentage of crimes committed with a group is related to neuroticism. The principle behind the task remains the same as in the second task so correlations with the developmental measures would not be expected.

The only significant correlations of the total efficiency measure, REWRESPT, are with introversion on JEPIE and JPQE on retest. This would be expected as the second DRL task contributes to REWRESPT to the greatest extent. The correlations of the other tasks with the personality and developmental measures would not appear in this total measure as no two tasks have similar correlations.

A Comparison of the work of de Wit (H), Rushton (JPR) and the present study (JMS).

An account of the de Wit experiment is given in Appendix C.

The rank order correlations of the interrelations of the initial rate and DRL measures for the JPR study are given in Table 7.6. One may first note the similar high positive correlations between the time measure for one task and the efficiency measure for the same task in all three sets of data, even though the sequence of DRL times is different in the H study (2sec., 10sec., 20sec.). As in the JMS study, DRL1 in the JPR study does not have any significant correlations with DRL measures for the other two DRL tasks. It does, however, have a significant correlation with REWRESPT. This may reflect the high correlation of REWRESP1 with REWRESPT. It is, thus, the first DRL task in the JPR study, as opposed to the second DRL task in the JMS study, which contributes the greatest part of the variance to the total efficiency measure. One may expect that the younger children in the JPR study might have found the principle behind the DRL schedules harder than the boys in the JMS study and so taken longer over the first task. This is also shown in the higher proportion of children failing to learn the first DRL task in the JPR study (8 out of 20) than in the JMS study (2 out of 23). In the H study, the older boys again found the second DRL task the most difficult, as evinced by the correlations of the REWRESP1, REWRESP2 and REWRESP3 measures with REWRESPT.

Unlike the JMS study, REWRESP1 in the JPR study does not correlate significantly with any measure of the second DRL task. It does, however,

Table 7.6 Rushton data Intercorrelations of initial rate and DRL measures. (rank order corrs.)

	NITRATE3	DRL1	DRL2	DRL3	REWRESP1	REWRESP2	REWRESP3	REWRESPT
NITRATE3								
DRL1	- 0.13 (NS)							
DRL2	0.47 (NS)	0.25 (NS)						
DRL3	0.71 (.020)	- 0.01 (NS)	0.73 (.006)					
REWRESP1	- 0.64 (.002)	0.65 (.002)	- 0.17 (NS)	- 0.67 (.034)				
REWRESP2	0.42 (NS)	0.30 (NS)	0.89 (.001)	0.58 (NS)	- 0.03 (NS)			
REWRESP3	0.16 (NS)	0.02 (NS)	0.29 (NS)	0.62 (NS)	- 0.51 (NS)	0.37 (NS)		
REWRESPT	- 0.65 (.002)	0.52 (.018)	- 0.08 (NS)	- 0.31 (NS)	0.91 (.001)	0.23 (NS)	- 0.05 (NS)	

correlate highly with both the measures of the third DRL task in a negative direction. DRL2 correlates with DRL3 but not with REWRESP3. REWRESP2 also correlates with DRL3 but not REWRESP3. One may hence say that the time required to learn the first task is not correlated with any other DRL task measure, but those who are efficient on the first task are both nonefficient and slow on the third task. Both those who are quick and those who are efficient on the second task are quick on the third task but not necessarily efficient at it. This bears out the picture discussed above in relation to the REWRESPT measure that the first task is very difficult for these children to understand. The second task, which may be considered, as in the JMS study, as more of a performance task, is allied to the third in that children who are good at the second are quick to learn the third. The low correlations between the second and third tasks on efficiency may well be due to interactions between low and high response rate children as discussed in the JMS study. The negative correlations between REWRESP1 and the third task measures show the completely different natures of the first as opposed to the third task.

In the H study, the correlations between tasks are all non-significant with the exception of REWRESP1 with REWRESP2.

Looking now at the correlations of the DRL measures with initial rate in the JPR study, one may see that, as in the JMS study, DRL1 is not correlated with initial rate but REWRESP1 is highly negatively correlated with it. This might be expected. Both DRL measures for the first task are uncorrelated with initial rate in the H study, but here the initial rate measure was taken from a period of two minutes of continuous reinforcement, and so may not reflect solely the stable rate of response of the child but also the effect of continuous reinforcement on this and so whether the child recognizes that he could earn a reward every time he pressed the lever. The correlations of DRL2 and DRL3 in the JPR study with initial rate are both positive, similar to the correlation of DRL3 with initial rate in the

JMS study. Here again, we see that the second task in the JMS study is perhaps more similar to the first task in the JPR study. The correlations of the efficiency measures in the second and third tasks with initial rate in the JPR study are both positive and nonsignificant, again a similar result to the third task of JMS.

The H study shows negative correlations for the second DRL task measures with initial rate and non-significant correlations for the third DRL task.

Correlations with personality and developmental measures

The correlations of initial rate and DRL measures with personality and developmental measures for the JPR study are given in Table 7.7. Considering first the initial rate measures, the H and JPR studies agree in that the only significant correlations are with introversion. The reverse is the case in the JMS study.

The only significant correlations for DRL1 in the JPR study are with teacher-rated neuroticism. REWRESP1, however, shows a significant positive correlation with teacher-rated extraversion (TRS2) and teacher-rated neuroticism on both test and retest and a negative correlation with the lie scale. It is independent of the developmental measures. This is dissimilar to the pattern found in the JMS study (correlations with developmental measures).

For the second DRL task, however, the pattern becomes more similar. DRL2 in the JPR study is significantly positively correlated with introversion (JEPIE), and has moderate correlations with self-rated stability but teacher-rated neuroticism. It hence appears that, for the younger children in the JPR study, the second task requires skill in performance (correlations with introversion and self-rated stability) rather than cognitive reasoning (negative correlation with developmental measures). The efficiency measure shows more moderate correlations, again with introversion

Table 7.7 Rushton data. Correlations of initial rate and DRL measures with personality and development (rank-order corrs.)

	JEPIE	CATEX	TRSE1	TRSE2	JEPIN	CATANX	TRSN1	TRSN2	JEPIL	AGE	RQ
NITRATE3 (product-moment corrs.)	- 0.46 (.040)	0.12 (NS)	- 0.43 (NS)		- 0.21 (NS)	0.17 (NS)	- 0.13 (NS)			- 0.03 (NS)	- 0.15 (NS)
DRL1	- 0.16 (NS)	- 0.27 (NS)	0.27 (NS)	0.20 (NS)	- 0.10 (NS)	- 0.30 (NS)	0.46 (.040)	0.47 (.038)	- 0.20 (NS)	0.15 (NS)	- 0.09 (NS)
DRL2	- 0.71 (.010)	- 0.13 (NS)	- 0.14 (NS)	- 0.27 (NS)	- 0.49 (NS)	- 0.29 (NS)	0.52 (NS)	0.18 (NS)	0.27 (NS)	- 0.29 (NS)	- 0.46 (NS)
DRL3	- 0.89 (.004)	0.72 (.018)	- 0.34 (NS)	- 0.92 (.001)	- 0.84 (.001)	- 0.69 (.028)	- 0.20 (NS)	- 0.03 (NS)	0.48 (NS)	- 0.43 (NS)	- 0.02 (NS)
REWRESP1	0.33 (NS)	- 0.26 (NS)	0.41 (NS)	0.48 (.032)	0.20 (NS)	- 0.09 (NS)	0.45 (.046)	0.48 (.030)	- 0.39 (NS)	0.01 (NS)	0.00 (NS)
REWRESP2	- 0.45 (NS)	- 0.05 (NS)	0.01 (NS)	- 0.18 (NS)	- 0.30 (NS)	- 0.41 (NS)	0.39 (NS)	0.14 (NS)	0.05 (NS)	- 0.07 (NS)	- 0.41 (NS)
REWRESP3	- 0.56 (NS)	0.47 (NS)	- 0.04 (NS)	- 0.66 (.038)	- 0.43 (NS)	- 0.79 (.006)	- 0.10 (NS)	- 0.08 (NS)	0.49 (NS)	0.06 (NS)	- 0.21 (NS)
REWRESPT	0.29 (NS)	- 0.11 (NS)	0.45 (.046)	0.39 (NS)	0.05 (NS)	- 0.30 (NS)	0.33 (NS)	0.43 (NS)	- 0.35 (NS)	- 0.02 (NS)	- 0.01 (NS)

(JEPIE), self-rated stability (JEPIN, CATANX) and low RQ.

The third DRL task shows more strongly the performance correlations that began to appear in the second task, and is allied to the correlations found for both the second and third tasks in the JMS study. DRL3 shows very high significant correlations with introversion (JEPIE, CATEX, TRSE2) and stability (JEPIN, CATANX). There are also moderate correlations with the lie scale and with low age. REWRESP3 again show more moderate correlations but these are in the same direction as those of DRL3.

The H study shows significant correlations with age in the first task. The correlation is still apparent, but lower, in the second task. The personality correlations are more mixed, the second task showing correlations with extraversion, teacher-rated neuroticism and self-rated stability and the third one again showing correlations with extraversion.

Discussion

In all three of the studies reviewed it may be seen that, although the time and efficiency measures of the same DRL task are correlated, there is variable correspondence between DRL tasks. In the present study, there is wider divergence between the first and the next two tasks than between the second and third tasks. Several lines of evidence indicate that the processes involved in learning the first task are different from those involved in the second and third tasks. The inefficiency found in learning the second task implies that it is considerably harder to pass from the first to the second task than to learn the first task.

In contradiction to the predictions from previous studies, efficiency is found to decrease as the DRL task becomes harder (prediction 2). This is not surprising considering the first and the second DRL tasks as the first task uses a very small DRL interval. It is more surprising with the second and third tasks, as it was previously found that training on a DRL interval half that of the interval on which the measures were taken improved performance.

It is of course the case that performance may well have improved over giving the third DRL task with no pretraining. Large individual differences, however, were shown on all the DRL performance measures. A median comparison is hence not very meaningful. If the figures for the individual boys are considered, though, it is still found that only 8 out of 21 boys increase in efficiency on the third task.

The large range of scores on the DRL measures, if the measures give consistent correlations with personality, implies that DRL is a useful technique to measure susceptibility to reward. This is found to be the case. It must be remembered, however, that the negative relationship between good DRL performance on the second task and initial rate implies that those boys with a high initial rate found it more difficult to exercise behavioural restraint. The stability of the initial rate measures throughout the study, together with their correlations with extraversion and stability, mean that the effects of initial rate on DRL performance may be obscuring the effects of personality on ability to restrain behaviour independently of initial rate. The relationship of initial rate to behavioural restraint, however, is not clear and there are no data available by which to separate out the possible theoretical effects of the two forms of individual differences. The first DRL task, as predicted (prediction 3), shows low correlations with personality but sizeable ones with the developmental measures. The second and third tasks show correlations with introversion and stability, the personality measures that would be predicted to be involved if DRL is a measure of behavioural restraint and low susceptibility to reward (prediction 4). These results are also found in the studies of Rushton and de Wit, although the transfer between developmental and personality correlations occurs at different points in the various studies. This would be expected given the nature of the populations. It is suggested that the processes involved in learning the first (and, in some cases, the second) task are a combination of learning to understand the apparatus and

finding the right strategy. These 'cognitive' problems would be expected to produce correlations with the developmental measures. The third (and, in some cases, the second) task is then primarily concerned with showing behavioural restraint which would be expected to correlate with the personality measures. If this is the case, then any study using DRL as a technique to measure personality must then use a succession of DRL tasks.

This separation between the first and the second tasks is also seen in the correlations between measures of crime and DRL measures (prediction 5). The first DRL task has, in general, positive correlations with number of crimes admitted whereas the second two have, in general, negative correlations. The second and third tasks also separate out very satisfactorily the percentage of crimes committed in a group and the percentage committed alone, the first having negative correlations and the second positive. Group crime, which is related to neuroticism, is hence committed by the more impulsive criminal boys and solitary crime by the more restrained.

CHAPTER 8

BEHAVIOUR, PERSONALITY AND CRIME

Behavioural contrast and peak shift

Terrace (1966a) suggested that (intradimensional) "behavioural contrast and the peak shift covary in a sense that the conditions necessary to produce both seem identical and that one phenomenon is always accompanied by the other". If it is the case that both are products of susceptibility to frustrative nonreward then first, one should be present when the other is, although if the measurement of the existence of one is more sensitive than that of the other, one may seem to appear before the other, and secondly, the magnitudes of both phenomena should covary. Gray and Smith (1969), however, suggest that, at high levels of frustration, generalization of inhibition rather than contrast might occur, although peak shift should still appear.

It is clear from almost all subsequent work (see Purtle, 1973) that individual differences exist in the occurrence or non-occurrence of the phenomena since no schedule has been found to produce both phenomena for all individual subjects. It may be claimed, however, that peak shift, depending as it does on the distance between the generalization stimuli along the continuum, is not as sensitive a measure as mean shift. The weakest form of Terrace's view would then be that subjects may show peak shift without contrast (from Gray and Smith's explanation) and may show contrast with mean but not peak shift (since mean shift is more sensitive). The mean shift measure has been used primarily with humans. The only previously published work on the covariance of mean shift and behavioural contrast is that of Nicholson (Nicholson, 1972, 1974; Nicholson and Gray, 1972). In Nicholson's first experiment (see Table 8.1), four out of seven subjects learnt the discrimination and showed behavioural contrast on an extradimensional task and three of these

showed mean shift on a subsequent intradimensional task. In his second experiment, again with normal children, 10 out of 14 children showed contrast on an intradimensional discrimination and all these subjects showed mean shift, as did those not showing contrast. In his third experiment with maladjusted children, 15 out of 18 subjects showed contrast, again on an intradimensional discrimination and 15 out of 18 showed mean shift. Two of the three not showing mean shift had already shown contrast and two subjects showed mean shift without showing contrast. As this population is an abnormal one, however, the results cannot necessarily be held to counteract Terrace's claim, especially since the amounts of mean shift and behavioural contrast shown (measured as in the present study) covaried ($r = 0.55$, $p<0.05$). In the second experiment, there was also covariance ($r = 0.66$, $p<0.05$), although it is ominous that, if the three children excluded from tha analysis because of their 'exceptional' qualities are included, this correlation disappears.

In the present study, it was found that, as shown in Table 8.1, 18 out of 24 boys showed mean shift and 20 out of 24 behavioural contrast in the intradimensional discrimination. Three of the four subjects that did not show contrast showed mean shift. Of the six boys not showing mean shift, five showed contrast. Similar partial dependence of the occurrence of mean shift on the occurrence of behavioural contrast was found for the contrast shown in the extradimensional discrimination, where four of the subjects that did not show contrast showed mean shift. In Rushton's study, 19 out of 20 children showed behavioural contrast and 17 out of 20 mean shift, the child failing to show contrast showing mean shift. The results with the abnormal population in Nicholson's study appear to hold for the larger normal samples in Rushton's study and in the present study. There were no differences in personality, developmental or crime scores between the children failing to show the phenomena and the children showing the phenomena. It must be concluded that the occurrence of behavioural contrast does not necessarily depend on the occurrence of peak or mean shift.

Table 8.1 Number of children showing behavioural contrast and mean shift in various studies.

Study	Total Numbers	Number showing contrast and shift	Number showing contrast not shift	Number showing shift not contrast	Number showing neither contrast nor shift
Nicholson 1 Extradimensional contrast	4	3	1	0	0
Nicholson 2 Intradimensional contrast	14	10	0	4	0
Nicholson 3 Intradimensional contrast	18	13	2	2	1
Present study Extradimensional contrast	24	15	4	3	2
Present study Intradimensional contrast	24	15	5	3	1
Rushton study Extradimensional contrast	20	16	3	1	0

The correlations between the behavioural measures in the present study are shown in Table 8.2, Pearson product-moment correlations being given if both variables involved had a normal distribution and Spearman rank-order correlations if one or both did not. It may be seen that the correlations between the amount of mean shift shown (POSTMS) and the amount of behavioural contrast shown on both discriminations (ABSSD, PERSD, CORLOGSD, ABSSD2, PERSD2, ORPERSD2) are all nonsignificant and all negative. In the Rushton study, if those boys not showing mean shift are excluded, the correlation of (extradimensional) behavioural contrast with mean shift is -0.11 (nonsignificant with n = 17). If initial rate is partialled out in the correlations of mean shift with CORLOGSD, ORLOGSD2 and behavioural contrast in the Rushton study, the correlations become 0.03, -0.10 and -0.24, respectively, all of which are nonsignificant. In opposition to the results of Nicholson and the views of Terrace, therefore, both the present study and that of Rushton find no covariance between the occurrence or the magnitude of behavioural contrast and mean shift. The phenomena may hence not both be taken as measures of say susceptibility to frustrative nonreward. Whether one is or not will be discussed later in the section on correlations with the personality measures.

