

Vol. 1

**An Investigation into the Role of the
Orbito-Frontal Cortex in the Presentation of
Emotional and Behavioural Problems in Children**

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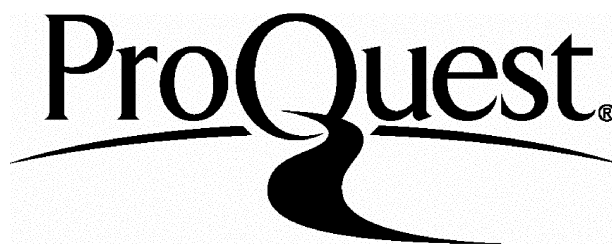
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ABSTRACT

Recent studies have indicated that the difficulties in reversal learning and response prevention seen in adult psychopaths (see Patterson & Newman, 1993), can also be seen in some children with severe emotional and behavioural disturbance, referred to as children with psychopathic tendencies (Blair, 1997; Fisher & Blair, 1998). The Orbito-Frontal Cortex (OFC) has been implicated with reversal learning and response prevention (Dias, et al., 1996; Rolls, 1997) and it has been suggested that a dysfunction within the OFC could offer an explanation for the development of psychopathy (Damasio, 1994; Fisher & Blair, 1998).

This study investigated whether severe emotional and behavioural disturbance in children is associated with OFC functioning. In particular, it examined whether levels of emotional and behavioural disturbance can predict performance on two computerised reversal learning tasks: The ID-ED Task (Dais, et al. 1996) and The Snake Game (Fine & Blair, in press). The ID-ED Task and The Snake Game are reported to be measures of OFC functioning as they both index sensitivity to changes in reward and punishment reinforcement strategies (Dais, et al. 1996; Fine & Blair, in press).

Fifty-six children from two schools for the emotionally and behaviourally disturbed completed both The ID-ED Task and The Snake Game. Their performance was measured by the number of errors they made on each task. The children's level of emotional and behavioural disturbance was measured using the Psychopathy Screening

Device (Frick & Hare, in press). The Psychopathy Screening Device (PSD) indexes a behavioural syndrome that consists of two dimensions: affective disturbance and impulsive/conduct problems. A measure of Attention Deficit Hyperactivity Disorder (ADHD) was also included because of the high co-morbidity between impulsive/conduct problems and ADHD (see Pennington & Ozonoff, 1996). The DuPaul Rating Scale (DRS; DuPaul 1991) is a quick measure of ADHD symptomology and was completed for each child, in order to distinguish those children with impulsive/conduct problems from those with ADHD. Teaching staff completed two copies of the PSD and the DRS for each child and the average of the two scores were taken.

The children's performance on the two computerised reversal learning tasks was analysed in relation to the scores they obtained on the PSD and the DRS. The results indicated that level of emotional and behavioural disturbance did not predict performance on The ID-ED Task nor The Snake Game. There were no significant differences between the performance of the most behaviourally disturbed and the least behaviourally disturbed on either task.

The results are interpreted within the proposed models of psychopathy and their relationship to possible neuro-anatomical sites is explored.

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INTRODUCTION

Two important political and social concerns of the twentieth century are crime and its prevention. It is commonly agreed that prevention is better than cure and therefore efforts should be concentrated on trying to identify either risk or causal factors of crime. An obvious starting point for this is to study children who show aggressive and criminal behaviour at an early age.

It is considered that there are two groups of individuals who show early aggressive behaviour. The first group are those who show a persistent pattern of violent offending across their life span. The second group are those who show a more acute pattern, which peaks shortly after puberty and then declines considerably in their late teens (Moffitt, 1993). Whilst evidence implicates social factors in the development of the second group, it has been suggested that the origin of the first group lies in some form of bio-cognitive impairment (Moffitt, 1993). However, there is disagreement about the nature of this supposed bio-cognitive impairment (Moffitt, 1993; Patterson & Newman, 1993; Pennington & Bennetto 1993; Quay, 1993). What is more readily accepted is that this persistently aggressive group are likely to be amongst the 50% of youths, who, diagnosed with conduct disorder as juveniles are then diagnosed as having Antisocial Personality Disorder or Psychopathy as adults (Robins, 1978; Zoccolillo et al., 1992).

The latter group, psychopaths, pose the most serious challenge to society as regards levels and seriousness of crime. Psychopaths commit more crimes, receive more convictions, and spend more time in prison before the age of 40 than do non-

psychopathic individuals (Hare, 1993; Harpur & Hare, 1994). They make considerable demands on services both in the criminal justice system and in the health and social care systems. These challenges are further compounded by the lack of consensus on many of the issues surrounding psychopathy. There is no agreement, yet, on either the defining characteristics or aetiology of psychopathy. There are also many different opinions on the effective management and treatment of the disorder.

This lack of consensus has continued for more than a century. Numerous reviews on the state of knowledge and understanding within the field all conclude the same: that more research is needed as existing research is flawed (see Scott, 1963; Blackburn, 1983; Quality Assurance Project, 1991 for reviews). This study suggests that any further research should be into understanding the development or causes of psychopathy. Once this is achieved then a tighter definition of the syndrome can be drawn, appropriate treatment regimes can be developed and efforts made towards identifying early potential psychopaths early.

Unfortunately, there still appears to be a tendency in the area to replicate reviews rather than concentrate on developing models of understanding. However, in the last decade there have been efforts to address this gap in the field. Researchers (e.g. Hare, 1970; Newman et al., 1987; Patterson & Newman, 1993; Blair et al., 1995; 1997, etc.) have tried to identify biological and cognitive pathways for the development of behavioural traits associated with psychopathy. Their findings indicate that in addition to the obvious anti-social behaviour displayed by psychopaths, they also have difficulty identifying, processing and even lack certain emotions. This suggests that psychopathy

is a complex interaction between social and psychological environmental experiences and particular biological and cognitive pre-dispositions. This nature-nurture model is supported by many researchers (e.g. Hare, 1993; Mitchell & Blair, 2000).

The nurture component, i.e. the social-psychological environmental factors, influence on the development of psychopathy has been well documented (Robbins, 1981; Farrington et al., 1990; Frick, et al., 1994). However, researchers believe that it is nature, the biological and cognitive genetic factors, that determine the severity of the emotional processing difficulties and in turn, determine the severity of the syndrome (Hare, 1993; Mitchell & Blair, 2000). Therefore, as Rutter & Plomin (1997) are keen to stress, genetic factors contribute to the biological bases of brain functioning and personality structure, which, in turn, influences the way individuals respond to, interact with and experience their social environment. Therefore, this study advocates that psychopathy emerges from a complex, but as yet not fully understood, interplay between biological, psychological and sociological factors.

The aim of this study is to begin to draw together current research findings on possible biological and cognitive pathways responsible for the development of psychopathy. Following the notion that prevention is better than cure, the focus is on those who have yet to develop the disorder but are most vulnerable to do so. Those children who display behavioural and emotional problems are targeted based upon the likelihood that this is the group from which adult psychopaths are most likely to emerge.

1. LITERATURE REVIEW

The literature review presented here is an examination of the areas considered relevant to this thesis. It is not intended to be a comprehensive review of the whole field of psychopathy. Hence, some topics are not covered in depth, such as treatment or social contributions, as these are not considered to be as directly relevant to the main aim of the study. The areas covered are:

- 1.1 The History of Psychopathy (a brief outline);
- 1.2 Diagnostic Issues: Introducing each of the existing measures and highlighting the problems with them;
- 1.3 Treatment: A brief outline of the efficiency of the different models of treatment
- 1.4 Proposed Models: A review of the proposed models to explain the characteristics of psychopathy;
- 1.5 Research on Children: An examination of the research addressing the pre-cursors to psychopathy;
- 1.6 Summary of Research
- 1.7 Current Study: A description of the overall aims and hypotheses of this thesis.

1.1 THE HISTORY OF PSYCHOPATHY

The term psychopathy originated in Germany in the early 19th century and initially referred to all disorders of personality. The French psychiatrist, Phillippe Pinel, was one of the first clinicians to use the term 'psychopath'. Writing in the 19th century, Pinel described the patterns of behaviours displayed by this group as "*distinct from the ordinary evil that men do*" (see Cleckley, 1976). He used the term 'insanity without delirium' to describe the utter remorselessness and complete lack of restraint he observed in these patients. Pinel implied that psychopaths were 'morally neutral', i.e. they did what they did because they were mad, not bad. This distinction split the field of psychiatry for over a century, with clinicians arguing for and against the mad versus bad standpoints (for a review see Cleckley, 1976). The start of World War II and the need to identify and screen out soldiers, who would disrupt, even destroy military operations, created an urgency to clarify the disorder. In addition, the general public were beginning to ask how an entity such as the Nazi regime, with their genocide and torture, come to exist.

Hervey Cleckley, in his now classic book '*The Mask of Insanity*' (first published 1941), began to address these issues. He wrote detailed case histories on his patients, providing the general public with their first experience of the world of a psychopath. He used phrases such as "*shrewdness and agility of mind*", "*exceptional charm and persuasion*", seeing the psychopaths as "*being unable to take even the slightest interest in the tragedy, joy, or the striving of life, as if he is indifferent to all these matters*". Cleckley (1976) suggested that despite their abstract reasoning abilities, psychopaths should be

classified as psychotic, as their behaviour was so inappropriate, self-damaging and inadequately motivated. He also was the first to highlight the psychopath's apparent lack of empathy and inability to experience emotions. He described it as “ *a lack of ability to see how others are moved. It is as though he is colour blind, despite his sharp intelligence, to this aspect of human existence* ” and how there was no point in trying to explain empathy to a psychopath because “*there is nothing in his orbit of awareness that can bridge the gap with comparison...there is no way for him to realise that he does not understand*”(p. 90).

This view of psychopathy, as Johns & Quay (1962) put it, that psychopaths “*know the words but not the music*” (p. 217) became the frame of reference in which clinicians during the 1960's began to research the development of psychopathy. However, even though there was now agreement on the nature of the disorder, i.e. psychopaths had difficulty with identifying and processing emotions, clinicians argued over which behavioural characteristics and traits were central to psychopathy. Since then, the concept of psychopathy has become contentious and has generated extensive literature espousing many differing opinions on classification (Blackburn, 1983). Butler (1975) being one the first to review the area concluded that the concept was logically flawed. He stated that prison inmates who had attracted the label ‘psychopathic disorder’, were a heterogeneous group, not readily identified by a single category from any medical, biological or psychological criteria. Gunn & Robinson (1976) agreed and mockingly proposed that there were only five facts that could be said about the term ‘psychopathic disorder’:

- 1) It has only a legal use in England and Wales;
- 2) Doctors use it to indicate that a patient is incurable or untreatable;
- 3) It is used in the vernacular as a term of derogation;
- 4) Authors disagree about its definition;
- 5) The diagnosis is unreliable.

Despite this apparent ineptitude, the terms 'psychopath' and 'psychopathy' are still in common usage today. The above concerns and many similar ones have not resulted in the removal of the term 'psychopathic disorder' from the legal system. What is agreed however, is that the group referred to as psychopaths pose a number of concerns to society, especially in terms of their behaviour to others (Hare, 1991; Harpur & Hare, 1994). Hence, there have been attempts to classify this heterogeneous group, so that diagnostic tools can be applied and appropriate treatment regimes developed.

1.2 DIAGNOSTIC ISSUES

As mentioned, during the 1960's the debate on classification highlighted the need for an agreed set of recognisable, diagnosable traits. Self-report measures had been in common usage, e.g. 'I lie: easily; with some difficulty; or never' (Hare, 1993). But psychopaths are experts at distorting and altering the truth in their favour, it was clear that what was needed was a diagnostic or classification system that did not rely on self-report.

Currently, four psychiatric diagnostic approaches to psychopathic disorder have been proposed and each differs in their developmental origin, taking a different perspective on their included set of features. All require intensive training for administration and interpretation. However there is also a legal classification of psychopathy, known as 'psychopathic disorder'. This is entirely separate from the psychiatric classification systems and therefore it will be addressed first.

1.2.1 The Legal Category

There is a difference between the clinical construct of psychopathy and the legal category 'psychopathic disorder'. In legal terms, psychopathy or 'psychopathic disorder' is one of the four categories of mental health problems recognised by the Mental Health Act 1983, where it is defined as:

“a persistent disorder or disability of mind (whether or not including significant impairment of intelligence) which results in abnormally aggressive or seriously irresponsible conduct”

The term is a means of detaining people under the Mental Health Act, 1983, because of their:

“persistent disorder or instability of mind, which results in abnormally aggressive or severely irresponsible conduct”

(Mental Health Act, 1983; section 1, part 2).

Chiswick (1992) has noted that there has been very little clarification of this label or any attempts at standardising the definition of “*abnormally aggressive*” or “*severely irresponsible*”. It appears to be the individual decision of the particular court dealing with an individual's case. As a result, as Coid (1992) highlights, it is not surprising to discover that there is a wide range of presenting psychopathology amongst the men and women detained under the category 'psychopathic disorder'.

1.2.2 Psychiatric Classifications

Psychopathy is associated with numerous different traits from various writers. They have described psychopaths as: selfish; aggressive; callous; impulsive; lacking insight; having no remorse or guilt for their behaviour; showing no shame or empathy; having no capacity to love or develop and retain friendships; engage in pathological lying; thrill seeking; risk takers; exhibit poor judgement and disregard for social conventions; having only superficial relationships; being manipulative and extricating themselves from difficult situations through lying; outright contradictory; detailed, dramatical lying in their self conviction of no blame; give broken promises and simulate emotions and attachment when advantageous to them.

The four psychiatric or clinical classification systems include some of these characteristics, but none contain them all. The four are:

- 1) The International Classification of Diseases, Version 10 (ICD-10);

- 2) The Diagnostic and Statistical Manual, Version IV (DSM-IV);
- 3) The Psychopathy Check-List, Revised (PCL-R);
- 4) Blackburn's Typology (1986).

1.2.2.1 The International Classification of Diseases, Version 10.

The International Classification of Diseases, Version 10 (ICD-10) is a diagnostic tool developed by The World Health Organisation (WHO, 1989). The ICD-10 does not contain a category entitled 'psychopathy' but refers to traits and behaviour associated with psychopathy as '*Dyssocial Personality Disorder (DPD)*'. The diagnostic conditions for DPD are concerned with degrees to which a person deviates from their own culturally expected norms and the accepted range of characteristics. Severity is based upon the level of disparity between observed behaviour and the prevailing social norms. Such behaviour, as defined by ICD-10, consists of:

- 1) Callous unconcern for the feelings of others and lack of capacity for empathy;
- 2) Gross and persistent attitude of irresponsibility and disregard for social norms rules and obligations;
- 3) Incapacity to maintain enduring relationships;
- 4) Very low tolerance of frustration and a low threshold discharge of aggression, including violence;
- 5) Incapacity to experience guilt and to profit from experience particularly punishment;

- 6) Marked proneness to blame others or to offer plausible rationalisations for the behaviour bringing the subject into conflict with society and
- 7). Persistent irritability.

If three or more of the above criteria are present, the diagnosis of DPD can be made.

ICD-10 obviously emphasises personality traits rather than behaviour. According to Dolan & Coid (1995), it has not been implemented much in research or clinical practice as yet and they suggest that it needs to increase its validity by adding more categories to cover all the possible presentations.

1.2 2.2 Diagnostic and Statistical Manual, version IV (DSM-IV)

Like the ICD-10, the DSM-IV (American Psychiatric Association, 1994) categorises psychopathy as a personality disorder. Personality disorders are classified under Axis II of the DSM-IV as pervasive developmental disorders (as opposed to the discrete mental illnesses, which are categorised under Axis I). Axis II defines personality disorders in terms of behaviour and/or personality traits, that are characteristic of a person's functioning since early adulthood (age 18). To receive the diagnosis of a personality disorder the collection of traits must have an impact across several domains of functioning, by causing social, occupational problems and subjective distress.

The DSM-IV category 'Anti-social Personality Disorder' (ASPD) closely resembles psychopathy. ASPD describes patterns of irresponsibility and antisocial behaviour, beginning in early adolescence, with a history of conduct disorder before the age of ten.

It has been used extensively in empirical research and it has higher inter-rater reliability than other Axis II syndromes (Mellsop, et al. 1982). To receive a diagnosis of ASPD, according to the DSM-IV, a person has to meet the following criteria:

- A. Their current age is 18 or above
- B. Evidence of conduct disorder with onset before age 15 as indicated by a history of at least three or more of these factors: truancy, running away, fights, using weapons, forcing sexual activities on to others, physical cruelty to animals, physical cruelty to people, destruction of property, fire-setting, lying, stealing with and without confrontation of a victim.
- C. A pattern of irresponsibility and antisocial behaviour since age 15 as indicated by at least four of the following: unable to sustain consistent work, failure to conform to social norms with respect to lawful behaviour, irritable and aggressive, failure to honour financial obligations, failure to plan ahead, impulsive, lack of regard for the truth, recklessness, lack of ability to function as a parent, never sustained a monogamous and lack of remorse.

The DSM-IV category ASPD refers primarily to a cluster of criminal and anti-social behaviours. The problem with this is that between 50 – 80 % of prison inmates meet the criteria for ASPD (Hart & Hare, 1996). Many psychopaths succeed at not being caught or engage in anti-social but not criminal behaviour (Hare, 1993). What DSM-IV seems to exclude is that psychopaths can be characterised by personality traits, not just criminal and anti-social behaviour (Dolan & Coid, 1995).

1.2.2.3 Hare's Psychopathy Checklist - Revised (PCL-R)

Hare (1991) felt there was a urgent need to address the issues highlighted above and developed his own method of identifying individuals whose behaviour may reflect an actual syndrome, i.e. psychopathy and not just criminality. He disagreed with Cleckley (1946) in his 'madness' proposal of psychopaths but agreed with the characteristics identified by Cleckley as those representing a typical psychopath. Hare proposed that psychopathy was a singular syndrome that can be indexed using a uni-dimensional scale, which included both personality traits and anti-social behaviour. After numerous studies on prison samples, and a complete revision, Hare published the Psychopathy Checklist Revised PCL-R (Hare, 1991).

The PCL-R has 20 items, scoring 0-2, with maximum score of 40. It has a cut off score of 25 for classification as a psychopath for a UK sample (Cooke & Michie, 1999). A number of studies have shown it has high inter-rater reliability, the lowest being $r = 0.83$, when used by trained researchers, following extensive training (Hare, 1991).

The 20 characteristics rated on the PCL-R are:

- | | |
|---|---|
| 1). Glibness / superficial charm; | 8). Callous lack of empathy; |
| 2). Grandiose sense of self worth; | 9). Parasitic lifestyle; |
| 3). Need for stimulation/ proneness to boredom; | 10). Poor behavioural controls; |
| 4). Pathological lying; | 11). Promiscuous sexual behaviour; |
| 5). Cunning / manipulative; | 12). Early behaviour problems; |
| 6). Lack of remorse or guilt; | 13). Lack of realistic long term goals; |
| 7). Shallow affect; | 14). Impulsivity; |

- 15). Irresponsibility;
- 16). Failure to accept responsibility for
own actions;
- 17). Many short term marital
relationships;
- 18). Juvenile delinquency;
- 19). Revocation of conditional release;
- 20). Criminal versatility.

Hare (1991) stressed that the items are to be scored by combining interview data, case history information and archival data. He also demonstrated by factor analysis that the PCL-R contains two correlated factors that have distinct patterns of inter-correlation with other variables. He suggested that the first factor (Factor 1) consisted of core personality traits corresponding to the DSM-IV category 'narcissistic personality disorder', such as 'superficial charm', 'lack of empathy' and 'shallow affect'. The second (Factor 2) contained the features of a chronic unstable lifestyle similar to DSM-IV's 'anti-social personality disorder', such as 'parasitic lifestyle', 'proneness to boredom' and 'impulsivity'.

It remains unclear whether Hare's (1991) concept is indeed uni-dimensional. However, as a measure, the PCL-R is increasingly being used in well-designed research programmes and effective treatment studies. In its favour is that it is very brief, has high inter-rater reliability and does emphasise its own limitations by recommending obtaining information from case notes to complement any diagnosis (an obvious requirement in a population where self report will be far from reliable because of extensive lying, etc.).

The PCL-R is also very useful in risk assessment. For example, Hart et al., (1988) report that 80% of those diagnosed as psychopaths with the PCL-R re-offended within three years of release, compared to 25% classified as non-psychopaths.

1.2.2.4 Blackburn's typology (1986) - derived from MMPI profiles.

Blackburn's (1986) typology is based upon the dimensional model of personality traits used in the Minnesota Multiphasic Personality Inventory (MMPI). From this framework, Blackburn classifies the psychopath along scales that measure degree of personality abnormality. When the MMPI has been used with forensic populations and prison samples, four groups emerge, yielding similar profiles. Two are considered to represent two groups of psychopaths and the remaining two Blackburn considers as non-psychopathic.

Psychopaths:

Type 1. Primary: They are highly extroverted, non-neurotic, guilt free, impulsive and violent.

Type 2. Withdrawn: They are hypocondriacal, suspicious, depressive, tense, disruptive and aggressive.