At this point, it is worth considering what differences between the procedure of Nicholson and that of Rushton and the present study might have caused the discrepancies between the results. There was, of course, a difference in population between Nicholson and Rushton, on the one hand, and the present study, on the other hand. Since the results of Rushton and those of the present study are similar, however, this cannot be a cause of the differences between the two recent studies and those of Nicholson. The only major difference in procedure is that Nicholson's subjects received only an intradimensional discrimination with generalization tests before and after discrimination training. Both Rushton's subjects and those of the present study had received extradimensional discrimination training before the intradimensional discrimination used to measure mean shift. The reason this

Table 8.2 Pearson product-moment and Spearman rank-order (starred) correlations of behavioural measures

	INITRATE	ABSSD*	PERSD*	CORLOGSD	NITRATE2	ABSSD2*	PERSD2*	ORLOGSD2	POSTMS	POSTGENR	DRL1*	NITRATE3	DRL2*	DRL3*	REWRESP1*	REWRESP2*	REWRESP3*	REWRESPT*
INITRATE																		
ABSSD*	0.18 (NS)																	
PERSD*	-0.47 (.028)	0.68 (.002)																
CORLOGSD	-0.51 (.016)	0.67 (.002)	0.99 (.001)															
NITRATE2	0.83 (.001)	0.64 (.010)	-0.05 (NS)	-0.25 (NS)														
ABSSD2*	0.65 (.016)	0.33 (NS)	-0.30 (NS)	-0.28 (NS)	0.73 (.005)													
PERSD2*	-0.31 (NS)	-0.47 (NS)	0.04 (NS)	0.04 (NS)	-0.21 (NS)	0.44 (NS)												
ORLOGSD2	-0.37 (NS)	-0.47 (NS)	0.04 (NS)	-0.12 (NS)	-0.14 (NS)	0.44 (NS)	1.00 (.001)											
POSTMS	0.15 (NS)	-0.15 (NS)	-0.14 (NS)	-0.06 (NS)	-0.16 (NS)	-0.13 (NS)	-0.02 (NS)	-0.14 (NS)										
POSTGENR	-0.24 (NS)	0.03 (NS)	0.24 (NS)	0.09 (NS)	-0.39 (NS)	-0.45 (NS)	-0.05 (NS)	-0.11 (NS)	0.19 (NS)									
NITRATE3	0.66 (.002)	0.62 (.006)	-0.10 (NS)	-0.18 (NS)	0.87 (.001)	0.78 (.001)	-0.21 (NS)	-0.21 (NS)	0.31 (NS)	0.02 (NS)								
DRL1*	-0.26 (NS)	0.06 (NS)	0.08 (NS)	0.08 (NS)	-0.22 (NS)	-0.24 (NS)	-0.12 (NS)	-0.12 (NS)	-0.21 (NS)	0.04 (NS)		-0.04 (NS)						
DRL2*	-0.32 (NS)	-0.40 (NS)	0.03 (NS)	0.03 (NS)	-0.41 (NS)	-0.25 (NS)	0.44 (NS)	0.44 (NS)	0.05 (NS)	0.14 (NS)	-0.02 (NS)	-0.35 (NS)						
DRL3*	0.36 (NS)	0.17 (NS)	0.04 (NS)	0.04 (NS)	0.34 (NS)	0.37 (NS)	0.17 (NS)	0.17 (NS)	-0.16 (NS)	-0.26 (NS)	-0.07 (NS)	0.42 (.050)	0.36 (NS)					
REWRESP1*	-0.68 (.002)	-0.43 (NS)	0.06 (NS)	0.05 (NS)	-0.61 (.010)	-0.52 (NS)	0.13 (NS)	0.13 (NS)	0.02 (NS)	0.14 (NS)	0.57 (.004)	-0.62 (.002)	0.48 (.028)	-0.16 (NS)				
REWRESP2*	-0.61 (.010)	-0.43 (NS)	0.25 (NS)	0.24 (NS)	-0.50 (.048)	-0.47 (NS)	0.32 (NS)	0.32 (NS)	-0.01 (NS)	0.19 (NS)	-0.28 (NS)	-0.78 (.001)	0.67 (.002)	-0.11 (NS)	0.41 (NS)			
REWRESP3*	0.06 (NS)	0.03 (NS)	0.10 (NS)	0.09 (NS)	0.01 (NS)	0.15 (NS)	0.26 (NS)	0.26 (NS)	-0.45 (NS)	-0.05 (NS)	0.13 (NS)	0.07 (NS)	0.47 (.030)	0.71 (.001)	-0.08 (NS)	0.25 (NS)		
REWRESPT*	-0.64 (.004)	-0.47 (.048)	0.18 (NS)	0.16 (NS)	-0.63 (.006)	-0.62 (.018)	0.04 (NS)	0.04 (NS)	-0.09 (NS)	0.35 (NS)	0.22 (NS)	-0.73 (.001)	0.82 (.001)	0.07 (NS)	0.76 (.001)	0.81 (.001)	0.32 (NS)	

tactic was adopted was that extradimensional training, from the model of Gray and Smith (1969), should produce a better measure of behavioural contrast. It has already been postulated, in the chapter on behavioural contrast, that the intradimensional contrast shown suffered from a practice effect from previous extradimensional discrimination training. It is hence more valid to use the extradimensional rather than the intradimensional measure of contrast as a measure of frustrative nonreward. In support of this, Friedman and Guttman (1965) gave discrimination training between a wavelength (S^D) and the same wavelength with a cross superimposed on it (S^Δ) (extradimensional training) followed by discrimination training between the S^D and another wavelength as S^Δ and found that the increase in amount of contrast shown to the second discrimination over that shown to the first was insignificant in magnitude, a result similar, though more pronounced, to that of the present study. A peak shift, however, was still obtained after the second discrimination.

It is possible that prior extradimensional training also affected the magnitude of the subsequent peak or mean shift produced in the Rushton study and the present study, although it is clear that it does not affect its presence or absence from the similar proportions of children showing mean shift in the various studies. Unfortunately, Friedman and Guttman did not do the appropriate control group to resolve this question, one trained on the S^D - wavelength S^Δ discrimination (intradimensional) only. The way in which prior discrimination training may affect the magnitude of a subsequent shift is unknown.

Generalization of reward and differential reinforcement of low rates of response

It has been hypothesized that both generalization of reward and differential reinforcement of low rates of response (DRL) are measures of susceptibility to reward, generalization increasing and DRL performance decreasing with increasing susceptibility. If such is the case, then there

should be a high negative correlation between the two. In the present study, the correlations of generalization with the measures of DRL range from -0.26 to 0.35, all nonsignificant. It is, however, the case that the highest negative correlations are found with the third DRL task, positive ones being found with the first and second. It was hypothesized that the first, and possibly the second, DRL tasks were measuring 'cognitive' variables whereas the third was measuring behavioural restraint. In Rushton's study, the correlations between generalization and the DRL measures range from -0.36 to -0.14, all nonsignificant. There is thus some slight evidence that generalization and DRL are related but the relationship is not significant.

Correlations between measures of susceptibility to reward and measures of susceptibility to frustrative nonreward

If behavioural contrast and mean shift are measures of susceptibility to frustrative nonreward, and generalization and DRL measures of susceptibility to reward then, on Gray's theory of personality the cross-correlations between the measures should be zero as the dimensions are hypothesized to be independent of each other.

Considering first the correlations of behavioural contrast, extradimensional contrast shows correlations of 0.03 (ABSSD), 0.24 (PERSD) and 0.09 (ORLOGSD) with generalization (all nonsignificant) and only one negative significant correlation out of 21 with the DRL measures, which is with ABSSD. Intradimensional contrast shows correlations of -0.45 (ABSSD2, nonsignificant), -0.05 (PERSD2, nonsignificant) and -0.11 (ORLOGSD2, nonsignificant) with generalization and one significant negative correlation out of 21 with the DRL measures, again with ABSSD2. Mean shift (POSTMS) shows a correlation of 0.19 (nonsignificant) with generalization and no significant correlations with DRL. It thus appears that the measures of susceptibility to frustrative nonreward are in general independent of those of susceptibility to reward in the present study although the absolute difference contrast measure does

have some negative correlations with both generalization and DRL. If the percentage or the logarithmic percentage measure of contrast is taken, as has been done by previous workers (Nicholson, 1972; Terrace, 1974), the prediction of independence is confirmed.

In the Rushton study, however, both contrast (logarithmic percentage measure) and mean shift show significant positive correlations with some of the DRL measures although no significant correlation is seen with generalization (Table 8.3). These correlations are in the opposite direction to those of the present study.

For the present study, these results imply that contrast (logarithmic percentage measure), mean shift and generalization are independent of each other with DRL being negatively related to generalization. It is necessary to explore the relationships of all these variables to personality in order to be able to see how the measures might be represented in factor space.

Correlations of behavioural measures with personality

Table 8.4 summarizes the relationships found between the behavioural measures and personality in the present study as discussed in the previous chapters. Extradimensional contrast rather than intradimensional contrast is presented, as the intradimensional task may have suffered from some practice effects. The second and third DRL tasks are given, as these are hypothesized to be the ones involving the measurement of behavioural restraint.

It may be seen that the independence of behavioural contrast from mean shift is reflected in the correlations with personality. Contrast, from its relationships with extraversion and the developmental variables, may hence be a measure of susceptibility to frustrative nonreward. Mean shift, apart from being independent of the amount of contrast shown, does not have the relationships with the personality and developmental variables predicted. Generalization and DRL have nearly opposite patterns of correlations with

Table 8.3 Rushton study Intercorrelations of behavioural measures. (Pearson product-moment correlations)

	INITIAL RATE	CONTRAST	MEAN SHIFT	DRL1	DRL2	DRL3	REWRESP1	REWRESP2	REWRESP3	REWRESPT
n = 20 INITIAL RATE				0.04 (NS)	- 0.15 (NS)	0.28 (NS)	- 0.61 (p<.01)	- 0.31 (NS)	0.26 (NS)	- 0.55 (p<.01)
n = 19 CONTRAST	- 0.45 (p<.05)			0.02 (NS)	0.55 (p<.05)	- 0.21 (NS)	0.32 (NS)	0.42 (NS)	0.06 (NS)	0.36 (NS)
n = 17 MEAN SHIFT	- 0.23 (NS)	- 0.11 (NS)		- 0.17 (NS)	0.63 (p<.05)	0.05 (NS)	0.17 (NS)	0.78 (p<.01)	0.19 (NS)	0.27 (NS)
n = 17 GENER-ALIZATION	0.40 (p<.05)	- 0.29 (NS)	- 0.30 (NS)	- 0.19 (NS)	- 0.25 (NS)	- 0.08 (NS)	- 0.35 (NS)	- 0.42 (NS)	- 0.11 (NS)	- 0.36 (NS)

Table 8.4 Gross summary of correlations between behavioural measures and personality and developmental measures

	EXTRAVERSION	NEUROTICISM	PSYCHOTICISM	DEVELOPMENT
EXTRADIMENSIONAL CONTRAST	(-)	0	(-)	(-)
MEAN SHIFT	0	(-)	0	0
GENERALIZATION	(+)	(+)	0	-
DRL (second and third tasks)	-	-	0	0

\- negative correlations
\+ positive correlations
( ) some nonsignificant or contradictory correlations
0 no relationship

personality, as would be predicted if DRL is a measure of behavioural restraint and generalization one of impulsivity.

The relationship between behavioural contrast and mean shift

It was suggested above that the differences in correlations between the studies of Nicholson and those of Rushton and the present author might be based on the prior extradimensional training in the Rushton study and the present study. Evidence was presented to show that this would affect the intradimensional contrast observed. In order, however, to explain the differences in the correlations of mean shift with personality, either the prior extradimensional discrimination must be taken to affect the nature of the mean shift produced or it must be postulated that mean shift is not a unitary variable, the studies of Nicholson tapping one source of variation and the studies of Rushton and the present author another. There is at present no independent evidence on the effect of extradimensional training on the correlations of subsequent mean shift with personality. There is, however, some evidence that mean shift may be tapping two sources of variation whereas behavioural contrast may be concerned with only one of these.

It has long been recognized that both punishment and frustrative nonreward have both energizing and directive effects (see chapter 5 for a definition of these). Behavioural contrast may be considered primarily a measure of the energizing effect of frustrative nonreward. Mean shift is then a measure of both the directive effect (in the shift of responding along the stimulus continuum) and the energizing effect (in that it is a rate of response measure). In order to explain the results of the three studies the following assumptions must be made:

1. That prior exposure to frustration (e.g. extradimensional training) affects the energizing rather than the directive effort.
2. That the energizing effect has correlations with introversion and neuroticism i.e. that 'susceptibility to frustrative nonreward' may be retermed 'susceptibility to the energizing effects of frustrative nonreward'.

3. That the directive effect has different or zero correlations with personality, at present unknown.

4. That the children in Nicholson's studies showed generalization gradients reflecting the energizing effect as opposed to the directive effect to a greater extent than did the children in the Rushton study and the present study.

These assumptions will explain:

a) The smaller amount of contrast in the intradimensional discrimination of the present study.

b) The lower correlations between contrast and mean shift in the Rushton study and the present study than in the Nicholson study.

c) The nonsignificant correlations of intradimensional contrast and mean shift with personality in the Rushton study and the present study.

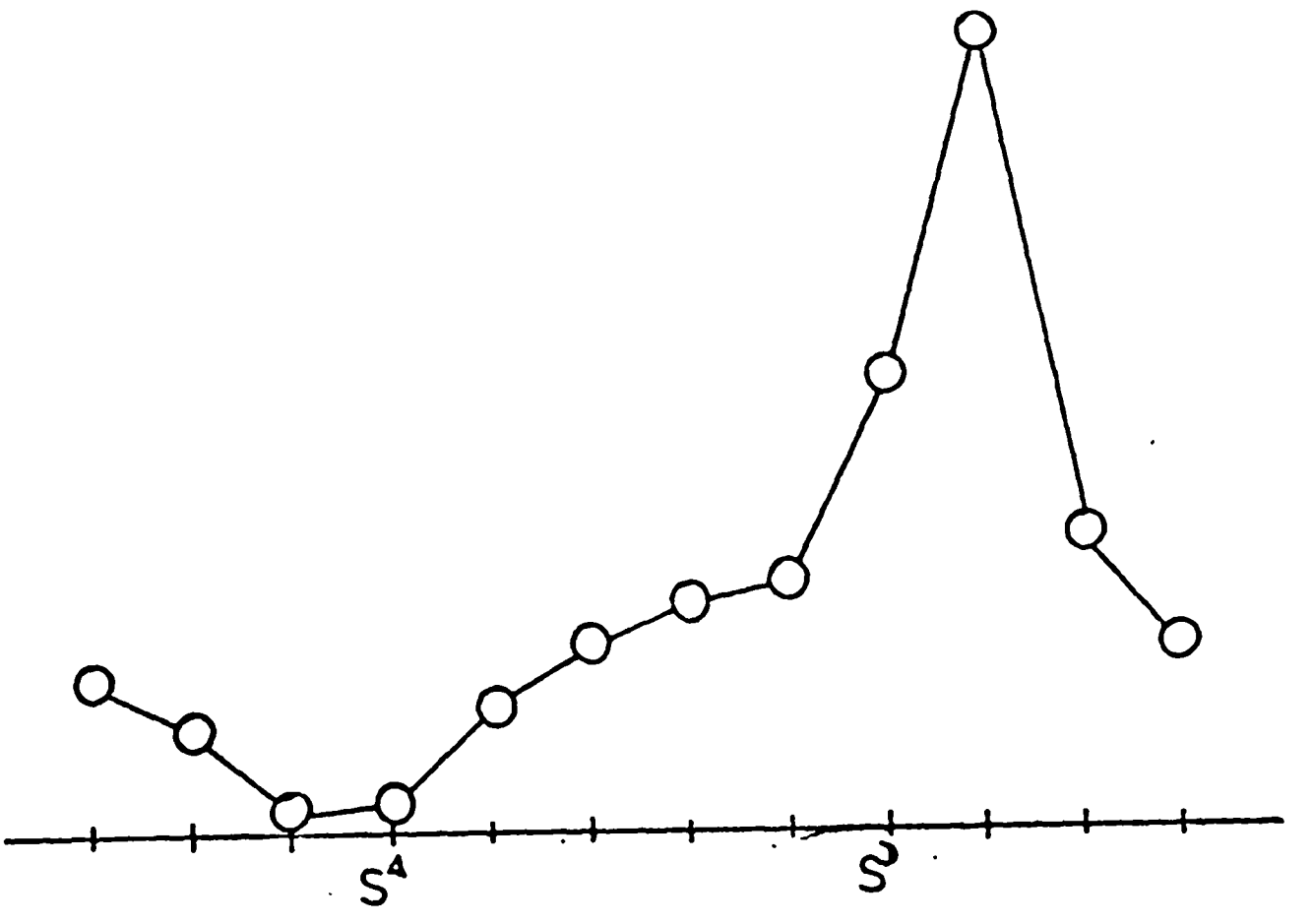
From the four assumptions two predictions may be made:

A) The generalization gradients in the Nicholson studies will be mainly of type I in Figure 8.5 (high energizing low directive) rather than type II (low energizing high directive) whereas those in the Rushton study and the present study will be mainly of the second type. An example of each type from the present study is given in Figures 6.1 and 6.2. The magnitude of the weighted frequency distribution i.e. the mean shift may be the same in both cases and the amount of peak shift can also be the same in both cases as is shown in the figure. The personality characteristics behind the two types of curves, however, will be different.

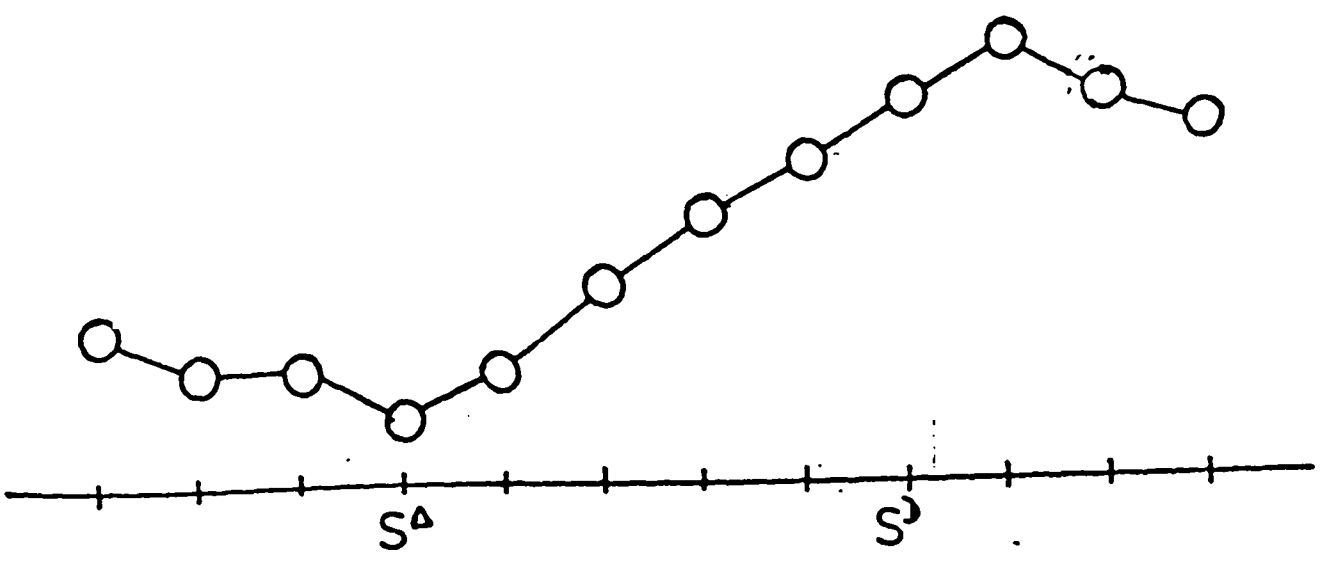
On examining the postdiscrimination generalization gradients of the three studies for which they are available, the present study, Nicholson's study with normal subjects and his study with maladjusted subjects, by visual inspection alone, the present study and the maladjusted study appear to have a considerable predominance of type II curves whereas the Nicholson normal study appears to have a considerable predominance of type I curves. This is in line with assumption 1, for the present study, and assumption 4.

gure 8.5 Hypothesized types of generalization gradient

ype I High energizing low directive type



pe II Low energizing high directive type



It also fits the difference in correlations of behavioural contrast and mean shift between the present study and the Nicholson normal study, no correlations being available for the maladjusted study.

B) If a pure test of the directive effect is given then the amount of directive effect shown should have correlations with personality variables different to those of the energizing effect (as measured by, say, behavioural contrast). It should also be the case that if tests of the energizing and directive effects are given and a mean shift measure is also taken in the same group of children, then the correlations of mean shift with personality should be an amalgam of the correlations of the directive and energizing effects with personality. None of these experiments have as yet been done. A suitable test of the directive effect might, however, be a modification of a transposition study. In this, successive discrimination training would be carried out between S^D and S^Δ in the same way as in a peak shift experiment. Instead of a postdiscrimination generalization test, however, the subject would be presented with pairs of adjacent stimuli separated by a small distance along the stimulus dimension. The point at which transposition reversal (Herbert and Krantz, 1965) occurs will then indicate the directive effect. Transposition reversal is the point at which, at some distance away from S^D in the direction away from S^Δ, the subject will choose the stimulus closer to S^D. This value may then be correlated with personality measures. This task may be used in a paradigm similar to that of Honig (1962) so that mean shift may also be measured. The dimension used should, however, be one in which perceptual effects should not occur, i.e. one of orientation not of hue.

There is some evidence from lesion studies in rats that the distinction between directive and energizing effects of frustrative nonreward and punishment is a valid one. Dickinson (1974) has reviewed the response suppressive and facilitative effects of septal and amygdaloid lesions. Septal-lesioned rats show persistent responding in extinction and under

punishment. The effects are not a gross learning deficit as they are not accompanied by distortion of response acquisition and maintenance. Nor do the effects seem to be the result of interference with the processing of response-associated cues or a decrease in the aversiveness of the aversive stimulus. It appears that, if aversiveness is measured by a technique involving response suppression, whether this be of a direct nature (e.g. punishment) or an indirect one (e.g. two-way active avoidance), then the lesion produces an apparent decrease in aversiveness. If, however, the aversive stimulus normally maintains an active response without involving approach-avoidance or avoidance-avoidance conflicts then performance is unchanged or, in some cases, increased. Amygdaloid lesions, as investigated by Henke et al., indicate an opposite pattern of results to septal lesions. This pattern may be summarized as a decrease in the energizing effect without the production of major changes in response persistence. The two systems appear to interact, as rats with septal damage respond at significantly higher rates than intact animals in paradigms such as behavioural contrast. Dickinson hence proposes that aversive stimuli are processed by two relatively independent systems; a response suppression system associated with septal functioning and a response facilitation system associated with amygdala functioning.

Correlations of behavioural measures with crime

In the introduction, it was predicted that the adolescent criminal should be more impulsive and susceptible to reward and slightly less susceptible to punishment than the non-criminal. This would mean that criminality should have a positive correlation with generalization and a negative one with DRL and possibly negative ones with behavioural contrast and mean shift. A summary of the relationships between the measures of crime and the behavioural measures is given in Table 8.6.

It will be remembered that the number of crimes committed (NOCRIM) is found to relate strongly to extraversion but not to neuroticism. The tendency

Table 8.6 Gross summary of correlations between behavioural measures and measures of crime

	NOCRIM	PERG	PERS	PERSS	PERGS
EXTRADIMENSIONAL CONTRAST	+	0	(-)	0	(-)
INTRADIMENSIONAL CONTRAST	-	0	(-)	0	(-)
MEAN SHIFT	0	(-)	0	0	0
GENERALIZATION	(+)	(+)	0	0	0
DRL (second and third tasks)	0	-	+	0	0

- negative correlation
+ positive correlation
( ) some nonsignificant or contradictory correlations
0 no relationship

to take part in group crime (PERG) independently of the number of crimes committed is related to neuroticism and, to some extent, extraversion.

The degree of correlation between the behavioural measures and the crime measures is very much less than that between the questionnaire personality measures and the crime measures. The behavioural measures, therefore, may be useful to answer questions about the susceptibility to reward or frustrative nonreward of criminals but they would not be as effective as the personality measures in predicting crime or, in most cases, type of crime.

It may be seen from Table 8.6 that there is a discrepancy between the correlations of extradimensional behavioural contrast and intradimensional behavioural contrast with number of crimes admitted. If extradimensional contrast is taken to reflect the energizing effect of frustration to a greater degree relative to the directive effect than intradimensional contrast, then the more criminal a child, the more he is susceptible to the energizing effects of frustration and, possibly, the less he is susceptible to the directive effects. If mean shift reflects both these variables, then it will not have significant correlations with crime, as is shown in the present study. It was predicted that the more criminal a child the more susceptible to reward he should be. This prediction is upheld in the case of generalization but not for DRL. Here, however, taking part in group crime (PERG), which has an expected negative correlation with behavioural restraint, is opposed to solitary crime (PERS), which has an expected positive correlation. It is thus the case that group criminals are susceptible to reward and solitary criminals not susceptible to reward. A measure of total number of crimes committed, both alone and with a group, would hence not have significant correlations with DRL. There are also weak correlations of group crime with generalization. The self-suggestion (PERSS) and other-suggestion (PERGS) measures are probably not measured to a sufficiently high degree of accuracy to give significant correlations with the behavioural measures.

The present study

At this point, it is perhaps worth summarizing the findings of the present study, in relation to the aims of the study.

The main hypothesis of the study is that delinquents should be more susceptible to reward and less susceptible to punishment than nondelinquents. This was to be tested in three ways: 1) by administering tests of the behavioural dispositions and correlating them with the crime measures 2) by correlating the behavioural tests with personality questionnaire scores 3) by correlating the personality questionnaire scores with the crime measures. There is, of course, a step prior to the actual testing of the hypothesis; that the measures used should be reliable and valid. The findings on this are presented below.

1. The self-report questionnaire measures of extraversion and neuroticism are as reliable and valid as claimed by the standardization data but there is considerable doubt as to the validity of the JEPI lie scale, though not of the JPQ lie scale.

2. The Teachers Rating Scale appears to be being used by the teachers as meaning a single quantity rather than both extraversion and neuroticism separately. On the evidence of the present study, the value of the TRSE and TRSN scales is doubtful.

3. The findings of the Cambridge study (West and Farrington, 1973) that a self-report delinquency scale is reliable has been confirmed in the present study. It has been shown that it is possible to measure involvement in group crime, solitary crime, self-suggested crime and other-suggested crime.

4. The phenomena used to measure susceptibility to frustrative nonreward, extra- and intra-dimensional behavioural contrast and mean shift, occurred to a substantial degree in the present study and that of Rushton, both the percentage of boys showing the phenomena and the magnitude of the phenomena replicating the results of Nicholson (Nicholson, 1972). The use of the subsequent baseline response rate control and the baseline correlation control

(chapter 5) strongly suggest that these are genuine contrast phenomena. However, there was no significant correlation between the magnitude of extradimensional contrast and the magnitude of intradimensional contrast shown. There was no correlation between the amount of contrast (of either type) and the amount of mean shift shown.

5. Although the correlations of behavioural contrast with JEPIE (introversion) and TRSN (neuroticism) predicted if behavioural contrast is a measure of susceptibility to frustrative nonreward and found in Nicholson's work (Nicholson, 1972), were found in the present study, they were weak and did not hold up when other measures of the personality variables were used. The correlations of mean shift found in Nicholson's work were not replicated in the present study. Mean shift did not have correlations with either introversion or neuroticism. As a result of these findings, it is proposed that behavioural contrast is measuring primarily the energizing effect of susceptibility to frustrative nonreward and mean shift both the energizing and the directive effects.

6. The time required to perform the discriminations was found to be considerably longer than the time required to describe the reinforcement conditions. The times required to learn the discrimination and the initial rate of response were found to be very stable characteristics of the boy.

7. The boys were able to learn the three, progressively more difficult DRL tasks. The tasks were found to have differing correlations with personality as predicted, the first task being primarily correlated with the developmental variables and not with personality, and the second and third tasks becoming correlated with introversion and stability, as would be predicted if bad DRL performance indicates high susceptibility to reward. The other measure of susceptibility to reward, generalization of reward, was found to be correlated to some extent with extraversion and teacher-rated neuroticism. It may thus have some validity.

It may be seen that only the third way of testing the main hypothesis

(personality with crime) may be employed with confidence that the measures used have some reliability and validy. This test shows that delinquents are more extravert and more psychotic than nondelinquents but that the two do not differ on neuroticism. This would be predicted if delinquents were both more susceptible to reward and less susceptible to punishment than nondelinquents (see chapter 1).

However, perhaps the most important development in this study has been to show that the hypothesis that criminals are more susceptible to reward and less susceptible to punishment or frustrative nonreward than noncriminals is a very crude one. There are suggestions that both the concept of crime and the concept of frustrative nonreward used in previous work are too simple. Whether a criminal is extravert, neurotic, susceptible to reward or susceptible to punishment will depend on what type of criminal he is. Overall criminality, the number of crimes admitted, will only reflect the proportions of the different types of criminals within the population studied. In an adolescent, working-class population where crime is primarily a group affair, as is the case in the present study, criminality will correlate with extraversion and susceptibility to reward. In another, say rural, population where the majority of crimes committed are committed alone and at the person's own instigation, the correlations would be expected to be different. Previous typologies of crime have stressed the type of offence committed or the type of personality of the criminal. The use of dimensions which reflect the social setting of the crime and, hence, the social pressures and choices of the criminal would seem to have very much more power to describe the differences between criminals and noncriminals and those between kinds of criminal. The present study has shown that these dimensions can be measured and that significant correlations occur between them and the personality and behavioural measures in the predicted directions. The measures, however, are crude and require some sharpening and clarifying on different populations. They may be used to answer questions about certain types of

crime - do football hooligans, for instance, always go around in a group? If the distinctions remain meaningful, then they have obvious implications for the penal system. Group criminals are unlikely to be persuaded not to commit more crimes if either shut up in solitary confinement or kept with their friends in the same group.

The other area of complication is in the behavioural measures. It appears that the simple response of the rat is hiding many different response tendencies and 'reasons' for acting. It is possible that the measures of frustrative nonreward in the study, behavioural contrast and mean shift, are measuring different aspects of frustrative nonreward, the strengths of which are independent. There will be no complete answer to these questions, which bear heavily on the disputes in the animal literature, until workers with animals explore the magnitude and not just the presence of phenomena. This may well raise the problem of individual differences between animals and compel its study. It would, however, be sad if the explanations of phenomena were ruled by the method of study in vogue rather than the nature of the phenomena. In humans, three particular areas seem promising: the separation of performance time from description time in learning discriminations; the possible presence of directive and energizing effects of frustrative nonreward and their combination in the measurement of behavioural contrast and mean shift; and the possible change from working out strategies to showing behavioural restraint in DRL. When these questions have been explored, it will then be possible to measure personality variables by behavioural tests in a more meaningful fashion. The aim of personality research is to measure and explain consistent individual differences in behaviour. Such differences have been found to occur in every part of this study.

APPENDIX A

GLOSSARY OF ABBREVIATIONS OF MEASURES USED

Personality, development and crime

JEPIE	test JEPI extraversion
JEPIN	test JEPI neuroticism
JEPIL	test JEPI lie scale
CATEXK1	test HSPQ exvia (CATEX)
CATANXK1	test HSPQ anxiety (CATANX)
TRSE	test Teachers' Rating Scale extroversion
TRSN	test Teachers' Rating Scale neuroticism
NOCRIM	test number of different types of crime admitted
FNOCRIM	test score of frequency of different types of crimes admitted
RACA	reading age minus chronological age
IQ	nonverbal IQ test
AGE	chronological age in months at time of first behavioural testing
JEPIIMP	test impulsivity calculated from JEPIE
CATBUK1	HSPQ test intelligence scale
RQ	reading quotient
JEPIE2	retest JEPI extraversion
JEPIN2	retest JEPI neuroticism
JEPIL2	retest JEPI lie scale
JEPIIMP2	retest impulsivity calculated from JEPIE2
CATEXK2	retest HSPQ exvia
CATANXK2	retest HSPQ anxiety
TRSE2	retest Teacher's Rating Scale extraversion
TRSN2	retest Teacher's Rating Scale neuroticism
EXVIA	CPQ exvia
ANXIETY	CPQ anxiety

JPQE2	retest JPQ extroversion
JPQN2	retest JPQ neuroticism
JPQL2	retest JPQ lie scale
JPQP2	retest JPQ psychoticism
CATBUK2	retest HSPQ intelligence scale
NOCRIM2	retest number of different types of crime admitted (27 - item questionnaire)
FNOCRIM2	retest score of frequency of different types of crimes admitted (27 - item questionnaire)
NOCRIS2	retest score of number of different types of crimes admitted (32 - item questionnaire)
FNOCRIS2	retest score of frequency of different types of crimes admitted (32 - item questionnaire)
PERG	percentage involvement in group crime to all crimes admitted
PERS	percentage involvement in solitary crime to all crimes admitted
PERSS	percentage involvement in crimes suggested by the boy himself to all crimes admitted
PERGS	percentage involvement in crimes suggested by others in the group to all crimes admitted

Behavioural Contrast - extradimensional

INITRATE	initial rate in number of responses per 30sec.
ABSSD	absolute change in rate of response to S^D per 30sec. from last baseline trial to last discrimination trial
PERSD	percentage change in rate of response to S^D per 30sec. = ABSSD X 100/INITRATE
CORLOGSD	log percentage change in rate of response to S^D = log PERSD
RATIO	discrimination ratio at last discrimination trial
BASELINE	number of baseline trials
CRITNO	number of discrimination trials
TOTALNO	total number of trials = BASELINE + CRITNO
KNOWNO	number of discrimination trials required to be able to describe discrimination conditions
PERFNO	number of discrimination trials required to be able to perform discrimination after having described it = CRITNO - KNOWNO

Intradimensional

NITRATE2	as INITRATE
ABSSD2	as ABSSD
PERSD2	as PERSD
ORPERSD2	as CORLOGSD
RATIO2	as RATIO
ASELINE2	as BASELINE
CRITNO2	as CRITNO
TOTALNO2	as TOTALNO
KNOWNO2	as KNOWNO
PERFNO2	as PERFNO

Mean Shift

POSTMS	postdiscrimination generalization test mean shift
POSTBYSD	postdiscrimination generalization test relative rate of response to stimuli beyond S^D in the direction away from S^Δ compared to rate of response at S^D
POSTSDSO	postdiscrimination generalization test rate of response to stimuli between S^D and S^Δ compared to rate of response at S^D
POSTGENR	postdiscrimination generalization test generalization test measure = POSTBYSD + POSTSDSO

DRL

NITRATE3	initial rate of response
DRL1	maximum number of trials possible before learning considered not to have taken place (40) minus time taken to learn DRL task where time = x + 2 and x = mean interresponse interval in seconds
DRL2	same as DRL1 where time = x + 9
DRL3	same as DRL1 where time = x + 19
REWRESP1	rewards obtained divided by responses made for DRL1 period
REWRESP2	rewards obtained divided by responses made for DRL2 period
REWRESP3	rewards obtained divided by responses made for DRL3 period
REWRESPT	total rewards obtained in all three DRL tasks divided by total responses made

APPENDIX B

THE SELF-REPORT DELINQUENCY SURVEY: DEVELOPMENT

Survey - first draft

(Behavioural instructions are underlined)

1. Would you like to sit down on that chair.

2. What is your name? How old are you?

3. This survey is about some of the things that boys do in their spare time. We need to know what lots of boys do and what kind of people they are so that we can build up a general picture of what boys are like.