Non-psychopaths:

Type 3. Controlled: They show defensive denial, are sociable, slightly extrovert and highly controlled.

Type 4. Inhibited: These also show defensive denial, are less controlled and more suspicious, exhibit extreme introversion, are depressed and have many different relationships.

The MMPI provides rich descriptions of characteristics, but it is unclear how relevant they are to psychopathy. Blackburn developed a shorter version, The Hospital Assessment of Personality and Socialisation (SHAPS) questionnaire (Blackburn, 1986) based on MMPI with additional items: belligerence/impulsive, hospitality/withdrawal: sociality/confidence. However, this also needs further research, especially with different populations of offenders and it is restricted to detained hospital populations (Dolan & Coid, 1995).

1.2.3 Criticisms of Classifications

Each of the above diagnostic systems can be used to assess and diagnose psychopathy. Dolan & Coid (1995) recommend, when looking to make a diagnosis, a full DSM-IV or ICD-10 assessment is preferable, but as a minimum, the PCL-R supplemented with case note referencing.

However, as highlighted, all have limitations. Most measures are time consuming, reliant on self-report and require specialised training. All include subjective psychological phenomena that are difficult to measure. None of them identify a homogenous group and comparisons between the different classifications yield varying results and minimal agreement (Barbour-McMullen, et al., 1988).

Different populations have been used, i.e. Hare (1991) recruited prisoners and Blackburn (1988) studied only forensic in-patients. It is probable that these different samples contain varying degrees of possible influencing factors, such as medication, alcoholism or co-morbidity with other psychiatric disorders. This is a criticism that is prevalent throughout this research area and will be highlighted again latter.

The syndromes outlined in the ICD-10, the DSM-IV and the one described by Hare (1991) in the PCL-R, appear to be reliable and have some established validity. However, as core diagnostic tools, they do not cover the whole range of psychopathology seen in psychopaths. Dolan & Coid (1995) suggest they are all likely to overlap with each other but highlight that there is little research or acknowledgement of this. The core syndromes outlined in these three diagnostic

systems do not have clear or identified aetiology. Instead, it is possible they represent final common pathways in all psychopaths deriving from different social, psychological and biological causes.

The problems with the diagnostic tools outlined above have implications a knock on effect when it comes to thinking about how to treat this group of people. It has to be clear from the outset what is it that is being treated and therefore what the aim of treatment is. Psychiatric syndromes have to be validated, beginning with the elucidation of the aetiology processes. Experience has shown that knowledge of underlying mechanisms helps in the prediction of outcome and in the development of effective treatment packages. More importantly, knowing the developmental pathways can help prevent the development of the disorder in the first instance. Reliable diagnostic approaches are needed, as there is a broad presentation of patients referred to as psychopaths. As highlighted, efforts are currently being made to address this gap, but all diagnostic tools are still in the early stages of development, validation and applicability.

1.3 TREATMENT

Within the treatment literature it appears that the aim of treatment is the reduction of aggression, impulsivity or recidivism in those diagnosed as psychopaths (although this is not clearly stated). Unfortunately, most of the research into effectiveness of treatment is at least fifteen years old. This may be a reflection of the already highlighted tendency to conduct reviews of the area in preference to conducting new research. Secondly,

some of the treatments outlined below are no longer currently in universal use, e.g. psychosurgery, etc. It is also possible that this lack of recent research reflects the mental health system's current stance that psychopathy is difficult if not impossible to treat (Bluglass, 1988; Coid & Cordless, 1992).

However, there exist seven recognised modalities for treatment of psychopathy:

- 1). Pharmacological treatment;
- 2). Physical treatment;
- 3). Psychodynamic approaches;
- 4). Cognitive Behavioural Therapy;
- 5). Therapeutic Communities;
- 6). Milieu Therapies or Long Term Hospitalisation;
- 7). Community Supervision.

1.3.1 Pharmacological Treatment

Prescribed medication for psychopathy varies between anti-convulsants, such as carbamazepine, to psycho-stimulants and lithium. All are aimed at dampening down the behaviour of the psychopath. There are no controlled studies assessing the efficiency of any medication in the treatment of psychopathy. However indications are that a wide range of medication is effective in targeting behavioural control at a minimal level in Forensic settings (Craft et al., 1987; Skekim et al., 1989).

1.3.2 Physical Treatment

The two options for physical treatment are psychosurgery and Electro-convulsive Therapy (ECT). Both supposedly reduce the incidence of aggression and anxiety of the psychopath. Again, there are no controlled investigations or reliable evidence that either can reduce aggression or impulsivity (Green et al., 1944; Andy, 1975).

1.3.3 Psychodynamic Approaches

There are very few studies evaluating the use of psychotherapy with psychopaths, independent from other treatment modalities. However, reports of short-term outpatient therapy has shown limited effectiveness (Reckless, 1970; Carney, 1977), but unfortunately there was no follow-up data.

1.3.4 Cognitive Behavioural Therapy (CBT)

Again short-term improvement has been shown with CBT but improvements, in terms of recidivism, are not maintained (Cohen & Filipczak, 1971). The only study indicating any long term benefit of CBT was an inpatient programme, where behavioural problems, not recidivism, reduced and remained low for two years (Jones et al., 1977).

1.3.5 Therapeutic Communities

All the published studies evaluating the efficiency of therapeutic communities do not include a comparison group. Therefore, no conclusions can be drawn about the specific effectiveness of Therapeutic Communities. However, in general, the patients show an

improvement on psychological measures, the number of serious incidents are reduced, and there appears to be no difference in the level of recidivism ten years after discharge (Vaglun, et al. 1990; Dolan, et al., 1992). Hence, it appears at present that therapeutic communities have the most promising results.

1.3.6 Milieu Therapies or Long Term Hospitalisation

In the studies looking at the effectiveness of milieu therapies, there is no description given of the actual treatment and again, there are no controlled studies (Norris, 1984; Tennent & Way, 1984). This is a concern as long-term hospitalisation is expensive and can institutionalise people.

1.3.7 Community Supervision

There is some evidence for a reduction in recidivism after 2 years discharge from the community supervision registrar (Walker & McCabe, 1973), but overall the results are inconclusive.

1.3.8 Criticism of the Treatment Literature

It is of concern that this population attracts large sums of public money and professional time devoted to changing them, when there are no established research findings that can offer a good rationale for a particular treatment regime (Blackburn, 1983; Quality Reassurance Project, 1991). The situation is further exacerbated by the fact that the etiological factors of psychopathy remain so unclear and poorly understood.

The fact that the characteristics of psychopathy are yet to be well defined invariably makes treatment and evaluation problematic. Some psychiatrists are unwilling to accept psychopaths for treatment due to the doubt about the validity of the concept (Dolan & Coid, 1995). Possibly because of this vagueness, the investigations into treatment outcome are few and of poor quality.

A consistent problem is the lack of a rigorous approach to diagnostic assessment before embarking upon treatment. Many studies do not clearly classify their participants or describe their treatment packages and none adopt the same measures as previous similar research (for example see Taylor, 1967; McCord, 1982; Valiant et al., 1984), thus it is impossible to compare outcomes.

Dolan & Coid (1995) highlight a further concern that this state of affairs has been acknowledged for decades and yet little obvious improvement has been made. Examples of comments by reviewers since the 1950's (e.g. Stafford-Clark et al., 1951; Scott, 1963; Frosch, 1983), indicate that many have been eager to point out the flaws and recommend what needs to be done, but few, if any, have taken this advice and acted upon it.

Overall, psychopathy remains an ill-defined concept. Therefore, how can appropriate diagnostic tools be developed if there is no agreement to what constitutes a psychopath? If psychopathy can not be defined, how can a suitable treatment programme be devised? Health professionals remain pessimistic about the success of treatment for psychopathy (Dolan & Coid, 1995). This status quo only adds to the need to understand the causal

mechanisms of psychopathy and its developmental pathway even more. If this can be achieved then the possibility of cure and even prevention can be addressed.

1.4 PROPOSED MODELS

Gunn (1992) argued that 'psychopathic disorder' could be considered a disease because it exerts a malign influence and puts the sufferer at a biological disadvantage. However, an illness model has never been fully explored and is possibly inappropriate. The solution lies appears to lie with other models.

It has been proposed by some researchers that psychopathy is a complex interaction between social and environmental experiences and innate biological and cognitive factors (Hare, 1993; Mitchell & Blair, 2000). This proposal is supported by anecdotal evidence, clinical evidence and by Robert Hare's work using the PCL-R (Hare, 1991) which confirms psychopaths have anti-social behaviour and emotional difficulties. It appears as if the social environment has an influence on the behavioural traits of psychopathy; for example, socio-economic status is inversely related to Factor 2 scores on the PCL-R. Conversely, the emotional component of the PCL-R, Factor 1, is unrelated to social economic status or IQ (Hare, et al., 1991).

1.4.1 Social and Environmental Contributions

Both clinical and empirical research clearly indicates that the basic traits of psychopathy do exist in children. As Hare (1993) comments, psychopathy does not just suddenly develop, parent's of psychopaths often report how their children were always different from other children, even as a toddler (Hare, 1993). Hence, psychopathy has commonly been linked to a problematic backgrounds or dysfunctional families.

Empirical research has supported this idea of the influence of the family, with research examining the quality of parenting (see Forth, 1995 and Wootton, et al., 1997). For example, if a parent encourages and models empathic responding following their child's aggressive acts, the child will less likely to continue with anti-social behaviour. In contrast, if a parent continually models aggressive behaviour as an option to meet own needs (including physical punishment of the child), the child is more likely to develop conduct problems (Wootton, et al 1997; Forth, 1995).

Further, in addition to parental anti-social behaviour and attitudes, inconsistent discipline, broken homes and childhood separation all predict high psychopathy scores in adolescence (Forth, 1995). Clearly these factors either provide the child with an anti-social model of resolving conflict or they provide motives for committing anti-social behaviour to compensate for their negative experiences.

However there are the group of children who not only show anti-social behaviour but also emotional difficulties (similar to psychopaths: lack of guilt, remorse, etc.). Wootton, et al., (1997) reported how the style of parenting or socialisation parent's

practise with these children had no effect on the probability of that child developing conduct problems, the children just continued in their aggressive acts.

Therefore it is hypothesised that social and environmental factors are only modulating factors in the development of psychopathy. A caring family will reduce the severity of psychopathy in these children, whereas a family modelling anti-social behaviour increases the severity of the psychopathy. This idea is similar to what Rutter & Plomin (1997) describe as a genetic vulnerability to a certain disorder, whose severity of presentation is shaped by the individual's environment. According to this notion then, in the case of psychopathy, it would be possible to come from a caring family, who do not show violence and aggression as a coping tool, but still to develop psychopathy. However, the presentation may be strongly favoured towards the non-aggressive traits, such as superficial charm, glibness, etc. What Hare (1993) refers to as 'a white collar psychopath'. In comparison, the child whose background is problematic, their presentation would be towards the aggressive and criminal traits.

What is clear is that whatever the early family and environmental experience of these children, they all exhibit emotional difficulties, which cannot be accounted for by social factors. Therefore, it is suggested that the emotional difficulties have a biological and/or cognitive origin.

1.4.2 Biological and Cognitive Contributions

If either a dysfunctional biological or cognitive system can explain the emotional difficulties, the exact nature of the emotional difficulty has to be specified. Currently there are two main theories. The first is that psychopaths have difficulty in how they experience fear. The second is that psychopaths do not develop the ability to feel empathy.

1.4.2.1 A Lack of Fear

This position relies on the idea that socialisation is developed through fear conditioning. Hence, if an individual has an inability to recognise fear or respond to a fearful stimulus, they cannot be socialised. In detail, the position outlines that an individual will learn to avoid anti-social behaviour because they are aware of the consequences (retaliation, prison, etc.) and therefore become reluctant to commit that act again. If a person cannot process fear, they will not be concerned with the consequences of their behaviour.

Hare (1970) suggested that psychopaths are not socialised because they are deficient in fear reactivity and that this is the root of their anti-social behaviour, insensitivity and inability to profit from experience. Hare's experiments involved psychopathic and non-psychopathic prison inmates (as indexed by the PCL-R) being presented with three different musical tones:

- 1) One followed by an electrical shock,
- 2) One followed by a pleasant visual stimulation, and
- 3) One followed by nothing.

The non-psychopaths showed an increase in Galvanic Skin Response (GSR) after hearing the tone that preceded the shock. In contrast, the psychopaths did not show any difference with any of the tones (Hare, 1970; Hare, 1991).

However there are a number of difficulties with this research. No measure was taken of the subjects' baseline response to fear. Each subject received the same 'level' of shock, but they may have had varying baselines for pain or fright. Secondly, no measures were taken of the participants brain functioning or a note of any co-morbidity problems. The difference between the two groups could have been caused by these factors which were not taken into account. Therefore it is suggested that this is a tentative finding amongst psychopaths.

Hare (1970) also suggested that psychopaths are in a chronic state of under arousal and this explained their risk taking behaviour, as they were always sensation seeking. However, subsequent research has shown that psychopaths do not have low or fixed levels of arousal, but instead have various levels of arousal in different situations (Patrick, et al, 1993). This contradicts Hare' (1970) suggestion that psychopaths are constantly sensation seeking because of their under arousal.

Hare (1970) concentrated on fear reactivity and arousal, but more recent studies have emphasised that psychopathy is possibly due to difficulty in processing fearful stimuli (Lykken, 1957; Patrick, 1994), rather than a difficulty reacting to it. Patrick (1994) employed a new technique to measure arousal: the Startle Reflex technique (Patrick, 1994). An individual involuntarily experiences a startle reflex when presented with something unexpected. The startle reflex can be primed by introducing threatening images, before the unexpected item. Patrick (1994) used pictures of a pointed gun and a wounded body to prime his participants, and then exposed them to an unexpected loud noise. He found non-psychopaths showed a greater startle reflex when primed, compared to just hearing the noise. However, psychopaths did not show any difference in their arousal from the loud noise and the priming effect (Patrick, 1994).

Again there are difficulties with this research. Patrick (1994) does not mention whether a hearing-test was included or whether he screened his participants for co-morbidity problems. It also has to be questioned whether a pointed gun or a wounded body is a fearful stimulus for everyone. A pointed gun may produce anger not fear in some individuals, and a wounded body for some may arouse feelings of empathy and sadness, not fear.

Finally, the fear model maintains that socialisation is acquired through fear conditioning and therefore psychopaths are not socialised as they have difficulty processing fear. This is problematic as the socialisation literature suggests that fear of consequences, e.g. punishment, is not effective in altering or preventing aggressive behaviour. This is in line with the findings that Therapeutic Communities appear to have the most success

with treating psychopaths (Vaglum, et al. 1990; Dolan, et al., 1992) as they introduce psychopaths to the experience of being a victim in efforts to develop empathy, not fear.

Therefore, instead of difficulty recognising or processing fear, a different perspective is that psychopaths cannot experience empathy, and therefore does not alter their behaviour and therefore are not socialised.

1.4.2.2 A Lack of Empathy

Blair (1995) has suggested that psychopaths have difficulty recognising the impact their behaviour has on others. His idea was prompted by the work of ethologists Eibl-Eibesfeldt (1970) and Lorenz (1981) who observed that most social animals possess mechanisms for the control of violent behaviour, i.e. aggression. The ethologists claimed that submission cues displayed to an aggressor by a victim ends the attack by the aggressor, e.g. a fighting dog will cease attacking if the opponent dog bares its throat.

Blair (1995) proposed that humans possess a functionally similar mechanism: the Violence Inhibition Mechanism (VIM). For a human, Blair (1995) argued that the submission cue would be the fearful or distressed facial expression of the victim. An individual seeing someone frightened by them and their actions, according to the VIM, would make them inhibit their aggressive behaviour towards the other person. Secondly, a healthy individual seeing their actions causing distress will make them feel uncomfortable. Therefore the fear expression of the 'victim' acts as a punishment,

making the transgressor less likely to commit that act again. The suggestion is that empathy induction is a mechanism for socialisation, as it effectively focuses a child's attention on their natural punishment. Blair (1995) argues that psychopaths have a dysfunctional VIM and therefore they do not inhibit their aggressive behaviour in the sight of fear or distress. He suggests that psychopaths are less sensitive to the sight of fear and distress and do not feel uncomfortable or responsible for its display.

Blair has provided empirical evidence to support his theory. In a number of studies, he has shown psychopaths and non-psychopaths a picture of a crying human face. The non-psychopaths experienced an increase in their GSR, but no change was recorded for the psychopaths (Blair, 1995; Blair, 1997; Blair, et al., 1997). This has been found in children with psychopathic tendencies also (Blair, et al., in press). It appears that this is not a generalised problem. Psychopaths showed the same GSR to the sight of angry faces, compared to non-psychopaths (Blair, et al., 1997).

In addition Blair has suggested that this mechanism, the VIM, is a prerequisite for the development of certain aspects of morality (Blair et al., 1995). According to his model, moral socialisation occurs through the pairing of VIM activation (by distress cues) with representations of acts that cause the distress cues. These are known as moral transgressions, an example being a person hitting someone else. Classical conditioning results in these representations of moral transgressions becoming triggers for the VIM. Transgressions will not activate the VIM if they do not result in harm. These transgressions are referred to as conventional transgressions, e.g. talking in class, as they are frowned upon but do not cause distress.

Smetana (1981; 1985; 1993) has shown that children as young as 4 years old can distinguish between moral (victim based) and conventional (social disorder based) transgressions. Blair (1997) demonstrated that normally developed children discriminate best between these two types of transgressions when they are asked to imagine situations where there are no rules prohibiting the transgressions. Adding further support for the VIM model, Blair and his colleagues have demonstrated that adults with psychopathy and children with psychopathic tendencies are less likely to make a discrimination under these conditions compared to controls (Blair, 1997; Blair et al., 1995a; Blair et al., 1995b; Blair et al., 1997; Fisher & Blair, 1998). It appears as if the psychopaths know the transgressions are prohibited but they do not feel 'upset' at the thought of distress or pain in others.

However a number of difficulties are inherent in the above research. In the first set of experiments, a picture of a crying face is used. Being shown a picture of a stranger crying may not produce the same level of arousal as real life upset, and yet Blair compares this measure to the actions of psychopaths in response to real life distress. Secondly, the sight of a crying human does not always mean the response in others will be empathy. Surely, this depends on the feelings towards the other person, if someone has done something to harm another loved ones, they will not be empathic towards them. This relates to a gap in the VIM proposal. Blair implies that distress cues will activate the VIM and the aggressor will stop their behaviour. He does not provide any account for the times an aggressor may actually want the other person to be upset and the aggressor continues in their actions, ignoring the distress cues.

Regarding sample selection, Blair does not account for co-morbidity of other disorders. Blair's participants are both prison inmates and patients at a secure hospital. He generalises his results across both groups and yet they may be fundamentally different if they are 'held' in different settings. To be sent to a secure hospital, psychopaths have to be considered treatable, i.e. they must have a treatable psychiatric problem such as psychosis, addiction, etc. and thus they will likely be on medication. This will have an effect on their performance.

Both the fear and empathy theories focus on emotional difficulties but it is difficult to see how they can account for characteristics associated with psychopathy such as impulsivity, superficial charm, etc. Hence, they appear to be not fully developed. A third model exists which does not focus on emotional difficulties but rather aims to explain psychopaths' apparent impulsivity and disinhibition traits. This model pertains that psychopaths have difficulty processing new information regarding their behaviour and therefore fail to inhibit their behaviour when it becomes non-rewarding. This is based on the concept of 'Response Modulation' (Patterson & Newman, 1993) and it offers support to the above VIM model (Blair, 1995), as a dysfunction within the VIM would mean failure to inhibit the aggressive act of the psychopath, despite the distress cues shown by the victim.

1.4.2.3 A Problem with Response Modulation

Based upon the observation that central to the traits of psychopathy is the notion of impulsivity and disinhibition, Patterson & Newmann (1993) have proposed that

psychopathy is caused by a dysfunction in the mechanism that controls behavioural responses. They proposed that the psychopath has difficulty processing certain information regarding the appropriateness of their behaviour.

Fundamental to this account, is the concept of 'Response Modulation'. Patterson & Newman (1993) defined this as "*brief and relatively automatic shifts of attention from the organisation and implementation of goal directed behaviour to the evaluation of the behaviour or response set*". They considered the shifting of attention to be automatic as it was effortless and not limited to short term memory capacity. Patterson & Newman (1993) also thought that although response modulation involved automatic processing, it was also responsible for initiation of higher order cognitive processing and in doing so, provides the context for exercising adaptive self-regulation (Patterson & Newman, 1993). If the automatic and controlled parts of the response modulation process are functioning correctly, behaviour that is judged to be appropriate is continued; if a minor modification is indicated, then the necessary adjustments in response strategy are made. If the behaviour appears to be inappropriate or maladaptive in the light of available information, the behaviour is inhibited and replaced with another, more appropriate response strategy.

If there is a problem with response modulation, the previously rewarded behaviour will continue, even though it is now inappropriate, and possibly punishing. In a series of studies, researchers examined the psychopath's ability to alter their response set. The researchers used a number of different rewards (e.g. money or praise) with psychopaths and non-psychopaths having to suspend their previous behaviour or attentional set, to

continue winning or be praised. Psychopaths consistently continued with their previously rewarded behaviour in all tasks, even though it had become non-rewarding, whilst the non-psychopaths terminated their behaviour when they began to lose (Jutai & Hare, 1983; Newman, et al, 1987; Newman & Kosson, 1986; Paterson & Newman, 1993).

Based upon the above findings, Wallace et al. (1999) conclude that psychopaths appear to suffer from a cognitive deficiency involving the automatic allocation of attentional and controlled processing resources. This diminishes their awareness and processing of potentially useful peripheral information and thus interferes with their ability to regulate dominant response inclinations and goal directed behaviour.

However, there are problems with Newman et al.'s work. They do not screen out co-morbid problems and generalise their results to all psychopaths, despite diagnostic queries. They assume that the difference between the psychopaths and the non-psychopaths was due to differences in inhibiting behaviour. It is possible that the psychopaths did in fact monitor their behaviour, but they also enjoyed the risk element. Many psychopaths are gamblers, seeking the excitement that comes with risk (Hare, 1993). From their past behaviour, some psychopaths may have believed that they 'were just lucky' or that they could somehow beat the game (because of their grandiose sense of self) and that sooner or later, they would begin winning again. All the participants were prison inmates. It is extremely likely that they are bored, being kept in cells for most of the day. It is possible therefore that some psychopaths deliberately took their time and played more cards to spend time away from the cell.

In contrast to Blair and colleagues, Newman et al., concentrate on an output model, without offering an explanation for how this 'output' is processed and what external cues control it. The psychopaths' lack of ability to inhibit non-rewarding behaviour may not be because they cannot stop themselves; they may have difficulty reading the external cues. Like Blair, Newman et al.'s proposal does not offer a complete explanation for all the behavioural characteristics linked to psychopathy.

What appears to be inherent in all of the above research is a sampling bias, in that it appears that researchers assume all psychopaths are the same. This cannot be true because the psychopaths included in all the above research have been 'caught'. There will be other psychopaths operating in society, involved in deviant behaviour, who are never caught. Is there something different about these psychopaths compared to their incarcerated colleagues? Also, psychopaths are well known to be cunning and manipulative. It is possible, therefore, that all the psychopaths above were able to figure out the purpose of the study and deliberately performed in the way they thought the investigator wanted them to.

None of the proposed models offer an explanation for all the characteristics of psychopathy. However, taken together they can offer an explanation for most of the characteristics. What is interesting is that Fisher & Blair (1998) found an association between performance on the moral/convention distinction task and performance on Newman's card playing task. But, how can the findings from one account for the findings in the other two? A logical step in this process then is not to consider the sets of findings in isolation, but to examine them together, at the neuro-cognitive level. Here

it could be that one structure or mechanism could underlie all three models or they each have separate systems, but these have many deep neural connections. If a part of the brain is dysfunctional in psychopaths then this could explain why social factors may only mediate the severity of psychopathy, and not prevent it.

1.4.2.4 Neuro-Cognitive Model

Most neuro-cognitive research has demonstrated that damage to the frontal brain regions can produce recognisable symptom clusters. In particular, damage to the frontal lobes is often associated with personality change, impulsivity, disinhibition, poor judgement, and increased levels of aggression. All these factors are similar to traits associated with psychopathy.

From the above cited research, it appears that adult psychopaths have difficulty processing negative valence emotions (possibly because of a dysfunctional VIM) and disinhibiting previously rewarded responses now irrelevant to the current situation (problems with response set modulation). These findings were also replicated in children with emotional and behavioural difficulties (or psychopathic tendencies). From a neuro-cognitive perspective, these findings may be considered as either an impairment in emotional processing (relating to the VIM research) or an impairment in executive processing of emotion stimuli (relating to the response modulation proposal).

Looking at emotional processing, a proposal could be that the basic emotion system that is impaired is fear (e.g. Eysenck, 1964; Gray, 1971). An impairment in fear processing implicates the amygdala. Alternatively, impairment in executive emotional functioning has been attributed to a dysfunction of the orbito-frontal cortex (OFC).

1.4.2.4.1 Emotional Processing & The Amygdala

The amygdala is an almond shaped structure located bilaterally in the forebrain. Electrophysiological and lesion studies have for many years implicated the amygdala in aspects of emotional processing in mammals (see review Zald & Pardo, 1997). It is widely believed to be the locus for fear conditioning, as individuals with impairments to the amygdala show reduced automatic responses (Zald & Pardo, 1987; Adolphs, et al 1994). However, the specific function of the amygdala in humans remains unclear. Research is limited to case studies of patients with neurological conditions. These have shown that lesions to the amygdala cause impairments in storing and recalling emotions and selective impairments in the recognition of fearful (but not positive) facial expressions (Adolphs, et al., 1994; Young, et al 1993).

Recent research is now indicating that the valence of a stimulus predicts amygdala activity. It appears that the amygdala is more likely to be involved with negative than positive emotions. Adolphs, et al. (1999) reported on a woman with damage to both sides of the amygdala. She was able to distinguish between pleasant and unpleasant emotions but unable to recognise emotional arousal in those facial expressions showing negative emotions, specifically fear and anger. Hence, it is suggested that the amygdala

is involved in responding to highly negative threat related stimuli that require a quick response. This is supported by a recent study, looking at functioning of the amygdala, using the PET functioning imagery technique. It was observed that with increasing degree of sadness of a facial expression, the amygdala and connected regions increased their activity (Blair, et al., 1999). This allows an explanation for both the fear and empathy models, i.e. it is possible psychopaths have a difficulty in the functioning of their amygdala. However, it cannot account for the information-processing model.

1.4.2.4.2 Executive Processing & The Orbito-Frontal Cortex

Executive processing of emotional stimuli involves the modification of behaviour when a reinforcement associated with a particular stimulus changes from positive to negative, i.e. reversal learning and ability to inhibit a previous reinforcing response. For example, unimpaired individuals show greater autonomic responses before choosing a high risk card than a low risk card in the Four Pack Card Playing Task (e.g. Bechara et al., 1994). This is similar to the findings of Newman, et al. However, direct measurement of psychopath's ability on reversal learning tasks has yet to be examined.

An impairment in executive emotional functioning has been attributed to a dysfunction of the orbito-frontal cortex (OFC). This is a small region of the frontal lobes, located behind and in the centre of the forehead. Eslinger & Damasio (1985) observed that damage to the OFC caused problems with disinhibition, i.e. behaviour remained guided by previously relevant responses that were inappropriate to the current situation. They proposed that specific damage to portions of the OFC could explain possible cognitive

mechanisms underlying anti-social behaviour. This has been recently supported with a number of case studies showing that individuals with impaired OFC functioning fail to show automatic responses to visual displays of affective stimuli (Damasio, 1994).

Dias, et al., (1996) addressed these observed difficulties from an empirical prospective. They examined damage to the OFC and the dorsal lateral prefrontal cortex (DLPC) using a procedure for examining different forms of inhibitory control of behaviour, using a task known as The ID-ED task (Dias, et al., 1996). The ID-ED task involves the individual needing to constantly monitor their responses to specific visual stimuli as:

- 1) Changes in the reward association to the stimuli are made and
- 2) Shifts in selective attention are required as previously relevant dimensions of a stimulus change to another dimension.

Dias et al., recruited two groups of subjects: one group had damage to their OFC and the other damage to the DLPC. First, the subjects were trained to make visual discriminations between stimuli consisting of 2 black lines superimposed on two blue polygons. The pairing of the black lines and the blue polygons is random. Initially, through trial and error, subjects learnt which was the rewarded stimulus and which was the non-rewarded stimulus. Selection of the correct stimulus led to the reward of praise. Then the subjects' ability to learn new reward associations was tested using three compound discriminations:

- 1) Intra-dimensional Shifting (ID): This is required when the previously rewarded dimension remains relevant, but the subjects are presented with novel stimuli, i.e. new black lines and different blue polygons;
- 2) Extra-dimensional Shifting (ED): This is required when the alternative rewarded dimension becomes relevant, e.g. previously the dimension associated with reward was the black lines but it then changes to the blue polygons and
- 3) Reversal Learning: This is when the rewarded dimension remains the same, but the reward association is reversed from one black line to the other.

No subjects had any problems with ID shifting, indicating that they all could transfer behavioural control from one pair of stimuli to similar, but novel pairs of stimuli, within same perceptual dimensions. Differences emerged between the groups when they had to learn a novel discrimination that required a shift of attentional set from one dimension to another, i.e. ED shifting. Subjects with lesions to the DLPC had difficulties and were unable to shift their attention to the new reward association. They took twice as many trials as the OFC damaged subjects to reach a degree of accuracy in their response selection. The subjects with damage to their OFC showed no problems, appearing able to learn that reward was now associated with the other dimension.

However, those with OFC damage had difficulty when a reward-stimulus association was reversed within the same dimension. This suggests these subjects failed to suppress the influence of previously acquired stimulus-reward associations, rather than

impairment in learning new stimulus-reward associations (as required for both the ID and the ED shifts). Dias et al., (1996) concluded that damage to the DLPC appears to cause a loss of inhibitory control in attentional selection, whereas damage to the OFC causes loss of inhibitory control in affective processing. Rolls (1997) has supported these proposals with evidence from his own research, where he claims to have used a similar task and obtained comparative results. However, he does not describe his task in detail or provide information on his subjects.

A criticism of the above research is in the numbers of participants either observed or recruited. This was extremely small (N=6) in Dias, et al.'s study and the case studies quoted by Eslinger & Damasio (1985) and Damasio (1994) were only six of their own patients. Secondly with regard to case studies, it can never be guaranteed there is no further damage to other areas of the brain. Those individuals with acquired damage to their OFC, as quoted by Damasio (1994), may have lesions in connected structures or damage to the neural network surrounding the OFC, all of which could influence their performance on any executive task.

Cornell et al., (1996) also note that those with acquired damage to the OFC show increased reactive aggression, i.e. they become aggressive as a response to their interpretation of external cues. This is different to the aggression observed by psychopaths, which appears to be instrumental aggression, i.e. they use it to gain advantage in a situation (Cornell, et al. 1996). Finally, psychopaths appear to have difficulty processing only fear and distress (Blair, et al., 1997) and not all emotions, as most of Damasio's patients do (Damasio, 1994).

In conclusion, impairments in executive emotional processing may be implicated in the development of psychopathy and therefore with the OFC, but the evidence is equivocal and the lack of detailed theory makes conclusions difficult. Secondly, the development of psychopathy also seems to be associated with impairment in emotional processing and this impairment may be due to dysfunction within a circuit that involves the amygdala.

Researchers have observed an asymmetry in OFC activation with amygdala activation. There is a high correlation between OFC and amygdala during exposure to aversive stimuli (Zald & Pardo, 1997). This suggests that an important functional interaction takes place between the OFC and amygdala, during processing of aversive stimuli. This is consistent with the dense anatomical connections between the two regions (Zald & Kim, 1996) and that OFC lesions produce behavioural alterations that closely resemble many of the behavioural abnormalities implicated with amygdala dysfunction (Zald & Kim, (1996). This is consistent to the neurological positions of both areas, as they have dense anatomical connections to each other.

It appears that the amygdala is involved in negative emotional processing and guiding behaviour based upon environmental cues and the OFC in rapid reversal learning. Therefore, impairment in both is likely to produce problems with response inhibition and reading certain emotional cues and impairment in both systems offers an explanation for many of the characteristics associated with psychopathy.

1.5 RESEARCH ON CHILDREN

Hare (1993) during his many years of work with psychopaths and their families has collected copious amounts of anecdotal evidence of parents' descriptions about their child. He comments that there is a consistent theme running throughout all their stories. All the parents felt there was something seriously wrong before their child went to school. Even though all the parents accepted that some children are boisterous and aggressive, they all felt there was something "different" about their child from other aggressive children. Their children appeared more wilful, deceitful and harder to relate to than others. Their children also engaged in serious levels of violence: attacking animals, siblings and than lying about their involvement.

It is apparent to him that all these families are different. Some were emotionally, behaviourally and even sexually abusive, but others where deeply caring and concerned. Hence, Hare concluded that as not all psychopaths come from troubled backgrounds and not all those who have had an abusive childhood are psychopaths, there must be something different about the psychopaths. These comments are supported by research, were subgroups of children with emotional and behavioural problems reduce their level of deviance in middle and late adolescence, while others, a smaller proportion, continue to display deviance despite a healthy upbringing (Moffitt, 1993).

Therefore, it appears that the probable precursors to psychopathy are high levels of emotional and behavioural disturbance during childhood and adolescence, only minimally dependent on the type of upbringing. However, both the ICD-10 and the DSM-IV do not have categories that reflect the full extent of psychopathy in children

and adolescents. What is listed are two disorders, described as 'Disruptive Behaviour Disorders' that together offer a near complete picture of the young psychopath. The two overlapping disorders are:

- 1) *Conduct Disorder*: defined as a persistent pattern of conduct in which the basic rights of other and major age-appropriate societal norms or rules are violated;

- 2) *Attention Deficit Hyperactivity Disorder*: defined as developmentally inappropriate degrees of inattention, impulsiveness and hyperactivity.

It is possible that a child who lacks or has difficulty recognising fear or empathy and difficulty monitoring their behaviour (i.e. the findings from psychopaths) could present with conduct disorder or ADHD. There is a high co-morbidity between conduct disorder and ADHD (Pennington & Ozonoff, 1996; Frith, 1998).

1.5.1 Conduct Disorder

DSM-IV and ICD-10 criteria for conduct disorder (CD) is met by 4 – 10% of children in the UK and they represent up to a half of all referrals to child psychiatric clinics (Rutter, 1975; Robins, 1981; Herbert, 1987). The DSM-IV criteria for CD outlines consistent behaviour patterns where the child violates major age-appropriate rules and the rights of others. A number of researchers have shown that a significant proportion of those children with CD and who:

- 1) Show poor peer relationships,
- 2) Come from disordered and deprived family backgrounds and
- 3) Have parents displaying mental illness, criminality and abusive behaviour

are more likely to have a personality disorder in adulthood (Robbins, 1974; McCord, 1982; Offord, 1982). It is predicted by some (Rutter & Giller, 1983) that this subgroup represents about 40% of this population.

This continuation into adulthood has led some researchers to consider whether conduct disorder is the childhood phase of a chronic psychiatric disorder, for example psychopathy or anti-social personality disorder. Eppright et al (1993) examined the possible overlap between CD and antisocial personality disorder (ASPD). Using the DSM-IV structured interview for diagnosis, 87% of a group of incarcerated juveniles (aged 11-17) met the criteria for CD and 75% met the criteria for ASPD. Eppright, et al (1993) also noted that removal of the age criterion in DSM-IV's definition of ASPD leaves a great similarity between criteria for CD and ASPD. They suggest that ASPD does manifest at an earlier age than has been thought (Eppright, et al., 1993) and that ASPD is the endpoint of a developmental process, starting CD in young children. Linking this back to the earlier findings that a sub-group of those diagnosed with CD continue displaying deviant behaviours into adulthood, it is possible that this subgroup may in fact be young psychopaths. Whilst those children with CD without ADHD are the group who go on to improve in adulthood.

Robins (1966) addressed this idea in a longitudinal study conducted in the USA. She followed up 524 children who had been referred to child guidance clinics: 406 referred for antisocial behaviour and CD and 118 referred for primarily neurotic symptoms. She also included 100 control school children. After 30 years, the antisocial and CD group were more likely to have left the area, 75% of the boys, now men and 40 % of the girls, now women, had been arrested for non-traffic offences. Half of the men had committed at least one serious crime. Of the women, 70% were currently divorced, with 23% having divorced more than once and a third married before they were 17. There was a high rate of childlessness in this group. Amongst those who did have children, their children were more likely to have behavioural problems than the other two groups. From these findings, Robins (1966) outlined the childhood factors that predicted the diagnosis of ASPD in adulthood:

- The presence of
- 1). Theft or aggression,
 - 2). A diversity of forms of antisocial behaviour,
 - 3). Many episodes of antisocial disorder, and
 - 4). Behaviour involving strangers and organisations other than schools or within the family home.

Robins replicated her study and included different socio-economic and ethnic groups (Robins, 1978). The above findings were replicated and she concluded that antisocial behaviour in children could predict level of antisocial behaviour in adults. She argued that her findings indicated that adult and child antisocial behaviour both formed closely

connected syndromes. She also concluded that antisocial personality disorder required a preceding pattern of childhood antisocial behaviour.

However Robins' (1966) study was conducted over 30 years ago. Society has undergone many changes since then. Secondly, the study concerned North American Children. It is often highlighted by the media how the cultures of the UK and the USA differ. For example their attitude towards guns, the higher levels of crime in the USA, etc. Finally, when Robins was conducting her research the only classification system available to her was DSM-II. DSM-II was criticised generally for being based upon poorly defined criteria and did not even contain a category for ASPD. Unfortunately, there appears to be no longitudinal research (i.e. follow through into adulthood) on children with CD since then.

However, the majority of conduct disorder diagnosed children do not go on to meet the criteria for antisocial personality disorder (Golobek et al 1986, Bernstein et al 1993, Loeber, et al 1991). Therefore, it can be concluded that only a small group of children manifesting conduct disorder go onto develop major personality disorder, or more specifically antisocial personality disorder.

However, there is little methodological research into the early life experiences of the psychopath. Frick & Hare (in press) wanted to address this and therefore developed a rating scale for adolescents, based upon the PCL-R, known as the Psychopathy Screening Device (PSD). The PSD consists of 20 items, scoring between 0 – 2, with a maximum score 40. Example items are: *'He/she is concerned about how well he/she*

does at school'; *'Braggs excessively about his/her abilities, accomplishments or possessions'* and *'Does not show feelings or emotions'*. The PSD encapsulates two factors similar to that found from the PCL-R. Frick & Hare (in press) termed these factors as Factor 1: callous/unemotional (C/UE) personality features and Factor 2: impulsive/conduct problems (I/CP). Example traits of Factor 1 are: No. 1 *'Blames others for his/her mistakes'* and No.11 *'Teases or makes fun of other people'*. Example traits of Factor 2 are: No. 2 *'Engages in illegal activities'* and No. 13 *'Engages in risky or dangerous activities'*. The PSD is currently being employed in many studies aimed at identifying extent of behavioural disturbance in children and by doing so, its reliability and validity is being established.

It is clear from the above studies that most research has looked at conduct disorder as the possible precursor to antisocial personality disorder or psychopathy. However, a second childhood disorder can also be thought as showing similar characteristics to antisocial personality disorder or psychopathy, that of Attention Deficit Hyperactivity Disorder (ADHD).

1.5.2 Attention Deficit Hyperactivity Disorder (ADHD)

ADHD presents as inappropriate degrees of inattention, impulsivity and hyperactivity in childhood and can be difficult to distinguish from conduct disorder. To support this, Farrington et al (1990) have reported evidence that ADHD can predict severity of juvenile delinquency. It could be concluded therefore that when ADHD and conduct

disorder are co-morbid they have an additive effect in predicting adult chronic offending.

As with conduct disorder, prospective studies have looked at the continuity of ADHD into adulthood. Klein & Mannuzza, (1991) have shown that 66% of children with ADHD will still meet criteria in middle adolescence. They also have a fourfold higher risk of developing antisocial personality disorder, compared to those who remit by adolescence. However, Robins (1966) noted the spontaneous improvement in 27% of ADHD children in adulthood, and therefore suggested that this improved group had been given the wrong diagnosis at an earlier stage. This proposal has recently been supported by findings indicating that ADHD does not usually decline, but in fact is a risk factor for anti-social behaviour, violence and hyperactivity later in life (Taylor, et al., 1996).

A difference between children with conduct disorder and children with ADHD is their abilities to perform tasks associated with executive functioning. Children with ADHD show poorer performance on tasks measuring skills associated with executive functioning compared to children with CD (Pennington & Ozonoff, 1996). Based on their findings, Pennington & Ozonoff (1996) suggest that ADHD is predominately a disorder of inhibition. This would implicate the damage to the dorsal-lateral prefrontal cortex (Dias, et al., 1996). This has been supported using functional imaging techniques which indicate the children with ADHD show lower activation of the prefrontal cortex during response inhibition tasks, compares to non-ADHD children (Taylor, 1999).

It is interesting to note that adult psychopaths also have no difficulty with tasks associated with executive functioning (Pennington & Ozonoff, 1996), instead as highlighted, psychopaths probably a disorder of either emotional processing or executive emotional processing. From this then, it appears likely that CD is the most likely candidate for the manifestation of psychopathy in children. However, because of the high co-morbidity rate of ADHD and CD (Frith, 1998, etc.), research looking at identifying the fledgling psychopaths would have to distinguish between those with ADHD, those with CD, and those with both.