That's why I'm talking to lots of boys at this school. If I'm to get a true picture of what boys are like, then it's necessary that you should be able to talk to me easily and not exaggerate or leave out things.

4. Nobody else will know anything of that you tell me. It's all entirely confidential. I'm not going to tell any one in the school anything that you tell me - so the headmaster, the teachers and the other pupils won't know anything. I'm going to take all these papers away with me when I go every day and no-one outside here will see them either.

5. I'm going to ask you to sort some cards about things boys may do in their spare time.

Show card so that he can read it

You can sort these cards onto the table. I shall pass them to you one at a time and you must put each one into either this box (indicate) which is for things that you have done, or into this box (indicate) which is for things that you have never done. If you're really not sure whether you've done a thing or not then put it face-down on the table in front of you.

6. So what things go into this box (indicate Yes Box) and into this one (indicate Never Box)? What do you do with cards where you're not sure

whether you've done the things on them or not?

7. The first five cards will just be to learn the rules and to get some practice.

Pass card 1. Hold the end of it and say Please read it out for me

If he can't read all the cards must be read out to him

Where would you put that one?

Where would you put it if you were only trying it out?

Now sort the card.

8. Pass the next card. Say Here is the next card. Please read it out to me.

Where would you put that one?

Where would you put it if it was a very long time ago?

9. Pass the third card. Say Where would you put this one?

Where would you put the card if you did this only when you were very young?

10. Pass the fourth card. Say Read it out to me.

Now, where would you put that one?

11. Do you have any questions? Is there anything you're unhappy about in this situation?

12. This is the last practice card. Pass it

Don't read this one out. Just think about it carefully and sort it.

13. Do all the other cards in the same way - don't read them out. And I won't be asking questions about them. Remember that everything you do is absolutely private.

Catch phrases - to be asked every few questions

1. If there's anything you don't understand, tell me and I'll try to help. O.K.?

2. It counts even if you did it a long time ago.

3. If you can't remember whether you did it or not put it face-down in front of you.

4. Take your time - don't hurry.

5. It counts even if you did the thing on the card just for fun or if you were just trying it out.

Between cards

Tell me each time you want the next card. Then I'll pass it through to you.

or

Now remember to ask me anything you want to know. O.K.? Here is the next card.

At end:

Here is a card that is different. Can you put it in front of the other cards.

Pass the Never card. When he has sorted it say:

Here is another. Put this one in front here as well.

Pass the Yes card. Bundle up the Yes and Never cards and put each to one side.

Not sure sorts

Now the next thing I want to do is to help you with any cards you were not sure about.

Have you got any cards face-down in front of you - ones you were not sure about?

If yes say Pick up the first one and look at it. Don't tell me what is on it, but just tell me why you were not sure about it.

Help solve the problem and resort. If there are any remaining put them on one side

Resorts

The first part of the interview is not over. I want you to do something slightly different.

Do you think that there is anything that might stop boys telling me everything they have done? If I know this then I can improve the way I ask the questions.

Discussion. After this say

With this card, just suppose for a minute that you had done this. I'm not saying that you have done this. Just let's pretend that you have. Now would you have told me about it. I mean, would you have put it into the Yes or the Never box.

Continue discussion

Now I want to go through the cards you put into the Never box once more. I'll tell you why, it's because you might have forgotten something the first

time you went through or perhaps you didn't want to tell me the first time. So I'll pass them to you one at a time and I want you to sort them slowly and carefully. Remember it's absolutely private. Here's the first one. Think about it.

The Yes cards

Now I want to ask you a few questions about the cards you put in the Yes box. Is that all right?

Collect them and enter numbers

Let's take this one for a start. Pass him the first card

How many times altogether have you ever done this sort of thing? Just before you answer me remember that I'm asking about everything of this sort you've ever done - the little things as well as the big things - about everything. So how many times altogether have you ever done this sort of thing?

When he replies ask him

Were you counting anything you did very recently as well?

Then How long ago was the very last time you did this sort of thing?

When he answers say Did you think very carefully when you said ... or was it only a rough idea?

If very carefully praise and say that is what you want for the other cards.

If a rough idea correct and stress importance of thinking hard. Then

Now I want to ask you exactly how old you were the very first time you did anything of this sort - the very first time even if it was a little thing.

Then ask about the rest of the Yes cards Probe

How did you work out that the number was ...? This number is very important.

How did you work out how long age the first/last offence was?

Do you mean exactly that?

How did you manage to work it out so quickly?

That is the same number/time ago/that age you gave for another card. How come it is just the same?

The survey includes the following sections:

1. An explanation of the purpose of the survey and a stressing of the confidentiality of the procedure (points 1 to 4)

2. Instructions for sorting the cards (point 5)

3. A check that the instructions have been understood (point 6)

4. The practice cards (numbers 1 to 5). This checks whether the boy could read the cards. If not, all the cards were read out to him. It was stressed throughout the interview that he should ask if he was not sure about anything. These cards also serve to check that the boy has understood the instruction that he should place a card in the 'Yes' box even if he had only done the act once or when he was very young (points 7 to 12).

5. The rest of the cards (numbers 6 to 40). The catch phrases were said after every few cards to make sure the instructions were being followed. This was taken from the procedure of Belson (point 13)

6. The 'Yes' and 'Never' cards. (plain cards of a different colour). These were also taken from the procedure of Belson. They indicate that the sorting part of the survey is over. (point 13)

7. The 'Not sure sorts'. If the boy had any cards for which he was not sure whether he had done the acts, these would be placed face-down on the table in front of him. This part is designed to help him with any problems with these cards. If he just couldn't remember whether he had done the activity, the cards were left as 'not sure' cards. There were very few of these. Another 'Yes' and another 'Never' card were then put in front of the other cards in the 'Yes' and 'Never' boxes.

8. Resorts. This section is designed to remove any remaining nervousness on the part of the boy by getting him to discuss what problems other boys might have in revealing what they did. It is followed by the 'pretend game' (also modified from Belson) in which the boy is asked what he would do if he had done an item taken at random from the 'Never' box. More discussion of why the boy might not admit offences, usually based on fears that the interviewer was

something to do with the police, followed.

9. Resort of 'Never' cards. The previous section having, hopefully, removed some of the fears the boy had, the present section was designed to encourage admission of more acts while providing acceptable reasons why the boy might not have admitted the acts the first time. This might be considered to encourage exaggeration, but the problem with self-report delinquency, as discussed at the beginning of the chapter, is concealment rather than exaggeration. It was considered that any instances of exaggeration would come out in the questions asked about each card sorted into the 'Yes' box. Although the number of resorts was not counted in the test administration, it was approximately the same as in the retest administration, in which the mean number was 1.9, the resorts being principally of the more serious delinquent items.

10. The 'Yes' cards. This section is concerned with the frequency of commission of the items and with the age of first commission. It includes the same kind of checks as in the original sorting to try to reduce response sets and perseverance on one figure. Any additional information required was also asked in this section.

Scoring sheets were designed for ease of scoring while still talking to the boy. Each item sorted into the 'Yes' box was marked, together with the frequency of commission and age of first offence. The interviewer was careful to write as least as much about the non-delinquency as the delinquency items.

Owing to problems of parental permission, it was not possible to pilot the technique on schoolboys not in the sample. Accordingly, the technique was piloted on 11 graduate students, who were invited to comment on any part of the interview. As a result of their comments and the experience of the interviewer, the following changes were made:

1. Three items which were naughty but not specifically illegal were included to reduce the gap between the non-delinquent and the delinquent items.

These were items 41 to 43.

2. The wording of some of the items was changed so that it became more comprehensible. For example, 'I have smoked cigarettes regularly' was changed to 'I have smoked cigarettes', as the students had different ideas of the word 'regularly'. 'I have stolen from people's clothes hanging up anywhere' was changed to 'I have stolen from people's clothes' as some subjects could not remember where the clothes had been and so tended to deny the item.

3. The initial section was made more informal. The second draft, which was used on test, is given below.

Survey - test administration

I'd like you to try and forget that we're in a school. You see - I'm nothing to do with the school - I'm not a teacher or anyone in authority. I want to find out some of the things that boys do in their spare time. Some of these things may be naughty things - but lots of boys do some of that kind of thing. I need to know what lots of boys do and what kind of people they are so that I can build up a general picture of what boys are like. That's why I'm talking to lots of boys at this school. If I'm to get a true picture of what boys are like, then it's necessary that you should be able to talk to me easily and not exaggerate or leave things out.

No-one else will know anything of what you tell me. It's all entirely private. I'm not going to tell anyone in the school anything that you tell me - so the headmaster, the teachers and the other boys won't know anything. I'm going to take all these papers away with me when I go every day and no-one outside here will see them either.

I'm going to ask you to sort some cards about things boys may do in their spare time.

Show card so that he can read it

You can sort these cards onto the table. I shall pass them to you one

at a time and you can put each one into either this box (indicate) which is for things you have done or into this box (indicate) which is for things that you have never done. If you're not sure whether you've done a thing or not then put it face-down on the table in front of you.

So what things go into this box (indicate Yes box)? And into this one (indicate Never box)? What do you do with cards where you're not sure whether you've done the things on them or not?

The first five cards will just be to learn the rules and to get some practice.

Pass card 1. Hold the end of it and say Please read it out for me.

If he can't read all the cards must be read out to him.

Where would you put that one?

Where would you put it if you'd been fishing only once?

Pass card 2. Here is the next card. Please read it out to me.

Where would you put that one?

Pass the third card. Where would you put that one?

Where would you put it if you did this only when you were very young?

Pass the fourth card. Read it out to me. Now where are you going to put that one?

Do you have any questions? Is there anything that you're unhappy about in this situation?

This is the last practice card.

Do all the other cards in the same way - don't read them out and I won't be asking questions about them. Remember that everything you say is absolutely private. If you can't remember anything or you're not sure just ask me.

Catch phrases -

If there's anything you don't understand, tell me and I'll try to help.

It counts even if you did it a long time ago.

If you can't remember whether you did it or not put it face-down in front of you.

Take your time - don't hurry.

It counts even if you did the thing on the card just for fun or if you were

just trying it out.

Remember it's all absolutely private.

At the end -

Here is a card that is different. Can you put it in front of the other cards in the Never box. Pass the first Never card. Then

Here is another. Put this one in front of the cards in the Yes box.

Pass the first Yes card.

Not sure sorts

Now the next thing I want to do is to help you with any cards you were not sure about.

Have you got any cards face-down in front of you - ones you were not sure about?

If yes, say Pick up the first one and look at it. Don't tell me what is on it, just tell me why you were not sure about it.

Help solve the problem and resort

After all the Not sure cards have been dealt with, pass the second Never card.

Can you put this in front of all the cards in the Never box.

Pass the second Yes card

Can you put this in front of all the cards in the Yes box.

Resorts

I want you to do something slightly different now.

Do you think that there is anything that might stop boys telling me what they had done?

After discussion -

With this card, just suppose for a minute that you had done this. I'm not saying that you have done this. Just let's pretend that you had. Now would you have told me about it?

Continue discussion then

Now I want you to go through the cards you put into the Never box once more. I'll tell you why - it's because you might have forgotten something the first time you went through or perhaps you didn't want to tell me the first time.

So I'll pass them to you one at a time and I want you to sort them slowly and carefully. Remember it's absolutely private.

Lots of people make mistakes on the first sort.

The Yes cards

Now I want to ask you a few questions about the cards you put in the Yes box. Is that all right?

Collect them and enter numbers

Let's take this one for a start.

Pass him the first card

How many times altogether have you ever done this sort of thing?

Just before you answer me remember that I'm asking about everything of this sort that you've ever done - the little things as well as the big things - about everything. So how many times altogether have you ever done this sort of thing?

When he replies ask him

Were you counting anything you did very recently as well?

Then How long ago was the very last time you did this sort of thing?

Did you think very carefully when you said that or was it only a rough idea?

Then Now I want to ask you exactly how old you were the very first time you did anything of this sort - the very first time even if it was a little thing.

Probes -

How did you work out that the number was....

Do you mean exactly that?

How did you manage to work it out so quickly?

That is the same number/time ago/age you gave for another card. How come it is just the same?

Then What is your name?

Survey - retest administration

This time we're just going to talk - there's no machine or anything like that. I'd like you to try and forget that we're in a school. As you know, I'm nothing to do with the school - I'm not a teacher or anyone in authority. I want to find out some of the things that boys do in their spare time. Some of these things may be naughty things - but lots of boys do some of that kind of thing.

I need to know what lots of boys do and what kind of people they are so that I can build up a general picture of what boys of your age are like. That's why I'm talking to lots of boys at this school. If I'm to get a true picture of what boys are like, then it's necessary that you should be able to talk to me easily and not exaggerate or leave anything out.

No-one else will know anything of what you tell me. It's all entirely private.

I'm not going to tell anyone in the school anything that you tell me - so the headmaster, the teachers and the other boys won't know anything. I'm going to take all these papers away with me when I go every day and no-one outside here will see them either.

I'm going to ask you to sort some cards about things boys may do in their spare time.

Show card so that he can read it.

You can sort these cards onto the table. I shall pass them to you one at a time and you must put each one into either this box (indicate) which is for things that you have done or into this box (indicate) which is for things you have never done. If you're not sure whether you've done a thing or not then put it face-down on the table in front of you.

So what things go into this box (indicate Yes box)? And into this one (indicate Never box)? What do you do with cards where you're not sure whether you've done the things or not?

The first five cards will just be to learn the rules and to get some practice.

Pass card 1. Hold the end of it and say Please read it out for me.

If he can't read all the cards must be read out to him.

Where would you put that one?

Where would you put it if you'd been fishing only once?

Pass card 2. Here is the next card. Please read it out to me.

Where would you put that one?

Pass the third card. Where would you put that one?

Pass the fourth card. Read it out to me. Now where are you going to put it?

Do you have any questions? Is there anything that you're unhappy about in this situation?

This is the last practice card. Pass card 5.

Do all the other cards in the same way - don't read them out and I won't be asking these questions about them. Remember that everything you say is absolutely private. If you can't understand anything or you're not sure just ask me.

Catch phrases

If there's anything you don't understand, tell me and I'll try to help.

It counts even if you did it a long time ago.

If you can't remember if you did it or not put it face-down on the table in front of you.

Take your time - don't hurry.

It counts even if you did the thing on the card just for fun or if you were just trying it out.

Remember it's all absolutely private.

Not sure sorts

Now the next thing I want to do is to help you with any cards you were not sure about.

Have you got any cards face-down in front of you - ones you were not sure about?

If yes, say Pick up the first one and look at it. Don't tell me what is on it, just tell me why you were not sure about it. Help solve the problem and resort.

Resorts

I want you to do something slightly different now.

Do you think that there is anything that might stop boys telling me what they had done?

Discuss, then say With this card, just suppose for a minute that you had done this. I'm not saying that you have done this. Just let's suppose that you had. Now would you have told me about this?

After discussion, Now I want to go through the cards that you put into the Never box once more. I'll tell you why - it's because you might have forgotten something the first time you went through or perhaps you didn't want to tell me the first time.