1.6 SUMMARY

Previous studies have indicated that psychopaths exhibit difficulties reacting to fearful and distressing facial cues (Hare, 1970; Patrick, 1994; Blair, et al., 1997). Other research has shown that adult psychopaths and children with psychopathic tendencies, as indexed by the PSD, have problems distinguishing between moral and conventional transgressions (Arsenio & Fliess, 1996; Blair, 1997). Blair (1997) proposed that all the above problems were due to a dysfunctional “Violence Inhibition Mechanism “ (VIM). The VIM is only activated by distress cues and on activation will terminate the current activity that caused the showing of the distress cue. If a participant’s VIM was dysfunctional, there would be a reduced probability of terminating the aggressive behaviour which is causing distress to others. Blair (1997) also states that if an individual has difficulty processing distress, then they will have difficulty developing empathy towards their victims. This would make it difficult for them to learn socially

appropriate behaviour, as they do not experience the discomfort normally experienced by causing distress to others. Therefore psychopaths would have difficulty distinguishing between moral and conventional transgressions.

Finally, a third finding amongst psychopaths and children with psychopathic tendencies is that they have difficulty shifting their attention from action to evaluation of action, known as “response set modulation” (Patterson & Newman, 1994; Newman, et al., 1997; Fisher & Blair, 1998), a type of reversal learning.

Fisher & Blair, (1998) found that level of behavioural disturbance could predict:

- 1) Performance on the moral and conventional distinction and
- 2) The extent of difficulty with the reversal/ extinction task.

Children with severe behaviour problems were less likely to make a distinction and more likely to play more cards, than their less severe peers. Fisher & Blair (1998) also found an association between performance on the above card game and the moral and conventional distinction tasks.

These two sets of findings are offered by their authors as possible pathways to the development of psychopathy. The association between the two tasks found by Fisher & Blair (1998) can possibly be explained if the same cognitive system and/or neural substrate drive the difficulties. Fisher & Blair (1998) have suggested that there must be either a single cognitive mechanism involved in both tasks or that each task is sub-

served by separate cognitive systems which are connected in the brain. The first hypothesis has to be ruled out, as dysfunction within response set modulation cannot explain the moral/conventional distinction finding. Impairment with response set modulation should impair performance in any situation where attention should shift from action to evaluation. The findings from the moral/distinction tasks indicated that this is a specific impairment, as it is only shown under conditions when rules prohibiting the transgressions have been removed.

Hence, attention is turned towards the second proposal that both tasks are mediated by proximal cognitive systems. Two likely areas are the amygdala and the OFC as both have been found to be involved with reward, punishment and facial affect (Bechara et al., 1995; Dias et al., 1994; Rolls, 1997). The amygdala, until recently, was associated with processing fearful facial affect (Young et al., 1993; Adolphs et al 1994). More recently, owing to PET scanning, the amygdala appears to also be involved with sad facial processing also (Blair, et al., 1999). Hence, a dysfunction of the amygdala offers an explanation for why psychopaths and children with psychopathic tendencies have difficulty with empathy or identifying fear.

Researchers believe that the OFC is involved in rapid, reversal learning and therefore it has been associated with response set modulation. It has been proposed that dysfunction in this area would result in difficulties of the nature associated with some of the characteristics of psychopathy (Newmann, et al., 1997).

1.7 CURRENT STUDY

The overall aim of this thesis is to contribute to the understanding of the possible developmental pathways of psychopathy. In particular, it is hoped to provide further evidence for existing proposals, which have attempted to identify the specific brain regions responsible for the cognitive mechanism(s) underpinning the behavioural traits of psychopathy. These proposals have centred upon two structures that have deep neural connections to each other: the amygdala and the orbito-frontal cortex (OFC).

This thesis is concerned with the latter as there is little research on psychopath's performance on reversal learning tasks, thought to be mediated by the OFC. The study focused on children, rather than adults, as it remains unclear whether the developing psychopath manifests as CD or ADHD in children. Therefore the study is addressing whether children with psychopathic tendencies have damage to their OFC.

The children's OFC functioning was measured by two computer reversal learning tasks: The ID-ED (Dias, et al., 1996) and The Snake Game (Fine & Blair, in press). Their level of psychopathic tendencies was measured by the Psychopathy Screening Device (PSD: Frick & Hare, in press). As mentioned, both conduct disorder and ADHD have been implicated as the behavioural pre-cursors to psychopathy, therefore a measure of ADHD was used to distinguish between those children with just psychopathic tendencies and those with ADHD: The DuPaul Rating Scale (DuPaul, 1991).

If the children with high levels of psychopathic tendencies have problems with their OFC, they should exhibit difficulties with reversal learning and not extra-dimensional

shifting (the ED component of the ID-ED Task). Whereas, if ADHD is not the precursor of psychopathy but it is associated with dysfunction in the frontal lobes (Pennington & Ozonoff, 1996), in particular, the dorsal lateral cortex (Dias, et al., 1996), these children should have difficulty with Extra-Dimensional (ED) learning task but not reversal learning.

In particular, this study will examine the level of behavioural disturbance influence on performance on reversal and ED learning tasks. Specifically, this study will be addressing three hypotheses:

- 1) Children with high emotional and behavioural disturbance (as indexed by the PSD) will perform poorly on the reversal tasks but not the ED task;
- 2) Children with high levels of impulsivity and inattention (as indexed by the DuPaul Rating Scale) will perform poorly on the ED task but not the reversal tasks.
- 3) Children with high levels of emotional and behavioural disturbance and impulsivity and inattention will perform poorly on both the reversal tasks and the ED task.

2. METHOD

2.1 DESIGN

This study employed a correlation design. The measures used were performance on two computerised visual discrimination learning tasks (known hereafter as the ID-ED Task and the Snake Game) and the extent of behavioural disturbance, as indexed by the Problem Behaviour Questionnaire. The latter was comprised of the Psychopathy Screening Device (PSD) and the DuPaul rating scale (see later).

2.2 PARTICIPANTS

The participants were pupils recruited from two North London special schools for the emotionally and behaviourally disturbed. Both schools provided a borough wide service and therefore their catchment areas' extended beyond their immediate locality. The latter for both were socially deprived areas, with a number of pupils living within these. The two schools had between them 70 pupils, all male, registered on their respective school rolls.

All participants had statements under the Education Act of 1993 (too problematic for mainstream education) and had been excluded from main stream schools. Originally, 64 pupils, aged between 10 and 16 years old, were recruited. Eight were subsequently

excluded from the study because they were either absent at the time of their second session (2 pupils), or had shown unruly behaviour and were removed before finishing both computer tasks (5 pupils) or had been excluded from school following their first session (1 pupil). Therefore a total of 56 participants completed both tasks. Their mean age was 12.9 years old (sd = 1.84).

Parental permission was sought prior to the children participating in the study. Parents received a take-home letter outlining the study and asking parents to return the refusal slip to the school if they did not want their child to participate (see Appendix A: Parental Permission Letter). None of the parents returned the refusal slip and so parental permission was assumed for all the children. It was not necessary to offer any inducements to the children to participate as their teachers informed them that participation was compulsory. In addition, all the children appeared eager to leave their formal lessons for a time.

2.3 MEASURES

The two computerised visual discrimination tasks were installed onto a laptop computer. This was for ease of transportation between the two school sites. The first task, ID-ED Task (see Dias, et al., 1996), operated through Visual Basic for Windows and the second, the Snake Game (Fine & Blair, in press), through MS-DOS.

2.3.1 The ID-ED Task (Dias, et al., 1996)

The ID-ED Task (Dias, et al., 1996) was designed to measure ability to learn a series of three compound discriminations: reversal learning, intra-dimensional (ID) shifting and extra-dimensional (ED) shifting. Reversal learning requires a shift of attention due to a stimulus-reward association being reversed. ID shifting requires a shift of attention from a familiar stimulus to a novel one, whilst the relevant dimension for reward remains unchanged. ED shifting requires a shift of attentional set from one dimension to another, as distinct from ID shifting, where the shift is to novel stimuli but the relevant dimension remains the same.

The ID-ED task begins by showing participants two stimuli on the computer screen. These stimuli consist of two different pink polygons, superimposed with two different sets of white lines (see Appendix B. for pictures and further details). The participants have to decide which stimuli, or picture, they think is the correct one. They do this by clicking on the picture they think is correct, with the mouse button. A message is instantly flashed up on the screen informing them the nature of their choice, either 'correct' or 'wrong'. For the first few trials, participants learn by trial and error, which is the 'correct' picture. The pink polygons are the 'correct' dimension and polygon A (see Appendix B.) is the 'correct' shape. After a number of trials and subsequent feedback, the participants learn which is the 'correct' picture.

Maintaining this attentional set (the tendency to respond to a particular perceptual dimension on the basis of previous experience) continually rewarded the participants

with 'correct' messages. After 8 consecutive 'correct' responses, the stimulus-reward association between the pair stimuli is reversed and the alternative shaped polygon (polygon B, see Appendix B.), becomes the relevant polygon. This is the first reversal trial. Again the participants have to guess which is the 'correct' shape and by trial and error to learn the new stimulus-reward association. Again they were rewarded for maintaining this attentional set by continual 'correct' messages if they select the 'correct' shape.

After 8 consecutive correct responses, the next trial begins. This trial concerns intra-dimensional (ID) shifting, where novel but related stimuli are presented. This time the 2 stimuli are 2 different shaped pink polygons and different sets of white lines. The dimension of polygon remains relevant. After 8 consecutive correct responses, the reward-association is again reversed, and the alternative shaped polygon becomes relevant.

After 8 consecutive correct responses, the next trial begins. This trial concerns extra-dimensional (ED) shifting. The participants have to learn a novel compound discrimination, where a shift in the relevant dimension (not stimulus) takes place, i.e. this time the white lines are the relevant dimension, not the polygons. Again participants are rewarded for maintaining their attentional set and after a number of correct responses, the stimulus-reward association is reversed.

If a particular trial took considerable time to complete, i.e. 8 consecutive 'correct responses were not achieved in 10 minutes, the whole task was considered to have been failed and the participant removed from the study. For those who completed the task, their performance was measured by the number of errors they made on each trial, i.e. the reversal, ID shifting and ED shifting trials. The computer recorded this data.

2.3.2 The Snake Game (Fine & Blair, in press)

The Snake Game (Fine & Blair, in press), was designed to measure reversal or extinction learning. Participants begin by learning a stimulus-reward association (whether a decision is good or bad) and over time, they are required to inhibit their previously rewarded response, as the stimulus-reward associations are gradually reversed, i.e. an action or decision that begins as good, changes to bad and vice versa.

The participants are told that on the computer screen they would see a snake and two coloured tokens. The tokens either gave mice to the snake, i.e. a good choice, or took mice away from the snake, i.e. bad. They were told they were in control of the snake's movements (using the computer keyboard's arrow keys) and that the snake was very hungry and needed to eat lots of mice. Their task was to decide which token to send the snake towards, in order to help the snake gain and eat as many mice as possible (see Appendix B. for pictures and further information).

As described above, the game began with two coloured tokens appearing on the screen simultaneously, equidistant from the snake's head. The coloured tokens either gave mice to the snake or took mice away. The participant had to direct the snake towards the token they believed would give the snake mice to eat. On reaching their chosen coloured token, the computer screen flashed a message telling the participant how many mice they had either been given or had taken away. The total number of mice won appeared at the top of the screen and was updated after each trial. The aim of eating as many mice as possible was emphasised to the participants.

Four coloured tokens were used: blue, yellow, red and light blue. The tokens were presented as pairs in 10 possible combinations (four same colour combinations and six different colour combinations). The experiment began with two coloured tokens always being associated with winning mice and the remaining two with losing mice. At the start, dark blue and light blue always gave mice and red and yellow always took mice away. This meant that not every pairing of tokens allowed a 'good' choice, i.e. when two red tokens appeared. Conversely, with some combinations a 'good' choice was guaranteed, i.e. two light blue tokens. The participants were not told that there was any relationship between the colour of the tokens and their value or that the experiment had different phases. They had to learn this independently, but no check was made as to whether the participants did in fact learn the relationship between colour and tokens

After approximately 20 trials, the dark blue tokens reversed their reward association, changing from giving mice to taking mice away. At the same time, red tokens reversed

their reward association and stopped taking mice away and began, instead, to give mice to the snake. The light blue and yellow tokens retained their values. After approximately 40 trials, the final phase began. In the final phase, the blue and red tokens did not change and remained non-rewarding and rewarding respectively. At the same time, both light blue and yellow tokens reversed their reward associations and became non-rewarding and rewarding respectively.

Participant's performance was measured by the numbers of times they chose a 'bad' token, when a 'good' token was available to them. The computer recorded this data.

2.3.3 The Problem Behaviour Questionnaire

The Problem Behaviour Questionnaire (PBQ) was a 34 item questionnaire, consisting of two independent, standardised questionnaires, both measuring different aspects of behavioural and emotional disturbance. The two standardised questionnaires were the Psychopathy Screening Device (PSD; Frick & Hare, in press) and the DuPaul Rating Scale (DRS; DuPaul, 1991). The two questionnaires were placed together in one continuous form, i.e. the PBQ, for ease of completion, yet still yielded their own separate scores. Items 1 – 20 on the PBQ were the 20 items of the PSD and items 21 – 34 were the 14 items of the DRS (see Appendix C.).

2.3.3.1 The Psychopathy Screening Device – PSD (Frick & Hare, in press)

The PSD (Frick & Hare, in press) is a 20 item rating scale. It is designed to measure the characteristics of psychopathy in children in a way that is analogous to the Revised Psychopathy Checklist (PCL-R) for adults (Hare, 1991). Each of the 20 items are statements pertaining to characteristics traits of a psychopath. For example, No. 6 “*Lies skilfully and easily*” and No. 19 “*Does not show feelings or emotions*”. The teachers and classroom assistants rated the participants on each of these statements, choosing a score between 0 and 2 were:

- 0 – referred to the fact that the statement was not true at all,
- 1 – referred to the possibility that the statement was sometimes true and
- 2 – referred to statements that were definitely true about the child.

Five items are inversely scored to prevent response acquiescence. All 20 items are totalled to give one PSD score. The maximum score is 40.

As the PSD is an ordinal scale and only two raters were involved, inter-rater reliability was examined using the product-moment correlation coefficient, r . Overall, inter-rater reliability for the PSD was 0.811.

A study of the PSD revealed a two-factor structure similar to that identified by analysis of the PCL-R (Frick, et al. 1994). These two factors were callous/unemotional traits (C/UE) and impulsiveness/conduct disorder traits (I/CP). The product-moment

correlation coefficient for the two raters for Factor 1 (C/UE) was 0.586 and for Factor 2 (I/CP) was 0.786.

2.3.3.2 The DuPaul Rating Scale – DRS (DuPaul, 1991)

The DuPaul Rating Scale (DuPaul, 1991) is a 14 item rating scale. It is designed as a quick measure of the characteristics of Attention Deficient Hyperactivity Disorder (ADHD), as indexed by DSM-IV. Sample items are No. 5. “*Often blurts out answers*” and No. 8. “*Often shifts from one uncompleted activity to another*”. For each of the 14 items, the raters give the participants a score between 0 and 3, were:

0 – referred to the item being not at all true

1 – referred to the item being a little true

2 – referred to the item being pretty much true and

3 – referred to the item being very much like the participant.

All items are totalled to give an overall score of ADHD, with a maximum score of 42.

As the DRS is an ordinal scale and only two raters were involved, inter-rater reliability, using the product-moment correlation coefficient, for the two raters was calculated to be 0.733.

Like the PSD, the DPS has a two-factor structure: Factor 1 being impulsively/hyperactivity characteristics (Imp/Hy) and Factor 2 being

inattention/hyperactivity characteristics (Ina/Hy). Inter-rater reliability for these was 0.781 for Factor 1 and 0.732 for Factor 2.

2.4 PROCEDURE

Ethical permission for this study to take place had previously been granted by University College London's Ethics Committee, under a Wellcome Institute Research Grant. The relevant schools, i.e. the two special schools in North London, were contacted via letter (see Appendix A: the Head teacher's Letter) and following discussions, permission gained to approach parents and subsequently recruit their pupils. Mutually convenient times were arranged for data collection and each head-teacher identified suitable participants, i. e. they were all attending school over the agreed data collecting period, they were the correct age and were not in any programmes which did not allow them to engage in extra curriculum activities.

A room in each school was allocated for data collection, usually extra-curriculum type rooms used for individual reading lessons, music lessons, etc. In both schools the allocated room changed on a daily basis because of timetable commitments. However, all rooms used were small, quiet and away from the participant's main classroom and had the required desk and electricity supply (as a backup for the laptop's battery).

The participants were interviewed separately by the investigator and the experiment began after a short period of familiarisation between the investigator and the participant. Each participant was then given 5 minutes to familiarise themselves with the laptop and both the mouse (for the ID-ED task) and the arrow keys of the laptop (for the Snake game).

2.4.1 Computer Tasks

The descriptions and instructions for both tasks were detailed on separate instruction sheets (see Appendix D.) and given to each participant to read and ask questions about, before beginning each task. The descriptions and instructions did not inform the participant of the investigator's objectives and expectations. The participant was then informed what they were to do. They had to complete two computer tasks, each taking approximately 30 – 40 minutes to complete (depending on performance). The participants completed one task during this first meeting and completed the second task during a second meeting. This was to prevent boredom, loss of concentration and minimise classroom absence. The order of presentation of the tasks was randomised across participants. After completion of each task, the participants were asked not to disclose to their peers the content or outcome of the task (it is assumed that they honoured this request as subsequent participants did not appear primed or familiar with the tasks).

Participants also completed the British Picture Vocabulary Scale (BPVS: Dunn, Dunn, Whetton & Pintilie, 1982), after completing their second computer task. The BPVS is a quick measure of child's receptive vocabulary and as such can be used as an indication of a child's verbal intelligence quotient - IQ (Dunn et al., 1982). The norms for the BPVS are a mean of 65.5, with a standard deviation of 23 and a range of 43 – 166, for a normal population. The participants range of IQ was 41 to 122, with a mean IQ of 81.96 (standard deviation = 17.12).

2.4.2 Problem Behaviour Questionnaire

Subsequent to the administration of the computerised tasks, the participants' teachers and classroom assistants completed a Problem Behaviour Questionnaire for each child. Hence, the experimenter was blind to each participant's level of behavioural and emotional disturbance (and IQ) during the administration of the tasks.

Once the two sets of questionnaires were returned, the inter-rater reliability was calculated. As this was high, the average score from both questionnaires was obtained for each child and noted. These average scores on the PSD and the DuPaul Rating Scales were then correlated with the number and type of errors made on the computer tasks, age and IQ, to test the stated hypotheses.

3. RE SULTS

3.1 OVERVIEW

The data collected in this study is drawn from a sample of 56 male school children who had received statements under the Education Act 1993. Measures of the participant's level of emotional and behavioural disturbance were collected, as was their IQ and age. All participants completed two computer tasks and the number of errors they made on each task was recorded.

As highlighted, the study of psychopathy poses many problems in defining and measuring the concept. These difficulties are further enhanced when investigating children with hypothesised psychopathic tendencies. Therefore it was felt important to establish the appropriateness of the selected sample in representing a group of children with emotional and behavioural difficulties, some of whom would have psychopathic tendencies. Hence, a series of analyses were conducted to assess the nature of the data. Following the exploration of the data set, the three hypotheses were tested. It was predicted that:

- 1) Children with high emotional and behavioural disturbance (as indexed by the PSD) will perform poorly on the reversal tasks but not the ED task;

- 2) Children with high levels of impulsivity and inattention (as indexed by the DuPaul Rating Scale) will perform poorly on the ED task but not the reversal tasks;
- 3) Children with high levels of emotional and behavioural disturbance and impulsivity and inattention will perform comparatively worst overall.

The testing of the first two hypotheses was achieved using two multiple regressions, to indicate the degree to which levels of emotional and behavioural disturbance, and impulsivity and inattention could predict performance on the two tasks. Secondly, any difference between the high and low 'psychopathic tendencies' children (as indexed by the PSD) and the number of reversal and ED errors they make was examined, using two independent t-tests. Two further t-test were conducted to examine the difference, if any, between high and low ADHD children (as indexed by the DRS) and the number of ED shift errors and reversal errors they made.

3.2 ANALYSIS OF THE DATA

3.2.1 Age & IQ

The mean age of the sample was 12.9 (sd = 1.84) and the mean IQ was 81.96 (sd = 17.12). The data sets of age and IQ were checked for normality to ensure that the sample

population was a good representation of the total population. For both sets of data, a histogram and normal curve indicated that both approximated towards normality (see Appendix E1.). Non-significant skewness and kurtosis for both normal curves further supported this (age: skewness = - 0.153, $p = 0.319$, kurtosis = - 0.415, $p = 0.628$; IQ: skewness = 0.120, $p = 0.319$, kurtosis = - 0.006, $p = 0.628$, i.e. skewness and kurtosis are non-significant as they are close to 0). This meant that there was symmetry to the distribution and the mean was in the centre of the distribution, with no 'peakedness'. In addition, the relationship between age and IQ was analysed to ensure appropriateness of the sample population. It would be expected that age and IQ would be independent of each other, as IQ, on average, remains constant throughout life, relative to age. As predicted, there was no significant correlation between age and IQ ($r = 0.149$, $p = 0.274$; see Table 1.). No further socio-demographic data on the participants was collected.

3.2.2 Emotional and Behavioural Measures

The distributions of the scores obtained from the behavioural measures were analysed.

3.2.2.1 The PSD (Frick & Hare, in press)

The distribution for PSD scores appeared uni-modal and approximating to normal, based upon the non-significant skewness (skewness = - 0.366, $p = 0.319$) and kurtosis (kurtosis = - 0.880, $p = 0.628$) (see Appendix E2.). The mean PSD score for the whole sample was 17.88 (sd = 7.7). Mean levels of I/CP and C/UE for the group were 9.03 (sd = 4.03) and

4.93 (sd = 2.55) respectively.

The adult version of the PSD, the PCL-R (Hare, 1992) for an UK population, has a clinical cut-off score of 25 (Cooke & Michie, 1999), i.e. a score on the PCL-R of 25 or above is considered to be a good indication of Psychopathy, with a maximum of 40. The PSD has yet to have such an agreed cut-off score. However, as PSD is based primarily on the PCL-R and reveals the same factor structure, the same notion of a clinical cut-off score of 25+ was tentatively applied to this group. This revealed 12 participants with a score of 25 or above. This group represented 20% of the total population.

To address whether age and/or IQ contaminated PSD scores, a correlation analysis was conducted. There was no significant correlation between age and PSD ($r = 0.214$, $p = 0.113$), age and C/UE ($r = -0.126$, $p = 0.355$), and age and I/CP ($r = -0.203$, $p = 0.134$). This was also true for IQ and PSD ($r = 0.068$, $p = 0.621$), IQ and C/UE ($r = 0.065$, $p = 0.637$) and IQ and I/CP ($r = 0.081$, $p = 0.551$). The non-significant finding for age and PSD is against theoretical expectations. It would be expected that PSD score would increase proportionally with age, as the research findings indicate that psychopathic traits become more prominent as a child nears adolescence. There is no literature on IQ and psychopathic tendencies. However, as expected, total PSD score was significantly correlated with I/CP score ($r = 0.949$, $p < 0.01$) and C/UE scores ($r = 0.837$, $p < 0.01$) and with each other ($r = 0.734$, $p < 0.01$; see Table 1. below).

Table 1. A Correlation Analysis between Age, IQ and PSD scores

	IQ	PSD- average	I/CP- average	C/UE- Average
Age	n.s.	n.s.	n.s.	n.s.
IQ	-	n.s.	n.s.	n.s.
PSD- average		-	.949**	.837**
I/CP- average			-	.734**

** Correlation is significant at the 0.01 level (2-tailed).

3.2.2.2 The DuPaul Rating Scale (DuPaul, 1991)

The distribution of impulsivity/inattention scores (i.e. from the DuPaul rating scale) also was uni-modal and tended towards normality, with non-significant skewness (skewness = -0.157, $p = 0.319$) and kurtosis (kurtosis = - 0.941, $p = 0.628$) (see Appendix E3.). The mean score on the DuPaul for the 56 participants was 19.48 (sd = 10.69), with the means of the sub-scales of impulsivity and inattention being 11.78 (sd = 6.89) and 11.92 (sd = 6.59) respectively. There is no published clinical cut-off score for the DuPaul.

To address whether age or IQ contaminated the DuPaul scores, a correctional analysis was conducted. There was no significant correlation between age and the DuPaul average but there was a trend in the data towards significance ($r = - 0.225$, $p = 0.096$). Again, there was

no significant correlation between age and impulsivity but there existed a trend ($r = -0.239$, $p = 0.076$) and finally, there was no significant correlation between age and inattention ($r = -0.174$, $p = 0.200$). There was also no significant correlation between IQ and DuPaul ($r = -0.110$, $p = 0.420$), IQ and impulsivity ($r = -0.087$, $p = 0.526$) and IQ and inattention ($r = -0.164$, $p = 0.228$). The non-significant relationship between IQ and ADHD is theoretically expected, as no research has yet to find IQ to be a main factor in development of ADHD. Regarding age, again the non-significance is not surprising. ADHD appears to be a disorder spanning all of childhood and adolescence, therefore there would be no difference in the severity of ADHD across the ages. As expected, the total DuPaul score was significantly correlated with both impulsivity ($r = 0.936$, $p < 0.01$) and inattention ($r = 0.956$, $p < 0.01$) scores and the two separate sub-scales with each other ($r = 0.832$, $p < 0.01$; see Table 2.).

Table 2. A Correlation Analysis between Age, IQ and DuPaul Scores

	IQ	DuPaul- average	Impulsivity- average	Inattention- average
Age	n.s	n.s	n.s	n.s
IQ	-	n.s.	n.s	n.s
DuPaul- average		-	.936**	.956**
Impulsivity- average			-	.832**

** Correlation is significant at the 0.01 level (2-tailed).

3.2.2.3 The PSD & The DuPaul

Based upon the research findings outlined in the literature review, it would be expected that the scores on Factor 1: impulsive/conduct problems (I/CP) from the PSD and both scales from the DuPaul would correlate positively. Whereas, theoretically, Factor 2: callous/unemotional (C/UE) traits would not be expected to correlate with either the impulsivity (Imp/Hy) or the inattention scales (Ina/Hy). To check these hypotheses' a correlational analysis was carried out between the two behavioural measures (without partialing out age or IQ due to their non-significant relationship). As expected, Factor 1 from the PSD was significantly correlated with impulsivity ($r = 0.469$, $p < 0.01$) and inattention ($r = 0.416$, $p < 0.01$; see Table 3. below). However, Factor 2 was also significantly correlated with impulsivity ($r = 0.652$, $p < 0.01$) and inattention ($r = 0.684$, $p < 0.01$; see Table 3.). This is against theoretical expectations, as level of callousness/unemotional traits has not been linked in the literature or clinical realm to impulsivity and/or inattention.

Table 3. A Correlational Analysis between the two sub-scales of the PSD and the DuPaul

	C/UE- Average	Impulsivity- average	Inattention- average
I/CP- average	.734**	.652**	.684**
C/UE- average	-	.469**	.416**
Impulsivity- average		-	.832**

** Correlation is significant at the 0.01 level (2-tailed).

3.2.3 Computer Tasks

3.2.3.1 The ID-ED Task (Dias, et al., 1996)

On the ID-ED task, the mean number of reversal errors was 4.39 (sd = 6.72), the mean number of ID errors was 0.45 (sd = 1.52) and the mean number of ED errors was 7.87 (sd = 5.94). From this it can be seen that participants found the ID task the easiest, with the reversal paradigm the second hardest and the ED task the most difficult. It can be seen from the standard deviation that the spread of ID errors was minimal, with 94% making only 1 or

no errors at all. This implies there may be a floor effect for the ID task. For the reversal and ED tasks the spread of number of errors was more continuous. The most common number of errors on the reversal task was 1 but only 30% of the sample made just 1 error. Two individuals made 32 reversal errors. Regarding the ED errors, again the most common number of errors only accounts for a small percentage of the total. Five errors were the most common number of errors in the whole sample, but this represents only 10% of the sample got 5. Four individuals made more than 21 errors on the ED task.

3.2.3.2 The Snake Game (Fine & Blair, in press)

The mean number of extinction / reversal errors after the first change of value in the snake game, was 9.11 (sd = 2.18). After the second change, the mean error rate for the whole group was 7.46 (sd = 2.10) and after the final change, the mean number of errors was 4.86 (sd = 2.08). Looking at the reduction in the means as the game continues, it could be hypothesised that participants began to learn from their previous responses and began adapting or anticipating the change in contingencies.

3.2.3.3 The ID-ED Task & Snake Game

Based upon the research literature, it would be expected that there would be no correlation between number of ID errors, ED errors and reversal errors. A correlational analysis was conducted to test this and the prediction was supported. It was expected that the number of

reversal errors on the ID-ED task would be correlated with the number of errors on the snake game as the snake game is entirely based upon reversal learning. From a correlational analysis, this was not found to be true ($r = -0.017$, $p = 0.903$) There was no significant relationship between reversal error rate on the ID-ED task and the snake game.

The above finding may have been influenced by presentation order of the tasks. If a participant played the snake game first, it is possible they would be primed to recognise the reversal tasks in the ID-ED task. This effect would be counter-balanced by those participants who receive the ID-ED task first. They would not be primed as much to reversal tasks and therefore possibly make more errors. The cumulative effect of this would be a type II error, where a relationship between the two variables is negated, because of the order effects. The presentation of the two tasks was counter-balanced to prevent any order effects. However, to test whether order of presentation did in fact influence number of errors, a 2 x 3 between subjects ANOVA (two groups depending on order of presentation and three types of error: reversal, ID and ED) was conducted to look for any significant differences between the two groups. There was no significant difference between the groups ($F_{(1,47)} = 2.213$, $p = 0.117$, see Appendix E5).

To further establish that error rate was not dependent on any other moderators, a second correlational analysis was conducted on error rate with age and IQ. No significant relationships were found between error rate and age ($r = 0.098$, $p = 0.471$) nor IQ ($r = -0.22$, $p = 0.870$).

3.3 HYPOTHESIS TESTING

In order to test the first two hypotheses, two multiple regressions were conducted. This was in order to establish how well the independent variables (scores on the PSD, I/CP and C/UE scales, the DuPaul and the Impulsivity and Inattention sub-scales) could predict the dependent variables: type of error (reversal and ED). It was predicted that total PSD score and I/CP and C/UE scores would be the best predictors of reversal error rate (Hypothesis 1.) Secondly, it was predicted that impulsivity and inattention scores would be the best predictors of ED error rate (Hypothesis 2). Both multiple regressions used the 'enter method' as a standard regression was required, where all the variables would be entered at the same time, so reducing the possibility of Type I errors.

Before the multiple regressions were calculated, first homogeneity of variance was checked. This was to ensure that the variance of the two dependent variables, (number of reversal and ED errors), was the same for all values of the predictors (scores on PSD, the PSD, I/CP and C/UE scales, the DuPaul and the impulsivity and inattention sub-scales). Secondly, that actual scores on the dependent variables were normally distributed about the predicted values of the dependent variables. However, for this set of variables, this was not the case. Here the errors were not equally scattered above and below zero and were clustered in the centre as opposed to the ideal of being spread evenly across all values of the predictors (see Appendix E6.). This gave an early indication that the predictors, i.e. the scores on the behavioural measures, were not good at accounting for any of the variance in the type of errors made.

This was further supported by the multiple regressions. Both regressions were not significant ($F_{(4,51)} = 0.930$, $p = 0.454$; $F_{(4, 51)} = 1.760$, $p = 0.151$), i.e. no significant regression co-efficient were obtained). Hence, scores on the behavioural measures did not independently predict performance, in terms of type and number of errors made. Secondly, they could not account, independently, for any significant proportion of the variance in performance.

To ensure that a Type II error was not present, the hypotheses were tested further by examining mean differences in performance between high and low scorers on the behavioural measures. Here it was predicted that high scorers on the PSD would perform worse on the reversal tasks than the low scorers, but that there would be no difference between the two groups on ED shifting. Secondly, high scorers on the DuPaul would perform worse than low scorers on the ED task, but there would be no difference between the two groups on the reversal tasks.

High and low scorers were determined by separating the participants according to the 25th and the 75th percentiles. Those who fell at or below the 25% percentile were grouped as low scorers and those whose fell at or above the 75th percentile were grouped as high scorers.

Four independent sample t-tests were conducted to test the following hypothesis:

- 1) High scorers on the PSD would perform worse on reversal learning tasks than their low scoring peers.
- 2) There would be no significant difference between the high and low scorers on the ED learning tasks.
- 3) High scorers on the DuPaul would perform worse on ED learning tasks than their low scoring colleagues.
- 4) There would be no difference between the high and low scorers on the reversal learning tasks.

The first two t-tests revealed no significant differences between the high and low PSD scorers' number of errors on either reversal or ED tasks (reversal: $t_{(26)} = 0.158$, $p = 0.143$; ED; $t_{(26)} = -0.361$, $p = 0.721$). This went against prediction for reversal tasks but as predicted for ED tasks.

The same was true for the second set of t-tests. These revealed there were no significant differences between high and low scorers on the DRS for both ED and reversal learning tasks (ED: $t_{(34)} = 0.158$, $p = 0.875$; reversal: $t_{(34)} = -0.080$, $p = 0.937$). Again, this was against prediction for the ED task but as predicted for the reversal tasks.

To test the third hypothesis, an independent samples t-test was conducted between those participants who scored high on both the PSD and the DRS and the those who scored low on both measures and their total number of errors. The t-test revealed no significant difference between the overall performance between those with high levels of behavioural disturbance and those low behavioural disturbance, but it did indicate a trend towards significance ($t_{(15)} = 0.864$, $p = 0.091$; see Appendix E7.).

This provides further information that, for this sample group, performance on reversal learning tasks, either good or bad, is not associated with behavioural disturbance. Secondly, performance on ED learning tasks is not associated with levels of impulsivity and inattention.

4. DISCUSSION

4.1 SUMMARY

Previous studies have indicated that adult psychopaths have a reduced arousal response to fearful stimuli compared to non-psychopaths (Hare, 1991; Patrick, 1994). Research has also shown children with psychopathic tendencies and their adult counterparts appear to have little ability to show an empathic response and making a distinction between moral and conventional transgressions (Blair, et al., 1995; Blair, 1997; Blair, et al., 1997; Fisher & Blair, 1999). Blair (1997) proposed that the latter was due to a dysfunctional "Violence Inhibition Mechanism: (VIM). Theoretically, the VIM is activated by the facial distress cues of others. Upon activation of the VIM, the current activity that has caused the distress is terminated. If an individual's VIM is dysfunctional, the probability of stopping the distress causing behaviour is small. The developmental consequence of which is that the individual does not become socialised and therefore has difficulty distinguishing between moral and conventional transgressions (Blair, 1997).

Another set of findings amongst children with psychopathic tendencies and adult psychopaths are that they have problems with reversal learning (Fisher & Blair, 1998; Patterson & Newman, 1993). Apparently, they have difficulty shifting their attention from action to evaluation of action, known as "response set modulation", a type of reversal learning (Newman, et al., 1997). Fisher & Blair, (1998) found that level of behavioural disturbance could predict extent of difficulty with the reversal task. In

addition, Fisher & Blair (1998) also found that performance on the above reversal learning task was associated with performance on the moral/conventional distinction task.

However, the results of all three sets of findings cannot account for each other. For example, how can difficulties with fear processing account for empathy difficulties or vice versa. The associations found by Fisher & Blair (1998) offer an answer. One way of integrating all three findings is at the anatomical level. There are two possible hypotheses:

- 1) There could be a single cognitive mechanism or neurological structure involved in all three tasks or
- 2) Separate cognitive systems or structures sharing a dense network of neural connections could serve each task.

Attention has focused on two possible areas: the amygdala and the orbito-frontal cortex (OFC). These structures have many neural connections between them and have been found to be involved with processing reward and punishment paradigms and in processing facial affect (e.g. Adolphs, et al., 1994; Bechara et al., 1995; Dias et al., 1996; Rolls, 1997). The amygdala traditionally was associated solely with processing fearful facial affect (e.g. Young, et al., 1993). However, more recently, owing to PET scans, neural functional imaging has shown the amygdala is also active in the processing of sad facial affect (Blair, et al., 1999; Adolphs et al., 1999). Sadness and

distress can be seen as the same emotional group. Hence, the amygdala may be the site of the VIM and a lesion of the amygdala could offer an explanation for the problems experienced in moral/distinction tasks.

In addition, the OFC has been implicated in 'Response Set Modulation' (Gorenstain & Newman, 1980) and reversal learning (Dias et al, 1996; Rolls 1997). It has been suggested that performance on the moral/conventional distinction tasks and problems with response modulation may be because the systems involved with the VIM and response set modulation rely on the amygdala and/or the OFC. Damage to one is likely to effect the other.

This thesis aimed to clarify these proposals further, by looking at the role of OFC functioning in children with emotional and behavioural disturbances. Two computer tasks, The ID-ED Task (Dias, et al., 1996) and The Snake Game (Fine & Blair, in press), were employed, as both include reversal learning tasks, i.e. a measure of OFC functioning. The severity of the children's emotional and behavioural problems was indexed by the Psychopathy Screening Device (Frick & Hare, in press). A measure of ADHD was taken to allow distinction between children with ADHD and children with emotional and behavioural problems, independent of ADHD. The measure used was the DuPaul Rating Scale (DuPaul, 1991). As previously stated, there remains uncertainty as to the behavioural precursor to psychopathy. Both conduct disorder and ADHD have been suggested (Robins, 1978). However, with the emerging evidence, it appears that conduct disorder is the more likely candidate. Current research suggests the ADHD problems are located in the dorsal-lateral frontal cortex (Pennington & Ozonoff, 1996).

Dysfunction in this area would cause problems with Extra-Dimensional (ED) shifting (Dais, et al., 1996). Therefore, in order to be sure the level of behavioural disturbance being observed was characterised by psychopathic tendencies, and not ADHD, the DuPaul rating scale was included to rate severity of ADHD and an ED learning task performed to identify possible dysfunction of the dorsal-lateral prefrontal cortex.

In particular, this thesis examined the relationship between level of behavioural disturbance in children and performance on reversal and ED learning tasks. There were three hypotheses concerning type of behavioural disturbance and performance on learning tasks.

The three main (one tailed) hypotheses were: -

- 1) Children with high emotional and behavioural disturbance (as indexed by the PSD) will perform poorly on the reversal tasks but not the ED task;
- 2) Children with high levels of impulsivity and inattention (as indexed by the DuPaul Rating Scale) will perform poorly on the ED task but not the reversal tasks.
- 3) Children with high levels of emotional and behavioural disturbance will perform comparatively worst overall.

4.2 OVERVIEW OF RESULTS

The data approximated to a normally distributed sample as indicated from the non-significant skewness and kurtosis of the normal curves (see Appendix E1.). The spread of ages was small (mean = 12.9, sd = 1.84) and the range of the IQ varied greatly, with a standard deviation of 17.12 (mean = 81.96). This was in line with the normative data for the BPVS. The means of the PSD and the DuPaul (17.88 and 19.48 respectively) both fell in the mid-range of possible scores, indicating that the sample generally exhibited moderate behavioural problems. There was no significant relationship between age and IQ and there was no significant relationship between the ADHD and PSD scores and with age and IQ. However, the two behavioural measures did correlate with each other, indicating that the more a child tended towards psychopathic tendencies the more likely they were to exhibit ADHD symptoms as well. All four correlated with each other. This is against theoretical expectations for Factor 2 on the PSD.

Regarding the two computer tasks, neither correlated with either age or IQ and it appeared that order of presentation did not influence performance. There was no correlation between types of error and behavioural disturbance, with all participants finding the ID learning tasks the easiest and experiencing the most difficulties with ED learning tasks (see Dias, et al., 1996). On The Snake Game (Fine & Blair, in press), most participants improved their performance over time.

In reference to the first two hypotheses, neither psychopathic tendencies nor ADHD were good predictors of performance on any of the learning tasks, in terms of number of errors made. This was against predictions, which stated that poor performance on the

reversal learning and ED tasks would be predicted from level of behavioural disturbance, as indexed by the PSD and the DRS. The third hypotheses predicted that those exhibiting a high level of psychopathic tendencies and ADHD would perform the worst. However, there was no significant difference between those participants attracting extreme scores, i.e. high and low scorers, on their performance of both tasks. Participants scoring highly on the PSD and DuPaul scales performed in the same varied way as their low scoring peers, on all learning tasks. These results are discussed below.

4.3 INTERPRETATION OF RESULTS

As stated, overall the results were not as predicted. In the present study, children's ability to learn reversal learning tasks was not associated with their level of behavioural disturbance, unlike previous similar studies. This highlights possible difficulties with the previous research and also the predictive theories they were based upon. It is also possible that the obtained results were influenced or associated by other factor(s), unfortunately whatever they were, they were not included or measured in this study. Alternatively, rather than suggesting the predictions were incorrect or misguided, it is possible that the results indicate problems with the selected sample or other design factors. With another sample and change to some aspects of the design, the predictions may have been supported. However, whatever the reasons, this study did not succeed in replicating previous findings.

In addition, again against prediction and theoretical propositions, high levels of impulsivity and inattention did not predict ability to perform ED shifting. In fact, none of the measures employed in this study had any association with ability to learn and respond to a required ED shift of attention. The same suggestions offered above as possible explanations for the unexpected results are proposed again for this outcome.

Another unexpected, non-significant result was the lack of association between age, IQ, and all types of performance. It would be expected, based simply on developmental arguments, that the older the child, the easier they will find the task and conversely, the more intelligent the child, the easier they would find it. Problems with the sample are offered as possible reasons for this unexpected result. In particular, the large spread of IQ scores ($sd = 17.12$), indicate that this sample were far from a homogeneous sample and any relationship that may have existed would have been diluted by the spread of scores (a Type II error).

There was one unexpected significant result. Against predictions, PSD Factor 2: Callous/Unemotional Traits' scores showed a strong positive correlation with both the impulsivity and inattention scales on the DuPaul scale. This would not be expected from the theoretical underpinnings of both syndromes. The research literature has no mention of the link between callousness with impulsivity or poor attention. This finding again could reflect design faults or a weakness of theory.