So I'll pass them to you one at a time and I want you to sort them slowly and carefully. Remember that it's all absolutely private.

Start passing cards

Lots of people make mistakes on the first sort.

The Yes cards

Now I want to ask you a few questions about the cards you put in the Yes box.

Is that all right?

Let's take this one for a start.

Pass first card.

How many times altogether have you ever done this sort of thing? Just before you answer me remember that I'm asking about everything of this kind you've ever done - the little things as well as the big things - about everything.

1. So how many times have you ever done this sort of thing?
2. Have you done it more often in the last year or less often?
3. How old were you when you started doing this?

Probes -

Do you mean exactly that?

How did you manage to work it out so quickly?

That is the same number/time ago/age you gave for another card. How come it is just the same?

Question 49

If this has been sorted into the Yes box, ask Tell me about the group.

How many boys are there in the group?

What kind of things do you do?

Can any other boy join the group? If no, What kind of boy has he got to be?

Would you call yourself a gang?

Do you have a leader?

Have you been going around with each other for a long time?

Additional questions

For questions 14 to 39 and 44 to 48, ask these as well

Tell me more about what happened and what you did.

If necessary,

4. Were you on your own or were you with some other boys? Were they friends of yours? Do you go around with them a lot? How many people were there? Were they all about your own age?

5. Did you think about doing something like this before you got there?

6. Did you take anything along with you to help you or get dressed in any special way?

7. Who suggested the idea? If no answer, Did it just arise on the spot or did anyone you met suggest it. I don't want to know anyone's name.

8. Where did it happen? If necessary, Was it at home, or in school, or in the area or somewhere else in Oxford?

Police

Have you ever had any contact with the police?

If yes, What happened?

The reference to the 'machine' at the beginning of the survey is concerned with the subject box for the behavioural measures. The retest survey administration was done immediately after the last of the behavioural tests.

An additional question on frequency of commission of the acts has been included as an additional probe to make sure that the boy is giving a correct answer to the frequency question.

Item 49 was placed sixth in the list so that a decision could be made as to whether the boy belonged to a gang. This was necessary to evaluate the answers to Question 4. The following features of a group had to be present in order for it to be designated as a gang:

a. definite membership

b. leadership

c. definite territory with occupation rights

d. persistence in time

e. illegal objectives

The last feature might or might not be present:

f. internal delimitation on the basis of authority, prestige or clique formation.

The additional questions on manner of commission of the offences were used for items 14 to 40 and 44 to 48. It was hoped that the boys would give the required information from the general question 'Tell me more about what you did'. Some, however, required additional prompting from questions 4 to 8. This part of the interview is semi-structured in that although the phraseology used in questions 4 to 8 was used in the initial prompting, clarification of some of the answers the boys gave was often needed, particularly when the argot of the area was used. For example, phrases such as 'dossing around' could mean going around fairly aimlessly with a group of boys or the more delinquent activities of playing catch with milk bottles, smashing slot machines etc.

Question 4 was designed to find out whether that particular act was

committed in a group, by the boy on his own, or with adults. The scoring categories were alone (S), with a group (g), with a gang (G), with an adult (over 18) (A), with a parent (P) and don't know (D). The average number of people in the group or gang was also noted. Obviously some acts were committed sometimes in one category and sometimes in another.

The following weightings were hence devised:

0 never in that category

$\frac{1}{3}$ seldom in that category

$\frac{1}{2}$ about equally in that category and in another

$\frac{2}{3}$ mostly in that category

1 almost always in that category

The weightings for any one item had to add up to 1.

The weightings are arbitrary but, in the opinion of the author, best fit the categories used by the boys to describe the events. This part of the interview is very much a pilot study of the possibility of using this technique to gain information on the circumstances leading up to the offences and on the possible function such an act had for the offender. It was remarkable, in fact, how well the boys received this type of question, which, of course, gave much more information to the interviewer which could have been passed on to the police. The boys seemed to consider it entirely natural that such questions should be asked.

Questions 5 and 6 were designed to see whether any planning had gone into the offence or whether it was an impulsive act. Question 5 was scored into categories: thought about it (C), did not think about it (NC) and don't know (D). Similar categories were used for question 6: T, NT and D i.e. took something, did not take something or don't know. The categories were given similar weightings as those for question 4.

Question 7 was designed to separate those acts which were suggested by the boy himself from those suggested by others, i.e. the leader-follower distinction. The scoring categories were: suggested by self (S), another

boy in the gang(G), another boy not in the gang (g), the gang leader (L), an adult over 18 (A), a parent (P) and don't know (D). Again, the weightings were as in question 4.

Question 8 was concerned with the locus of the crime activity. Scoring categories were: home (H), school (R), home district (B), shop (SH), elsewhere in Oxford (OX), on holiday (HOL) and don't know (D).

At the end of the interview the boy was asked whether he had ever had any contact with the police. If so, he was then asked to describe what form this had taken and what offence or offences it was connected with.

APPENDIX C

PILOT STUDY OF DE WIT ON DIFFERENTIAL REINFORCEMENT OF LOW RATES

Method

Subjects

Subjects were 34 maladjusted boys aged 10.08 to 15.66 years who were all resident at Bessels Leigh School, Oxfordshire. Ten of the children had participated in previous experiments on peak shift and behavioural contrast 18 months beforehand using different apparatus and with a different experimenter (Nicholson, 1972). All the children were tested using the DRL (differential reinforcement of low rates) technique but data from 8 of the children had to be dropped due to piloting and hence either lack of standardization of the test procedure or suspected prior knowledge of DRL requirements.

Apparatus

The children, who were tested singly, sat in front of a large cabinet within easy reach of a lever and a slot from which rewards (Green Shield Stamps) emerged as they were earned. The cabinet also contained a red and a green light, one of which indicated when a reward had been received. A motorized Green Shield Stamp machine, contained in the cabinet and controlled by a series of solid-state logic units, dispensed the rewards, according to the interval set by the experimenter. The number of responses made by the subject and number of rewards obtained were recorded on a print-out counter. A screen blocked the subject's view of the experimenter.

Procedure

Personality data was obtained from all subjects on the following tests: self-rated Junior Eysenck Personality Inventory (JEPI, giving extraversion,

neuroticism and lie scores); the Cattell Childrens Personality Questionnaire (CPQ) or High School Personality Questionnaire (HSPQ), accoring to the age of the child (giving the 14 primary factors and second-order ervia and anxiety scores); the Childrens Manifest Anxiety Scale (CMAS, giving anxiety and lie scores); and teacher-ratings on the Teacher's Rating Scale (TRS, giving extraversion and neuroticism scores.

Reading ages as scored on the Schonell Reading Test (administered three months before experimenting began) ranged from 5.7 to 13.5 years.

Behavioural

Instructions were kept to a minimum, emphasizing mainly that pressing the lever was somehow related to the delivery of Green Shield Stamps and encouraging the children to try to work out the relationship and to obtain as many stamps as possible. The children were allowed to keep the stamps they had earned.

Each child was first given 20 rewards on continuous reinforcement (CRF) for pretraining and to determine the initial rate of response per minute. Then a 2sec. DRL schedule was introduced. In this the child only receives a reward if he responds (presses the lever down and releases it) after an interval greater or equal to 2sec. from his last response. This was continued until at least half as many responses as were possible to obtain in one minute were earned for two consecutive one minute periods (i.e. 15 rewards per minute). This was followed by a 10sec. and a 20sec. DRL schedule with the same criterion (i.e. 3 rewards and 2 rewards respectively). Sessions lasted for approximately 30 minutes or until the criterion for the 20sec. schedule had been reached. Many subjects learnt all three schedules to criterion in the first session. Four of the subjects, on their second session, were commenced on CRF and the 2sec. schedule although they had already learnt this last. The results are presented with these children's data both present and absent. In a few cases of exceptionally fast

responding subjects were reminded that there was a way to earn more rewards. No subject was tested for more than two sessions. Number of responses and rewards per minute were recorded.

Results

The behavioural measures used are as follows:

a. a measure of the initial rate of response of the child, being the average rate of response per minute during CRF (INITRATE);

b. measures of DRL performance: the time taken to learn the 2sec. DRL schedule to criterion in minutes (DRL1) and corresponding measures for the 10sec. and 20sec. tasks (DRL2 and DRL3); the ratio of rewards obtained to responses emitted for the 2sec. task (REWRESP1) and corresponding measures for the 10sec. and 20sec. tasks (REWRESP2 and REWRESP3); and the ratio of total rewards obtained to total responses emitted during performance on all three schedules (REWRESPT).

All measures were calculated so that a high score on any of them implies good DRL performance, the time measures being subtracted from a constant number greater than the longest time taken.

c. measures of behavioural contrast and peak shift tasks:

behavioural contrast (logarithmic percentage measure taken between the prediscrimination and postdiscrimination generalization tests on an intradimensional discrimination) (BC); mean shift, (POSTMS); beyond S^D response rate (BEYSD); and generalization of reward.

The personality measures used are as follows:

extraversion measures from the JEPI (JEPIE), CPQ or HSPQ (CATEX), and TRS (TRSE); neuroticism or anxiety measures from the JEPI (JEPIN), CPQ or HSPQ (CATANX), TRS (TRSN) and CMAS (CMASA); and lie scores from the JEPI (JEPIL) and CMAS (CMASL).

Developmental measures used are as follows:

the chronological age of the child (CA); the Schonell reading age (RA); and the difference between these (CA-RA).

Means and standard deviations for the population studied and, where available, standardized means and standard deviations are presented in Table C.1.

Pearson product-moment correlations between all the variables were calculated and are presented in Tables C.2 to C.5A.

In Tables C.2, C.3, C.4 and C.5 data for all the children tested (omitting the 8 children dropped as a result of methodological flaws) were used in the analyses. In Tables C.2A, C.3A, C.4A and C.5A the 4 children with slightly incorrect second session procedure were also dropped from the analyses.

From Table C.1 it can be seen that the Besselsleigh children are significantly more neurotic or anxious than the standardization sample of the same age and sex on both the JEPI (at the .01 significance level) and the CMAS (at the .05 significance level). This would be expected since the school is specifically for maladjusted children who should be, at least in the eyes of their teachers, more neurotic or anxious. What might not be expected is that, since both these scales are self-report inventories, the children are rating themselves as more neurotic than a normal population. The population is significantly more introvert than a standardization sample of the same age and sex on the JEPI, the only test of extroversion for which appropriate standardization data is available. The population does not, however, have any tendency to lie more than the standardization sample on either the JEPI or the CMAS.

From tables C.2 and C.2A, the intercorrelations of the DRL measures, it may be seen that the correlations between the two measures of DRL performance for each DRL task are highly significant. The time taken to learn the task and the efficiency of performing the task are thus related. The correlations between the tasks on either type of measure, however, although positive, mostly fail to reach significance. The same is true of the correlations between the time measure on one task and the efficiency measure on another task. DRL performance is thus not unitary. It will hence be

Table C.1 Means and standard deviations both of this population and standardized for the personality measures used

TEST	POPULATION MEAN	POPULATION S.D.	STANDARDIZED MEAN	STANDARDIZED S.D.	t
JEPIE	16.21	4.56	17.84	3.80	2.04*
CATEX	115.18†	30.14†	-	-	-
TRSE	36.44	7.73	-	-	-
JEPIN	13.62	5.91	10.85	4.83	2.68**
CATANX	30.67†	6.22†	-	-	-
TRSN	39.24	7.29	-	-	-
CMASA	20.30	8.86	16.58	7.39	2.13*
JEPIL	2.76	2.08	3.03	2.34	0.67
CMASL	2.88	3.76	1.84	1.63	1.55
RUTA1	0.53	1.02	-	-	-
RUTA2	2.79	3.76	-	-	-

For those tests given dashes in the standardization means and standard deviation columns, no appropriate standardized means and standard deviations exist.

† Scores adjusted to allow for the use of both the CPQ and the HSPQ. For df 120, t = 1.98 at .05 significance level(*) and 2.62 at .01 significance level.(**) on a two-tailed test.

Table C.2 Bessels Leigh DRL data Intercorrelations of DRL measures. Doubtful children (n = 4) in

	INITRATE	DRL1	DRL2	DRL3	REWRESP1	REWRESP2	REWRESP3	REWRESPT
INITRATE n = 25								
DRL1 n = 23	0.16 (NS)							
DRL2 n = 22	- 0.57 (.006)	0.11 (NS)						
DRL3 n = 14	- 0.21 (NS)	0.33 (NS)	0.31 (NS)					
REWRESP1 n = 20	0.08 (NS)	0.72 (.001)	0.15 (NS)	0.07 (NS)				
REWRESP2 n = 21	- 0.32 (NS)	0.29 (NS)	0.51 (.018)	0.20 (NS)	0.47 (NS)			
REWRESP3 n = 14	- 0.15 (NS)	0.34 (NS)	0.33 (NS)	0.79 (.001)	0.30 (NS)	0.29 (NS)		
REWRESPT n = 11	0.38 (NS)	0.52 (NS)	0.70 (.016)	0.27 (NS)	0.77 (.006)	0.84 (.001)	0.37 (NS)	

NB DRL1 = 2"
2 = 10"
3 = 20"

Table C.2A Besselsleigh DRL data. Intercorrelations of DRL measures. Doubtful children out

	INITRATE	DRL1	DRL2	DRL3	REWRESP1	REWRESP2	REWRESP3	REWRESPT
INITRATE n = 25								
DRL1 n = 23	+ 0.22 (NS)							
DRL2 n = 22	- 0.16 (NS)	0.65 (.006)						
DRL3 n = 14	- 0.21 (NS)	0.35 (NS)	0.33 (NS)					
REWRESP1 n = 20	- 0.32 (NS)	0.78 (.001)	0.53 (NS)	0.05 (NS)				
REWRESP2 n = 21	- 0.34 (NS)	0.36 (NS)	0.62 (.006)	0.18 (NS)	0.50 (NS)			
REWRESP3 n = 14	- 0.16 (NS)	0.37 (NS)	0.31 (NS)	0.79 (.001)	0.28 (NS)	0.26 (NS)		
REWRESPT n = 11	0.32 (NS)	0.62 (NS)	0.69 (.026)	0.24 (NS)	0.77 (.008)	0.82 (.004)	0.33 (NS)	

necessary to consider each DRL task separately with respect to the other variables. The total efficiency measure (RESPT) is highly correlated with the other efficiency measures, as would be expected, and is more highly correlated with the time measures than are the other efficiency measures.

Initial rate, taking both tables together, is not significantly correlated with any of the DRL measures, although, if anything, the correlations are in the negative direction, a high initial rate leading to bad DRL performance.

Tables C.3 and C.3A show the correlations between the DRL measures and the other behavioural measures. This being a pilot study, the numbers tested on behavioural contrast and peak shift are unfortunately very small, and the correlations obtained need to be interpreted with caution. This is shown in the increased number of discrepancies between the two tables.

The variables are measured in such a way that a positive correlation indicates that good DRL performance is associated with a large amount of mean shift or behavioural contrast, i.e. a high susceptibility to frustration. It is interesting to note that the correlations of these two variables with the DRL variables are very similar although in opposite directions, the similarities being greater in Table C.3A than in Table C.3. As the number of subjects tested on the other behavioural measures is very small, it is necessary to look at the significance levels rather than the size of the correlation coefficients. The measure of responding beyond S^D gives correlations which, in Table C.3A, are of approximately the same size and in the same direction as those with mean shift. The picture is less clear in Table C.3.

As there is a positive correlation between POSTMS and BEYSD in Table C.5A, and a negative correlation between POSTMS and BC, this picture might be expected. The pattern of correlations between the three behavioural measures in Table C.5 is different and not so clear. If such a difference in size of correlation can be produced by taking out only two children, the

Table C.3. Besselsleigh DRL data. Intercorrelations of behavioural measrues. Doubtful children in

DRL MEASURES→ OTHERS↓	DRL1 n = 23	DRL2 n = 22	DRL3 n = 14	REWRESP1 n = 20	REWRESP2 n = 21	REWRESP3 n = 14	REWRESPT n = 11	INITRATE
POSTMS n = 9	0.55 (NS)	0.34 (NS)	0.27 (NS)	- 0.21 (NS)	- 0.05 (NS)	0.34 (NS)	- 0.34 (NS)	0.37 (NS)
BC n = 8	0.04 (NS)	- 0.29 (NS)	- 0.82 (.044)	- 0.62 (NS)	0.19 (NS)	- 0.54 (NS)	- 0.89 (.042)	- 0.62 (NS)
POSTGENR n = 10	0.35 (NS)	0.05 (NS)	0.30 (NS)	0.61 (NS)	0.19 (NS)	0.44 (NS)	0.70 (NS)	0.27 (NS)
BEYSD n = 9	0.30 (NS)	0.41 (NS)	0.45 (NS)	0.58 (NS)	- 0.02 (NS)	0.81 (.028)	0.72 (NS)	0.36 (NS)

Table C.3A Besselsleigh DRL data. Intercorrelations of DRL with other behavioural measures. Doubtful children out

DRL MEASURES→ OTHERS ↓	DRL1 n = 23	DRL2 n = 22	DRL3 n = 14	REWRESP1 n = 20	REWRESP2 n = 21	REWRESP3 n = 14	REWRESPT n = 11	INITRATE n = 25
POSTMS n = 7	+ 0.67 (NS)	- 0.25 (NS)	0.38 (NS)	- 0.03 (NS)	- 0.18 (NS)	0.52 (NS)	- 0.10 (NS)	0.52 (NS)
BC n = 6	- 0.14 (NS)	0.70 (NS)	- 0.79 (NS)	0.13 (NS)	0.80 (NS)	- 0.46 (NS)	0.15 (NS)	- 0.58 (NS)
POSTGENR n = 8	0.71 (.046)	- 0.33 (NS)	0.26 (NS)	0.09 (NS)	- 0.15 (NS)	0.40 (NS)	- 0.54 (NS)	0.18 (NS)
BEYSD n = 7	0.58 (NS)	- 0.39 (NS)	0.45 (NS)	0.56 (NS)	- 0.03 (NS)	0.92 (.010)	- 0.06 (NS)	0.60 (NS)

results must be interpreted with great caution, especially as the negative correlation between mean shift and behavioural contrast would not be expected either theoretically or on the basis of past work.