However, although most of the predictions were not supported and no significant relationships or differences were found, there were trends in the data. In particular, there

was a trend towards significance between the scores of the high and low PSD and ADHD groups compared to the low scorers ($t_{(15)} = 0.864, p = 0.091$). This indicates that given a more severe sample, in terms of behavioural disturbance, this trend could reach significance. If this were true, this would support the hypothesis that children with a high co-morbidity of emotional and behavioural problems and ADHD would perform worse on all tasks, compared to children with low levels of emotional and behavioural problems and ADHD.

In general though, several interesting conclusions can be drawn from the results and these centre on identifying possible explanations for the unexpected and unpredicted results. These possible explanations are divided into problems with existing research and problems with the design of the study.

4.4 EXPLANATIONS FOR RESULTS 1: CRITICISM OF EXISTING RESEARCH

A general criticism that can be applied to all the cited research is one of sampling bias. As highlighted in the literature review, researches have used heterogeneous samples and then generalised their results across the whole population of psychopaths. Researchers have recruited prison inmates (Hare, 1970; Patrick, 1994), special hospital in-patients and forensic patients (Newman et al., Blair, et al.). However these groups are probably different in that the former will have been classified as criminals, whereas the other two will have received a diagnosis of mental illness. They also have to be somewhat

different from those psychopaths who are not 'caught' and continue living in society. Most of the research quoted also involves small sample sizes ($N < 50$) or include evidence from case studies as support for the proposed model. Again this limits the generalisability of results.

Some of the research proposes dysfunctions within brain structures as the cause for psychopaths' difficulties (e.g. Blair, et al., 1997; Mitchell & Blair, 2000). However, only neuro-imaging techniques such as PET and MRI scans can highlight damage to particular brain structures and techniques such functional MRI scans indicate the function of an area. It is possible that damage is to the connections or 'wiring' between structures, rather than the structures themselves.

In reference to the fear and empathy models, they both lack real life testing stimuli. Participants are shown pictures or told to read stories. It can not be assumed that these stimuli will produce the same levels of arousal as real life situations. Secondly, individuals may differ in their interpretation of the presented stimuli and yet researchers make no reference to this possibility.

In the studies supporting the response modulation hypothesis, the rewards given are either praise or money (see Newman, et al.). It is possible that these are not sufficient to activate the OFC, as only highly contingent rewards or punishments may engage the functioning of the OFC, similar to the amygdala (Adolphs, et al., 1999).

Apart from criticism raised at actual studies, the theories and models on which these studies are based has to be examined. There is an inherent assumption in Blair, et al's work that a dysfunction in the structure which controls the VIM is not acquired. Therefore either genetic abnormality or a developmental impairment must cause it. However, if it was that an infant is born with such a dysfunction or develops one, why do not other connected structures take over the damaged areas functioning? Blair, et al., do not address this possibility. They also do not specify whether the VIM operates on a continuum, i.e. are some distress cues more likely to activate the VIM than others? Also, there is no discussion about the possibility of individual differences in what activate the VIM. Some individuals may find a particular stimulus distressing, whilst others do not. The VIM also has yet to account for the role of social factors in the presentation of psychopathy.

Finally, central to the VIM proposal is that an individual will inhibit their aggressive behaviour on being shown a distress cue by their victim. However, there are situations where an aggressor may actually desire to see their victim distressed, e.g. if the victim has in the past caused pain to the aggressor. Also, some theories of aggression stress other factors as important in controlling and terminating aggressive behaviour. Dodge (1986) emphasises a person's current mood state and appraisals of the situation as the main mediators of aggression.

4.5 EXPLANATIONS FOR RESULTS 2: OVERALL DESIGN PROBLEMS

Examination of the overall design of this study produced a number of areas as possible explanations:

- 1) Problems with the design,
- 2) Problems with the selected sample,
- 3) Problems with the equipment and setting of the study and
- 4) Problems with the measures employed.

4.5.1 Problems with the Design

This was a correlational design, with no control group present, as the focus was examining associations between level of behavioural disturbance and performance on tasks. Hence, participants were not matched on factors such as IQ and age and then placed in separate experimental groups. Although, such an approach could have been adopted by defining different groups as high and low scores obtained on the PSD (Frick & Hare, in press) and DRS (DuPaul, 1991). However, they would not be experimental groups in that the groups were not matched pairs and then exposed to different experimental tasks. Instead, they would be comparison groups, with matching taking place with all factors except behaviour scores and then both groups completing the same tasks. The focus would then have been differences between performance and not associations, as this study focused on. To improve this correlational design, it is acknowledged that those sampled would have to represent the two extreme ends of

possible scores. This would require considerable screening of a large number of participants in order to achieve sufficient numbers to make a statistical comparison valid.

Teachers and classroom assistants completed the behavioural measures that provided the information on level of behavioural disturbance. A more accurate evaluation may have been obtained from parents who see their child each day, in more than one setting. However, parents may have tended to over represent the problems their child displays, in an effort to attract sympathy for the difficulties they have to endure as parents. A preferred approach therefore may have been to obtain ratings from parents and teachers and check for their inter-rater reliability or to ask parents and teachers to rate each child, not from an overall perspective, but from the worse they have experienced their behaviour. This clear instruction hopefully would lesson any tendency amongst some raters to over estimate problems, as all raters would have been specifically requested to do just that.

Finally, referring again to completion of behavioural measures, it may have been preferable to obtain anonymous ratings. The questionnaires required the teachers and assistants to identify themselves. Raters may have been reluctant to 'label' a child as particularly problematic. Hence, they may have regulated their responses, in fear of being found to be judgmental and this may reflect upon their professional standing.

4.5.2 Problems with the Sample

It is clear from the results that, overall, the sample were not severely behaviourally disturbed. Only 12 children received a PSD score above 25¹. All the participants were children attending schools for the emotional and behaviourally disturbed (EBD). These special schools are not the holding ground of fledging psychopaths, as was assumed for this study. Children with psychopathic tendencies may not emerge until much later than the age of this sample, i.e. around age 15- 16, and therefore this sample, although stated, may not be potential psychopaths. Children who do develop into adult psychopaths may indeed be present within EBD schools but quite quickly, because of the severity of their behaviour, get transferred to custodial environments, such as borstals, the statutory places for young offenders age 15 – 17 years old.

There is also a possibility that as both schools were in London, they would have been operating under similar budget restrictions and policies. London's education services have a number of EBD schools offering the main stream schools options for removal of difficult children from their classroom. If these facilities did not exist or were of limited availability, it is possible that main stream schools would have to keep the unruly children on their roll. The consequence of transferring children as soon as they become difficult is that a number of children within EBD schools will be unsuitably placed. They may have exhibited unruly behaviour only for a short time but consequently found themselves in an environment, the EBD School, which exposed them to further unruly behaviour. These children, it is supposed, would have low levels of emotional and

¹ Cooke & Michie (1999) defined a clinical cut-off point for diagnosing psychopathy in an UK population, using the PCL-R (Hare, 1991) as 25.

behavioural problems. If this were the case, it would explain the low level of overall behavioural scores. This notion is supported by teacher's comments at the end of the behavioural questionnaire. A few of the children's presence in the EBD schools was questioned by their teachers as to them, these children did not display any emotional or behavioural problems.

However, those participants who completed both tasks were those participants who were attending school and were available to participate (i.e. they were not in detention or observation by head-teachers, etc.). The children not attending, because of truancy, detention or temporary exclusion for bad behaviour were never tested. These children, by simple definition, are the most severely behaviourally disturbed group. They probably would have provided very interesting scores, attracting high scores for example on the PSD. Unfortunately, as highlighted, because of their unavailability, they were not included.

Finally, the overall attitude of these participants to any type of testing has to be considered. A consistent rating for each participant was his attitude to schoolwork. All children received "not at all true" for the statement "*they are concerned about how well they were doing at school*" on the PSD. It is possible that some participants associated the tasks with schoolwork and therefore did not try their best. Along similar lines, it is possible that if this group are indeed cunning, callous and charming (i.e. like psychopaths), then they may have appeared to the investigator to be trying hard but really, they did not care about their performance and wanted to manipulate the situation, just for fun. Although it appeared most children were eager to leave their classroom to

participate, it is possible that once in the experimental room they realised that they would still be working and their enthusiasm and motivation was dampened. The consequence of which maybe again, that they would not try hard.

In addition, this group's experience of testing through statementing has to be considered. The outcome of their statementing testing was their enrolment in an EBD school. Some may hold negative and suspicious attitudes to any tests outside the classroom, given on an individual basis by a stranger (similar to the process of statementing) and this would have a consequence on their performance.

4.5.3 Problems with the Equipment and Setting

A consistent comment from participants was that they found both tasks boring and too long. They found it difficult to sustain interest, especially as all participants had access to modern personal computers in their schools, which had multi-media and Internet facilities. When confronted with a computer task with no sound and no interaction capability, they soon lost interest. It appeared to the investigator that some participants randomly made choices so they could finish as quickly as possible. Although each child was asked whether they were familiar with a laptop computer and a roller-ball mouse, it is possible that social pressure may have led some to say yes, when in fact they were anxious about using computers and in particular, laptops.

Both tasks involved discrimination involving colour. An oversight here was no screening for colour blindness. Possibly because of performance anxiety or concerns about consequences of performance, no participants volunteered this information and as stated, it was never asked for. If a participant was colour blind to the colours in either game, it would have had a significant effect on the number of errors they made.

Regarding the settings, each school provided separate rooms away from the classrooms for the investigation to take place. In both schools, the identified room changed on a daily basis. This had the benefit of other children not knowing at the beginning of each day where the experiment was taking place and therefore they could not interrupt. However, after a number of sessions, pupils began to gain knowledge of where the experiment was occurring that day and on a number of occasions, if they were passing the room, they would interrupt a testing session. This placed the participant under stress, knowing that at any time they could be criticised and made fun of by their peers.

A second disadvantage was that although most of the rooms were similar in that they were small anterooms, used for extra curricular activities such as music, etc. they all had different stimuli present. They were rooms in which the participants would normally not be in and therefore the novelty did take their attention off the tasks. One room was positioned next to the playground and common pathways around the school. Children looked in through the window and shouted comments to any participant in the room.

On a more tentative level, it was observed by the investigator that some of the participants appeared more nervous and uncomfortable than the rest. It is possible that

some of the participants may have felt anxious about being in a room with a complete stranger, alone. In particular if they have had distressing experiences with strangers before, which led them to develop emotional difficulties. All the above factors can only have served to effect the participant's concentration and performance anxiety

Finally, with the number of competing pressures in any system like a school, ensuring motivation and eagerness is a priority. Working within a school brings a number of barriers to achieving competent research. It is difficult to control for error. A school's dynamics change according to time of year and day of week. At Christmas time, children are reluctant to engage in any activity that takes them away from Christmas preparations. At exam time, children are both reluctant and eager to leave class, dependent on their attitude. Teachers also are hesitant about their pupils missing valuable lesson time. In addition, any experiment has to fit in with the timetable of lessons and the length of the school day. Data collection, especially if large numbers are required, can take a considerable length of time.

Collectively, all the above comments suggest that the performance data obtained may not have been true performance data as there were a number of factors present, which may have influenced concentration, willingness to engage and motivation to perform their best.

4.5.4 Problems with Measures

4.5.4.1 The ID-ED Task (Dias, et al., 1996)

Regarding the ID-ED Task (Dias, et al., 1996), this has mainly been used with primates. It has been historically popular to assume functioning in primates and therefore their performance on tasks, is similar in humans. However, this philosophy is to be treated with caution. The testing of the primates with the ID-ED task did in fact show activity in the OFC for reversal tasks and dorsal lateral cortex for ED tasks (Dias, et al., 1996). It cannot be certain that the same holds true for humans and there are no large studies to confirm this.

The only research using the ID-ED task with humans has been single cases of neurological damage, following accidents. Patients with lesions to their OFC appear to have difficulty with reversal learning and extinction tasks (Damasio, 1994). However, for these cases, the damage to the OFC was acquired and not because of developmental dysfunction and therefore it cannot be certain whether other areas of the brain were effected by the accident. In addition, the total lack of errors on the ID task indicates a floor effect for the ID task with these children. They all found it easy and therefore a more sensitive measure of ID learning should have been used. This brings into question the validity of the ID-ED task to measure OFC function in adults and in particular in children, where the frontal lobes are not fully developed.

Finally, it may be possible that OFC is only activated when levels of reward and punishment to changing behaviour are quite high, similar to the amygdala (Adolphs, et

al., 1999). A message concerning correctness of response, or number of mice obtained, are not high levels of reward or punishment.

4.5.4.2 The Snake Game (Fine & Blair, in press)

As noted in the literature review, The Snake Game (Fine & Blair, in press) is only in its pilot stage. To date it has only been tested with adults and therefore there is a lack of studies testing its validity or reliability or its applicability for use with children. More importantly, its suitability for use with children has not been examined. The frontal lobes are not fully developed until adolescence. It is possible that this measure is not sensitive enough for use with children and in fact, performance data may not reflect difficulty with reversal errors but the participants not fully understanding the task. The investigator observed that some children never acquired the understanding and relationship of colour in The Snake Game. They appeared to be looking for higher order explanations. For example, a number of participants proposed that there was some pattern in the sequence of colours or in the position of colours. When their predictions were not supported, they developed further elaborate contingencies, as explanations for the rationale behind the game.

4.5.4.3 The Psychopathy Screening Device (PSD), (Frick & Hare, in press)

As highlighted by Blair (1995), a high score on the PSD indicates high levels of current behaviour problems. This is very different from a PCL-R high score, which indicates a high level of long term behavioural disturbance. If chronicity is a central trait of

psychopathy, which many researchers would say it is, then the PSD is, in fact, not indexing this crucial factor. It is therefore possible that more children would have received higher psychopathic tendencies' scores, if chronicity had been taken into account.

4.7. CHANGES TO BE MADE TO THE STUDY

Based upon the above issues, a number of changes would be needed in order to replicate this study. Recognising that the lack of validation of The Snake Game is an issue that can only be addressed through further use. However, other changes can be introduced. Like all studies, a larger sample in terms of numbers is beneficial. In addition, more socio-economic data could be collected to build up a detailed profile for each participant that could offer further explanations for their performance, not just their age, IQ and PSD and DuPaul scores. The procedure has to include a colour blind screening test and any participants with difficulties in this area are not to be included. Parental ratings should be collected alongside anonymous teacher ratings, to give a true reflection of the child's level of behaviour problems. Only children receiving the extreme ends of scores should be included in the study. These children are more likely to be found in borstals and recruitment of only the 15 –17 year olds in these establishment should be aimed for, rather than younger children in EBD schools. Finally, if possible, a consistent room for testing to be arranged.

4.8 IMPLICATIONS AND DIRECTIONS OF FUTURE RESEARCH

There is an obvious need to replicate this study, with all the above issues and problems addressed. Unfortunately, the overall aim of the thesis has not been met in that it has not given further clarity to the understanding of the development of psychopathy. However, this study has also brought together fractionated pieces of research and theory that up until now have been written in isolation, without any acknowledge of the existing alternatives. In doing so it has offered a focus for subsequent research, i.e. using functional imaging techniques with highly psychopathic individuals involved in real life tasks. It has also given challenge to the idea that psychopathy is ‘untreatable’ by indicating that psychopathy may be based upon cognitive dysfunctions, not just social factors. By identifying these cognitive difficulties, for example difficulties with empathy, more attention can be given to those related treatment regimes.

It is hoped that future research is not discouraged by the findings here as trying to find links between proposed models and findings of psychopathy remains an important, if not crucial, area of research. The present situation still lacks clarity, with the number of competing models vying for position as overall main causal model. As yet, no one model offers an explanation for all the characteristics associated with psychopathy.

Finally, as regards the ‘prevention better than cure’ stance, it still appears difficult to gain a full picture of causal and risk factors for the development of psychopathy. What this study has highlighted is that this may not be possible. Even if a fledging psychopath could be identified at an early age, what could be done for them at that age? If it does emerge that central to the development of psychopathy is a particular brain region’s

dysfunction, does prevention then indicate neuro-surgery or a comprehensive bio-psycho-social therapeutic programme from an early age? Either way the cost in financial and ethical terms will be high.

There are well-established findings already in place regarding risk factors for mental health problems. Yet, little is being done by society to address these. Is there then any likelihood that an expensive programme aimed at prevention of a vaguely defined syndrome, which is not manifesting in childhood or that is predicted with only a degree of certainty, will be supported and funded? With the number of behavioural traits involved in classification of psychopathy and the developmental nature of most of these, society may have to wait until the child becomes a psychopath before it intervenes. However, at the point of intervention, if future efforts are made towards understanding the traits to psychopathy at least appropriate and effective interventions can be hoped for.

REFERENCES

- Andy, O. J. (1975) Thalamotomy for psychopathic behaviour. *Southern Medical Journal*, **68**, 437-442.
- Adolphs, R., Tranel, D. & Damasio, A. (1994) Impaired recognition of emotion in facial expressions. *The Journal of Neuroscience*, **16**, 7678-687.
- Adolphs, R., Russell, J.A., & Tranel, D. (1999) A role for the human amygdala in recognising emotional arousal from unpleasant stimuli. *Psychological Science*, **10**, 167-71.
- American Psychiatric Association (1994) *Diagnostic and Statistical Manual for the Mental Disorders, 4th Edition*. Washington, DC: APA.
- Arsenio, W.F. & Fliess, K. (1996) Typical and behaviourally disruptive children's understanding of the emotional consequence of social moral events. *British Journal of Developmental Psychology*, **14**, 173-86.
- Barbour-McMullen, J., Coid, J. & Howard, R.C. (1988) The psychometric identification of psychopathy in mentally abnormal offenders. *Personality and Individual Differences*, **9**, 817-23.

- Bechara, A., Damasio, A.R., Damasio, H. & Anderson, S.W. (1994) Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, **50**, 7-15.
- Bernstein, D. P., Cohen, P. & Velez, C.N. (1993) Prevalence and stability of DSM-III-R personality disorders in a community based sample of adolescents. *American Journal of Psychotherapy*, **150**, 1237-43.
- Blackburn, R. (1983) Are personality disorders treatable? *Issues in Criminology and Legal Psychology*, **4**, 23-26.
- Blackburn, R. (1986) Patterns of personality deviation among violent offenders: Replication and extension of an empirical taxonomy. *British Journal of Criminology*, **26**, 254-269.
- Blackburn, R. (1988) On moral judgements and personality disorders: The myth of psychopathic personality revisited. *British Journal of Psychiatry*, **153**, 505-512.
- Blair, R.J.R. (1995) A cognitive developmental approach to morality: Investigating the psychopath. *Cognition*, **57**, 1-29.
- Blair, R.J.R. (1997) Moral reasoning in the child with psychopathic tendencies. *Personality and Individual Differences*, **22**, 731-739.

- Blair, R.J.R. (in press) Responsiveness to distress cues in children with psychopathic tendencies.
- Blair, J.R.J., Jones, L., Clark, F. & Smith, M. (1995a) Is the psychopath morally insane? *Personality and Individual Differences* , **22**, 731-739.
- Blair, R.J.R., Sellars, C., Strickland, I., Clark, F., Williams, A.O., Smith, M. & Jones, L. (1995b) Emotion attributions in the psychopath. *Personality and Individual Differences*, **19**, 431-437.
- Blair, R.J.R., Jones, L., Clark, F. & Smith, M. (1997) The psychopathic individual: A lack of responsiveness to distress cues? *Psychophysiology*, **34**, 192-198.
- Blair, R.J.R., Morris, J.S., Frith, C.D., Perrett, D.I., & Dolan, (1999) Dissociable Neural responses to facial expressions of sadness and anger. *Brain*, **122**, 883-93.
- Bluglass, R. (1988) Psychiatric approaches to aggression and violence. *Issues in Criminology and Legal Psychology*, **12**, 24-33.
- Butler, A. (1975) *Report of Committee on Mentally Disordered Offenders*. Home Office and Department of Health And Social Security, Cmnd 6244. London: HMSO
- Carney, F.L. (1977) Some recurring therapeutic issues in group psychotherapy with criminal patients. *American Journal of Psychotherapy*, **26**, 34-41.

Chiswick, D. (1992) Compulsory treatment of patients with psychopathic disorder: An abnormally aggressive or seriously irresponsible exercise. *Criminal Behaviour and Mental Health*, **2**, 106-13.

Cleckley, H. (1976) *The Mask of Sanity* (4th Ed). St. Louis: C.V. Mosby & Co.
(First published in 1946).

Cohen, H. & Filippczak, J. (1971) *A New Learning Environment*. San Fran: Jossey-Bass.

Coid, J. (1992) DSM-IV III diagnosis in criminal psychopaths: A way forward. *Criminal Behaviour and Mental Health*, **2**, 78-79.

Coid, J. & Cordless, C. (1992) Compulsory admission of dangerous psychopaths. *British Medical Journal*, **304**, 1581-1582.

Cooke, D. J. & Michie, C. (1999) Psychopathy across cultures: North America and Scotland compared. *Journal of Abnormal Psychology*, **101**, 58-68.

Cornell, D.G., Warren, J., Hawk, G., Stafford, E., Oram, G. and Pine, D. (1996) Psychopathy in instrumental and reactive violent offenders. *Journal of Consulting and Clinical Psychology*, **64**, 783-790.

Craft, M., Ismail, I.A. & Krishnamurth, D. (1987) Lithium in the treatment aggression in mentally handicapped patients: A double blind trial. *British Journal of Psychiatry*, **150**, 685-689.

Damasio, A.R. (1994) *Descartes' error: Emotion, rationality, and the human brain*. New York: Putman (Grosset Books).

Dias, R., Robbins, T.W. & Roberts, A.C. (1996) Dissociation in prefrontal cortex of affective and attentional shifts. *Nature*, **380**, 69-72.

Dolan, B. & Coid, J. (1995) *Psychopathic and Antisocial Personality Disorders: Treatment and Research Issues*. London: Gaskell.

Dolan, B., Evans, C.D. & Wilson, J. (1992) Therapeutic community treatment for personality disordered adults: Changes in neurotic symptomology and length of stay on follow up. *International Journal of Social Psychiatry*, **38**, 243-250.

DuPaul, P. (1991) A rating scale for attention deficit hyperactivity disorder. *British Journal of Developmental Psychology*, **7**, 237-50.

Dunn, L.M., Dunn, L. M., Wheklan, C., & Pintillie, D. (1982) *British Picture Vocabulary Scale*. Windsor, UK: NFER-Nelson.

- Eibl-Eibesfeldt, I. (1970) *Ethology: The Biology of Behaviour*. New York: Holt, Rinehart & Winston.
- Eppright, T.D., Kashani, J.H. & Robinson, B.D. (1993) Co-morbidity of conduct disorder and personality disorders in an incarcerated juvenile population. *American Journal of Psychiatry*, **150**, 1233-1236.
- Eslinger, P. J. & Damasio, A. R. (1985) Severe disturbance of higher cognition after bilateral frontal lobe ablation: Patient EVR. *Neurology*, **35**, 1731-41.
- Eysenck, H.J. (1964) *Crime and Personality*. London: Routledge & Kegan Paul.
- Farrington, D., Loeber, R. & van Kammen, W.B. (1990) Long-term criminal outcomes of hyperactivity-impulsivity-attention deficits and conduct problems in childhood. In L.N.Robins & M. Rutter, (Eds.) *Straight and Devious Pathways from Childhood to Adulthood*.
- Fine, C. & Blair, R.J.R. (in press) Discrepant reinforcement, somatic markers and behavioural change: The role of autonomic arousal.
- Fisher, L. & Blair, R. J. R (1998) Cognitive impairment and its relationship to psychopathic tendencies in children with emotional and behavioural difficulties. *Journal of Abnormal Child Psychology*, **26**, 511-19.

Forth, A. (1995) Psychopathy in adolescent offenders: Assessment, family background and violence. *Issues in Criminology and Legal Psychology*, **24**, 42-44.

Frick, P.J. & Hare, R.D. (in press) *The Psychopathy Screening Device*. Toronto: Multi-Health Systems.

Frick, P.J., O'Brien, B. S., Wootton, J.M. & McBurnett, K. (1994) Psychopathy and conduct problems in children. *Journal of Abnormal Psychology*, **103**, 700-07.

Frith, U. (1998) Cognitive difficulties in developmental disorders. *Scandinavian Journal of Psychology*, **39**, 191-195.

Frosch, J.P. (1983) The treatment of antisocial and borderline personality disorders. *Hospital Community Psychiatry*, **34**, 243-248.

Golombek, H., Marton, P. & Stein, P. (1986) Personality dysfunction and behavioural disturbance in early adolescence. *Journal of the American Academy Child Psychiatry*, **25**, 697-703.

Gorenstein, E. E. & Newman, J.P. (1980) Disinhibitory psychopathology: A new perspective and a model for research. *Psychological Review*, **37**, 301-15.

Gray, J.A. (1971) *The Psychology of Fear and Stress*. Cambridge, UK: Cambridge University Press.

- Green, E., Silverman, D. & Geil, G. (1944) Petit mal electro shock therapy of criminal psychopaths. *Journal of Criminal Psychopathology*, **5**, 667-695.
- Gunn, J. & Robinson, G. (1976) Psychopathic personality: A conceptual problem. *Psychological Medicine*, **6**, 631-634.
- Hare, R.D. (1970) *Psychopathy: Theory and Research*. New York: Wiley.
- Hare, R.D. (1991) *The Hare Psychopathy Checklist-Revisited*. Toronto, Ontario: Multi-Health Systems.
- Hare, R.D. (1993) *Without Conscience: The Disturbing World of the Psychopaths Amongst Us*. New York: Simon & Schuster.
- Harpur, T.J. & Hare, R.D. (1994) Assessment of psychopathy as a function of age. *Journal of Abnormal Psychology*, **103**, 604-09.
- Hart, S. D. & Hare, R. D. (1996) Psychopathy and antisocial personality disorder. *Current Opinion in Psychiatry*, **9**, 129-132.
- Hart, S. D., Kropp, P.R. & Hare, R. D. (1988) Performance of male psychopaths following conditional release from prison. *Journal of Consulting and Clinical Psychology*, **56**, 227-232.

- Herbert, M. (1987) *Conduct Disorders of Childhood and Adolescence: A Social Learning Perspective (2nd Ed)*. Chichester: Wiley.
- Johns, J. H. & Quay, H. C. (1962) The effect of social reward on verbal conditioning in psychopathic and neurotic military offenders. *Journal of Consulting and Clinical Psychology*, **26**, 217-220.
- Jones, F.D., Stayer, S.J. & Wichlaz, C.R. (1977) Contingency management of hospital diagnosed character and behaviour disordered soldiers. *Therapy and Experimental Psychiatry*, **8**, 333.
- Jutai, J.W. & Hare, R. D. (1983) Psychopathy and selective attention during performance of a complex perceptual motor task. *Psychophysiology*, **20**, 146-151.
- Klein, R.G. & Mannuzza, S. (1991) Long-term outcome of hyperactive children: A review. *Journal of the American Academy of Child and Adolescent Psychiatry*, **30**, 383-387.
- Loeber, R. (1982) The stability of antisocial and delinquent child behaviour: A review. *Child Development*, **53**, 1431-1446.
- Lorenz, K (1981) *The Foundation of Ethology*. New York: Springer-Verlag.

- Lykken, D. T. (1957) A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology*, **55**, 6-10.
- McCord, J. (1982) *The Psychopath and Milieu Therapy: A Longitudinal Study*. New York: Harcourt Brace Jovanich.
- Mellsop, G., Varghese, F. & Joshua, T. (1982) The reliability of Axis II. *American Journal of Psychiatry*, **139**, 1360-1361.
- Mitchell, D. & Blair, J. (2000) State of the art: Psychopathy. *The Psychologist*, **13**, 356-360.
- Moffitt, T.E. (1993) Adolescence limited and life course persistent antisocial behaviour: A developmental taxonomy. *Psychological Review*, **100**, 674-701.
- Newman, J.P. & Kosson, D. S. (1986) Passive avoidance learning in psychopathic and non-psychopathic offenders. *Journal of Abnormal Psychology*, **95**, 252-256.
- Newman, J.P., Patterson, C.M. & Kosson, D.S. (1987) Response perseveration in psychopaths. *Journal of American Psychology*, **96**, 145-48.

- Newman, J.P., Schmitt, W.A., & Vass, W.D. (1997) The impact of motivationally neutral cues on psychopathic individuals: Assessing the generality of the response modulation hypothesis. *Journal of Abnormal Psychology*, **106**, 563-575.
- Norris, M. (1984) *Integration of Special Hospital Patients into the Community*. London: Gower.
- Nucci, L. P. & Herman, S. (1982) Behavioural disordered children's conceptions of moral, conventional and personal issues. *Journal of Abnormal Child Psychology*, **10**, 411-425.
- Offord, D.R. (1982) Family backgrounds of male and female delinquents. In J. Gunn & D.P. Farrington (Eds.) *Abnormal Offenders, Delinquency and the Criminal Justice System* Chichester: Wiley.
- Patrick, C. J. (1994) Emotion and psychopathy: Startling new insights. *Psychophysiology*, **31**, 319-30.
- Patterson, C. M. & Newman, J. P. (1993) Reflectivity and learning from aversive events: Toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review*, **100**, 716-36.

- Patrick, C.J., Bradley, M.M. & Lang, P.J. (1993) Emotion in the criminal psychopath: Startle reflex modulation. *Journal of Abnormal Psychology*, **102**, 82-92.
- Pennington, B.F. & Ozonoff, S. (1996) Executive functions and developmental psychopathology. *Journal of Child Psychology & Psychiatry*, **37**, 51-87.
- Pennington, B.F. & Bennetto, L. (1993) Main effects or transaction in the neuropsychology of conduct disorder? Commentary on 'The neuropsychology of conduct disorder'. *Development and Psychopathology*, **5**, 153-64.
- Quality Assurance Project (1991) Treatment outlines for antisocial personality disorder. *Australian and New Zealand Journal of Psychiatry*, **25**, 541-547.
- Quay, H. C. (1993) The psychobiology of under socialised aggressive conduct disorder: A theoretical perspective. *Development and Psychopathology*, **5**, 165-180.
- Reckless, J.B. (1970) Enforced out-patient treatment of advantaged pseudosociopathic neurotically disturbed young women. *Canadian Psychiatric Association Journal*, **15**, 335-345.
- Robins, L.N. (1966) *Deviant children Grow Up: A Sociological and Psychiatric Study of Sociopathic Personality*. Baltimore: Williams & Wilkins.

- Robins, L.N. (1974) Antisocial disturbances in childhood. In Anthony & Koupernik (Eds). *The Child in His Family* London; Wiley.
- Robins, L.N. (1978) Sturdy childhood predictors of adult antisocial behaviour: Replications from longitudinal studies. *Psychological Medicine*, **8**, 611-22.
- Robins, L.N. (1981) Epidemiological approaches to natural history research: Antisocial disorders in children *Journal of the American Academy of Child Psychiatry*, **20**, 556-580.
- Rolls, E. T. (1997) The orbito-frontal cortex. *Philosophical Transactions*, **B 351**, 1433-44.
- Rutter, M. (1975) Attainment and adjustment in two geographical areas: I The prevalence of psychiatric disorder. *British Journal of Psychiatry*, **126**, 493-509.
- Rutter, M. & Giller, H. (1983) *Juvenile Delinquency: Trends and Perspectives*. Harmondsworth: Penguin.
- Rutter, M. & Plomin, R. (1997) Opportunities for psychiatry from genetic findings. *British Journal of Psychiatry*, **171**, 209-219.
- Scott, P. D. (1963) Psychopathy. *Postgraduate Medical Journal*, **39**, 1-7.

- Skekim, W.O., Masterson, A. & Cantwell, O.P. (1989) Nomifensine maleate in adult attention deficit disorder. *Journal of Nervous and Mental Disease*, **177**, 296-99.
- Smetana, J.G. (1981) Preschool children's conceptions of moral and social rules. *Child Development*, **52**, 1333-36.
- Smetana, J.G. (1985) Preschool children's conceptions of transgressions: The effects of varying moral and conventional domain-related attributes. *Developmental Psychology*, **21**, 18-29.
- Smetana, J.G. (1993) Understanding of social rules. In M. Bennett (eds.), *The Child as Psychologist: An Introduction to the Development of Social Cognition*. New York: Harvester Wheatsheaf.
- Stafford-Clarke, D., Pond, D. & Doust, J. W. L. (1951) The psychopath in prison: A preliminary report. *British Journal of Delinquency*, **2**, 117-129.
- Taylor, A. J. W. (1967) An evaluation of group therapy in a borstal. *International Journal of Group Therapy*, **17**, 168-177.
- Taylor, E. (1999) Hypofrontality in ADHD during higher-order motor control: A study with functional MRI. *American Journal of Psychiatry*, **156**, 891-896.

- Taylor, E., Chadwick, O., Heptinstall, E. & Danckaerts, M. (1996) Hyperactivity and conduct problems as risk factors for adolescent development. *Journal of the American Academy of Child and Adolescent Psychiatry*, **35**, 1213-1226.
- Tennent, G. & Way, (1984) The English Special Hospital: A 12-17 year follow-up study. *Medicine, Science and the Law*, **24**, 81-91.
- Valliant, P. M., Asu, M. E. & Cooper, D., (1984) Profile of dangerous and non dangerous offenders referred for pre-trial psychiatric treatment. *Psychological Review*, **54**, 411-18.
- Vaglun, P., Irion, T & Jons, E. (1990) Treatment response of severe and non-severe personality disorders in a therapeutic community day unit. *Journal of Personality Disorders*, **2**, 161-172.
- Walker, M. & McCabe, S. (1973) *Crime and Insanity in England*, vol. 2. Edinburgh: Edinburgh University Press.
- Wallace, J.F., Vitale, J., Newman, J.P. (1999) Response modulation deficits: Implications for the diagnosis and treatment of psychopathy. *Journal of Cognitive Psychotherapy*, **13**, 55-70.

World Health Organisation (1989) *Tenth Revision of the International Classification of Disease, Chapter V(F), Mental and Behavioural Disorders (Including Disorders of Psychological Development)*. Geneva: WHO.

Wootton, J. M., Frick, P. J., Shelton, K. K. & Silverthorn, P. (1997) Ineffective parenting and childhood conduct problems: The moderating role of callous / unemotional traits. *Journal of Consulting and Clinical Psychology*, **65**, 301-308.

Young, A.W., Newcombe, F., de Hau, E.H., Small, M. & Hay, D.C. (1993) Face perception after brain injury: Selective impairments affecting identity and expression. *Brain*, **116**, 941-59.

Zald, D.H. & Kim, S.W. (1996) The amygdala and orbito-frontal cortex: Connections. *Journal of Neuropsychiatry & Clinical Neuroscience*, **8**, 125-138.

Zald, D.H. & Pardo, J.V. (1997) Emotion, olfaction and the human amygdala: Amygdala activation during aversive olfactory stimulation. *Proceedings of the National Academy of Science, USA*, **94**, 4119-124.

Zoccolillo, M., Pickles, A., Quinton, D & Rutter, M. (1992) The outcome of childhood conduct disorder: Implications for defining adult personality disorder and conduct disorder. *Psychological Medicine*, **22**, 971-986.

Appendix A.

Parental Permission Letter

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Head-Teacher Letter

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September 1999

Dear Parent / Guardian

We are conducting research in order to assess children's ability to concentrate, make decisions and then change focus. This will help us to understand the strengths and weaknesses of children in these areas.

We will be conducting our study at XXXXX School, with the consent of XXXXXXXX, Headteacher. Your child is invited to take part in this work, which will take no more than 2 x 30 minutes.

Your child will be asked to play two computer games. The first game shows two shapes at a time. Your child has to decide which shape is right or wrong, according to a pattern. The second game is like a card game. Your child will be asked at each stage whether they want to continue to play the game, or end it. The longer they play, the more points they can earn. However, the risk of losing increases the longer the game is played. Previous research has shown that children enjoy playing these computer games.

If you have any questions do not hesitate to contact either Dr. James Blair or myself.

Yours faithfully

Ms. Christine Potter
Researcher

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September 1999

Dear Mr. XXXXXX

I am a researcher at University College London, working with Dr. James Blair. We are currently engaged in a research programme investigating the emotional difficulties underlying behavioural problems. The research has Welcome Trust funding and ethical approval has already been granted.

Our research involves computer based presentation of pictures, for which each child has to decide which picture or shape is the correct one. If their choice is correct they are rewarded with points. We have found that most children enjoy these tasks.

Currently we are carrying out this research in schools in north and central London. However, we are looking to expand the number of locations where the research is carried out and therefore we are approaching you to request the possibility of working at your school.

I would need to spend approximately 30 minutes with each child on two occasions and ask their teachers to complete a questionnaire on each child (this usually takes no more than 2 minutes). There will be no specific reference to individual children in the analysis or presentation of the research findings. I enclose the research proposal, a copy of the letter to send to parents and a copy of the teachers questionnaire.

If you would like more information, please do not hesitate to call me. I would be delighted if I could come and discuss our work in person. I hope it will be possible for me to visit your school. I shall call you in a few days to discuss this.

Yours sincerely

Ms. Christine Potter

Researcher

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Appendix B.

Details of the ID-ED Task

&

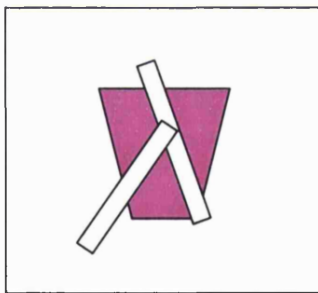
Details of the Snake Game

The ID-ED Task (Dias, et al., 1996)

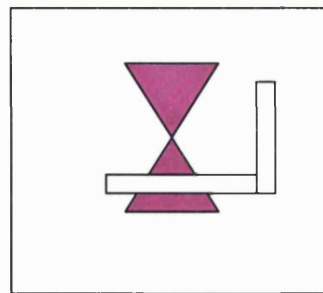
Start of the Task

The task begins with 2 boxes appearing on the screen. In each box is a pink polygon paired with a set of white lines. The participant has to guess which is the 'correct' box, by clicking on the box they think is the 'correct' one with the mouse.

One of the pink polygons is the 'correct' one and the white lines are irrelevant. At the start of the game, polygon A below is the 'correct' polygon. Clicking on the box that contains polygon A, regardless of which set of white lines are present, will result in a 'correct' message appearing on the screen. If polygon B is chosen, the message 'wrong' appears.



A
'correct'

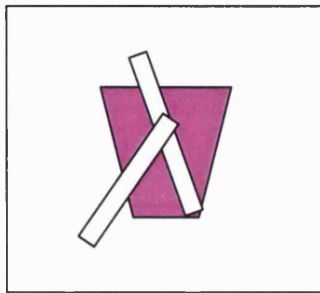


B
'wrong'

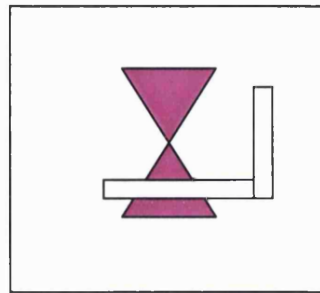
The shape of the polygons and the white lines stay constant for each phase of the task but the pairings of the two dimensions and the positions of the boxes are random. After 8 consecutive correct responses, i.e. clicking on whichever box contains polygon A, the task moves onto the next phase. There are three phases: reversal learning, intra-dimensional shifting (ID) and extra-dimensional shifting (ED).

1) Reversal Learning:

After 8 consecutive correct responses, the reward association is reversed, and changes to polygon B. The participant now has to choose the box with polygon B to gain the 'correct' message.



A
'wrong'

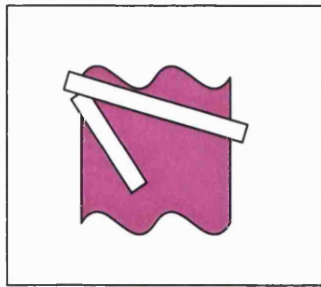


B
'correct'

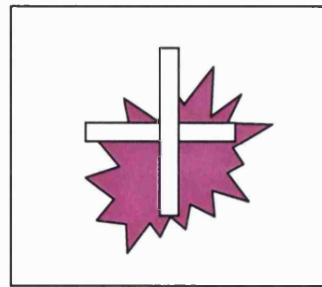
After 8 consecutive correct responses, the task moves onto the second phase.

For Intra-Dimensional (ID) shifting:

The participant has to be able to retain the same attentional set of responding to the pink polygons but adjust to the novel stimuli of new shapes of polygons, i.e. the pink polygons remain the dimension associated with reward, but their shapes change – see below. In this phase, again one of the polygons is the 'correct' one (polygon C) and then the reward association changes (a second reversal learning) to the other polygon (polygon D) after 8 consecutive 'correct' responses. The white lines remain irrelevant.



C

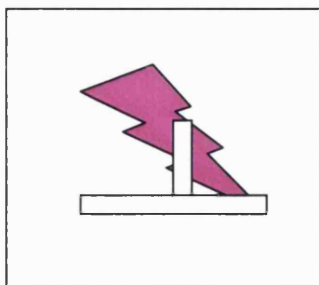


D

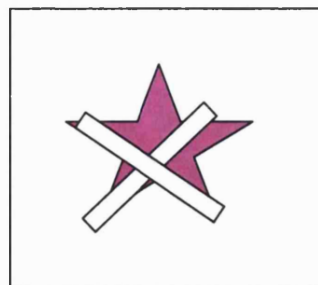
After 8 consecutive 'correct' responses following the second reversal, the task moves onto the third phase.

For Extra-Dimensional (ED) shifting:

The participant has to inhibit their previously rewarded response of choosing the 'correct' polygon and now shift to their attention to the white lines, i.e. the white lines are now the dimension associated with reward and the pink polygons are irrelevant. Again, one of the sets of white lines starts off as the 'correct' set (set E) and after 8 consecutive 'correct' responses, the reward association is reversed and the alternative set become the 'correct' ones (set F).