It can, however, be seen that behavioural contrast correlates negatively with the time measures of DRL in both Tables C.3 and C.3A, the size of the correlations becoming more pronounced as the DRL time interval increases. The relationships with the efficiency measures are not so clear, only the correlations with REWRESP3 being negative. In general, however, one might say that the more behavioural contrast a child shows, the worse he is at DRL. The results with POSTMS and BEYSD are in the opposite directions to those with BC. The only significant findings, however, are the positive correlations between POSTMS and DRL1 and between BEYSD and REWRESP3.

The generalization of reward measure, POSTGENR, does not show any significant correlations with the DRL measures that appear in both Table C.3 and Table C.3A. Its pattern of correlations is more similar to that of BEYSD than those of any other of the variables.

Tables C.4 and C.4A show the correlations between the behavioural measures and the personality and developmental measures. Taking the DRL measures first, it can be seen that initial rate is slightly related to introversion but has no other significant correlations.

Performance on the first DRL task is not related significantly to any variables except age. Performance on the second DRL task is slightly related to extroversion, to teacher-rated neuroticism but to self-rated stability (CATANX), and to age and strongly related to high scores on the lie scales. Performance on the third DRL task is slightly related to extroversion, to neuroticism on the JEPI and unrelated to age. It is thus possible that the first, and possibly the second DRL tasks are tapping the ability of the child to discover the contingencies of the tasks. This will grow with age. The negative correlations with initial rate also make this more likely, as a child with a high initial rate is not so likely to pause in his responding long

Table C.4 Besselsleigh DRL data with personality (Doubtful children in)

PERSONALITY→ / BEHAVIOURAL↓	JEPIE	E CATEX	TRSE	JEPIN	N CATANX	TRSN	CMASA n = 33	JEPIL	CMASL	RUTA1	RUTA2	AGE	RA	CA-RA ←n = 34
INITRATE n = 25	- 0.46 (.020)	- 0.24 (NS)	- 0.19 (NS)	0.18 (NS)	0.03 (NS)	- 0.30 (NS)	0.11 (NS)	0.07 (NS)	- 0.19 (NS)	0.20 (NS)	- 0.11 (NS)	- 0.11 (NS)	0.15 (NS)	- 0.19 (NS)
DRL1 n = 23	+ 0.04 (NS)	- 0.33 (NS)	0.06 (NS)	0.05 (NS)	0.32 (NS)	0.19 (NS)	- 0.07 (NS)	- 0.10 (NS)	0.18 (NS)	0.02 (NS)	0.16 (NS)	0.48 (.020)	0.00 (NS)	0.26 (NS)
DRL2 n = 22	+ 0.59 (.004)	+ 0.13 (NS)	0.25 (NS)	0.19 (NS)	- 0.09 (NS)	0.37 (NS)	- 0.15 (NS)	- 0.15 (NS)	- 0.09 (NS)	- 0.08 (NS)	0.23 (NS)	0.24 (NS)	0.01 (NS)	0.09 (NS)
DRL3 n = 14	0.04 (NS)	0.30 (NS)	0.47 (NS)	0.47 (NS)	0.01 (NS)	0.23 (NS)	+ 0.30 (NS)	- 0.16 (NS)	- 0.24 (NS)	- 0.30 (NS)	0.15 (NS)	- 0.14 (NS)	0.35 (NS)	- 0.40 (NS)
REWRESP1 n = 20	0.16 (NS)	- 0.25 (NS)	- 0.11 (NS)	- 0.01 (NS)	0.04 (NS)	- 0.03 (NS)	- 0.09 (NS)	- 0.12 (NS)	0.32 (NS)	0.07 (NS)	0.04 (NS)	0.51 (.022)	0.08 (NS)	0.21 (NS)
REWRESP2 n = 21	0.18 (NS)	- 0.13 (NS)	- 0.02 (NS)	0.01 (NS)	- 0.46 (.036)	- 0.09 (NS)	- 0.12 (NS)	0.33 (NS)	0.48 (.028)	0.14 (NS)	- 0.14 (NS)	0.2? (NS)	- 0.10 (NS)	0.19 (NS)
REWRESP3 n = 14	0.41 (NS)	0.29 (NS)	0.13 (NS)	0.44 (NS)	- 0.13 (NS)	- 0.15 (NS)	0.38 (NS)	0.02 (NS)	- 0.08 (NS)	+ 0.03 (NS)	0.07 (NS)	- 0.04 (NS)	0.43 (NS)	- 0.43 (NS)
REWRESPT n = 11	0.20 (NS)	0.15 (NS)	- 0.01 (NS)	0.26 (NS)	- 0.45 (NS)	- 0.30 (NS)	0.26 (NS)	0.10 (NS)	0.50 (NS)	0.31 (NS)	- 0.08 (NS)	0.48 (NS)	0.42 (NS)	- 0.19 (NS)
POSTMS n = 9	+ 0.53 (NS)	+ 0.68 (.044)	- 0.22 (NS)	+ 0.08 (NS)	- 0.40 (NS)	+ 0.40 (NS)	- 0.00 (NS)	+ 0.01 (NS)	- 0.19 (NS)	+ 0.23 (NS)	+ 0.01 (NS)	+ 0.36 (NS)	+ 0.17 (NS)	- 0.06 (NS)
BC n = 8	0.15 (NS)	- 0.29 (NS)	0.06 (NS)	- 0.74 (.038)	- 0.01 (NS)	0.25 (NS)	- 0.74 (.036)	0.72 (.046)	0.27 (NS)	-	- 0.55 (NS)	0.21 (NS)	- 0.58 (NS)	0.60 (NS)
POSTGENR n = 10	- 0.23 (NS)	- 0.16 (NS)	0.00 (NS)	0.30 (NS)	- 0.27 (NS)	- 0.09 (NS)	0.54 (NS)	0.06 (NS)	0.36 (NS)	0.02 (NS)	0.06 (NS)	0.32 (NS)	0.28 (NS)	- 0.19 (NS)
BEYSD n = 9	- 0.44 (NS)	- 0.23 (NS)	- 0.12 (NS)	0.39 (NS)	- 0.33 (NS)	- 0.14 (NS)	0.73 (.026)	0.24 (NS)	0.52 (NS)	0.05 (NS)	0.31 (NS)	0.40 (NS)	- 0.02 (NS)	0.12 (NS)

Table C.4A Besselsleigh DRL data with personality (Doubtful children excluded)

PERSONALITY→ / BEHAVIOURAL↓	JEPIE	CATEX	TRSE	JEPIN	CATANX	TRSN	CMASA	JEPIL	CMASL	RUTA1	RUTA2	AGE ← n = 34	RA	CA RA
INITRATE n = 21	- 0.21 (NS)	- 0.22 (NS)	- 0.00 (NS)	0.00 (NS)	0.06 (NS)	0.07 (NS)	0.23 (NS)	- 0.31 (NS)	- 0.25 (NS)	0.01 (NS)	0.07 (NS)	0.22 (NS)	- 0.05 (NS)	0.17 (NS)
DRL1 n = 19	+ 0.13 (NS)	- 0.32 (NS)	0.07 (NS)	0.02 (NS)	0.32 (NS)	0.28 (NS)	- 0.10 (NS)	- 0.16 (NS)	0.18 (NS)	0.03 (NS)	0.23 (NS)	0.52 (.022)	0.01 (NS)	0.31 (NS)
DRL2 n = 18	+ 0.10 (NS)	- 0.38 (NS)	0.14 (NS)	0.19 (NS)	- 0.03 (NS)	0.12 (NS)	0.00 (NS)	0.28 (NS)	0.42 (NS)	- 0.11 (NS)	0.08 (NS)	0.51 (.030)	- 0.07 (NS)	0.30 (NS)
DRL3 n = 13	+ 0.10 (NS)	0.34 (NS)	0.49 (.046)	0.46 (NS)	0.04 (NS)	0.22 (NS)	0.28 (NS)	- 0.18 (NS)	0.29 (NS)	- 0.33 (NS)	0.13 (NS)	0.13 (NS)	0.34 (NS)	- 0.38 (NS)
REWRESP1 n = 16	0.29 (NS)	- 0.23 (NS)	- 0.11 (NS)	- 0.07 (NS)	- 0.03 (NS)	- 0.13 (NS)	- 0.18 (NS)	- 0.08 (NS)	0.33 (NS)	0.08 (NS)	- 0.04 (NS)	0.50 (.046)	0.18 (NS)	0.13 (NS)
REWRESP2 n = 18	0.15 (NS)	- 0.18 (NS)	- 0.01 (NS)	0.03 (NS)	- 0.51 (.032)	- 0.16 (NS)	- 0.10 (NS)	0.41 (NS)	0.72 (.002)	0.07 (NS)	- 0.23 (NS)	0.34 (NS)	- 0.17 (NS)	0.31 (NS)
REWRESP3 n = 13	0.52 (NS)	0.34 (NS)	0.14 (NS)	0.44 (NS)	- 0.10 (NS)	- 0.17 (NS)	0.35 (NS)	- 0.00 (NS)	- 0.13 (NS)	0.01 (NS)	0.04 (NS)	- 0.02 (NS)	0.41 (NS)	- 0.41 (NS)
REWRESPT n = 10	0.42 (NS)	0.25 (NS)	0.05 (NS)	0.23 (NS)	- 0.41 (NS)	- 0.35 (NS)	0.16 (NS)	0.09 (NS)	0.46 (NS)	0.29 (NS)	- 0.20 (NS)	0.58 (NS)	0.38 (NS)	- 0.07 (NS)
POSTMS n = 7	+ 0.26 (NS)	+ 0.57 (NS)	- 0.34 (NS)	+ 0.37 (NS)	- 0.56 (NS)	- 0.41 (NS)	+ 0.55 (NS)	+ 0.13 (NS)	+ 0.21 (NS)	+ 0.27 (NS)	+ 0.17 (NS)	+ 0.59 (NS)	+ 0.13 (NS)	+ 0.04 (NS)
BC n = 6	0.00 (NS)	- 0.57 (NS)	0.21 (NS)	- 0.92 (.010)	- 0.34 (NS)	0.40 (NS)	- 0.90 (.016)	0.90 (.014)	0.62 (NS)	-	- 0.54 (NS)	0.19 (NS)	- 0.58 (NS)	0.62 (NS)
POSTGENR n = 8	0.41 (NS)	0.29 (NS)	0.12 (NS)	0.16 (NS)	- 0.18 (NS)	- 0.24 (NS)	0.25 (NS)	- 0.04 (NS)	0.04 (NS)	- 0.07 (NS)	- 0.22 (NS)	0.41 (NS)	0.38 (NS)	- 0.26 (NS)
BLYSD n = 7	0.51 (NS)	0.54 (NS)	- 0.04 (NS)	0.13 (NS)	- 0.64 (NS)	- 0.47 (NS)	0.41 (NS)	0.17 (NS)	- 0.01 (NS)	0.11 (NS)	0.21 (NS)	0.40 (NS)	0.19 (NS)	- 0.08 (NS)

Table C.5 Besselsleigh DRL data. Intercorrelations of BC, MS measures. Doubtful children in

	POSTMS	BC	POSTGENR	BEYSD
POSTMS n = 9				
BC n = 8	- 0.16 (NS)			
POSTGENR n = 10	- 0.03 (NS)	- 0.55 (NS)		
BEYSD n = 9	- 0.13 (NS)	- 0.35 (NS)	0.91 (.001)	

Table C.5A Besselsleigh DRL data. Intercorrelations of BC, NS measures. Doubtful children out

	POSTMS	BC	POSTGENR	BEYSD
POSTMS n = 7				
BC n = 6	- 0.54 (NS)			
POSTGENR n = 8	+ 0.86 (.014)	- 0.31 (NS)		
BEYSD n = 7	+ 0.73 (NS)	- 0.25 (NS)	0.93 (.001)	

enough to discover the schedule as is a child with a low initial rate. The influence of personality may only become apparent in the third DRL task where the child is already familiar with the nature of DRL and is required to restrain his behaviour to a greater extent rather than discover a completely new task. The total efficiency measure appears to be an average of the other efficiency measures, being most strongly affected by the second task.

The correlations of the behavioural contrast and peak shift measures are more adequately shown, with a larger sample size, in Nicholson's data (Nicholson, 1972).

These correlations, with a sample size of 15, are 0.55 (at .05 level of significance) between behavioural contrast and mean shift, and 0.32 (non-significant) between mean shift and BEYSD. The instability of the mean shift-behavioural contrast correlation with a reduction in sample size is marked. (see Tables C.5 and C.5A).

BIBLIOGRAPHY

Akers, R. Socio-economic status and delinquent behaviour: a retest. J. Research in Crime and Delinquency (1964), 1, 38-46.

Allsopp, J. Unpublished doctoral dissertation, London University. Personal communication.

Amelang, M. and Wantoch, H. Untersuchen zur selbstberichteten Delinquenz, Monatschrift für Kriminologie und Strafrechtsreform (1971), 54, 377-393.

Amsel, A. The role of frustrative nonreward in noncontinuous reward situations. Psychological Bulletin (1958), 55, 102-119.

Amsel, A. Frustrative nonreward in partial reinforcement and discrimination learning. Psychological Review (1962), 69, 306-328.

Anger, D. The dependence of interresponse times upon the relative reinforcement of different interresponse times. J. of Experimental Psychology (1956), 52, 145-161.

Anger, D. The role of temporal discrimination in the reinforcement of Sidman avoidance behaviour. J. of the experimental Analysis of Behavior (1963), 6, 477-506.

Azrin, N.H., Hutchinson, R.R. and Hake, D.F. Extinction-induced aggression. J. of experimental Analysis of Behavior (1966), 9, 191-204.

Baltzer, V. and Weiskrantz, L. Negative and positive behavioural contrast in the same animals. Nature (1970), 228, 581-582.

Baron, A. Postdiscrimination gradients of human subjects on a tone continuum. J. of experimental Psychology (1973), 101, 337-342.

Bell, R.Q. A reinterpretation of the direction of effects in studies of socialization. Psychological Review (1968), 75, 81-96.

Belson, W.A. The extent of stealing by London boys and some of its origins. Advancement of Science (1968), 25, No. 124.

Belson, W.A. The extent of stealing by London boys and some of its origins (1969), London: Survey Research Centre, London School of Economics, No. 39.

Belson, W.A., Millerson, G.L. and Didcott, P.J. The development of a procedure for eliciting information from boys about the nature and extent of their stealing (1968), London: Survey Research Centre, London School of Economics and Political Science, D7.

Blackmore, J. The relationship between self-reported delinquency and official convictions amongst adolescent boys. British J. of Criminology (1974), 14, 172-176.

Bloomfield, T.M. Two types of behavioural contrast in discrimination learning. J. of the experimental Analysis of Behavior (1966), 9, 155-161.

Bloomfield, T.M. Some temporal properties of behavioral contrast. J. of the experimental Analysis of Behavior (1967), 10, 159-164.

Bloomfield, T.M. Discrimination learning in animals; an analysis through side-effects. Nature (1969), 217, 929-930.

Blough, D.S. The shape of some wavelength generalization gradients. J. of the experimental Analysis of Behavior (1961), 4, 31-40.

Blough, D.S. The reinforcement of least frequent interresponse time. J. of the experimental Analysis of Behavior (1966), 9, 581-592.

Boakes, R.A. Response decrements produced by extinction and by response-independent reinforcement. J. of the experimental Analysis of Behavior (1973), 19, 293-302.

Bornstein, M.H. Perceptual generalization: a note on the peak shift. Psychological Bulletin (1974), 81, 804-808.

Bottoms, K. Report to 4th National Conference on Research and Teaching in Criminology (1970), Cambridge: Institute of Criminology.

Brethower, D.M. and Reynolds, G.S. A facilitative effect of punishment upon unpunished behaviour. J. of the experimental Analysis of Behavior (1962), 5, 191-199.

Brown, M.J., McCulloch, J.W. and Hiscox, J. Criminal offences in an urban area and their associated social variables. British Journal of Criminology (1972), 12, 250-268.

Bruner, A. and Revusky, S.H. Collateral behaviour in humans. J. of the experimental Analysis of Behavior (1961), 4, 349-350.

Buikhuisen, W. and Hemmel, J.J. Crime and conditioning. British Journal of Criminology (1972), 12, 147-157.

Burgess, P.K. Eysenck's theory of criminality: a new approach. British Journal of Criminology (1972a), 12, 74-82.

Burgess, P.K. Eysenck's theory of criminality: a test of some objections to disconfirmatory evidence. British J. social and clinical Psychology (1972b), 11, 248-256.

Burgess, P.K. (1973) Sociability, impulsivity and criminality. Conference paper, mimeo.

Campbell, A. and Rushton, P. Postscript: evidence from a female staff. Bulletin of the British Psychological Sooiety (1975), 28, 67-68.

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

Catania, A.C. Concurrent performances: reinforcement interaction and response independence. J. of the experimental Analysis of Behavior (1963), 6, 253-264.

Cattell, R.B. and Cattell, M.D.L. Handbook for the Jr.-Sr. High School Personality Questionnaire (1969), Windsor; N.F.E.R.

Christie, N. Hidden delinquency: some Scandinavian experiences. Third National Conference on Research and Teaching in Criminology (1968), Cambridge: Institute of Criminology.

Christie, N., Andenaes, J. and Skirbekk, S. A study of self-reported crime, in (ed.) Christiansen, K.O. Scandinavian Studies in Criminology (1965), London: Tavistock, 1, 86-116.

Claridge, G.S. and Chappa, H.J. Psychoticism: a study of its biological basis in normal subjects. British Journal of social and clinical Psychology (1973), 12, 175-187.

Clark, J.P. and Tifft, L.L. Polygraph and interview validation of self-reported deviant behaviour. American Sociological Review (1966), 31, 516-523.

Claster, D.S. Comparison of risk perception between delinquents and non-delinquents. J. Criminal Law, Criminology and Police Science (1967), 58, 80-86.

Cloward, R.A. and Ohlin, L.E. Delinquency and Opportunity: a Theory of Delinquent Gangs (1960), Glencoe: Free Press.

Cochrane, R. Crime and personality: theory and evidence. Bulletin of the British psychological Society (1974), 27, 19-22.

Cohen, A.K. Delinquent Boys: The Culture of the Gang (1955), Glencoe: Free Press.

Cohen, S. Adolescent group violence and vandalism. British Journal of Criminology (1971), 11, 319-340.

Corballis, M.C. and Beale, I.L. Bilateral symmetry and behavior. Psychological Review (1970), 77, 451-464.

Crespi, L.P. Quantitative variations of incentive and performance in the white rat. American Journal of Psychology (1942), 55, 467-517.

Dentler, R.A. and Monroe, L.J. Social correlates of early adolescent theft. American Sociological Review (1961a), 26, 733-743.

Dentler, R.A. and Monroe, L.J. The family and early adolescent conformity and deviance. Marriage and Family Living (1961b), 23, 243.

Dickinson, A. Response suppression and facilitation by aversive stimuli following septal lesions in rats: a review and model. Physiological Psychology (1974), 2, 444-456.

Dinitz, S. Interactional and small-group components in deviant and criminal behavior (1970) in Reckless, W.C. American Criminology: New Directions (1973), New York: Appleton-Century-Crofts, Appendix 1-C.

Donahoe, J.W., McCroskery, J.H. and Richardson, W.K. Effects of context on the postdiscrimination gradient of stimulus generalization. J. of Experimental Psychology (1970), 84, 58-63.

Downes, D.M. The delinquent solution (1966), London: Routledge & Kegan Paul.

Dukhayyil, A. and Lyons, J.E. The effect of overtraining on behavioural contrast and the peak-shift. J. of the experimental Analysis of Behavior (1973), 20, 253-263.

Dunham, P.J. Contrasted conditions of reinforcement: a selective critique. Psychological Bulletin (1968), 69, 295-315.

Dysart, J., Marx, M.H., McLean, J. and Nelson, J.A. Peak shift as a function of multiple schedules of reinforcement. J. of the experimental Analysis of Behavior (1974), 22, 463-470.

Ellis, W.R. Role of stimulus sequences in stimulus discrimination and stimulus generalization. J. of Experimental Psychology (1970), 83, 155-163.

Elmhorn, K. Study in self-reported delinquency among school children in Stockholm, in (ed) Christiansen, K.O. Scandinavian Studies in Criminology (1965), 1, 117-146.

Erickson, M.L. The group context of delinquent behavior. Social Problems (1971), 19, 114-129.

Erickson, M.L. The changing relationship between official and self-reported measures of delinquency: an exploratory-predictive study. J. Criminal Law, Criminology and Police Science (1972), 63, 388-396.

Erickson, M.L. and Empey, L.T. Court records, undetected delinquency and decision-making. J. Criminal Law, Criminology and Police Science (1963) 54, 456-469.

Erickson, M.L. and Empey, L.T. Class position, peers and delinquency. Sociology and Social Research (1965), 49, 268-282.

Eysenck, H.J. Manual of the Maudsley Personality Inventory (1959), London: University of London Press.

Eysenck, H.J. Crime and Personality (1970), London: Granada.

Eysenck, H.J. Crime and Personality reconsidered. Bulletin of the British Psychological Society (1974), 27, 23-24.

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

Eysenck, H.J. and Eysenck, S.B.G. A factorial study of psychoticism as a dimension of personality. Multivariate Behaviour Research (1968), 15-32.

Eysenck, H.J. and Eysenck, S.B.G. Personality Structure and Measurement (1969), London: Routledge and Kegan Paul.

Eysenck, H.J. and Eysenck, S.B.G. The orthogonality of psychoticism and neuroticism: a factorial study. Perceptual and Motor Skills (1971), 33, 461-462.

Eysenck, H.J. and Levey, A. Conditioning, introversion-extraversion and the strength of the nervous system, in (eds) Nebylitsyn, V.D. and Gray, J.A. Biological Bases of Individual Behavior (1972), New York-London: Academic Press.

Eysenck, H.J. and Rachman, S. The causes and cures of neurosis (1965), San Diego: Knapp.

Eysenck, S.B.G. Manual of the Junior Eysenck Personality Inventory (1965), London: University of London Press.

Eysenck, S.B.G. and Eysenck, H.J. Crime and personality: an empirical study of the three-factor theory. British Journal of Criminology (1970), 10, 225-239.

Eysenck, S.B.G. and Eysenck. H.J. Crime and personality: item analysis of questionnaire responses. British Journal of Criminology (1971a), 11, 49-62.

Eysenck, S.B.G. and Eysenck, H.J. A comparative study of criminals and matched controls on three dimensions of personality. British J. social and clinical Psychology (1971b), 10, 362-366.

Eysenck, S.B.G. and Eysenck, H.J. Personality and recidivism in Borstal boys. British Journal of Criminology (1974), 14, 385-387.

Eysenck, S.B.G., Eysenck, H.J. and Shaw, L. The modification of personality and lie scale scores by special 'honesty' instructions. British J. social and clinical Psychology (1974), 13, 41-50.

Farrington, D.P. Self-reports of deviant behaviour: predictive and stable? J. of Criminal Law and Criminology (1973), 64, 99-110.

Farrington, D.P. and West, D.J. A comparison between early delinquents and young aggressives. British Journal of Criminology (1971), 11, 341-358.

Farthing, G.W. Behavioral contrast with multiple positive and negative stimuli on a continuum. J. of the experimental Analysis of Behavior (1974), 22, 419-425.

Farthing, G.W. and Hearst, E. Generalization gradients of inhibition after different amounts of training. J. of the experimental Analysis of Behavior (1968), 11, 743-752.

Ferguson, T. The Young Delinquent in his Social Setting (1952), Oxford: Oxford University Press.

Ferster, C.B. and Skinner, B.F. Schedules of reinforcement (1957), New York: Appleton-Century-Crfts.

Field, J.G. The personality of criminals. Paper read to the Annual Conference of the British Psychological Society (1959).

Fitch, J.H. Two personality variables and their distribution in a criminal population: an empirical study. British J. social and clinical Psychology (1962), 1, 161-167.

Friedman, H. and Guttman, N. Further analysis of the various effects of discrimination training on stimulus generalization gradients, in (ed) Mostofsky, D.I. Stimulus Generalization (1965), Stanford: Stanford University Press.

Frieman, J. and Thomas, D.R. A peak shift resulting from a chained reinforcement schedule. Psychonomic Science (1970), 18, 315-316.

Gamzu, E. and Schwartz, B. The maintenance of key-pecking by stimulus-contingent and response-independent food presentation. J. of the experimental Analysis of Behavior (1973), 19, 65-72.

Ganz, L. Hue generalization and hue discriminability in Macaca mulatta. J. of experimental Psychology (1962), 64, 142-150.

Gerry, J.E. Peak shift on the tonal frequency continuum: the effects of extinction and punishment. Psychonomic Science (1971), 23, 33-34.

Gibbens, T.C.N. The Porteus Maze test and delinquency. British Journal of Educational Psychology (1958), 28, 209-216.

Gibson, H.B. The significance of "lie responses" in the prediction of early delinquency. British Journal of educational Psychology (1969), 39, 284-290.

Gibson, H.B. The factorial structure of juvenile delinquency: a study of self-report acts, British Journal of social and clinical Psychology (1971), 10, 1-9.

Gibson, H.B., Morrison, S. and West, D.J. The confession of known offences in response to a self-reported delinquency schedule. British Journal of Criminology (1970), 10, 277-280.

Gold, M. Status Forces in Delinquent Boys (1963). Ann Arbor, Michigan: University of Michigan Institute for Social Research.

Gold, M. Undetected delinquent behaviour. J. Research in Crime and Delinquency (1966), 3, 27-46.

Gold, M. Delinquent behavior in an American city (1970), Belmont, California, Wadworth.

Gonzalez, R.C. and Champlin, G. Positive behavioral contrast, negative simultaneous contrast and their relation to frustration in pigeons. J. of comparative and physiological Psychology (1974), 87, 173-187.

Gould, L.C. Who defines delinquency: a comparison of self-reported and officially-reported indices of delinquency for three racial groups. Social Problems (1969), 16, 325-336.

Gray, J.A. Disappointment and drugs in the rat. Advancement of Science (1967), 23, 595-605.

Gray, J.A. The psychophysiological basis of introversion-extraversion Behavioural Research and Therapy (1970), 8, 249-266.

Gray, J.A. Causal theories of personality and how to test them, in (ed) Royce, J.R. Multivariate Analysis and Psychological Theory (1973), London: New York: Academic Press.

Gray, J.A. Elements of a Two-process Theory of Learning (1975), London: Academic Press.

Gray, J.A. and Smith, P.T. An arousal-decision model for partial reinforcement and discrimination learning, in (eds) Gilbert, R.M. and Sutherland, N.S. Animal Discrimination Learing (1969), London: Academic Press.

Grusec, T. Peak shift in stimulus generalization: equivalent effects of errors and noncontingent shock. J. of the experimental Analysis of Behavior (1968), 11, 239-249.

Gupta, B.S. Extraversion and reinforcement in verbal operant conditioning. British Journal of Psychology (1975).

Guttman, N. Generalization gradients around stimuli associated with different reinforcement schedules. J. of experimental Psychology (1959), 58, 335-340.

Halliday, M.S. and Boakes, R.A. Behavioural contrast without response-rate reduction. J. of the experimental Analysis of Behavior (1974), 22, 453-462.

Hanson, H.M. The effects of discrimination training on stimulus generalization. J. of experimental Psychology (1959), 58, 321-334.

Hardt, R.H. and Bodine, G.E. Development of self-report instruments in delinquency research (1965), Syracuse University: Youth Development Center.

Hardt, R.H. and Peterson, S.J. Arrests of self and friends as indicators of delinquency involvement. J. of research in Crime and Delinquency (1968), 5, 44-51.

Hargreaves, D.H. Social Relations in a Secondary School (1967), London: Routledge and Kegan Paul.

Hearst, E. Discrimination learning as the summation of excitation and inhibition. Science (1968), 162, 1303-1306.

Hearst, E. Excitation, inhibition and discrimination learning, in (eds) Mackintosh, N.J. and Honig, W.K. Fundamental Issues in Associative Learning (1969), Halifax: Dalhousie University Press.

Hebert, J.A. and Krantz, D.L. Transposition: a re-evaluation. Psychological Bulletin (1965), 63, 244-257.

Herrick, R.M., Myers, J.L. and Korotkin, A.L. Changes in S^{D} and S^{Δ} rates during the development of an operant discrimination. J. of comparative and physiological Psychology (1959), 52, 359-364.

Hewitt, L.E. and Jenkins, R.L. Fundamental Patterns of Maladjustment (1946), Michigan, Illinois: D.H. Green.

Hindelang, M.J. Personality Attributes of self-reported delinquents (1969), unpublished PhD dissertation, University of California at Berkeley.

Hindelang, M.J. The social versus solitary nature of delinquent involvement. British Journal of Criminology (1971a), 11, 167-175.

Hindelang, M.J. Extraversion, neuroticism and self-reported delinquent involvement. J. Research in Crime and Delinquency (1971b), 8, 23-31.

Hindelang, M.J. The relationship of self-reported delinquency to scales of the CPI and MMPI. J. of Criminal Law, Criminology and Police Science (1972), 63, 75-81.

Hoghighi, M.S. and Forrest, A.R. Eysenck's theory of criminality; an examination with approved school boys. British Journal of Criminology (1970), 10, 240-254.

Honig, W.K. Prediction of preference, transposition, and transposition reversal from the generalization gradient. J. of Experimental Psychology (1962), 64, 239-248.

Hood, R, and Sparks, R. Key Issues in Criminology (1970), London: Weidenfeld and Nicolson.

Hoyt, C.J. Note on a simplified method of computing test reliability. Educational and psychological Measurement (1941), 1, 93-95.

Hulse, S.H. Reinforcement contrast effects in rats following experimental definition of a dimension of reinforcement magnitude. J. of comparative and physiological Psychology (1973), 85, 160-170.

Jenkins, H.M. The effect of discrimination training on extinction. J. of experimental Psychology (1961), 61, 111-121.

Jones, H. Approaches to an ecological study. British Journal of Delinquency (1958), 8, 277-293.

Karpicke, J. and Hearst, E. Inhibitory control and errorless discrimination learning. J. of the experimental Analysis of Behavior, (1975), 23, 159-166.

Keller, K. The role of elicited responding in behavioral contrast. J. of the experimental Analysis of Behavior (1974), 21, 249-257.

Kelly, J.F. and Hake, D.F. An extinction-induced increase in an aggressive response with humans. J. of the experimental Analysis of Behavior (1970), 14, 153-164.

Klein, J. Samples from English Culture (1965), London: Routledge and Kegan Paul.

Klein, M.W. and Crawford, L.Y. Groups, gangs and cohesiveness. J. Research in Crime and Delinquency (1967), 4, 63-75.

Knight, B.J. and West, D.J. Temporary and continuing delinquency, British Journal of Criminology (1975), 15, 42-50.

Kramer, T.J. and Rilling, M. Effects of timeout on spaced responding in pigeons. J. of the Experimental Analysis of Behavior (1969), 12, 283-288.

Kramer, T.J. and Rilling, M. Differential reinforcement of low rates: a selective critique. Psychological Bulletin (1970), 74, 225-254.

Kraus, J. Judicial labels as a typology of offences committed by male juveniles. British Journal of Criminology (1973), 13, 269-274.

Kulik, J.A., Stein, K.B. and Sarbin, T.R. Disclosure of delinquent behavior under conditions of anonymity and non-anonymity. J. Consulting and Clinical Psychology (1968), 32, 506-509.

Landau, J.S. Postdiscrimination generalization in human subjects of two different ages. J. of Experimental Psychology (1968), 76, 656-663.

Lattal, K.A. and Griffin, M.A. Punishment contrast during free-operant avoidance. J. of the experimental Analysis of Behavior (1972), 18, 509-516.

Lawrence, C. Generalization along the dimension of sound intensity in pigeons. Aninal Learning and Behaviour (1973), 1, 60-64.

Lawson, R. Frustration: the development of a scientific concept (1965), New York: Macmillan.

Lerman, P. Groups networks and subcultural delinquency. American Journal of Sociology (1967), 73, 63-72.

Lesieur, H.R. and Lehman, P.M. Remeasuring delinquency: a replication and critique. British Journal of Criminology (1975), 15, 69-80.

London, P. Developmental aspects of discrimination in relation to adjustment. Genetics Psychology Monographs (1958), 57, 293-336.