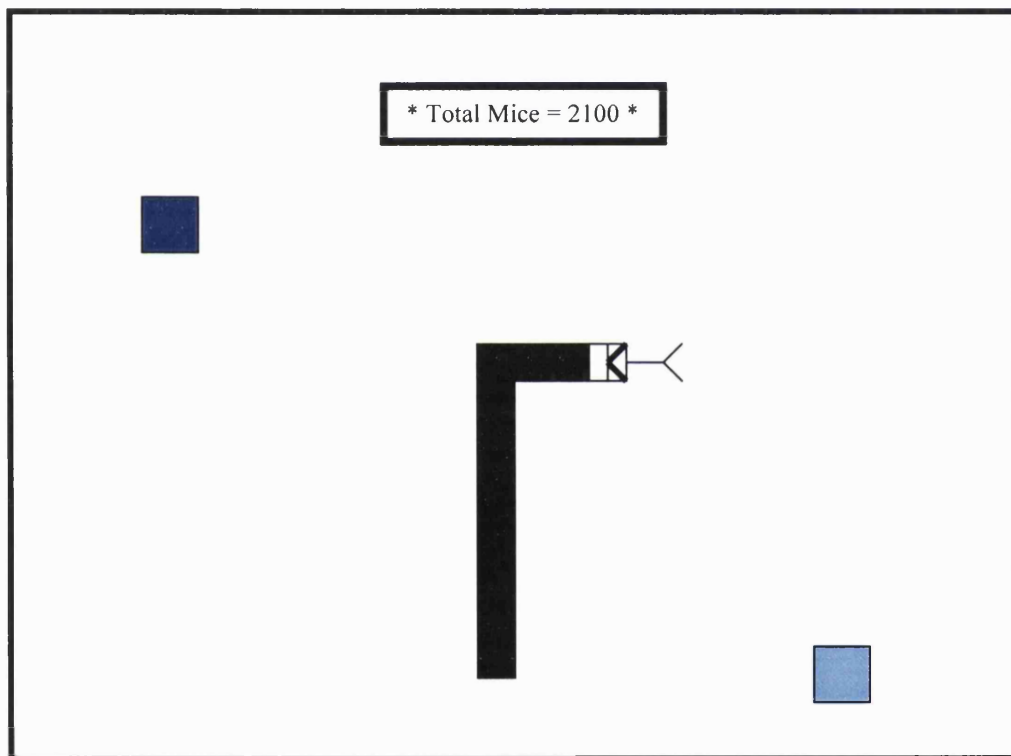
E













F

The Snake Game (Fine & Blair, in press)

The participant moves the snake using the arrow keys on the keyboard and directs the snake to the coloured token of their choice. On reaching the token, a message appears on the screen informing the participant whether they have 'won' mice for the snake or had mice 'taken away'. As the game progresses, the coloured tokens change by reversing their values, i.e. 'winning mice' tokens become 'losing mice' tokens and vice versa. Hence, the participants have to inhibit their previously rewarded response and learn the new reward associations.



Introduction:	 Dark Blue tokens 'win mice'	 Light Blue tokens 'win mice'
Phase:	 Red tokens 'lose mice'	 Yellow tokens 'lose mice'
2 nd Phase:	 Dark Blue tokens 'lose mice'	 Light Blue tokens 'win mice'
	 Red tokens 'win mice'	 Yellow tokens 'lose mice'
3 rd Phase:	 Dark Blue tokens 'lose mice'	 Light Blue tokens 'lose mice'
	 Red tokens 'win mice'	 Yellow tokens 'win mice'

Appendix C.

Problem Behaviour Questionnaire

Problem Behaviour Questionnaire

Name of Child: _____ Sex: _____ DOB: _____ Year: _____

Name of Teacher: _____ Today's Date: _____

How long has the child been in your class? (months) _____

Instructions: (after completing the background information above)

Please read each statement below and decide how well it describes the above child. Give your answers by circling the appropriate number for each statement. Please do not leave any statement unrated.

	Not at all True 0	Sometimes True 1	Definitely True 2
1. Blames others for his/her mistakes	0	1	2
2. Engages in illegal activities.....	0	1	2
3. Is concerned about how well he/she does at school	0	1	2
4. Acts without thinking of the consequences.....	0	1	2
5. His/her emotions seem shallow and not genuine.....	0	1	2
6. Lies easily and skilfully.....	0	1	2
7. Is good at keeping promises.....	0	1	2
8. Brags excessively about his/her abilities, accomplishments or possessions	0	1	2
9. Gets bored easily.....	0	1	2
10. Uses or 'cons' other people to get what he/she wants.....	0	1	2
11. Teases or makes fun of other people.....	0	1	2
12. Feels bad or guilty when he/she does something wrong.....	0	1	2
13. Engages in risky or dangerous activities.....	0	1	2
14. Can be charming at times, but in ways that seem insincere or superficial	0	1	2
15. Becomes angry when corrected or punished.....	0	1	2
16. Seems to think that he/she is better than other people.....	0	1	2
17. Does not plan ahead or leaves things until the last minute.....	0	1	2
18. Is concerned about the feelings of others.....	0	1	2
19. Does not show feelings or emotions.....	0	1	2
20. Keeps the same friends.....	0	1	2

	Not at all	Just a little	Pretty much	Very much
21. Often fidgets or squirms.....	0	1	2	3
22. Has difficulty remaining seated.....	0	1	2	3
23. Is easily distracted.....	0	1	2	3
24. Has difficulty waiting for turn in groups.....	0	1	2	3
25. Often blurts out answers.....	0	1	2	3
26. Has difficulty following instructions.....	0	1	2	3
27. Has difficulty sustaining attention to tasks.....	0	1	2	3
28. Often shifts from one uncompleted activity to another.....	0	1	2	3
29. Has difficulty playing quietly.....	0	1	2	3
30. Often talks excessively.....	0	1	2	3
31. Often interrupts or intrudes on others.....	0	1	2	3
32. Often does not seem to listen.....	0	1	2	3
33. Often loses things necessary for tasks.....	0	1	2	3
34. Often engages in physically dangerous activities without considering consequences	0	1	2	3

Comments:

.....

.....

.....

.....

****NB Items 1 – 20 are The Psychopathy Screening Device (Frick & Hare, in press)
Items 21 – 34 are The DuPaul Rating Scale (DuPaul, 1991)**

Appendix D.

Instructions for the ID-ED Task

&

Instructions for the Snake Game

☺ Instructions for the ID-ED Task ☺

- The computer will always show you 2 pictures on the screen
- You have to decide which picture is the “correct” one
- To do this – move the mouse to the picture you think is the “correct” one and click on it
- The computer will tell you if you are “correct” or “wrong”
- From time to time, there may be changes in which is the correct picture. Also the pictures may change
- Try to chose the correct picture as much as possible

☺ Instructions for the Snake Game ☺

- You are in control of a snake.
- The snake is very hungry and needs to eat as many mice as possible.
- On the screen you will 2 tokens.
- These tokens either give you mice for the snake to eat
or
they take mice away from the snake
- You have to decide which token will give the snake some mice and direct the snake to it
- To do this you use the arrow keys on the keyboard.

The up arrow to move the snake upwards

The down arrow to move the snake down

The left arrow ← to move the snake to the left

The right arrow → to move the snake to the right

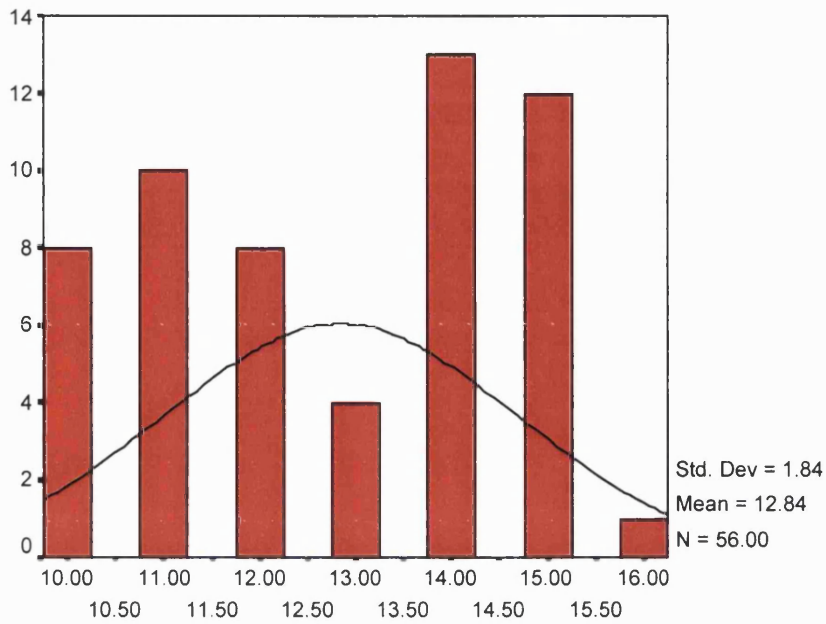
- Once the snake gets to your chosen token, the computer will tell you if you have won mice for the snake or had them taken away
- The total number of mice is displayed at the top of the screen

Remember, the snake is very hungry so try hard to get as many mice as possible!!!

Appendix E.

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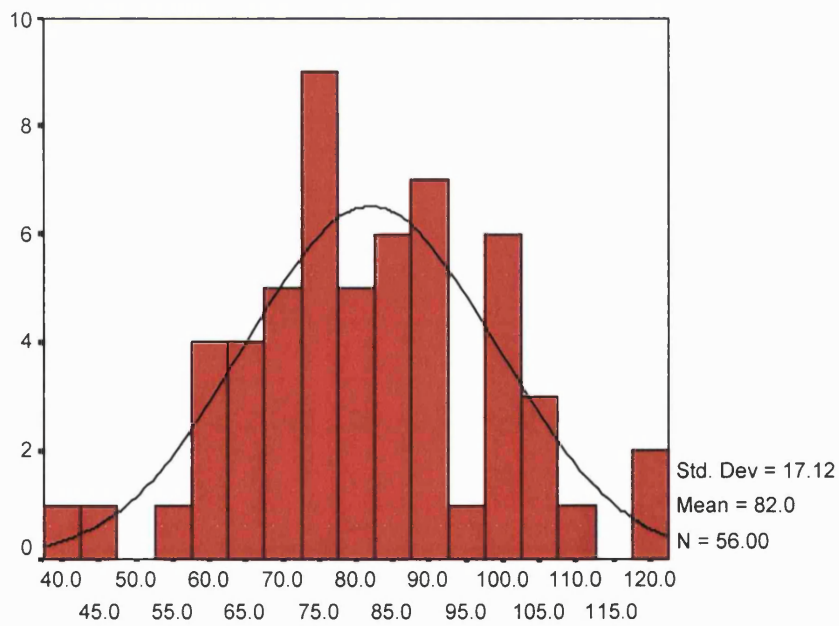
Appendix E 1. Histogram and Normal Curve for Age



age

Skewness = - 0.153, p = 0.319 Kurtosis = - 0.415, p = 0.628

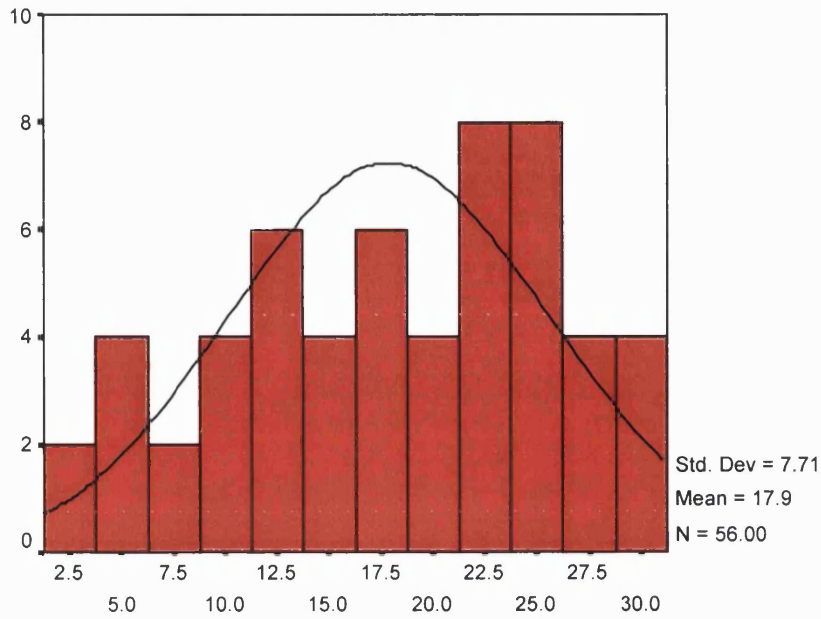
Histogram and Normal Curve for IQ



IQ

Skewness = 0.120, p = 0.319 Kurtosis = 0.0006, p = 0.628

Appendix E 2. Histogram and Normal Curve for the PSD

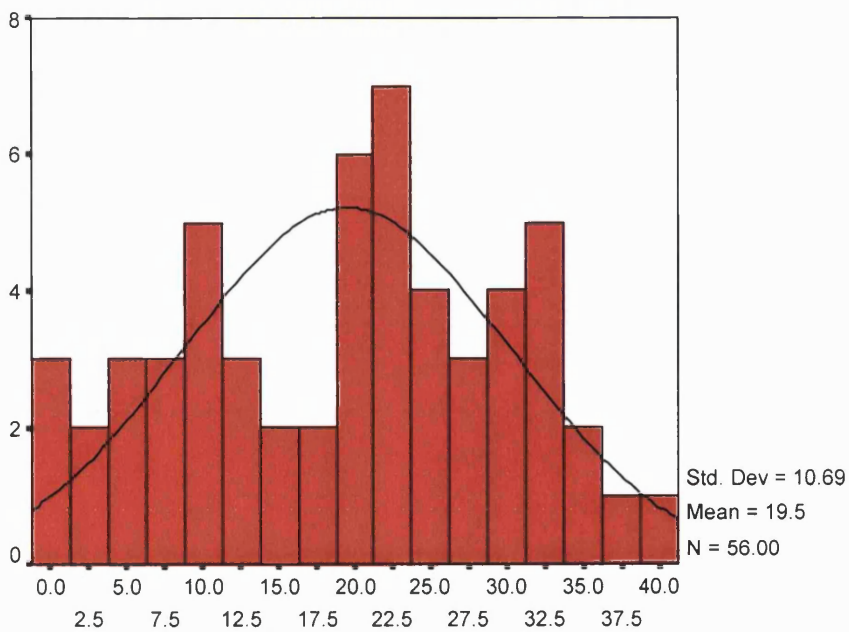


PSD-average

Skewness = - 0.366, p = 0.319

Kurtosis = 0.880, p = 0.628

Appendix E 3. Histogram and Normal Curve for the DRS



DuPaul-average

Appendix E 4. Tables of Means for all the Measures

Table 4. Overall Age & IQ means (standard deviation in brackets)

Age	IQ
12.84 (1.84)	81.96 (17.12)

Table 5. Overall Means on the Behavioural Measures

Total	PSD		Total	DuPaul	
	Factor 1 (I/CP)	Factor 2 (C/UE)		Factor 1 (Impulsive)	Factor 2 (Inattention)
17.88 (7.71)	9.03 (4.03)	4.93 (2.55)	19.48 (10.69)	11.77 (6.88)	11.92 (6.59)

Table 6. Overall Means on the Computer Tasks

The ID-ED Task			The Snake Game			
ID Errors	ED Errors	Reversal Errors	Total errors	Errors after 1 st change	Errors after 2 nd change	Errors after 3 rd change
0.45 (1.52)	7.87 (5.94)	4.39 (6.72)	15.89 (10.31)	9.11 (2.18)	7.46 (2.10)	4.86 (2.08)

Table 7. Means for Highest & Lowest Scorers on the PSD

Score	ID-ED			Total errors	Snake	Game	Errors after 3 rd change
	ID Errors	ED Errors	Reversal Errors		Errors after 1 st change	Errors after 2 nd change	
High	0.42 (1.16)	9.33 (7.70)	6.33 (8.32)	19.33 (15.02)	9.00 (2.41)	6.92 (1.56)	5.17 (1.27)
Low	0.89 (2.47)	7.94 (6.04)	5.56 (8.42)	17.44 (9.07)	9.28 (2.37)	7.11 (2.54)	4.17 (2.20)

Table 8. Means for the Highest and Lowest Scorers on the DuPaul

Score	ID-ED			Total errors	Snake	Game	Errors after 3 rd change
	ID Errors	ED Errors	Reversal Errors		Errors after 1 st change	Errors after 2 nd change	
High	0.40 (0.94)	8.40 (7.34)	4.90 (8.12)	18.25 (13.12)	9.05 (2.09)	7.65 (1.81)	5.05 (2.14)
Low	0.75 (2.36)	8.65 (5.43)	4.20 (6.86)	16.70 (9.29)	9.05 (2.44)	7.25 (2.36)	4.75 (2.17)

Appendix E 5.

Table 9. Anova Table

(Tests of Between-Subjects Effects, Dependent Variable: ORDER)

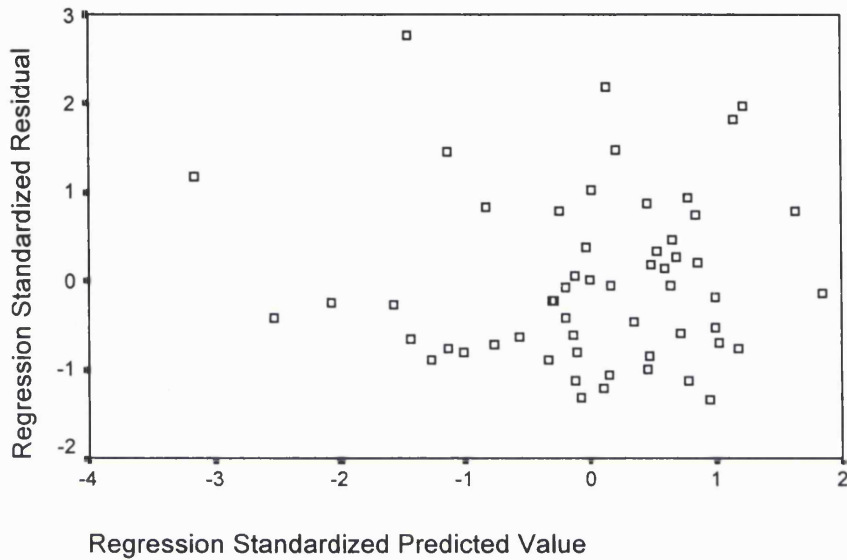
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13.000	47	.277	2.213	.117
Intercept	49.983	1	49.983	399.860	.000
R.ERR	2.454	10	.245	1.963	.176
ED.ERR	4.294	18	.239	1.908	.177
ID.ERR	.917	2	.458	3.667	.074
R.ERR * ED.ERR	3.508	11	.319	2.551	.097
R.ERR * ID.ERR	.000	0	.	.	.
ED.ERR * ID.ERR	.250	1	.250	2.000	.195
R.ERR * ED.ERR * ID.ERR	.000	0	.	.	.
Error	1.000	8	.125		
Total	140.000	56			
Corrected Total	14.000	55			

a R Squared = .929 (Adjusted R Squared = .509)

Appendix E 6. Homogeneity of Variance

Scatterplot

Dependent Variable: No. of Ed errors



Regression Tables

Table 10. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.361	.130	.024	5.87

Table 11. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	252.429	6	42.072	1.221	.312
	Residual	1687.696	49	34.443		
	Total	1940.125	55			

Table 12. Coefficients

Model		Unstandardised	Std. Error	Standardised	t	Sig.
		Coefficients B		Coefficients Beta		
	(Constant)	8.175	2.025		4.036	.000
	DuPaul- average	.352	.514	.633	.684	.497
	PSD- average	9.855E-02	.447	.128	.220	.827
	I/CP- average	-.692	.678	-.469	-1.020	.313
	C/UE- average	.873	.649	.375	1.346	.185
	Impulsivity- average	-.575	.417	-.666	-1.379	.174
	Inattention- average	-1.679E-02	.546	-.019	-.031	.976

Table 13. Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.11	11.82	7.87	2.14	56
Residual	-7.90	16.22	1.08E-15	5.54	56
Std. Predicted Value	-3.159	1.843	.000	1.000	56
Std. Residual	-1.345	2.763	.000	.944	56

Table 14. Independent Samples Test for ED errors and high and low scorers on the PSD

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
No. of ED errors	Equal variances assumed	.609	.442	-.361	26	.721	-.93	2.57	-6.22	4.36
	Equal variances not assumed			-.361	25.481	.721	-.93	2.57	-6.23	4.37

Table 15. Independent Samples Test on ED errors and high and low scorers on the DRS

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
No. of Ed errors	Equal variances assumed	2.354	.134	.158	34	.875	.35	2.21	-4.15	4.85
	Equal variances not assumed			.163	33.889	.871	.35	2.14	-4.01	4.71

Table 16. Independent Samples Test for Reversal Errors and high and low scorers on the DRS

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
No. of reversal errors	Equal variances assumed	.077	.784	-.080	34	.937	-.21	2.65	-5.60	5.17
	Equal variances not assumed			-.081	33.085	.936	-.21	2.63	-5.56	5.14