Lovibond, S.H. Personality and conditioning. Progress in experimental personality Research (1964), 1, 115-168.

Lykken, D.T. A study of anxiety in the sociopathic personality. J. Abnormal and Social Psychology (1957), 55, 5-10.

Lyons, J. Stimulus generalization along the dimension of S+ as a function of discrimination learning with and without errors. J. of Experimental Psychology (1969), 81, 95-100.

Lyons, J., Klipec, W.D. and Steinsultz, G. The effect of chlorpromazine on discrimination performance and the peak shift. Physiological Psychology (1973), 1, 121-124.

Mackintosh, N.J. The Psychology of Animal Learning (1974), London: Academic Press.

Mackintosh, N.J., Little, L. and Lord, J. Some determinants of behavioural contrast in pigeons and rats. Learning and Motivation (1972), 3, 148-161.

Maier, N.R.F. Frustration: The Study of Behaviour without a goal (1949), New York: McGraw-Hill.

Mariner, R.W. and Thomas, D.R. Reinforcement duration and the peak shift in postdiscrimination gradients. J. of the experimental Analysis of Behavior (1969), 12, 759-766.

Michaelis, W. and Eysenck, H.J. The determination of personality inventory factor patterns and intercorrelations by changes in real-life motivation. J. Genetic Psychology (1971), 118, 223-234.

Miller, W.B. Theft behaviour in city gangs, in (ed) Klein, M. Juvenile gangs in context (1967), New Jersey: Prentice Hall.

Mischel, W. Theory and research on the antecedents of self-imposed delay of reward in (ed) Maher, Progress in Experimental Personality Research (1966), 3, 85-132.

Nevin, J.A. and Shuttleworth, S.J. Analysis of contrast effects in multiple schedules. J. of the experimental Analysis of Behavior (1966), 9, 305-315.

Newson, J. and Newson, E. Four Years Old in an Urban Community (1968), London: George Allen and Unwin.

Nicholson, J.N. Some operant conditioning effects in children and their relation to personality and development (1972), Oxford University: unpublished doctoral dissertation.

Nicholson, J.N. Behavioural indices of frustration in normal and emotionally maladjusted children. J. of Child Psychology and Psychiatry (1974), 15, 1-13.

Nicholson, J.N. and Gray, J.A. Behavioural contrast and peak shift in children. British Journal of Psychology (1971), 62, 367-373.

Nicholson, J.N. and Gray, J.A. Peak shift, behavioural contrast and stimulus generalization as related to personality and development in children. British Journal of Psychology (1972), 63, 47-62.

Nye, F.I. Family Relationships and Delinquent Behavior (1958), New York: Wiley.

Passingham, R.E. Crime and Personality: a review of Eysenck's theory, in (eds) Nebylitsyn, V.D. and Gray, J.A. Biological Bases of Individual Behavior (1972), New York-London: Academic Press.

Patrick, J. A Glasgow Gang observed (1973), London.

Pawlik, K. Right answers to the wrong questions? A re-examination of factor analytic personality research and its contribution to personality theory in (ed) Royce, J.R. Multivariate Analysis and Psychological Theory (1973), London-New York: Academic Press.

Penney, R.K. The effect of reward and punishment on children's orientation and discrimination learning. J. Experimental Psychology (1967), 75, 140-142.

Pert, A. and Gonzalez, R.C. Behavior of the turtle (Chrysemys Picta Picta) in simultaneous, successive and behavioral contrast situations. J. of the experimental Analysis of Behavior (1974), 87, 526-538.

Peterson, D.R. and Quay, H.C. Personality factors related to juvenile delinquency. Child Development (1961), 32, 355-372.

Peterson, D.R., Quay, H.C. and Camerson, G.R. Personality and background factors in juvenile delinquency as inferred from questionnaire responses. J. consulting Psychology (1959), 5, 395-399.

Piliavin, I. and Briar, S. Police encounters with juveniles. American Journal of Sociology (1964), 70, 206-214.

Porter, R.B. and Cattell, R.B. Handbook for the IPAT Children's Personality Questionnaire "the CPQ" (1959), Champaign, Illinois: IPAT.

Porterfield, A. Youth in Trouble (1946), Austin, Texas: New Pottisnam Foundation.

Porteus, S.D. Porteus Maze Test: Fifty Years' Application (1965), Palo Alto, California: Pacific Books.

Purtle, R.B. Peak shift: a review. Psychological Bulletin (1973), 80, 408-421.

Rachlin, H. Contrast and matching. Psychological Review (1973), 80, 217-234.

Rachlin, H.C. and Baum, W. Effects of alternative reinforcement: does the source matter? J. of the experimental Analysis of Behavior (1972), 18, 231-241.

Radzinowicz, L. Economic Pressures, in (eds) Radzinowicz, L. and Wolfgang, M.E. Crime and Justice (1971), 1, New York-London: Basic Books.

Reckless, W.C., Dinitz, S. and Murray, E. The 'good' boy in a high delinquency area. J. Criminal Law, Criminology and Police Science (1957), 48, 18-25.

Redford, M.E. and Perkins, C.C. Jr. The role of autopecking in behavioral contrast. J. of the experimental Analysis of Behavior (1974), 21, 145-150.

Reiss, A.J. and Rhodes, A.L. The distribution of juvenile delinquency in the social class structure. American Sociological Review (1961), 26, 720-732.

Reynolds, G.S. An analysis of interactions in a multiple schedule. J. of the experimental Analysis of Behavior (1961a), 4, 107-117.

Reynolds, G.S. Relativity of response rate and reinforcement frequency in a multiple schedule. J. of the experimental Analysis of Behavior (1961b), 4, 179-184.

Richards, R.W. Reinforcment delay: some effects on behavioral contrast. J. of the experimental Analysis of Behavior (1972), 17, 381-394.

Richards, R.W. Stimulus generalization and delay of reinforcement during one component of a multiple schedule. J. of the experimental Analysis of Behavior (1973), 19, 303-309.

Richardson, M.W. and Kuder, G.F. The calculation of test reliability coefficients based upon the method of rational equivalence. J. educational Psychology (1939), 30, 681-687.

Richardson, W.K. A test of the effectiveness of the differential-reinforcement-of-low-rate schedule. J. of the experimental Analysis of Behavior (1973), 20, 385-391.

Rilling, M. and Caplan, H.J. Extinction-induced aggression during errorless discrimination learning. J. of the experimental Analysis of Behavior (1973), 20, 85-92.

Robinson, C.D. Personality variables of juvenile delinquents grouped according to the type of crime committed. Australian and New Zealand Journal of Criminology (1971), 4, 181-186.

Sadowsky, S. Behavioral contrast with timeout, blackout, or extinction as the negative condition. J. of the experimental Analysis of Behavior (1973), 19, 499-507.

Sanocki, W. The use of Eysenck's inventory for testing young prisoners. Przeglad penitencjarny (Warszawa) (1969), 7, 53-68 (quoted in Eysenck, S.B.G. and Eysenck, H.J. Crime and personality: item analysis of questionnaire responses. British Journal of Criminology (1971), 11, 49-62).

Saville, P. and Finlayson, L. British Supplement to the High School Personality Questionnaire (Form A) Anglicised 1968/69 Edition (1973), Windsor: N.F.E.R.

Schachter, S. and Latané, B. Crime, cognition and the autonomic nervous system, in (ed) Jones, H.R. Nebraska symposium on motivation (1964), Lincoln: University of Nebraska Press, pp. 221-275.

Schaffer, H.R. Early social behaviour and the study of reciprocity. Bulletin of the British Psychological Society (1974), 27, 209-216.

Schalling, D. and Holmberg, M. Extraversion in criminals, (1968), Karolinska Institute, Sweden. Unpublished manuscript.

Schlichter, K.J. and Ratliff, R.G. Discrimination learning in juvenile delinquents. J. Abnormal Psychology (1971), 77, 46-48.

Schmauk, F. Punishment, arousal and avoidance learning in sociopaths. J. Abnormal Psychology (1970), 76, 325-335.

Schonell, F. and Schonell, F.E. Scholastic diagnostic and attainment testing (1960), London: Oliver and Boyd.

Schwartz, B. Discriminative stimulus location as a determinant of positive and negative behavio ral contrast in the pigeon. J. of the experimental Analysis of Behavior (1975), 23, 167-176.

Schwitzgebel, R. Short-term conditioning of adolescent offenders on socially relevant variables. J. Abnormal Psychology (1967), 72, 134-142.

Scull, J., Davies, K. and Amsel, A. Behavioural contrast and frustration effect in multiple and mixed fixed-interval schedules in the rat. J. of comparative and physiological Psychology (1970), 71, 478-483.

Scull, J. and Westbrook, R.F. Interactions in multiple schedules with different responses in each of the components. J. of the experimental Analysis of Behavior (1973), 20, 511-519.

Selekman, W. Behavioural contrast and inhibitory stimulus control as related to extended training. J. of the experimental Analysis of Behavior (1973), 20, 245-252.

Sellin, T. and Wolfgang, M.E. The Measurement of Delinquency (1964), New York: Wiley.

Short, J.F. Differential association and delinquency. Social Problems (1957), 4, 233-239.

Short, J.F. Differential association with delinquent friends and delinquent behavior. Pacific Sociological Review (1958), 1, 20-25.

Short, J. Jr. The study of juvenile delinquency by reported behavior: an experiment in method and preliminary findings. Paper read at the annual meeting of the American Sociological Society, Washington, D.C. (September, 1965), reported in Erickson, M.L. The changing relationship between official and self-reported measures of delinquency: an exploratory-predictive study. J. of Criminal Law, Criminology and Police Science (1972), 63, 388-396.

Short, J.F. Jr. and Nye, F.I. Extent of unrecorded juvenile delinquency. J. Criminal Law, Criminology and Police Science (1958), 49, 296-302.

Short, J.F. and Strodbeck, F.L. Group Process and Gang Delinquency (1965), Chicago: University of Chicago Press.

Sidman, M. Time discrimination and behavior interaction in a free operant situation. J. of comparative and physiological Psychology (1956), 49, 469-473.

Sidman, M. and Fletcher, F.G. A demonstration of auto-shaping with monkeys. J. of the experimental Analysis of Behavior (1968), 11, 307-309.

Simon, F.H. Prediction methods in criminology (1971), Home Office research studies no. 7, London: H.M.S.O.

Sinclair, I. and Chapman, B. A typological and dimensional study of a sample of prisoners. British Journal of Criminology (1973), 13, 341-353.

Singh, D. Effect of level of manifest anxiety and type of pretraining on timing behaviour, American Journal of Psychology (1970), 84, 134-139.

Smith, M.H. and Hoy, W.S. Rate of response during operant discrimination. J. of experimental Psychology (1954), 48, 259-264.

Spence, K.W. The differential response in animals to stimuli varying within a single dimension. Psychological Review (1937), 44, 430-444.

Sprott, W.J.H., Jephcott, A.P. and Carter, M.P. The Social Background of Delinquency (1954), Nottingham: University of Nottingham, Department of Philosophy, mimeo.

Staddon, J.E.R. Some properties of spaced responding in pigeons. J. of the experimental Analysis of Behavior (1965), 8, 19-28.

Stevenson, J.G. Stimulus generalization: the ordering and spacing of test stimuli. J. of the experimental Analysis of Behavior (1966), 9, 457-468.

Stoddard, Operant conditioning of timing behaviour in children (1962). Dissertation Abstracts Order No. 62-4250 (unpublished doctoral dissertation, Columbia University).

Sveri, K. Group Activity, in (ed) Christiansen, K.O. Scandinavian Studies in Criminology (1965), London: Tavistock, 1.

Taylor, J.A. A personality scale of manifest anxiety. J. of Abnormal and Social Psychology (1953), 48, 285-290.

Terrace, H.S. Discrimination learning with and without errors. J. of the experimental Analysis of Behavior (1963), 6, 1-27.

Terrace, H.S. Wavelength generalization after discrimination training with and without errors. Science (1964), 144, 78-80.

Terrace, H.S. Stimulus control, in (ed) Honig, W.K. Operant behavior: areas of research and application (1966a), New York: Appleton-Century-Crofts.

Terrace, H.S. Behavioural contrast and the peak shift: effects of extended discrimination training. J. of the experimental Analysis of Behavior (1966b), 9, 613-617.

Terrace, H.S. Discrimination learning, the peak shift, and behavioural contrast. J. of the experimental Analysis of Behavior (1968), 11, 727-741.

Terrace, H.S. Escape from S-. Learning and Motivation (1971), 2, 148-163.

Terrace, H.S. Conditioned inhibition in successive discrimination learning, in (eds) Boakes, R.A. and Halliday, M.S. Inhibition and Learning (1972), London-New York: Academic Press.

Terrace, H.S. On the nature of non-responding in discrimination learning with and without errors. J. of the experimental Analysis of Behavior (1974), 22, 151-159.

Thomas, A, Chess, S. and Birch, H.G. Temperament and Behaviour Disorders in Children (1968), London: University of London Press.

Thomas, D.R. The effects of drive and discrimination training on stimulus generalization. J. of Experimental Psychology (1962), 64, 24-28.

Thomas, G.V. and Cameron, G.N. Response rate, reinforcement frequency and behavioral contrast. J. of the experimental Analysis of Behavior (1974), 22, 427-432.

Thomas, J.R. Avoidance of a return to the first component of a chain from the terminal component. J. of the experimental Analysis of Behavior (1966), 2, 435-441.

Tindall, R.C. and Ratliff, R.G. Interaction of reinforcement conditions and developmental level in a two-choice discrimination task with children. J. Experimental Child Psychology (1974), 18, 183-189.

Tomie, A. and Thomas, D.R. Adaptation level as a factor in human wavelength generalization. J. of experimental Psychology (1974), 103, 29-36.

Trasler, G. Criminal behaviour, in (ed) Eysenck, H.J. Handbook of Abnormal Psychology (1973), London: Pitman Medical.

Tribble, S. Socio-economic status and self-reported juvenile delinquency. Canadian J. of Criminology and Corrections (1972), 14, 409-415.

Vaz, E.W. Self-reported delinquency and socio-economic status. Canadian J. of Corrections (1966), 8, 20-27.

von Frisch, K. Bees: Their vision, chemical senses and language (1964). Ithaca, New York: Cornell University Press.

Voss, H.L. Differential association and reported delinquent behavior: a replication. Social Problems (1964), 12, 78-85.

Voss, H.L. Socio-economic status and reported delinquent behavior. Social Problems (1966), 13, 314-324.

Wagner, A.R. Frustration and punishment, in (ed) Haber, R.N. Current research in motivation (1966), New York: Holt.

Waite, W.W. and Osborne, J.G. Sustained behavioral contrast in children. J. of the experimental Analysis of Behavior (1972), 18, 113-117.

Wallerstein, J.S. and Wyle, C.L. Our lawabiding lawbreakers. National Probation (1947), March-April, 107-112.

Waters, T.S. The validity of the JEPI L scale, Educational and psychological Measurement (1968), 28, 1197-1206.

Weisberg, P. Effects of reinforcement history on timing (DRL) performance in young children. J. of Experimental Child Psychology (1970), 9, 348-362.

Weisberg, P. and Tragakis, C.J. Analyses of DRL behavior in young children. Psychological Reports (1967), 21, 709-715.

West, D.J. Present Conduct and Future Delinquency (1969), London: Heinemann.

West, D.J. and Farrington, D.P. Who becomes a delinquent? (1973), London: Heinemann.

Westbrook, R.F. Failure to obtain positive contrast when pigeons press a bar. J. of the experimental Analysis of Behavior (1973), 20, 499-510.

White, D. Brum's mobs. New Society (1971), 18/473, 760-763.

Wildemann, D.G. and Holland, J.G. The effect of the blackout method on acquisition and generalization. J. of the Experimental Analysis of Behavior (1973), 19, 73-80.

Wilkie, D.M. Variable-time reinforcement in multiple and concurrent schedules. J. of the experimental Analysis of Behavior (1972), 17, 59-66.

Willcock, H.D. Deterrents and incentives to crime among youths aged 15 to 21 years (1966), Report and Tables prepared by the U.K. Government Social Survey. Mimeo.

Williams, J.R. and Gold, M. From delinquent behavior to official delinquency. Social Problems (1972), 20, 209-229.

Willmott, P. Adolescent Boys in East London (1966), London: Routledge and Kegan Paul.

Wilson, R. Difficult Housing Estates (1963), London: Tavistock.

Witte, K.L. and Grossman, G.E. The effects of reward and punishment upon children's attention, motivation and discrimination learning. Child Development (1971), 42, 537-542.

Wright, A.A. and Cumming, W.W. Colour-naming functions for the pigeon. J. of the experimental Analysis of Behavior (1971), 15, 7-17.

Yabonsky, L. The Violent Gang (1962), New York: Macmillan.

Yarczower, M. Behavioral contrast and inhibitive stimulus control. Psychonomic Science (1970) 18, 1-3.